ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	Paul Bauder GmbH & Co. KG
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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FPO roofing and sealing membranes BauderTHERMOPLAN

Paul Bauder GmbH & Co. KG

Institut Bauen und Umwelt e.V.

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1. General Information

Paul Bauder GmbH & Co. KG

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

Declaration number
EPD-BAU-20220195-IBC1-EN

This declaration is based on the product category rules:
Plastic and elastomer roofing and sealing sheet systems, 11.2017
(PCR checked and approved by the SVR)

Issue date
20.10.2022

Valid to
19.10.2027

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(chairman of Institut Bauen und Umwelt e.V.)

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FPO roofing and sealing membranes BauderTHERMOPLAN

Owner of the declaration
Paul Bauder GmbH & Co. KG
Korntaler Landstraße 63
D-70499 Stuttgart

Declared product / declared unit
The declared unit is the production of 1 m² of the means weighted according to the production quantity for the BauderTHERMOPLAN FPO roofing and sealing membranes fixed mechanically or under ballast and sealed by means of hot air, including packaging materials.

Scope:
This document is valid for FPO roofing and waterproofing membranes:

- BauderTHERMOPLAN T (12/15/18/20),
- BauderTHERMOPLAN T (15/18/20) V,
- Bauder THERMOPLAN SK (15/18/20)

manufactured at the German BAUDER production plant in Schwepnitz.

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

M. Schulz
(Independent verifier)

2. Product

2.1 Product description/Product definition

BauderTHERMOPLAN are synthetic roofing and waterproofing membranes based on flexible polyolefins (FPO) with a synthetic fibre core. The product range is divided into the following variants:

- **BauderTHERMOPLAN T (12/15/18/20)**
  Embedded polyester reinforcement
- **BauderTHERMOPLAN T (15/18/20) *V***
  Embedded polyester reinforcement, special fleece lamination on the underside
- **Bauder THERMOPLAN SK (15/18/20)**
  Embedded special composite reinforcement, fleece/self-adhesive layer on underside

The reported results declare an average over all BauderTHERMOPLAN products. The averaging is based on the corresponding production quantities (by area produced).

Regulation (EU) No 305/2011(CPR) applies to the placing on the market of the product in the EU/EFTA (except Switzerland). The product requires a declaration of performance taking into account *DIN EN 13956:2012 Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics and DIN 13967:2012 Flexible sheets for waterproofing - Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet - Definitions and characteristics*.
The respective national regulations apply to the use.

2.2 Application

The FPO roofing and sealing membranes are laid in a single layer and hot-air welded at the seams. The wind suction is secured by mechanical fastening, by ballast or by bonding.

Roof waterproofing - Single-ply waterproofing of non-utilized and utilized roofs (e.g., solar roof, green roof) in flat and pitched form.

Structural waterproofing - Single-layer waterproofing of non-waterproof structures and building components against ground soil and non-pressing water.
BauderTHERMOPLAN roofing and waterproofing membranes are used according to requirements:
- mechanically fixed,
- under superimposed load or
- adhered.

2.3 Technical Data

Technical properties

Name	Value	Unit
Watertightness for type B according to EN 1928 method B	passed	kPa/72 h
Peel resistance of the seam joint according to EN 12316-2	≥ 300	N/50mm
Shear resistance of the seam joint according to EN 12317-2	≥ 500, tear-off outside the joint seam	N/50mm
Maximum tensile strength according to EN 12311-2 A	lengthwise: ≥ 1200 crosswise: ≥ 1200	N/50 mm
Maximum elongation according to EN 12311-2 A	lengthwise: ≥ 19 crosswise: ≥ 19	%
Tear resistance according to EN 12310-2	> 320	N
Resistance to root penetration according to EN 13948/FLL	FLL fulfilled	-
Dimensional stability according to EN 1107-2	< 0,3	%
Folding in the cold according to EN 495-5	< -30	°C
Bitumen compatibility according to EN 1548 (roofing membranes)	Not relevant	-
Resistance to impact loads according to EN 12691 (geomembranes)	700 - 1250	mm
UV exposure (1000 h) according to EN 1297	fulfilled > 5000 h	-
Water vapour properties μ according to EN 1931	approx. 200.000	-
Behaviour on exposure to bitumen according to EN 1548	complies with EN 13956 ab. 5.2.1.8 method B	-

Further technical data is not relevant.

Performance values of the product according to the declaration of performance in relation to its essential characteristics in accordance with *DIN EN 13956:2012 Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics* and *DIN 13967:2012 Flexible sheets for waterproofing - Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet - Definitions and characteristics.*

2.4 Delivery status

The FPO roofing and sealing membranes are wound onto cardboard sleeves and individually wrapped with a protective film and delivered ex works on a Euro pallet. The BauderTHERMOPLAN variants have the following dimensions:

Variant	Lengths [m]	Widths [m]	Thicknesses [mm]	Colours
T12	25	1,5 - 2,0	1,2	pearl white, silver grey
T15	20	1,5 - 2,0	1,5	pearl white, silver grey
T18	15 - 20	1,5 - 2,0	1,8	pearl white, silver grey, granite black
T20	15 - 20	1,5 - 2,0	2,0	pearl white, silver grey
T15V	20	1,5	1,5 + fleece	pearl white, silver grey
T18V	20	1,5	1,8 + fleece	pearl white, silver grey
T20V	20	1,5	2,0 + fleece	pearl white, silver grey
T Cuts	20	0,2 - 1,0	1,2 - 2,0	pearl white, silver grey
SK 15	15-20	2,0	1,5	pearl white, silver grey
SK 18	15-20	2,0	1,5	pearl white, silver grey
SK 20	15-20	2,0	1,5	pearl white, silver grey

Colours white and granite black available on request.

2.5 Base materials/Ancillary materials

Material	Components	Share (mass%)
Polymer	Base polymer / produced by polymerisation of propylene (synthesis)	45 - 55
Stabilisers	Phosphite and phenolic derivatives as thermal and long-term protection / generated by synthesis	1 - 2
Additive	Processing aids or dispersants / produced by synthesis	<1
Flame protection	Aluminium trihydroxide to reduce flammability / produced by synthesis	35 - 45
Colour	Oxide compound of titanium as white pigment and UV protection as well as organic or inorganic pigments / produced by synthesis	1 - 2
Circulation material	Edge trimmings; chaff / produced during the manufacture of finished goods	1 - 2
Fabric/Fleece	Synthetic fibres	4 - 6

The product/article/ at least one partial article contains substances on the ECHA list of Substances of Very High Concern (SVHC) (date 11.04.2022) above 0.1% by mass: **no.**

The product/article/ at least one partial article contains other CMR substances of category 1A or 1B not on the candidate list above 0.1% by mass in at least one sub-product: **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.**
Aluminium trihydroxide is used as a flame retardant and phosphite and phenolic derivatives as stabilisers.

2.6 Manufacture

FPO roofing and sealing membranes are manufactured in a single-stage process.
The mixing and plasticising of the raw materials on the extruders is carried out separately for top and bottom film.
The polyester fabric reinforcement is first coated with the bottom film, then with the top film.
Some of the FPO roofing and sealing membranes have a special fleece lamination on the underside.
After cooling and final edge trimming, the products are made-up.
All production waste is treated internally. Recyclable fractions are recycled and directly reintroduced into the production process. Non-recyclable components are disposed of.
Permanent measurement of product quality and continuous improvement of internal processes is ensured through the use of the *ISO 9001* quality management system.

2.7 Environment and health during manufacturing

The maximum workplace concentration (MAK) limits are regularly checked and corresponding limits are not exceeded in the production process. In addition to the general occupational safety measures for commercial enterprises, precautionary measures are offered and implemented.
The national and plant-specific requirements for environmental protection are complied with in the manufacturing process. The cooling water for product cooling is recirculated. Optimal use of raw materials is achieved through recycling.

2.8 Product processing/Installation

FPO roofing and sealing membranes can be installed as follows:

- Loosely laid mechanically fastened
The products are laid loose and mechanically fixed with approved fasteners in the seam or field area. The seam covers or cover tapes are homogeneously welded using hot air.

- Loosely laid under ballast
The products are laid loosely and secured with a subsequent ballast system of green roof, gravel or slab covering. The seam covers are homogeneously welded using hot air.

- Adhered
The fleece-laminated products are partially or fully bonded to the substrate with 1-component polyurethane adhesives. The seam overlaps or cover tapes are homogeneously welded using hot air.
The self-adhesive sheets are placed on the substrate, the protective film is removed and pressed on. The seam overlays or cover tapes are homogeneously welded using hot air.
For all types of installation, the relevant standards and guidelines (e.g. *DIN 18531*, DIN *18195*, *DIN 18532* and Fachregeln des Deutschen Dachdeckerhandwerks -Flachdachrichtlinien) as well as the installation instructions and manufacturer's information must be observed.
Residues of FPO roofing and sealing membranes can be reused or disposed of as mixed construction and demolition waste (waste code number 17 09 04 according to the Waste Catalogue Ordinance *AVV*).

2.9 Packaging

The FPO roofing and sealing membranes are wound onto cardboard tubes, individually packed in PE protective sleeves and delivered on wooden pallets. The load is secured using polyethylene (PE) stretch film. All packaging materials are recyclable.
If the waste is sorted by type, it is taken back via INTERSEROH (INTERSEROH certificate 27113).

2.10 Condition of use

Substances may migrate slightly during the period of use of the FPO roofing and sealing membranes. There are no changes in the properties during the service life.

2.11 Environment and health during use

The small changes in weight according to various test methods indicate that the ecological impact of migrating substances is small. For further information see *Burkhardt et al. 2020.*

2.12 Reference service life

The service life depends on the thickness of the roofing and sealing membrane and any surface protection used (gravel, green roof).
An average service life was calculated for BauderTHERMOPLAN based on the production quantities in 2020. With professional installation, an average of 35 years can be assumed.

2.13 Extraordinary effects

Fire

Property	Test method	Requirements
Exposure to fire from the outside	DIN V ENV 1187	passed*
Fire behaviour	DIN EN ISO 11925-2	Class E according to DIN EN 13501-1

* in defined built-ups

Fire protection

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

* not specified for roofing and sealing membranes > 1 mm.

Water
The declared FPO roofing and sealing membranes are water-insoluble and resistant to the effects of water when used as intended. The watertightness is tested according to *EN 1928.*

Mechanical destruction
Destruction of FPO roofing and sealing membranes does not produce environmentally harmful products and hazardous waste.

2.14 Re-use phase

FPO roofing and sealing membranes are deconstructed and recycled at the end of their useful life.
Loosely laid roof structures are suitable for unmixed deconstruction. Adhesive residues and fleece adhesions are unavoidable with glued roof structures.

After thorough cleaning, the material is recycled by shredding and separation. The used plastics are then returned to the material cycle and used, for example, for floor protection mats.
After the end of the useful life, thermal recycling is also possible. Through use in incineration plants, the energy contained in the declared products can be recovered.

2.15 Disposal

The following lists the waste code numbers according to the European Waste Catalogue in accordance with the Waste Catalogue Ordinance (*AVV*) for the individual product components.

Packaging
The packaging materials are disposed of via INTERSEHROH AG. The components of the packaging that are produced during installation in the building have the following waste code number:
- 15 01 01: Paper and cardboard packaging
- 15 01 02: Plastic packaging
- 15 01 03: Wood packaging

End of Life
The product at the end of its life has the following waste code number:
- 17 09 04: Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03

In general, material recovery (recycling) is preferable to energy recovery (waste incineration plant (WtE) route).

2.16 Further information

Contact details can be found on the back of this declaration. Further product information is available online as a download (www.bauder.de).

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is the production of 1 m² of the production quantity weighted average for the mechanically or ballasted, hot air sealed BauderTHERMOPLAN roofing and waterproofing membrane variants T (12/15/18/20) and T (15/18/20) V including packaging materials.

Declared unit

Name	Value	Unit
Declared unit	1	m^2
Grammage	2.2	kg/m^2
Conversion factor to 1 kg	0.455	m^2/kg
Layer thickness (average)	1.74	mm

3.2 System boundary

Type of EPD: from cradle to gate with options (modules A1-A3, C1-C4 and module D).
The modules A1-5, C1-4 and D are declared in accordance with EN 15804. The following points were taken into account in the preparation of the life cycle assessment:

Module A1-3
All upstream chains of the raw materials and materials used, as well as their procurement transports. Production processes including energy and waste flows (cradle to factory gate). Waste produced is taken into account up to the end-of-waste status.

Module A4-5
Transport to the construction site and an average installation cost (hot-air bonding and any offcuts) as well as fixing material. Recycling of the packaging material.

Module C1
Tear off the roofing and waterproofing membrane from the roof.

Module C2-1
Transports as part of the recycling route.

Module C2-2
Transports as part of the energy recovery route.

Module C3-1
Material recovery (recycling) of the product, including processing costs.

Module C3-2
Energy recovery (incineration in a waste incineration plant).

Modules D-1 and D-2
Reporting of credits generated by waste treatment in modules A5, C3-1 and C3-2.

3.3 Estimates and assumptions

No estimates and assumptions were made that would be relevant for the interpretation of the LCA results.

3.4 Cut-off criteria

All material and energy flows entering the product system were taken into account. The exception here is the reused Euro pallets as packaging. It can be assumed that the sum of the neglected mass fractions does not exceed 5 % of the results from the impact categories.

3.5 Background data

For modelling the life cycle, the software for holistic accounting (*GaBi* 10.6) was used. All background data sets were taken from various *GaBi* databases and the *ecoinvent* database.

3.6 Data quality

The current background data sets from the *GaBi databases* were used for the balancing. One *ecoinvent dataset* used exceeds the age of 10 years, but is most suitable for modelling the product system under investigation. This dataset was only used for one ingredient that does not enter the product in large quantities (< 1 %).
Data collection for the products investigated was based on evaluations of internal production and environmental data and the collection of LCA-relevant data within the supplier chain. The geographical reference was taken into account when using the data sets. The data collected was checked for plausibility

and consistency, which means that a good level of representativeness can be assumed.

The variants considered in this EPD have a comparable composition and differ mainly in their basis weight. This varies between -24 % and +24 % compared to the weighted average product. Similarly, the potential environmental impacts also vary.

3.7 Period under review

The data collection referred to the analysis period from 01.01.2020 to 31.12.2020.

3.8 Allocation

The material input and output flows were determined on the basis of the corresponding production quantities. The energy input and output flows were taken into account on the basis of the corresponding total quantities from the 2020 calendar year and allocated to production on the basis of consumption measurements.
Credits from modules A5 and C3-1 are reported in module D-1, credits from modules A5 and C3-2 in module D-2.

3.9 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.

GaBi software 10.6 with database version 2022.2 was used. In isolated cases, *ecoinvent* 3.6 was used if not otherwise possible.

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic carbon
The biogenic carbon content was calculated based on the product components. Biogenic carbon is only found in the packaging (cardboard, paper and wood).

Information describing the biogenic carbon content at the factory gate

Name	Value	Unit
Biogenic carbon content in product	0	kg C
Biogenic carbon content in accompanying packaging	0.0062	kg C

Transport to construction site (A4)

Name	Value	Unit
Transport distance	565	km
Capacity utilisation (including empty runs)	85	%

The transport distance was modelled using the average distance to the customer base. Due to the European distribution routes, European data sets were used.

Installation in the building (A5)

Name	Value	Unit
Auxiliary fastener	0.05	kg
Excipient adhesive	0.02	kg
Electricity consumption for hot air and drill	0.049	kWh
Material loss	0.0215	kg

The energy consumption for hot air and drilling machine was calculated, the information on material losses is based on empirical values. The auxiliary materials required for the three different types of installation were taken into account proportionally.

Service life
The service life depends on the thickness of the roofing and sealing membrane and any surface protection used (gravel, green roof). A weighted average value was calculated. The service life is based on the company's experience.

Name	Value	Unit
Life Span according to manufacturer	35	a

End of life (C1-C4)
Scenario 1:
Recycling route (C3-1) 100.0 %

Scenario 2:
Energy recovery route (C3-2) 100.0 %

Name	Value	Unit
Collected separately	2.2	kg
Collected as mixed construction waste	-	kg
Reuse	-	kg
Recycling scenario 1	2.09	kg
Energy recovery scenario 2	2.09	kg
Landfilling	-	kg
Loss (estimated)	5	%

For the modelling of the End of Life, two different scenarios were calculated, each representing a 100 % route, but also allowing a proportional calculation (e.g. Scenario 1 = 30 % / Scenario 2 = 70 %). The end-of-life processes are modelled with data sets that represent the European average. Intra-European transports and recycling rates were taken into account.

Reuse, recovery and recycling potential (D)

In module D, both the credits from energy recovery for the product in the end of life (resulting from modules C3-1 and C3-2) and for the packaging materials (resulting from module A5) are mapped. In order to be able to consider the end-of-life scenarios separately, the results are shown in modules D-1 (credits resulting from scenario 1) and D-2 (credits resulting from scenario 2).
In the recycling scenario, only the amount of thermoplastic polyolefin (TPO) and flame retardant was credited as TPO with a value correction factor of 0.73.

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5. LCA: Results

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	X	X	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m² BauderTHERMOPLAN T (12/15/18/20), SK (15/18/20) und T (15/18/20) V incl. packaging

Core Indicator	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
GWP-total	[kg CO_2-Eq.]	3.32E+0	6.16E-2	3.93E-1	2.14E-2	3.27E-2	9.93E-3	8.24E-1	4.08E+0	0.00E+0	-2.44E+0	-2.02E+0
GWP-fossil	[kg CO_2-Eq.]	3.34E+0	6.12E-2	3.70E-1	2.14E-2	3.25E-2	9.88E-3	8.24E-1	4.08E+0	0.00E+0	-2.44E+0	-2.02E+0
GWP-biogenic	[kg CO_2-Eq.]	-2.29E-2	4.04E-7	2.29E-2	-4.29E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
GWP-luluc	[kg CO_2-Eq.]	9.52E-4	4.17E-4	1.79E-5	1.39E-6	2.20E-4	4.53E-5	1.06E-4	6.56E-6	0.00E+0	-3.07E-4	-3.16E-4
ODP	[kg CFC11-Eq.]	8.16E-10	6.07E-15	2.03E-10	2.12E-13	3.20E-15	1.75E-15	6.28E-12	5.86E-9	0.00E+0	-7.16E-12	-1.90E-11
AP	[mol H^+-Eq.]	6.07E-3	3.56E-4	7.41E-4	3.15E-5	1.05E-4	3.09E-5	1.15E-3	1.15E-3	0.00E+0	-3.96E-3	-2.22E-3
EP-freshwater	[kg P-Eq.]	1.12E-5	2.21E-7	4.24E-7	9.62E-9	1.16E-7	2.37E-8	8.00E-6	7.86E-8	0.00E+0	-3.04E-6	-3.89E-6
EP-marine	[kg N-Eq.]	1.64E-3	1.73E-4	1.77E-4	8.61E-6	4.75E-5	1.43E-5	3.03E-4	2.26E-4	0.00E+0	-1.08E-3	-7.25E-4
EP-terrestrial	[mol N-Eq.]	1.77E-2	1.92E-3	1.74E-3	9.20E-5	5.33E-4	1.60E-4	3.09E-3	4.02E-3	0.00E+0	-1.15E-2	-7.70E-3
POCP	[kg NMVOC-Eq.]	5.66E-3	3.34E-4	5.58E-4	2.43E-5	9.40E-5	2.80E-5	7.94E-4	6.31E-4	0.00E+0	-3.89E-3	-1.95E-3
ADPE	[kg Sb-Eq.]	5.55E-7	6.23E-9	6.94E-6	2.55E-9	3.28E-9	9.90E-10	1.27E-7	7.03E-9	0.00E+0	-5.62E-7	-5.96E-7
ADPF	[MJ]	1.01E+2	8.12E-1	5.19E+0	4.55E-1	4.28E-1	1.30E-1	1.11E+1	2.00E+0	0.00E+0	-8.66E+1	-3.01E+1
WDP	[m^3 world-Eq deprived]	1.18E+0	6.90E-4	4.15E-2	1.60E-3	3.64E-4	5.96E-5	1.17E-1	4.71E-1	0.00E+0	-1.80E-1	-7.63E-2

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m² BauderTHERMOPLAN T (12/15/18/20), SK (15/18/20) und T (15/18/20) V incl. packaging

Indicator	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
PERE	[MJ]	5.28E+0	5.63E-2	9.35E-1	6.57E-2	2.97E-2	8.70E-3	4.32E+0	2.00E-1	0.00E+0	-3.76E+0	-9.50E+0
PERM	[MJ]	6.11E-1	0.00E+0	-6.11E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	5.89E+0	5.63E-2	3.24E-1	6.57E-2	2.97E-2	8.70E-3	4.32E+0	2.00E-1	0.00E+0	-3.76E+0	-9.50E+0
PENRE	[MJ]	4.81E+1	8.15E-1	5.59E+0	4.55E-1	4.30E-1	1.31E-1	6.37E+1	5.45E+1	0.00E+0	-8.67E+1	-3.01E+1
PENRM	[MJ]	5.29E+1	0.00E+0	-3.81E-1	0.00E+0	0.00E+0	0.00E+0	-5.25E+1	-5.25E+1	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	1.01E+2	8.15E-1	5.21E+0	4.55E-1	4.30E-1	1.31E-1	1.12E+1	2.00E+0	0.00E+0	-8.67E+1	-3.01E+1
SM	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.24E+0	3.49E-2
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m^3]	3.49E-2	6.50E-5	1.23E-3	9.95E-5	3.42E-5	7.61E-6	4.58E-3	1.10E-2	0.00E+0	-1.00E-2	-5.29E-3

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

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m² BauderTHERMOPLAN T (12/15/18/20), SK (15/18/20) und T (15/18/20) V incl. packaging

Indicator	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
HWD	[kg]	1.80E-8	4.31E-12	2.94E-10	3.25E-11	2.27E-12	6.01E-13	1.28E-9	5.60E-11	0.00E+0	-6.32E-9	-4.84E-9
NHWD	[kg]	1.00E-1	1.33E-4	5.12E-3	9.66E-5	7.00E-5	2.13E-5	2.32E-1	1.61E-2	0.00E+0	-1.26E-2	-8.30E-3
RWD	[kg]	1.02E-3	1.51E-6	1.57E-4	7.56E-5	7.97E-7	1.84E-7	1.23E-3	1.15E-4	0.00E+0	-6.97E-4	-1.43E-3
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.20E+0	3.49E-2	0.00E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	1.53E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.39E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	2.72E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.60E+1	0.00E+0	0.00E+0	0.00E+0

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m² BauderTHERMOPLAN T (12/15/18/20), SK (15/18/20) und T (15/18/20) V incl. packaging

Indicator	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
PM	[Disease Incidence]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
IRP	[kBq U235-Eq.]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	[CTUe]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-c	[CTUh]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-nc	[CTUh]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SQP	[-]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

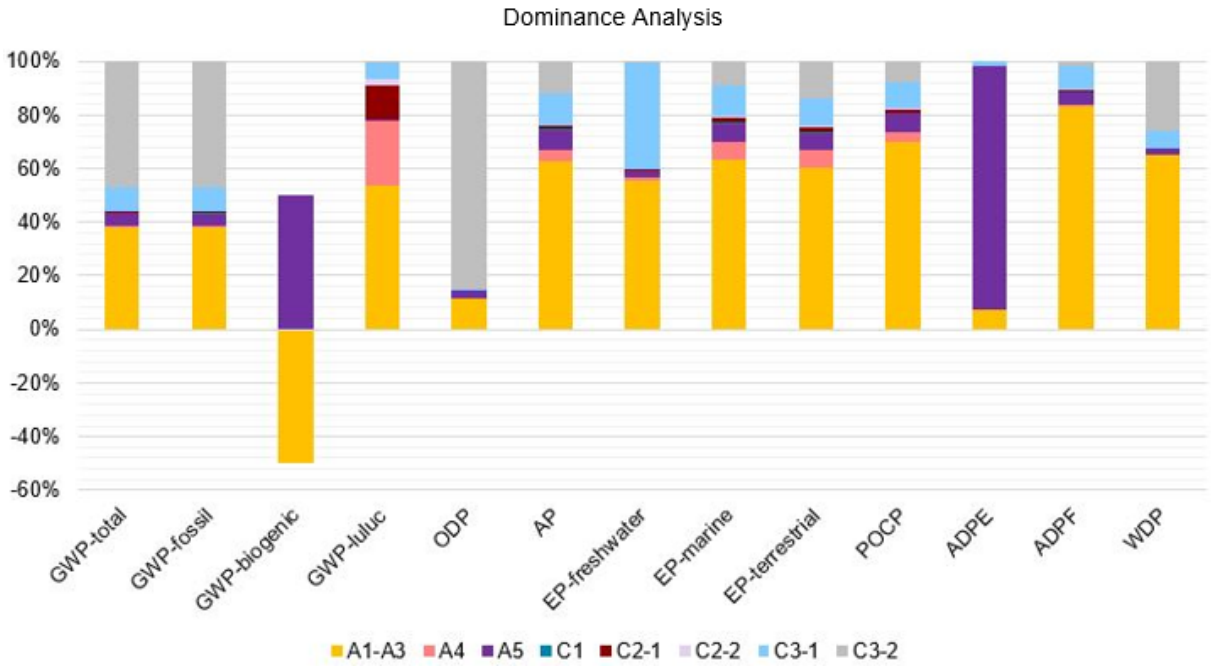
Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Restriction notice
Concerning the indicators: potential for depletion of non-fossil abiotic resources (ADPE), potential for depletion of abiotic fossil fuels (ADPF), water use (WDP): The results of these environmental impact indicators need to be used with caution, as the uncertainties in these results are high or as there is limited experience with the indicator. The indicators PM, IR, ETP-fw, HTP-c, HTP-nc and SQP are voluntary and have not been declared due to the remaining uncertainties in these results.

Note
The impact assessment results are only relative statements that do not make any statements about endpoints of the impact categories, exceedances of threshold values, safety margins or about risks. For all indicators mentioned, the characterisation factors of EK-JRC were applied.

6. LCA: Interpretation

The evaluation of the environmental impacts allows the following interpretation:



Module A1-A3 has a dominant influence on almost all environmental impacts. In the following, the environmental impacts are analysed using the example of global warming potential (GWP-total) in order to identify the responsible sources along the life cycle.
The manufacturing phase (module A1-A3) implies a contribution to the total global warming potential of 38 %. Here, the manufactured FPO mixture dominates the total emissions of the module with 80 %. Here again, the PP/EPDM granulate is the main driver with approximately 67 %. All other materials contribute less than 6 % to the manufacturing phase.
Transport to the customer has no major relevance in terms of GWP (A4). Product installation at the construction site (A5) has a contribution of 4 %. The negative contribution to GWP-biogenic in A1-A3 and the positive contribution in A5 can be explained by the use of packaging such as cardboard and wood, in which biogenic carbon is bound.
The disposal transports (C2-1/C2-2) have hardly any influence on the result. The recycling of the product at the end of life implies a low environmental impact of 9 % (C3-1), while the energy recovery of the product and the associated emissions from the incineration plants (C3-2) make a significantly high contribution to the overall result (approx. 47 %).
Since the composition of the different products is very similar, hardly any variances in the percentage contributions are to be expected. The absolute values

vary depending on the thickness of the product. GWP-total shows a variance of -24 % and +24 % compared to the average product.

7. Requisite evidence

No evidence required.

8. References

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