Environmental Product Declaration (EPD)

Declaration code: EPD-LK-GB-11.1

LAMILUX Heinrich Strunz GmbH

Light domes

Rooflight F100 and Smoke Lift Rooflight F100

Basis:

DIN EN ISO 14025
EN15804

Company-EPD
Environmental
Product **D**eclaration

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13.05.2019

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Declaration holder	LAMILUX Heinrich Strunz GmbH Zehstraße 2 95111 Rehau		
Declaration code	EPD-LK-GB-11.1		
Designation of the declared product	LAMILUX Rooflight F100 and Smoke Lift Rooflight F100		
Scope	Daylight systems for increased daylight incidence and natural ventilation and extraction.		
Basis	This EPD was compiled in accordance with EN ISO 14025:2011 and EN 15804:2012+A1:2013 erstellt. In addition the Guidance on preparing type III Environmental Product Declarations is valid. The Declaration is based on the PCR document "PCR Teil A" PCR-A-0.1:2018 and „Fenster, Flachdachfenster, Lichtkuppeln und Lichtbänder“ PCR-FE-2.1:2018 (windows, flat roof windows, light domes and continuous rooflights)		
Validity	Publication Date: 13.05.2019	Last revision: 13.05.2019	Next revision: 13.05.2024
	This verified company Environmental Product Declaration applies solely to the specified products and is valid for a period of 5 years from the date of publication in accordance with DIN EN 15804.		
LCA basis	The LCA was prepared in accordance with EN ISO 14040 and DIN EN ISO 14044. The base data include both data collected the LAMILUX Heinrich Strunz GmbH production sithe and the generic data derived from the "GaBi 8.6" database. LCA calculations were based on the "cradle to gate with options" life cycle including all upstream processes (e.g. raw materials extraction, etc.).		
Notes on publication	The "Conditions and Guidance on the Use of ift Test Documents" apply. The declaration holder assumes full liability for the underlying data, certificates and verifications.		

Prof. Ulrich Sieberath Director of institute	Dr.-Ing. Carolin Roth External verifier

1 General product information

Product definition

This EPD relates to the product group Light domes and applies to:

1 m² Rooflight F100 and Smoke Lift Rooflight F100
of the company LAMILUX Heinrich Strunz GmbH

The functional unit is declared as follows:

Considered product	Functional unit (FU)	Weight per FU
Rooflight F100	1,20m x 1,20m (1,00m²)	35,2 kg
Smoke Lift Rooflight F100	1,20m x 1,20m (1,00m²)	40,5 kg

The average unit is declared as follows:
Directly used material flows are determined using average size of the reference products (1,44 m²) and assigned to the declared unit. All other inputs and outputs in the manufacture were scaled to the declared unit as a whole, since no direct assignment to the average size is possible.

Product definition

LAMILUX Rooflight F100

- Double skin, triple skin, quad skin - synthetic glazing made of polyethylene, polycarbonate or glass fibre plastics
- Glass-fibre reinforced plastic profile
- Thermally insulated upstand made of fibre-reinforced plastics

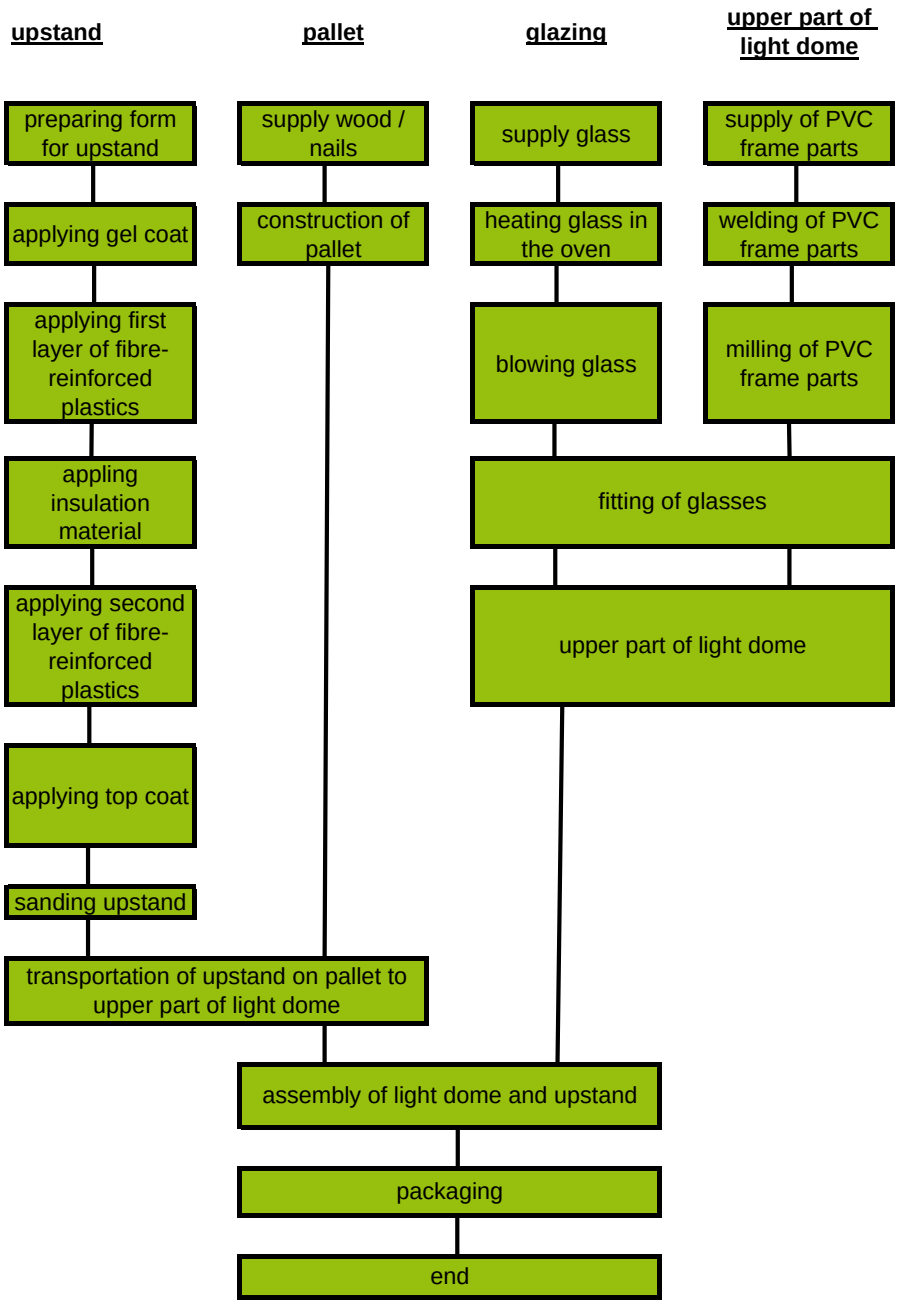
Lamilux Smoke Lift Rooflight F100

- Same construction as Rooflight F100
- Suitable for Smoke and heat exhaust ventilation systems (SHEVS)
- Also available with integrated opening device (see EPD „Electrical drives and pneumatic cylinders for SHEV and ventilation systems")

For detailed product descriptions and performance specifications of LAMILUX light domes refer to the manufacturer specifications at www.lamilux.de or product descriptions of the respective product.

Product manufacture

Production process Rooflight F100 and Smoke Lift Rooflight F100



Application

Daylight systems for increased daylight incidence and natural ventilation and extraction.

Verifications

The following verifications are held:

- Product quality as per DIN EN 1873
- NRWG as per DIN EN 12101-2

Management systems

The following management systems are in place:

- Quality management system as per DIN EN ISO 9001:2015
- Energy management system as per DIN EN ISO 50001:2008

Additional information

For detailed structural characteristics refer to the CE marking and to the documents accompanying the product.

2 Materials used

Primary products

The primary products used are listed in the LCA (see Section 7).

Declarable substances

In accordance with the REACH candidate list, no substances of very high concern are contained (declaration of 15. April 2019).

All safety data sheets are available on request from LAMILUX Heinrich Strunz GmbH.

3 Construction process stage

Processing recommendations, installation

The instructions for installation, operation, maintenance and disassembly must be noted. See www.lamilux.de for more information.

4 Use stage

Emissions to the environment

There are no known emissions to indoor air, water and soil. VOC emissions may occur.

Reference service life (RSL)

RSL information to be declared in an EPD covering the use stage shall be provided by the manufacturer. The RSL shall refer to the declared technical and functional performance of the product within a building. It shall be established in accordance with any specific rules given in European product standards and shall take into account ISO 15686-1, -2, -7 and -8. Where European product standards provide guidance on deriving the RSL, such guidance shall have priority.
If the reference service life can´t be determined according to ISO 15686, the BBSR table „Nutzungsdauern von Bauteilen zur Lebenszyklusanalyse nach BNB“ can be used. For further information visit www.nachhaltigesbauen.de

Relevant for this EPD is:
The service life of Rooflight F100 and Smoke Lift Rooflight F100 of the company LAMILUX Heinrich Strunz GmbH is optionally specified at 25 years according to BBSR table.

The reference service life depends on the characteristics of the product and the reference terms of use. The features described in the EPD are applied, in particular the following:

- Outdoor conditions: Weather conditions can have a negative effect on the service life.
- Indoor conditions: There are no known impacts that have a negative effect on the service life.

The reference service life is for the features, which are reported in this EPD or the relevant references for this purpose.
The RSL does not reflect the actual life time, which is usually

determined by the service life and the redevolpement of a building. It represents no statement about service life, guarantee of performance or promise of guarantee.

5 End of life stages

Possible end of life stages

Rooflight F100 and Smoke Lift Rooflight F100 are shipped to the central collection points. There they are gennerally shredded and separated. Certain Parts of aluminum, steel, plastic and glass are recycled. Residual fractions are deposited or partly thermally recycled.

The end-of-life stage depends on the site where the products are used and is therefore subject to local regulations. Observe the locally applicable regulatory requirements.

Disposal methods

The average disposal routes were taken into account in the LCA.

All life cycle scenarios are described detailed in the Annex.

6 Life Cycle Assessment (LCA)

Environmental product declarations are based on life cycle analyses (LCAs) which use material and energy flows for the calculation and subsequent representation of environmental impacts.

As the basis for this, an LCA was prepared for Rooflight F100 and Smoke Lift Rooflight F100.The LCA was developed in accordance with EN 15804 and the requirements set out by the international standards DIN EN ISO 14040, DIN EN ISO 14044, ISO 21930 and EN ISO 14025.

The LCA is representative of the products presented in the declaration and the specified reference period.

6.1 Definition of goal and scope

Goal

The goal of the LCA is to demonstrate the environmental impacts of Rooflight F100 and Smoke Lift Rooflight F100. In accordance with EN 15804, the environmental impacts covered by this Environmental Product Declaration are presented for the entire product life cycle in the form of basic information. Apart from these, no other environmental impacts have been specified.

Data quality, data availability, and geographical and time-related system boundaries

The specific data originate exclusively from the fiscal year 2012. 2018, the data has been verified to it’s acuality. These were recorded at the plant in Rehau by on-site collection and originate partly from company records and partly from values directly obtained by measurement.

The generic data originates from the "Professional Datenbank" and "Baustoff Datenbank" (professional database and building materials database) from the software "GaBi 8.6", as well as ecoinvent database

(V2.2). The last update of both databases was in 2018. Data from before this date originate also from this databases and are not more than 10 years old. No other generic data were used for the calculation.

Data gaps were either filled with comparable data or conservative assumptions, or the data were cut off in compliance with the 1 % rule.

The life cycle was modelled using the sustainability software tool “GaBi 8.6” for the development of Life Cycle Assessments.

Scope / System boundaries

The system boundaries refer to the supply of raw materials and purchased parts, the manufacture, the use and the end-of-life stage of Rooflight F100 and Smoke Lift Rooflight F100 (cradle to gate with options).
No additional data from pre-suppliers / subcontractors or other sites were taken into consideration.

Specific data for smoke and heat exhaust ventilation systems can be found in the EPD „Electrical drives and pneumatic cylinders for SHEV and ventilation systems” and “Electrical control units and pneumatic valves / alert stations for SHEV and ventilation systems” for the „Verband Fensterautomation und Entrauchung e.V. (VFE). These construction parts have not been considered in this EPD.

Cut-off criteria

All company data collected, i.e. all input and output materials used, the thermal energy, the electricity consumption were taken into consideration.

The boundaries cover only the production-relevant data. Building sections / parts of facilities that are not relevant to the manufacture of the products were excluded.

The transport distances of the pre-products were taken into consideration. Delivery distances were multilied with the percental part of transported masses. This shows an average transportation distance.

Considered Product	Mass (kg)	Distance (km)
Rooflight F100	87,5	162,9
Smoke Lift Rooflight F100	92,8	175,8

The criteria for the exclusion of inputs and outputs as set out in EN 15804 are fulfilled. It can be assumed that the total negligible processes per life cycle stage doesn´t exceed 1 per cent of the mass or the primary energy. This way the total of negligible processes does not exceed 5 per cent of the energy and mass input. The life cycle calculation also includes material and energy flows that account for less than 1 per cent.

6.2 Inventory analysis

Goal

All material and energy flows are described below. The processes covered are presented as input and output parameters and refer to the declared / functional units.

Life Cycle stages

The Annex shows the entire life cycle of Rooflight F100 and Smoke Lift Rooflight F100. Product stage “A1 – A3”, construction stage “A4 – A5”, use stage “B2 and B3”, end-of-life stage “C2 – C4” and benefits and loads beyond the system boundaries “D” are considered.

Benefits

The below benefits have been defined as per EN 15804:

- Benefits from recycling
- Benefits from (thermal and electric) incineration

Allocation of co-products

Waste materials, that are generated in the production process (i.e. steel, aluminium, plastics) are treated as co-products, as a market for these secondary raw materials exist. Inputs for these co-products are treated as en economical allocation (energy) or a physical allocation (use of material).

Allocations for reuse, recycling and recovery

If Rooflight F100 and Smoke Lift Rooflight F100 are reused / recycled during product stage (rejects), the elements are shredded, as necessary, and then sorted into original pure components. This is done by various process plants such as magnetic separators. The system boundaries for the Rooflight F100 and Smoke Lift Rooflight F100 were set following their disposal, with termination of their waste characteristics.

Allocations beyond life cycle boundaries

The use of recycled materials in the product stage is based on the current market-specific situation. In parallel to this, a recycling potential was taken into consideration that reflects the economic value of the product after processing (recyclate).
The system boundary of the recycled material was set during collection.

Secondary material

The use of secondary materials in the module A3 by company LAMILUX Heinrich Strunz GmbH was not considered. Secondary material is not used.

Inputs

The LCA includes the following production relevant inputs:

Energy
The electricity mix is based on „Strommix Deutschland“ (German electricity mix). Gas is based on „Erdgas Deutschland“ (German natural gas). In addition, solar electricity produced by company LAMILUX Heinrich Strunz GmbH photovoltaic system has been considered as follows:

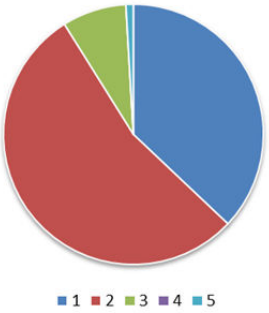
Production hall	Electricity from photovoltaic system
Production upstand	0,0%
Production real glass dome	4,3 %
Production glass architecture / continuous rooflights	2,4 %

Water:
No water is consumed by the individual process steps for the manufacture of the Rooflight F100 and Smoke Lift Rooflight F100.

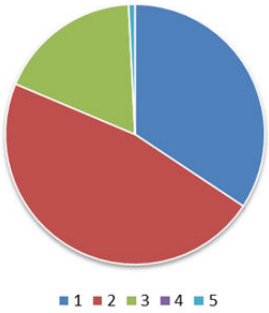
The consumption of fresh water specified in Section 6.3 originates (among others) from the upstream processes of the pre-products.

Raw material / Pre-products:
The chart below shows the use of raw materials / pre-products per cent.

Rooflight F100



SmokeLlift Rooflight F100



		Mass in %	
No.	Material	Rooflight F100	Smoke Lift F100
1	Plastics	37,1	34,3
2	GFRP	54,0	47,0
3	Stainless steel	8,0	17,9
4	Aluminium	<0,1	0,0
5	Other metals	0,9	0,8

Operating supplies
The only relevant operating supply is gas for forklifts.

Product package
The following quantities of product package accumulate:

		Mass in kg per FU	
No.	Material	Rooflight F100	Smoke Lift F100
1	Wood	46,3	46,3
2	Steel	0,1	0,1
3	Plastics	0,2	0,2

Outputs

Following outputs have been balaced per m² Rooflight F100 and Smoke Lift Rooflight F100:

Waste
Secondary raw materials were considered in the benefits. See section 6.3 Impact assessment.

Waste water
The manufacturer of Rooflight F100 and Smoke Lift Rooflight F100 produces no waste water per 1 m².

6.3 Impact assessment

Goal

Impact assessment covers inputs and outputs. The impact categories applied named below:

Impact categories

The models for impact assessment were applied as described in EN 15804-A1. The impact categories presented in the EPD are as follows:

- Depletion of abiotic resources (fossil fuels);
- Depletion of abiotic resources (elements);
- Acidification of soil and water;
- Ozone depletion;
- Global warming;
- Eutrophication;
- Photochemical ozone creation.

Waste

The waste generated during the production of 1 m² Rooflight F100 and Smoke Lift Rooflight F100 is evaluated and shown separately for each of the three main fractions, namely trade wastes, special wastes and radioactive wastes. Since waste handling is modelled within the system boundaries, the amounts shown refer to the deposited wastes. A portion of the waste indicated is generated during the manufacture of the pre-products.

Results per m² Rooflight F100										
Environmental impacts	**unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2-equiv.	45,70	5,27	58,40	0,16	1,91	0,14	42,50	0,18	-37,10
Depletion potential of stratospheric ozone layer	kg R11-equiv.	3,32E-07	1,11E-13	6,04E-13	6,14E-12	6,28E-08	2,95E-15	7,62E-08	3,05E-12	-1,05E-06
Acidification potential of soil and water	kg SO_2-equiv.	0,23	2,22E-02	7,32E-03	3,41E-04	1,64E-02	5,64E-04	2,69E-02	4,73E-04	-8,91E-02
Eutrophication potential	kg PO_4^{3-}equiv.	2,69E-02	5,65E-03	1,95E-03	5,88E-05	5,42E-04	1,43E-04	4,98E-03	4,39E-04	-7,02E-03
Formation potential of tropospheric ozone	kg C_2H_4-equiv.	2,89E-02	-8,51E-03	1,73E-03	4,42E-05	9,56E-04	-2,15E-04	1,05E-03	5,38E-05	-6,38E-03
Depletion of abiotic resources (ADP elements)	kg Sb-equiv.	1,30E-03	5,50E-07	7,55E-07	3,26E-08	3,36E-05	1,46E-08	1,65E-05	3,74E-08	-5,59E-03
Depletion of abiotic resources (ADP fossil fuels)	MJ	1930,00	71,00	14,40	6,54	25,70	1,88	45,40	2,44	-502,00
Use of ressources	**unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**C2**	**C3**	**C4**	**D**
Renewable primary energy as energy source	MJ	-148,00	4,79	935,00	9,93E-02	2,19	0,13	9,78	0,19	-104,00
Renewable primary energy for material use	MJ	933,00	0,00	-933,00	0,00	0,00	0,00	0,00	0,00	0,00
Total use of renewable primary energy	MJ	785,00	4,79	2,49	9,93E-02	2,19	0,13	9,78	0,19	-104,00
Non-renewable primary energy as energy source	MJ	1480,00	71,20	24,40	6,60	36,10	1,89	641,00	2,53	-637,00
Non-renewable primary energy for material use	MJ	600,00	0,00	-8,68	0,00	-7,42	2,53E-08	-584,00	0,00	-2,97E-07
Total use of non-renewable primary energy	MJ	2080,00	71,20	15,70	6,60	28,70	1,89	57,20	2,53	-637,00
Use of secondary materials	kg	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-2,07
Renewable secondary fuels	MJ	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Non-renewable secondary fuels	MJ	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Use of fresh water resources	m^3	3,50	5,56E-03	0,13	2,90E-04	2,14E-02	1,47E-04	7,63	-9,60E-05	-0,15
Waste categories and output material flows	**unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**C2**	**C3**	**C4**	**D**
Disposed hazardous waste	kg	9,09E-06	4,56E-06	2,52E-08	2,04E-03	7,94E-08	1,21E-07	3,17E-07	1,08E-08	-5,29E-07
Disposed non-hazardous waste	kg	1,78	5,31E-03	2,08	4,14E-03	0,13	1,41E-04	9,32	2,66	-0,30
Radioactive waste	kg	5,75E-02	8,59E-05	5,19E-04	2,50E-05	1,01E-03	2,28E-06	1,83E-03	3,61E-05	-5,16E-02
Components for further use	kg	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Materials for recycling	kg	0,00	0,00	0,00	0,00	0,00	0,00	2,18	0,00	0,00
Materials for energy recovery	kg	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exported electrical energy	MJ	0,00	0,00	93,20	0,00	0,00	0,00	0,94	0,00	0,00
Exported thermal energy	MJ	0,00	0,00	218,00	0,00	0,00	0,00	2,20	0,00	0,00

Results per m² Smoke Lift Rooflight F100										
Environmental impacts	**unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2-equiv.	58,00	5,61	58,40	0,18	4,27	6,86E-02	18,00	0,20	-39,60
Depletion potential of stratospheric ozone layer	kg R11-equiv.	4,81E-07	1,18E-13	6,04E-13	7,05E-12	1,13E-07	1,45E-15	8,18E-08	3,50E-12	-2,17E-06
Acidification potential of soil and water	kg SO_2-equiv.	0,29	2,36E-02	7,32E-03	3,92E-04	0,04	2,77E-04	9,95E-03	5,27E-04	-0,12
Eutrophication potential	kg PO_4^{3-}equiv.	3,07E-02	6,01E-03	1,95E-03	6,76E-05	1,63E-03	7,04E-05	4,50E-03	4,54E-04	-8,10E-03
Formation potential of tropospheric ozone	kg C_2H_4-equiv.	3,43E-02	-9,06E-03	1,73E-03	5,08E-05	2,87E-03	-1,06E-04	5,92E-04	5,93E-05	-8,35E-03
Depletion of abiotic resources (ADP elements)	kg Sb-equiv.	2,34E-03	5,85E-07	7,55E-07	3,75E-08	3,12E-04	7,17E-09	5,32E-06	4,15E-08	-1,18E-02
Depletion of abiotic resources (ADP fossil fuels)	MJ	2110,00	75,50	14,40	7,51	77,90	0,93	20,00	2,72	-509,00
Use of ressources	**unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**C2**	**C3**	**C4**	**D**
Renewable primary energy as energy source	MJ	147,00	5,10	651,00	0,11	4,02	6,25E-02	2,69	0,21	-105,00
Renewable primary energy for material use	MJ	648,00	0,00	-648,00	0,00	0,00	0,00	0,00	0,00	0,00
Total use of renewable primary energy	MJ	795,00	5,10	2,49	0,11	4,02	6,25E-02	2,69	0,21	-105,00
Non-renewable primary energy as energy source	MJ	1830,00	75,70	21,80	7,58	83,60	0,93	461,00	2,82	-665,00
Non-renewable primary energy for material use	MJ	438,00	0,00	-6,10	0,00	0,00	0,00	-432,00	0,00	0,00
Total use of non-renewable primary energy	MJ	2270,00	75,70	15,70	7,58	83,60	0,93	29,10	2,82	-6650
Use of secondary materials	kg	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-4,62
Renewable secondary fuels	MJ	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Non-renewable secondary fuels	MJ	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Use of fresh water resources	m^3	3,61	5,91E-03	0,13	3,33E-04	6,30E-02	7,25E-05	8,70	-1,10E-04	-0,15
Waste categories and output material flows	**unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**C2**	**C3**	**C4**	**D**
Disposed hazardous waste	kg	9,12E-06	4,86E-06	2,52E-08	2,34E-03	5,19E-08	5,96E-08	1,43E-06	1,22E-08	-1,86E-06
Disposed non-hazardous waste	kg	2,15	5,65E-03	2,08	4,75E-03	0,49	6,93E-05	0,94	3,05	-0,55
Radioactive waste	kg	6,13E-02	9,15E-05	5,19E-04	2,87E-05	2,02E-03	1,12E-06	3,14E-04	4,01E-05	-5,85E-02
Components for further use	kg	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Materials for recycling	kg	0,00	0,00	0,00	0,00	0,00	0,00	5,28	0,00	0,00
Materials for energy recovery	kg	0,00	0,00	0,00	0,00	0,00	0,00	0,00	5,28	0,00
Exported electrical energy	MJ	0,00	0,00	93,2	0,00	0,00	0,00	2,44	0,00	0,00
Exported thermal energy	MJ	0,00	0,00	218,00	0,00	0,00	0,00	1,03	0,00	0,00

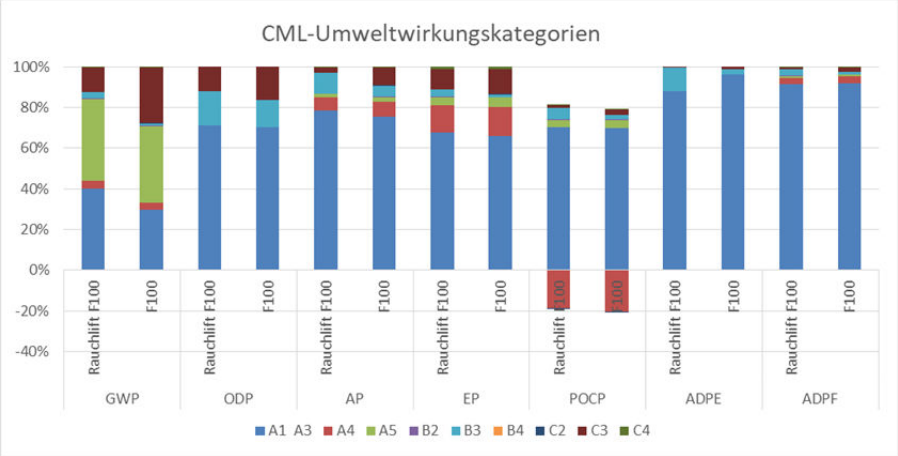
6.4 Interpretation, LCA presentation and critical verification

Evaluation

Global Warming Potential (GWP) is dominated by the modules A1-A3 and A5. During production stage, polyester resin, S-PVC, PMMA and energy are dominating.
Module A5 shows a comparatively high effects, as large numbers of packaging (mostly wood) needs to be consumed for the product and is burned after use. This fact does not highly influence the other categories, A1-A3 is dominating with different materials (steel and fibre glass in acidification, polyester resin, wood and PVC in eutrophication, steel and zinc in ozone depletion potential.
Transports cause small amounts of benefits for POCP, which can be explained by the different weighting of environmental indicators according to CML methodology (as of 2013).
Environmental impacts of both products are very similar.

The values obtained from the LCA calculation are suitable for the certification of buildings, as necessary.

Diagrams



Report

The LCA underlying this EPD was developed according to the requirements of DIN EN ISO 14040 and DIN EN ISO 14044 as well as EN 15804 and EN ISO 14025. It is not addressed to third parties for confidentiality reasons. It is deposited with the ift Rosenheim. The results and conclusions reported to the target group are complete, correct, without bias and transparent. The results of the study are not designed to be used for comparative statements intended for publication.

Critical review

The critical review of the LCA and the report took place in the course of verification of the EPD by the external verifier Dr.-Ing. Carolin Roth.

7 General information regarding the EPD

Comparability

This EPD was prepared in accordance with EN 15804 and is therefore only comparable to those EPDs that that also comply with the requirements set out in EN 15804.

Any comparison must refer to the building context and the same boundary conditions of the various life cycle stages.
For comparing EPDs of construction products, the rules set out in EN 15804 (Clause 5.3) apply.

Communication

The communications format of this EPD meets the requirements of EN 15942:2011 and is therefore the basis for B2B communication. Only the nomenclature has been changed according to EN 15804.

Verification

Verification of the Environmental Product Declaration is documented in accordance with the "Richtlinie zur Erstellung von Typ III Umwelt-produktdeklarationen" (Guidance on preparing Type III Environmental Product Declarations) in accordance with the requirements set out in ISO 14025.

This declaration is based on the ift PCR document "PCR Teil A" (PCR part A) PCR-A-0.1:2018 und „Fenster, Flachdachfenster, Lichtkuppeln und Lichtbänder“ (windows, flat roof windows, light domes and continuous rooflights) PCR-FE-2.1:2018.

The European standard EN 15804 serves as the core PCR [a)]
Independent verification of the Declaration and statement according to EN ISO 14025:2010 ☐ intern ☒ extern
Independent third party verifier: [b)] Dr.-Ing. Carolin Roth
[a)] Product category rules [b)] Optional for business-to-business communication, mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Revisions of this document

No.	Date	Note	Practitioner of the LCA	Verifier/s
1	13.05.2019	External verification	Zwick	Roth
2				
3				

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8 Annex

Description of life cycle scenarios for Rooflight F100 and Smoke Lift Rooflight F100

Product stage			Con-struction stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacture	Transport	Construction / Installation	Use	Inspection, maintenance, cleaning	Repair	Exchange / Replacement	Improvement / Modernisation	Operational energy use	Operational water use	Deconstruction	Transport	Waste management	Disposal	Re-use Recovery Recycling potential
✓	✓	✓	✓	✓	—	✓	✓	—	—	—	—	—	✓	✓	✓	✓

For the calculation of the scenarios a building life time of 50 years was considered (see RSL 4 use stage).

The scenarios were based on information provided by the manufacturer. The scenarios were furthermore bases on the research project "EPDs for transparent building components [38].

Note: The standard scenarios selected are presented in bold type. They were also used for calculating the indicators in the summary table.

- ✓ Included in the LCA
- — Not included in the LCA

A4 Transport to construction site

No.	Scenario	Description
A4.1	Direct delivery to construction site / branch domestic	40 t truck Euro 4, 30% capacity used, approx. 350 km distance to domestic construction site, return trip with 0% load
A4.2	**Direct delivery to construction site / branch abroad**	**40 t truck Euro 4, 30% capacity used, approx. 900 km distance to construction sites abroad, return trip with 0% loading**

A4 Transport to construction site		Rooflight F100		Smoke Lift F100	
Environmental impacts	**unit**	A4.1	**A4.2**	A4.1	**A4.2**
Global warming potential	kg CO_2-equiv.	2,05	**5,27**	2,18	**5,61**
Depletion potential of stratospheric ozone layer	kg R11-equiv.	4,33E-14	**1,11E-13**	4,61E-14	**1,18E-13**
Acidification potential of soil and water	kg SO_2-equiv.	8,64E-03	**2,22E-02**	9,18E-03	**2,36E-02**
Eutrophication potential	kg PO_4^{3-}equiv.	2,20E-03	**5,65E-03**	2,34E-03	**6,01E-03**
Formation potential of tropospheric ozone	kg C_2H_4-equiv.	-3,31E-03	**-8,51E-03**	-3,52E-03	**-9,06E-03**
Depletion of abiotic resources (ADP elements)	kg Sb-equiv.	2,14E-07	**5,50E-07**	2,28E-07	**5,85E-07**
Depletion of abiotic resources (ADP fossil fuels)	MJ	27,60	**71,00**	29,40	**75,50**
Use of ressources	**unit**	A4.1	**A4.2**	A4.1	**A4.2**
Renewable primary energy as energy source	MJ	1,87	**4,79**	1,98	**5,10**
Renewable primary energy for material use	MJ	0,00	**0,00**	0,00	**0,00**
Total use of renewable primary energy	MJ	1,87	**4,79**	1,98	**5,10**
Non-renewable primary energy as energy source	MJ	27,70	**71,20**	29,50	**75,70**
Non-renewable primary energy for material use	MJ	0,00	**0,00**	0,00	**0,00**
Total use of non-renewable primary energy	MJ	27,70	**71,20**	29,50	**75,70**
Use of secondary materials	kg	0,00	**0,00**	0,00	**0,00**
Renewable secondary fuels	MJ	0,00	**0,00**	0,00	**0,00**
Non-renewable secondary fuels	MJ	0,00	**0,00**	0,00	**0,00**
Use of fresh water resources	m^3	2,16E-03	**5,56E-03**	2,30E-03	**5,91E-03**
Waste categories and output material flows	**unit**	A4.1	**A4.2**	A4.1	**A4.2**
Disposed hazardous waste	kg	1,78E-06	**4,56E-06**	1,89E-06	**4,86E-06**
Disposed non-hazardous waste	kg	2,07E-03	**5,31E-03**	2,20E-03	**5,65E-03**
Radioactive waste	kg	3,35E-05	**8,59E-05**	3,56E-05	**9,15E-05**
Components for further use	kg	0,00	**0,00**	0,00	**0,00**

Materials for recycling	kg	0,00	**0,00**	0,00	**0,00**
Materials for energy recovery	kg	0,00	**0,00**	0,00	**0,00**
Exported electrical energy	MJ	0,00	**0,00**	0,00	**0,00**
Exported thermal energy	MJ	0,00	**0,00**	0,00	**0,00**

A5 Construction / Installation
In case of deviating consumption during the construction or installation of the products forms part of the site management and is covered at the building level and not within the EPD.

There are environmental impacts resulting from the disposal of packagings. It is deemed that packaging materials are delivered to a suitable treatment of waste. Credits fom A5 are shown in module D.

Since this is the only scenario, the results are shown in the summary table.

B1 Use of the installed product (not considered)
See chapter 5 Use stage – Emissions to the environment. Emissions cannot be quantified.

B2 Inspection, maintenance, cleaning

B2.1 Cleaning

No.	Scenario	Description
B2.1	**Rare manually**	**Manually with suitable detergent, anually during functional test of SHEVS (refer to B2.2)** **use of 16,5 l water/waste water per 50 years**

Ancillary materials, energy use and waste as well as transport distances during cleaning are negligible.

Since this is the only scenario, the results are shown in the summary table.

B2.2 Maintenance

No.	Scenario	Description
B2.2	**Normal use**	**Annual functional test of SHEVS, visual inspection, lubrication and maintenance if necessary** **Use: 0,5 kg lubricants per 50 years**

Operating supplies, the use of energy / water, losses of material and waste materials as well as transport distances during maintenance can be neglected.

Since this is the only scenario, the results are shown in the summary table.

B3 Repair

No.	Scenario	Description
B3	**Normal use**	**One replacement*): hardware 3,19 kg, seals 0,13 kg**

* Assumptions for evaluation of possible environmental impacts; statements made do not constitute any guarantee or warranty of performance.

Current information in the respective instructions for installation, operation, maintenance and disassembly for Rooflight F100 and Smoke Lift Rooflight F100 can be found on www.lamilux.de.

The service life of Rooflight F100 and Smoke Lift Rooflight F100 from LAMILUX Heinrich Strunz GmbH is declared with 25 years. For the scenario B3 the respective components of the parts are accounted, if their service life is less than the given period of 25 years.

Operating supplies, the use of energy / water, losses of material and waste materials as well as transport distances during repair can be neglected.

Calculation of replacement parts are based on the same information, quota and benefits regarding waste management as „first parts“ (see C2-C4).

Since this is the only scenario, the results are shown in the summary table.

B4 Replacement / Exchange (not considered)

No.	Scenario	Description
B4	Normal use	one replacement in 50 years*)

* Assumptions for the assessment of possible environmental impacts; Statements do not constitute a promise of guarantee or warranty of any characteristics

In this EPD, only informative information is given to allow consideration at building level.

With a service life of 25 years and the scheduled building service life of 50 years, one replacements is planned.

Current information in the respective instructions for installation, operation, maintenance and disassembly for Rooflight F100 and Smoke Lift Rooflight F100 can be found on www.lamilux.de.

In the chosen scenario, environmental impacts from the manufacture, construction and end of life phases occur.Module B4 (replacement) can be calculated by adding module A, C and D and multi-lying it by the number of replacements.

Operating supplies, the use of energy / water, losses of material and waste materials as well as transport distances during exchange / replacement can be neglected.

B5 Improvement / Modernisation (not considered)

No improvement / modernisation of Rooflight F100 and Smoke Lift Rooflight F100 is planned.

Current information in the respective instructions for installation, operation, maintenance and disassembly for Rooflight F100 and Smoke Lift Rooflight F100 can be found on www.lamilux.de.

B6 Operational energy use (not considered)

Energy use for construction parts for smoke and heat exhaust ventilation systems (SHEVS) can be found in the EPDs „Electrical drives and pneumatic cylinders for SHEV and ventilation systems" and "Electrical control units and pneumatic valves / alert stations for SHEV and ventilation systems"of the „Verband Fensterautomation und entrauchung e.V. (VFE)". These construction parts have not been taken into consideration in this EPD.

B7 Operational water use (not considered)

No water consumption when used as intended. Water consumption for cleaning is specified in module B2.1.

C1 Deconstruction (not considered)

No.	Usage scenario	Description
C1	Deconstruction	Dismantling rate of 99% is taken as basis, as process of deconstruction is simple. Further dismantling rates possible, appropriately substantiates.

There are no relevant inputs or outputs in this scenario. Energy consumption during deconstruction can be neglected. Resulting efforts are marginal.

In case of deviating consumption the removal of the products forms part of the site management and is covered at the building level.

C2 Transport

No.	Usage scenario	Description
C2	Transport	Transport to collecting point using a 40 t truck, 80 % capacity used, approx. 50 km distance

Since this is the only scenario, the results are shown in the summary table.

C3 Waste management

No.	Usage scenario	Description
C3	Disposal	Share for the return of materials: Metals 90% in melting Rest 90% thermal use in incineration plants

The below table presents the disposal processes and their percentage by mass/weight. The calculation is based on the above mentioned shares in per cent related to the declared unit of the product system.

C3 Disposal	Unit	Rooflight F100	Smoke Lift F100
Collection process, collected separately	kg	0,0	0,0
Collection process, collected as mixed construction waste	kg	24,2	27,8
Recovery system, for re-use	kg	0,0	0,0
Recovery system, for recycling	kg	1,9	4,7
Recovery system, for energy recovery	kg	19,9	20,4
Disposal	kg	2,4	2,8

Since this is the only scenario, the results are shown in the summary table.

C4 Disposal		
No.	**Usage scenario**	**Description**
C4	**Disposal**	**The non-measurable quantities and losses of the re-use/recycling chain (C1 and C3) are modelled as "disposed".**
The consumption of scenario C4 results from physical pre-treatment, waste recycling and operating of the disposal site. The benefits obtained here from the substitution of primary material production are allocated to module D, e.g. electricity and heat from waste incineration.		

D Benefits and loads beyond the system boundaries		
No.	**Usage scenario**	**Description**
D	**Recycling potential**	**Steel scrap from C3.1 excluding the recyclate used in A3 replaces 100% of steel; Credits from WtE facility: Electricity replace EU-28 electricity mix; thermal energy replaces thermal energy out of natural gas**
The values in module D results from both, the recycling of the packaging material in module A5 and the de-construction at the end of the service life.		

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Notes
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