ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Letbek A/S
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-LET-20230177-CBA1-EN
Issue date	11.08.2023
Valid to	10.08.2028

OC frame system

Letbek A/S

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

www.ibu-epd.com | https://epd-online.com

General Information

Letbek A/S

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-LET-20230177-CBA1-EN

This declaration is based on the product category rules:

Windows and doors , 29.06.2023
(PCR checked and approved by the SVR)

Issue date

11.08.2023

Valid to

10.08.2028

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

OC frame system

Owner of the declaration

Letbek A/S
Hornevej 18
6862 Tistrup
Denmark

Declared product / declared unit

One meter of OC frame system

Scope:

Product line is the OC frame system manufactured by Letbek in Tistrup, Denmark, but designed and sold by Outercore.
Declaration is made according to ISO 14025 and EN 15804.

This EPD is a representative EPD covering the most sold depth of the OC frame system.
The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Ms Jane Anderson,
(Independent verifier)

Product

Product description/Product definition

The calculated product in this EPD is the most popular version of the OC frame system with a depth of 250 mm. Typically, all parts are produced at a depth of 285 mm and cut to fitting size. More information about the OC frame system can be found at https://outercore.dk/. For the use and application of the product the respective national provisions at the place of use apply, in Germany for example the building codes of the federal states and the corresponding national specifications.

Application

The OC frame system is a window frame attached to the inner wall and is used for mounting windows onto the building early in the building process. Thereafter, a window can be installed inside of the frame. It consist of four sides called base profiles, consisting of polyvinyl chloride (PVC), and four corners, consisting of recycled polypropylene (PP). To keep them in place some vertical fixings are attached to the bottom of the frame during installation.

Technical Data

No standards are applicable for the production of the OC frame system.

Constructional data

The technical documentation for all the mentioned constructional data can be found at https://outercore.dk/teknisk-dokumentation/

Name	Value	Unit
Heat transfer coefficient Including outer and inner wall acc. to EN ISO 418	0.43	W/(m^{2}K)
Resistance against wind loads acc. DIN EN 12211	0.3	mm
Reaction to fire acc. to EN 13501-1:2007	C	class

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

Base materials/Ancillary materials

Name	Value	Unit
Corner profile - recycled PP (rPP)	7	%
Base profile - PVC	83	%
OV-fixings	0.1	%
Steel vertical fixings	4	%
Filler	5	%
Screws	2	%

This product/article/at least one partial article contains substances listed in the ECHA candidate list (date: 26.01.2023) exceeding 0.1 percentage by mass: **no**

Reference service life

No use-stage modules (B1-B7) have been declared as the product is embedded and unreachable during the building's lifetime.

LCA: Calculation rules

Declared Unit

The declared unit is one running metre (rm). For the calculation of corners per rm a standard window has been chosen. A standard window according to *EN 17213* is 1,23 m x 1,48 m.

Declared unit

Name	Value	Unit
Declared unit	1	rm
linear density	4.17	kg/rm

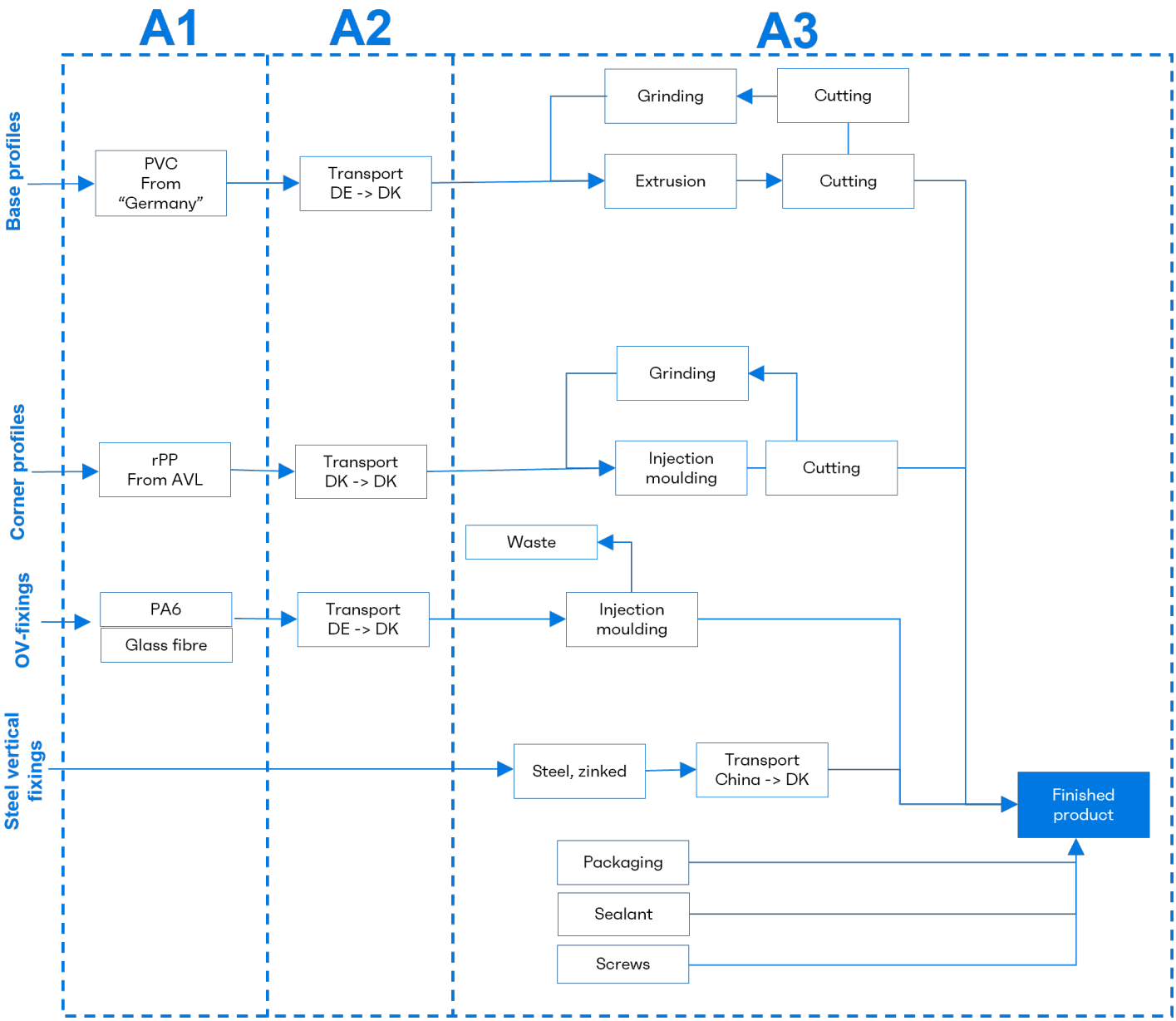
System boundary

Type of EPD: Cradle to gate with modules C1-C4 and module D.

Module A1-A3

Included have been the raw material extraction and processing (A1), transport to the manufacturing facility (A2) and manufacturing activities at Letbek (A3). Waste and losses during manufacturing processes are included in the unit processes in which they occur according to the polluter pays principle and the modular approach of *EN 15804*.
This means that incineration of inlet waste from the production of OV-fixings has been included in A3. Furthermore, regranulation of base profiles and corner profiles has been included in A3. The recycled PP used for the corner profiles are included burden-free in A1.The manufacturer data used in A3 is based on measurements done in 2022.

The product stage (A1-A3) can be seen below:



Module C1-C4
The OC frame is disassembled manually, resulting in no unit processes.
The transportation distance is assumed to be 50 km.
it is assumed that:

- Base profiles will go to landfill
- Corner profiles will go to recycling
- OV-fixings will be incinerated
- Steel vertical fixings will be recycled
- Screws will be recycled

Packaging is going through waste treatment in module A5 which is not declared.

Module D
Includes the potential benefits and loads from reuse, recycling and recovery potentials that are outside the scope of the study. This includes all flows leaving the product system having passed the end-of-waste stage.

The potential benefits is the following:

- Incineration of OV-fixings resulting in avoided energy production.
- Virgin input of steel in steel vertical fixings and screws resulting in avoided primary material production.

The potential loads are the following:

- Melting of the steel vertical fixings and screws into sellable product.

Exclusion of inputs and outputs
Disposal of the packaging of the steel vertical fixing resold by Letbek have not been included, as this packaging does not result in any revenue for Letbek, thereby having no value. Furthermore, the packaging of the steel vertical fixings is not part of the finished, sellable product. Thereby, the exclusion of inputs and outputs are no more than 5% of the total mass or energy usage and 1% of the unit processes, following the requirement of *EN15804+A2*.

Geographic Representativeness
Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Denmark

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. The system model EN15804 - cut-off available in the LCI database ecoinvent v. 3.9.1 is used in this EPD. The range in age of ecoinvent data used is between 1 to 3 years.

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

Information on the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in product	1.65E-06	kg C
Biogenic carbon content in accompanying packaging	0.33	kg C

Installation into the building (A5)

As A5 including the disposal of the packaging is not declared, the amounts of packaging materials are provided below so they can be modelled correctly when A5 is assessed.

Name	Value	Unit
Euro pallet for recycling	0.76	kg
Top wood pieces for recycling	0.02	kg
Packaging film for incineration	0.01	kg
Cardboard for recycling	0.02	kg

End of life (C1-C4)

Name	Value	Unit
Collected separately waste type waste type	3.972	kg
Collected as mixed construction waste	0.2	kg
Recycling	0.509	kg
Energy recovery	0.0055	kg
Landfilling	3.658	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Incineration of OV-fixings from C3	0.0056	kg
Recycling of steel vertical fixings from C3	0.114	kg
Recycling of screws from C3	0.058	kg
Melting of metal scrap from steel from C3	0.172	kg

Regarding steel only the average amount of virgin steel included in the ecoinvent input process is included as a benefit/load. This means that the recycled (scrap) steel included in the process does not provide a benefit when it is turned into scrap steel yet again. Currently, the European process for steel in ecoinvent has an input of 23 % scrap steel. Thereby, only 77 % of the steel is being credited for recycling. Furthermore, the steel need melting for it to regain its market value, for which reason this load has been added to the module.

For the OV-fixings, only the amount of PA6 in the product gives an avoided energy production. This amounts to 70 % of the total weight of the OV-fixing.

LCA: Results

The results below indicate the impacts and indicators of one running metre of the OC frame system.
The overall data quality is judged to be good, using datasets from one of the world's leading LCA database ecoinvent, which is updated annually. Some of the datasets, however, are not of the best quality but are judged to be sufficient since it concerns datasets for low quantities. The foreground system has been modelled using data collected at the actual manufacturing facility and consists of good geographical, temporal, and technological representation.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	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	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2:

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential total (GWP-total)	kg CO_2 eq	1.14E+01	0	2.21E-04	8.84E-02	2.63E-01	-2.9E-02
Global Warming Potential fossil fuels (GWP-fossil)	kg CO_2 eq	1.24E+01	0	2.21E-04	8.85E-02	2.63E-01	-2.88E-02
Global Warming Potential biogenic (GWP-biogenic)	kg CO_2 eq	-1.06E+00	0	1.92E-07	-1.2E-04	4.53E-04	-1.41E-04
Global Warming Potential luluc (GWP-luluc)	kg CO_2 eq	1.07E-02	0	1.09E-07	4.53E-05	8.31E-06	-1.11E-04
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	3.69E-06	0	4.81E-12	6.14E-10	1.08E-09	1.51E-10
Acidification potential of land and water (AP)	mol H^+ eq	5.62E-02	0	4.83E-07	1.91E-04	2.44E-04	-1.84E-04
Eutrophication potential aquatic freshwater (EP-freshwater)	kg P eq	3.38E-03	0	1.57E-08	1.35E-05	2.51E-06	-9.31E-06
Eutrophication potential aquatic marine (EP-marine)	kg N eq	1.14E-02	0	1.22E-07	8.49E-05	1.43E-03	-9.32E-05
Eutrophication potential terrestrial (EP-terrestrial)	mol N eq	1.15E-01	0	1.24E-06	5.35E-04	1.09E-03	-3.73E-04
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	4.34E-02	0	7.49E-07	1.67E-04	4.71E-04	-1.4E-04
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	1.18E-04	0	7.38E-10	5.96E-07	7.47E-08	6.19E-07
Abiotic depletion potential for fossil resources (ADPF)	MJ	2.51E+02	0	3.16E-03	3.95E-01	8.57E-01	-5E-01
Water use (WDP)	m^3 world eq deprived	4.79E+00	0	1.57E-05	1E-02	7.1E-03	-7.68E-02

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2:

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier (PERE)	MJ	1.71E+01	0	4.93E-05	4.05E-02	3.62E-02	1.7E-02
Renewable primary energy resources as material utilization (PERM)	MJ	1.07E+01	0	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ	2.78E+01	0	4.93E-05	4.05E-02	3.62E-02	1.7E-02
Non renewable primary energy as energy carrier (PENRE)	MJ	1.7E+02	0	3.16E-03	-1.57E+01	-7.78E+01	-5E-01
Non renewable primary energy as material utilization (PENRM)	MJ	8.09E+01	0	0	1.61E+01	7.87E+01	0
Total use of non renewable primary energy resources (PENRT)	MJ	2.51E+02	0	3.16E-03	3.95E-01	8.57E-01	-5E-01
Use of secondary material (SM)	kg	1.6E-01	0	1.44E-06	1.33E-03	3.36E-04	-3.01E-02
Use of renewable secondary fuels (RSF)	MJ	3.38E-01	0	1.84E-08	1.4E-05	1.4E-05	1.16E-06
Use of non renewable secondary fuels (NRSF)	MJ	0	0	0	0	0	0
Use of net fresh water (FW)	m^3	-4.09E-02	0	3.81E-07	3.5E-04	1.02E-03	1.75E-03

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2:

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	5.45E-01	0	2.15E-06	2.45E-03	4.86E-04	7.07E-03
Non hazardous waste disposed (NHWD)	kg	1.48E+01	0	6.53E-05	6.12E-02	3.67E+00	2.82E-03
Radioactive waste disposed (RWD)	kg	5.54E-05	0	2.52E-10	2.4E-07	9.91E-08	-2.22E-07
Components for re-use (CRU)	kg	0	0	0	0	0	0
Materials for recycling (MFR)	kg	3.87E-03	0	2.35E-08	5.63E-01	8.59E-06	-2.54E-05
Materials for energy recovery (MER)	kg	1.46E-05	0	1.97E-10	1.46E-07	1.68E-08	4.07E-07
Exported electrical energy (EEE)	MJ	3.84E-01	0	5.12E-07	2.86E-03	4.44E-04	-9.94E-04
Exported thermal energy (EET)	MJ	3.56E-01	0	6.79E-07	1.46E-04	3.08E-04	1.04E-03

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Incidence of disease due to PM emissions (PM)	Disease incidence	5.77E-07	0	1.65E-11	3.75E-09	5.91E-09	-5.3E-09
Human exposure efficiency relative to U235 (IR)	kBq U235 eq	8.71E-01	0	4.25E-06	4.27E-03	2.1E-03	-2.17E-03

Comparative toxic unit for ecosystems (ETP-fw)	CTUe	5.74E+01	0	1.54E-03	2.98E-01	1.37E+01	-7.57E-01
Comparative toxic unit for humans (carcinogenic) (HTP-c)	CTUh	1.86E-08	0	1.05E-13	9.86E-11	2.72E-11	-6.52E-10
Comparative toxic unit for humans (noncarcinogenic) (HTP-nc)	CTUh	1.47E-07	0	2.24E-12	1.03E-09	6.57E-10	-3.96E-09
Soil quality index (SQP)	SQP	1.3E+02	0	1.9E-03	5.09E-01	2.09E+00	-7.1E-02

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. 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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

References

Standards

DS/EN 418
DS 418:2011 + Till.1:2020, Calculation of heat loss from buildings

DIN EN 12211
DIN EN 12211:2016, Windows and doors - Resistance to wind loads - Test method

EN 13501
EN 13501-1:2007 Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests

DIN ISO 14025
EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

DIN EN 15804
EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

DIN EN 17213
DIN EN 17213:2020, Windows and doors - Environmental Product Declarations - Product category rules for windows and pedestrian doorsets

Further References

ECHA candidate list
Candidate List substances in articles (date: 26.01.2023)

Ecoinvent 3.9.1
ecoinvent database version 3.9, allocation, cut-off, EN 15804. ecoinvent Version 3, Wernet G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, e., and Weidema, B., 2016. The ecoinvent database version 3 (part I): overview and methodology. The international Journal of Life Cycle Assessment, [online] 21(9), pp. 1218-1230. Available at: https://link.springer.com/article/10.1007/s11367-016-1087-8 [Accessed 26/01/2023]

IBU 2021
Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V., Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021 HYPERLINK "http://www.ibu-epd." www.ibu-epd.com

IBU PCR Part A
PCR - Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, version 1.3, Institut Bauen und Umwelt e.V., www.ibu-epd.com, 2021

IBU PCR PART B
PCR – Part B: Requirements on the EPD for Windows and doors, version 2, 29/06/2023, Institut Bauen und Umwelt e.V., www.ibu-epd.com, 2023

Publisher

Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Programme holder

Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Author of the Life Cycle Assessment

Viegand Maagøe
Nørre Farigmagsgade 37
1364 Copenhagen
Denmark

+4533349000
info@viegandmaagoe.dk
www.viegandmaagoe.dk/en

Owner of the Declaration

Letbek A/S
Hornevej 18
6862 Tistrup
Denmark

+45 75299444
info@letbek.dk
www.letbek.com

OuterCore
Center Salling, Torvet 4
7870 Roslev
Denmark

+45 71 74 57 47
info@outercore.dk
www.outercore.dk/