ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	mfh systems GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-MFH-20240488-ICI1-EN
Issue date	04.04.2025
Valid to	03.04.2030

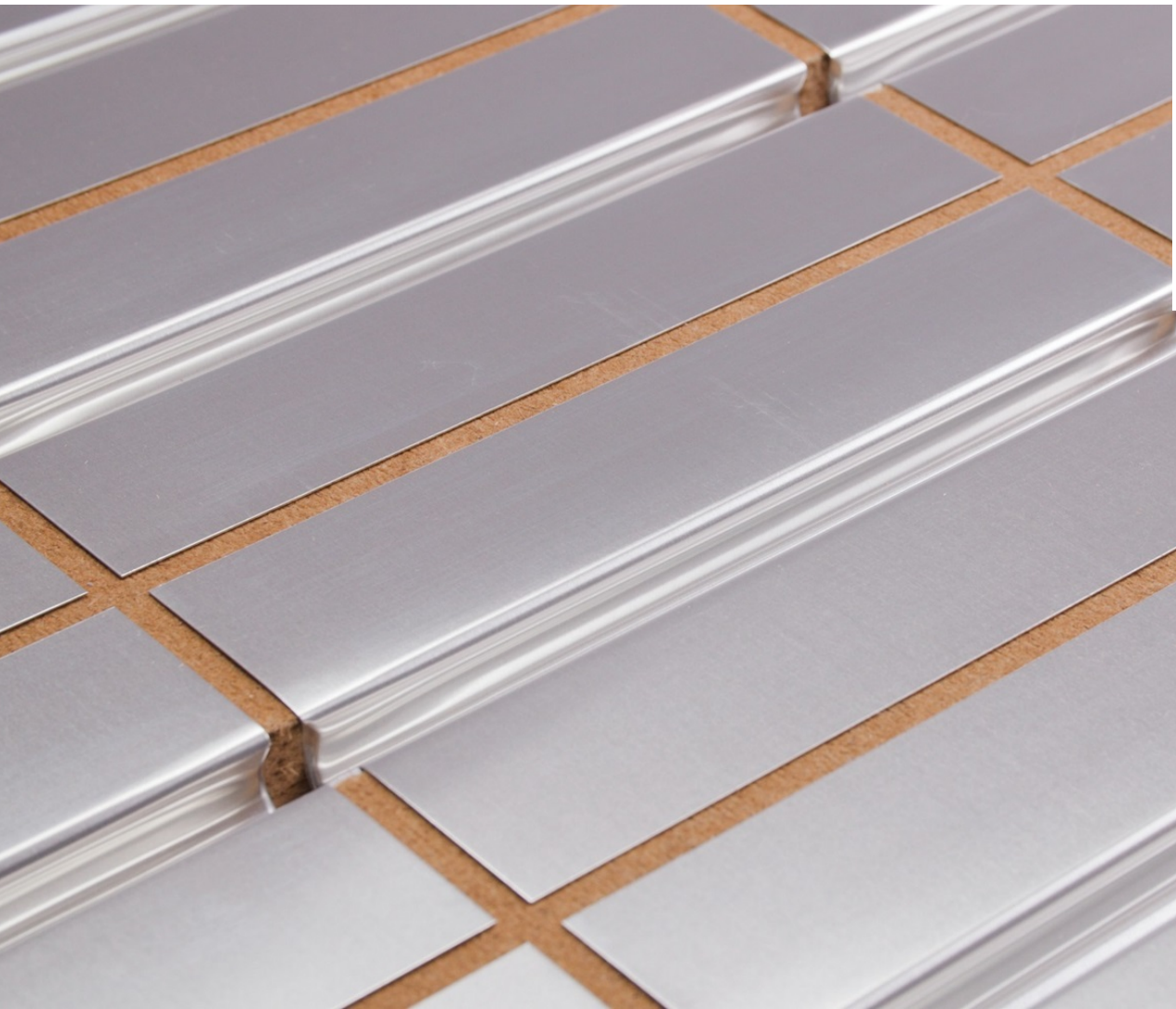
IDEAL / E-NERGY ÖKO Heating System

mfh systems GmbH

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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



1. General Information

mfh systems GmbH

Programme holder

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

Declaration number

EPD-MFH-20240488-ICI1-EN

This declaration is based on the product category rules:

Installation systems for surface heating and cooling with water flow, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

04.04.2025

Valid to

03.04.2030

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

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

IDEAL / E-NERGY ÖKO Heating System

Owner of the declaration

mfh systems GmbH
Hager Feld 8
49191 Belm
Germany

Declared product / declared unit

The declared unit is 1m^2 of IDEAL / E-NERGY ÖKO heating system and its accompanying packaging. The representative system is IDEAL classic ÖKO 30.

Scope:

This declaration is a representative EPD. The calculation of the life cycle assessment refers to 1 m² of heating element. This EPD covers the following systems:

- System IDEAL CLASSIC ÖKO 30 (Representative system)
- System IDEAL BASIC ÖKO 30
- System IDEAL TOP ÖKO 20
- System E-NERGY IQ ÖKO 20

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

Dr.-Ing. Nikolay Minkov,
(Independent verifier)

2. Product

2.1 Product description/Product definition

The IDEAL / E-NERGY ÖKO system panels are made of wood fibre with aluminium heat distribution plates which are laminated at the factory. The panels are used as surface heating/cooling systems in wet or dry constructions for installation in floor, wall and ceiling areas.For the placing on the market of the product in the European Union/European Free Trade Association (*EU/EFTA*) (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a declaration of performance taking into consideration *EN 13171*, Thermal insulation products for buildings - Factory made wood fibre (WF) products - Specification and the CE-marking.
For the application and use the respective national provisions apply.

2.2 Application

The IDEAL ÖKO systems are universal hot water surface heating/cooling systems as dry and wet systems for installation in floor, wall and ceiling areas. By inserting a pipe (surface heating pipe) into the mfh heating elements with different installation distances, it is possible to customise the output. The pipe is fixed and secured by the specially shaped pipe channels (omega shape) of the factory- laminated aluminium heat distribution plates. The systems work with surface temperatures within the thermo-physiologically permissible range and are suitable for accommodating floor coverings with a maximum thermal resistance of 0.15 m²K/W.

2.3 Technical Data

The following (structural) technical data in the delivery state are relevant for the declared product.

Technical data

Name	Value	Unit
Density	180	kg/m³
Rated value thermal conductivity	0.050	W/(mK)
Nominal value thermal conductivity	0.048	W/(mK)
Water vapour diffusion resistance factor	5	µ
Formaldehyde emissions according to EN 717-1	< LOD*	µg/m³
Compressive strength	≥ 0.18	N/mm²

*LOD: Limit of Detection

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN 13171*, Thermal insulation products for buildings - Factory made wood fibre (WF) products - Specification.

2.4 Delivery status

The IDEAL / E-NERGY ÖKO system panels are supplied in the following dimensions: Panel thickness: 20-30 mm & Format: 1000 x 500 mm, 1200 x 750 mm

2.5 Base materials/Ancillary materials

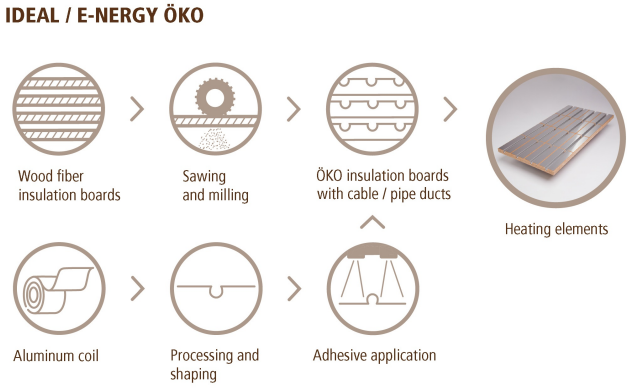
Composition of IDEAL / E-NERGY ÖKO system panels

Name	Value	Unit
Wood fibre	86	%
Aluminium	13	%
Adhesive	1	%

This product/article/at least one partial article contains substances on the *ECHA* list of Substances of Very High Concern (SVHC) (status: 05.04.2023) exceeding 0.1 percentage by mass: no
This product/article/at least one partial article contains other carcinogenic, mutagenic, reprotoxic (*CMR*) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: no
Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): no

2.6 Manufacture

The production of IDEAL / E-NERGY ÖKO system panels involves the following process steps:



Raw wood is processed into chips, heated under vapour pressure, and mixed with water to form fiber pulp. The boards are moulded by pressing, cut to size, and dried at 160°C–200°C, with glueing applied if necessary. Aluminium sheets are cut, punched into guide plates with straight or curved profiles, trimmed, and assembled by gluing onto straight or curved plates. The finished boards and panels are then packed on a wooden pallet.
Systems for quality assurance:
CE marking according to EN 13171
FSC certificate CU-COC-841217
PEFC certificate CU-PEFC-841217 IBR 3023-1395

2.7 Environment and health during manufacturing

Due to the manufacturing conditions, no measures for the protection of the environment or health beyond the legal and other regulations must be taken.

2.8 Product processing/Installation

The IDEAL / E-NERGY ÖKO system panels can be handled with standard woodworking tools (handsaw, insulation knife, circular and band saw, etc.). If processing is carried out without extraction, the use of breathing protection measures is recommended.
The relevant standards and guidelines as well as the manufacturer's instructions must be observed for all applications.
The system boards are usually installed floating. Fixing by glueing and, if necessary, additional mechanical fixing is also possible. The application is system-dependent and requires approval from the manufacturer, in which the system components and processing are defined. Additional measures to protect the environment are not required.

2.9 Packaging

Polyethylene (PE) film, paper, cardboard and cardboard packaging as well as wood are used for the packaging and delivery of IDEAL / E-NERGY ÖKO system panels. All

packaging materials are recyclable by type or can be utilised for energy recovery.

2.10 Condition of use

No material changes to the product are to be expected during the utilisation phase if used correctly and as intended.

2.11 Environment and health during use

When IDEAL / E-NERGY ÖKO system panels are used as designated, no hazard potential for water, air or soil is currently known. When IDEAL / E-NERGY ÖKO system panels are installed correctly, no health risks or impairments are to be expected. It is possible that small quantities of product substances may escape. No emissions of health relevance were determined. In order to exceed the statutory limit values with regards to emissions, radioactivity, VOC etc., IDEAL / E-NERGY ÖKO system panels are tested externally (IBR 3023-1395, 2023).

2.12 Reference service life

If used as intended, no end to the durability of the IDEAL / E-NERGY ÖKO system panels is known or to be expected. The average service life of the product is equivalent to the service life of the building. Under Central European climatic conditions, a conservatively estimated service life of 50 years can be assumed.Influences on the ageing of the product when used in accordance with the rules of technology are not known or expected.

2.13 Extraordinary effects

Fire

Specification of the building material class in accordance with *EN 13501-1*

Fire protection

Name	Value	Unit
Building material class	E	-
Smoke gas development	-	-
Burning droplets	-	-

Water

The IDEAL / E-NERGY ÖKO system panels are not water-soluble and do not release any water-soluble substances that could lead to contamination of groundwater, rivers and oceans.

Mechanical destruction

Information on the behaviour of the product, including possible consequences for the environment, in the event of unforeseen mechanical destruction is not relevant.

2.14 Re-use phase

The IDEAL / E-NERGY ÖKO system panels can be reused for the same application or can be reused in an alternative location in the same range of applications if they are dismantled without damage after use.
If the IDEAL / E-NERGY ÖKO system panels are not contaminated, the raw material can be recycled and reused without any problems (e.g. reintroduction into the production process).

2.15 Disposal

Pure insulation residues without impurities (offcuts and deconstruction material) can be recycled in the production process.
The waste code according to the *European Waste Catalogue* (EWC) is: 030105/170201/170904.

2.16 Further information

Information about IDEAL / E-NERGY ÖKO system panels and other products from mfh Systems GmbH is available at www.mfh-systems.com.

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is 1m^2 of IDEAL / E-NERGY ÖKO heating system and its accompanying packaging. The representative system is IDEAL CLASSIC ÖKO 30.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	m^2
Grammage (incl. packaging)	7.19	kg/m^2
Grammage (without packaging)	6.88	kg/m^2
Layer thickness	0.03	m

Other declared units are allowed if the conversion is shown transparently.

The GWP was calculated for all systems covered by the EPD and compared with their selected representative product. The total GWP, of modules A1-A3 and C1-C3, for all balanced IDEAL / E-NERGY ÖKO systems, revealed that the IDEAL CLASSIC ÖKO 30 corresponds to the best-seller system of 2021 as well as being the system with the highest GWP

3.2 System boundary

The declared unit is 1m^2 of IDEAL / E-NERGY ÖKO heating system and its accompanying packaging. The EPD type is: a) cradle to gate with modules C1–C4 and module D (A1–A3 + C + D)

Modules A1-A3 utilize generic datasets for raw material extraction and precursor production (A1), including Aluminium, Wood fibre, and Adhesive for IDEAL CLASSIC ÖKO 30. Transportation (A2) is modeled with generic data, considering upstream fuel processes and emissions. The manufacturing phase (A3) incorporates manufacturer-specific energy data, accounting for 5% aluminum processing waste and the bonding and pressing of insulating panels. Upstream energy inputs are modeled with generic datasets.
Modules C1-C4 cover end-of-life processes. C1 accounts for dismantling or demolition, assuming manual removal. C2 includes transportation for disposal, considering upstream fuel processes and emissions. C3 involves waste treatment, with wood and adhesive undergoing thermal recovery and aluminum being recycled. Emissions and treatment loads are assigned to C3, while resulting credits are allocated to D. C4 addresses disposal if recovery or reuse is not possible.
Module D documents secondary materials or fuels from waste treatment in A3 and C3 for potential energy or material input in downstream systems. Emissions from waste incineration are assigned to C3, not D. Energy recovery credits from wood waste incineration during production are allocated to D. The net flow, representing the difference between input and output flows, determines the overall impact in module D.

3.3 Estimates and assumptions

Proxy datasets were used for Lightweight wood fibre panel (wood fibre) and Hot-melt based on EVA (adhesive). System elements not produced in 2021 were modeled based on material composition, energy needs, and waste outputs, balanced to 1m² and included in variability analysis. Due to limited primary data, a conservative 5% material loss was assumed for aluminum sheet cutting, considering straight-line shearing efficiency, with no recycling credit applied to reflect a worst-case scenario. At end-of-life, 95% of the aluminum sheet is assumed to be recycled, with a 5% mass loss, and recycling credits allocated in Module D. The heating system's disposal was modeled with a shredder consuming 30 kWh/t, based on secondary data from a disposal company.

3.4 Cut-off criteria

All operational data was considered, including material flows with a mass fraction of less than one percent. No material or energy flow from primary production data was excluded. Pallet production effort was omitted, as they are reused almost indefinitely, but their transport weight was included to account for life cycle impacts.

3.5 Background data

The LCA model was developed using *GaBi* 10.8 from *Sphera* (Sphera Solutions, 2024). Manufacturer-specific data was applied for the manufacturing process, while generic background datasets from the *GaBi* database (Service Pack 2023.2) were used for upstream and downstream processes.

3.6 Data quality

Foreground Data

Primary data is of good quality, with high accuracy ensuring confidence in LCA results. Plausibility was verified by Brands and Values GmbH. Time representativeness is medium, based on 2021 production data. Technical representativeness is very good, with energy requirements measured by the manufacturer and validated by Brands and Values GmbH.

Background Data

Secondary data is of very good quality, with high accuracy ensuring reliable LCA results. Datasets covering over 80% of the GWP impact have excellent time representativeness (2022). Similar manufacturing technologies ensure good technical quality. Geographical representativeness is very good, with datasets sourced from Germany and Europe.

3.7 Period under review

The collected material and energy data originate from the period 01.01. - 31.12.2021. The data collection for the investigated products was carried out based on evaluations of internal production and environmental data, the collection of LCA-relevant data within the supplier chain as well as by measuring relevant data for the energy supply.

3.8 Geographic Representativeness

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

3.9 Allocation

The primary data for material and energy inputs was measured for all studied systems, within the defined system boundaries and considering each processing step. The allocation of electricity, thermal energy and waste to the individual products and participating processing locations was done directly by mfh Systems GmbH, based on primary data of yearly production volumes and energy consumption observed in 2021.
Based on the manufacturer's data, the produced units were scaled to the declared unit (m^2). The production is modelled with specific data for the declared products, there are no co-products and allocation is avoided. The selection of representative product was based on a worse-case scenerio and the representative product are also the highest produced product. The variability study was analysed, in comparison to the representative product.

3.10 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. All background data sets used for modelling come from the *LCA for experts* (GaBi) database (Service pack 2023.2).

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The declared products contain biogenic carbon stated in the table below. Module A5 is not within the scope of the LCA study. The biogenic carbon in the packaging is balanced out directly in Modules A1-A3.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	2.85	kg C
Biogenic carbon content in accompanying packaging	-	kg C

Note: 1 kg of biogenic carbon equals 44/12 kilograms of CO_2.

Installation into the building (A5)

Module A5 is not declared. Amounts of packaging for waste treatment after installation are given as a technical scenario.

Name	Value	Unit
Polyethylene Film	0.02	kg
Wooden pallet	0	kg

If used as intended, no end to the durability of the IDEAL / E-NERGY ÖKO system panels is known or to be expected. The average service life of the product is equivalent to the service life of the building.
A reference service life according to *ISO 15686* can be declared based on the *BBSR* table. Under Central European climatic conditions, a conservatively estimated service life of 50 years can be assumed.

Reference service life

Name	Value	Unit
Life Span (according to BBSR)	50	a

End of life (C1-C4)

Name	Value	Unit
Collected separately waste type	5.9	kg
Recycling	0.98	kg

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

Name	Value	Unit
Thermal energy recovery	6.6	kWh
Electricity recovery	3.6	kWh
Aluminium sheet cut for recycling	0.98	Kg

5. LCA: Results

The declared unit is 1m^2 of IDEAL/E-NERGY ÖKO heating system. The present results in the impact categories refer to the potential environmental impacts in an analysis period of 100 years. Long-term emissions (> 100 years) are not considered in the impact assessment.

Note: Impact assessment results are relative statements only and do not provide information on impact category endpoints, threshold exceedances, margins of safety, or on risks.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = 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	3.43E+00	0	4.97E-02	1.07E+01	0	-1.16E+01
Global Warming Potential fossil fuels (GWP-fossil)	kg CO_2 eq	1.39E+01	0	4.94E-02	2.72E-01	0	-1.16E+01
Global Warming Potential biogenic (GWP-biogenic)	kg CO_2 eq	-1.05E+01	0	0	1.05E+01	0	0
Global Warming Potential luluc (GWP-luluc)	kg CO_2 eq	8.55E-03	0	2.92E-04	3.87E-05	0	-2.49E-03
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	1.68E-11	0	2.99E-14	9.46E-13	0	-3.24E-11
Acidification potential of land and water (AP)	mol H^+ eq	5.1E-02	0	7.4E-05	1.59E-03	0	-4.45E-02
Eutrophication potential aquatic freshwater (EP-freshwater)	kg P eq	2.18E-05	0	1.18E-07	2.73E-07	0	-9.06E-06
Eutrophication potential aquatic marine (EP-marine)	kg N eq	1.01E-02	0	2.92E-05	4.63E-04	0	-6.94E-03
Eutrophication potential terrestrial (EP-terrestrial)	mol N eq	1.08E-01	0	3.35E-04	6.61E-03	0	-7.53E-02
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	2.78E-02	0	6.62E-05	1.27E-03	0	-2.08E-02
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	6.74E-07	0	3.68E-09	8.85E-09	0	-6.27E-07
Abiotic depletion potential for fossil resources (ADPF)	MJ	1.73E+02	0	6.83E-01	2.4E+00	0	-1.66E+02
Water use (WDP)	m^3 world eq deprived	1.6E+00	0	4.72E-04	1.04E+00	0	-1.55E+00

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	1.04E+02	0	5.66E-02	5.97E-01	1.56E+01	-6.63E+01
Renewable primary energy resources as material utilization (PERM)	MJ	1.56E+01	0	0	0	-1.56E+01	0
Total use of renewable primary energy resources (PERT)	MJ	1.2E+02	0	5.66E-02	5.97E-01	0	-6.63E+01
Non renewable primary energy as energy carrier (PENRE)	MJ	1.73E+02	0	6.84E-01	2.4E+00	0	-1.66E+02
Non renewable primary energy as material utilization (PENRM)	MJ	0	0	0	0	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	1.73E+02	0	6.84E-01	2.4E+00	0	-1.66E+02
Use of secondary material (SM)	kg	5.44E-02	0	0	0	0	9.3E-01
Use of renewable secondary fuels (RSF)	MJ	0	0	0	0	0	0
Use of non renewable secondary fuels (NRSF)	MJ	0	0	0	0	0	0
Use of net fresh water (FW)	m^3	1.38E-01	0	4.94E-05	2.45E-02	0	-1.37E-01

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	9.67E-09	0	-4.76E-13	5.49E-11	0	-8.25E-09
Non hazardous waste disposed (NHWD)	kg	2.63E+00	0	1.14E-04	1.99E-01	0	-2.54E+00
Radioactive waste disposed (RWD)	kg	8.71E-03	0	4.11E-06	1.35E-04	0	-1.05E-02
Components for re-use (CRU)	kg	0	0	0	0	0	0
Materials for recycling (MFR)	kg	5.16E-02	0	0	1.03E+00	0	0
Materials for energy recovery (MER)	kg	0	0	0	0	0	0
Exported electrical energy (EEE)	MJ	0	0	0	0	0	1.44E+01
Exported thermal energy (EET)	MJ	0	0	0	0	0	2.6E+01

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	5.92E-07	0	1.01E-09	1.07E-08	0	-4.88E-07
Human exposure efficiency relative to U235 (IR)	kBq U235 eq	1.65E+00	0	6.33E-04	2.16E-02	0	-2.02E+00

Comparative toxic unit for ecosystems (ETP-fw)	CTUe	4.6E+01	0	4.89E-01	9.91E-01	0	-3.73E+01
Comparative toxic unit for humans (carcinogenic) (HTP-c)	CTUh	5.93E-09	0	9.95E-12	1.02E-10	0	-5.52E-09
Comparative toxic unit for humans (noncarcinogenic) (HTP-nc)	CTUh	1.49E-07	0	4.09E-10	5.65E-09	0	-1.07E-07
Soil quality index (SQP)	SQP	4.14E+02	0	2.44E-01	7.29E-01	0	-1.53E+01

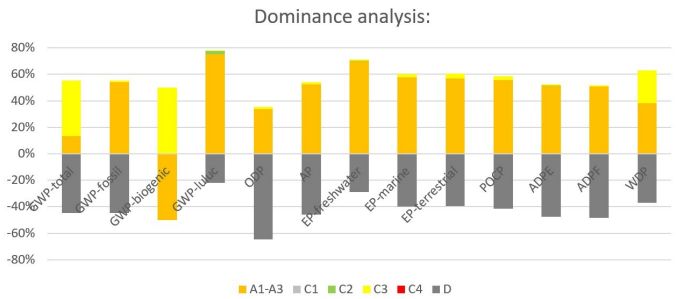
Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure 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.

This EPD was created using a software tool.

6. LCA: Interpretation

The following dominance analysis shows the individual impact categories and explores them in depth. The results are shown for representative product although it covers for the other systems as well.



Theenvironmental impacts were analysed using the example of global warmingpotential (GWP total) to identify the responsible sources along the life cycle.Module C1-C4 (76%) has a dominant influence and the rest by modules A1-A3 (24%)GWP total. This is because of the incineration of the untreated wood andaluminium treatment in module C1-C4, and in modules A1-A3 the extraction of thealuminium and wood fibre in the product are the primary contributors of GWP.Adhesive plays very small role in GWP.
Transportationof raw materials to and between the manufacturing sites (A2) and disposaltransportation of the product in EoL (C2) are not very relevant in terms ofGWP. The contribution to biogenic GWP in C1-C4 can be explained by the use ofwooden material in the product, in which biogenic carbon is bound.
The contribution of Module A1-A3 to GWP varies between 7% and 24%, while the contribution of Module C1-C4 ranges from 76% to 93% across different product variations. Despite these variations, Module A1-A3 remains the dominant contributor. The fluctuations in C1-C4 impacts are primarily influenced by different end-of-life scenarios, particularly the incineration phase.

7. Requisite evidence

The following requisite evidence is available:
Formaldehyde
The IDEAL / E-NERGY ÖKO system panels are produced without adhesives containing formaldehyde. The tests were carried out at the Institut für Baubiologie Rosenheim GmbH (3023-1395).

MDI
The system panels do not use adhesive systems containing MDI.
VOC-Emissions
VOC certificates are available for the IDEAL / E-NERGY ÖKO system panels. The measurements were carried out at the Institut für Baubiologie Rosenheim GmbH (3023-1395).

8. References

Standards:
DIN EN 1264-1:2021-08
Water-based surface embedded heating and cooling systems – Part 1: Definitions and symbols, German version EN 1264-1:2021, Deutsches Institut für Normung e.V. (DIN), Berlin, Germany.
DIN EN 15804:2012+A2:2019+AC:2021
Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products, Deutsches Institut für Normung e.V. (DIN), Berlin, Germany.
EN 13171:2012+A1:2015
Thermal insulation products for buildings - Factory-made wood wool (WW) products - Specification, European Committee for Standardization (CEN), Brussels, Belgium.
EN 13501-1:2019-05
Classification of construction products and building elements according to their reaction to fire - Part 1: Classification using the data from reaction to fire tests of construction products, European Committee for Standardization (CEN), Brussels, Belgium.
ISO 11855-1
Building environmental design – Embedded radiant heating and cooling systems – Part 1: Definitions, symbols, and comfort criteria, International Organization for Standardization (ISO), Geneva, Switzerland.
ISO 15686-1:2011
Buildings and constructed assets - Service life planning - Part 1: General principles and framework, International Organization for Standardization (ISO), Geneva, Switzerland.
Further Reference
AgBB
Committee for Health-related Evaluation of Building Products, Health-related assessment of emissions of volatile organic

compounds from building products, German Environment Agency, Berlin, Germany.
BBSR
Service life of components for life cycle analysis according to BNB, Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), 2017, Germany.
BMWSB
Federal Ministry for Housing, Urban Development and Building of the German government, Service life of components, last amended February 22, 2017, Available online at https://www.nachhaltigesbauen.de/austausch/nutzungsdauern-von-bauteilen/.
CMR
Number of substances identified as carcinogenic, mutagenic, or toxic for reproduction (Indicator), European Environment Agency, Published 16 Apr 2024, Modified 23 May 2024.
ECHA
List of substances of very high concern for authorization (ECHA Candidate List), published in accordance with Article 59(10) of the REACH Regulation, European Chemicals Agency, Helsinki, Finland.
EU/EFTA
European Union/European Free Trade Association (EU/EFTA), Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC, Document 32011R0305.
EWC
European Waste Catalogue (EWC), Federal Environmental Agency, Commission Decision 2014/955/EU, Available online at https://www.umweltbundesamt.de/dokument/european-waste-catalogue.
FIW
Forschungsinstitut für Wärmeschutz e.V. München (FIW), External Monitoring Report, Identification Number 0751, Munich, Germany, 2021.
IBR
Institute for Building Biology Rosenheim GmbH (IBR), VOC Certificate, Reference Number 24-3538-001/002, 2024.
IBU
Institut Bauen und Umwelt e.V., General Instructions for the EPD Programme of the Institut Bauen und Umwelt e.V., Version 2.0, Berlin, 2021, www.ibu-epd.com.
IBU PCR Part A
Institut Bauen und Umwelt e.V., PCR Guidance-Texts for Building-Related Products and Services. Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, Version 1.3, Berlin, 2022.
IBU PCR Part B
Institut Bauen und Umwelt e.V., PCR Guidance-Texts for Building-Related Products and Services. Part B: Requirements on the EPD for Installation systems for surface heating and cooling with water flow, Version 3, Berlin, 2024.
Sphera
Sphera Solutions, GaBi LCA for Experts (Version 10.8) [Computer software and LCA Database], Sphera Solutions, 2024, https://www.sphera.com/life-cycle-assessment-software.
Thünen Institute
Thünen Institute (2014), Carbon content in wood and paper products - derivation and conversion factors, Thünen Working Paper 38, Hamburg, Germany.

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

brands & values GmbH
Hollerallee 14A
28209 Bremen
Germany

+49 421 70 90 84 33
info@brandsandvalues.com
www.brandsandvalues.com

Owner of the Declaration

mfh systems GmbH
Hager Feld 8
49191 Belm
Germany

+49 (0)5406 69995-10
mail@mfh-systems.com
www.mfh-systems.com