Environmental Product Declaration

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

Polyurethane and Polyisocyanurate Insulated Sandwich Panels with Steel Facings

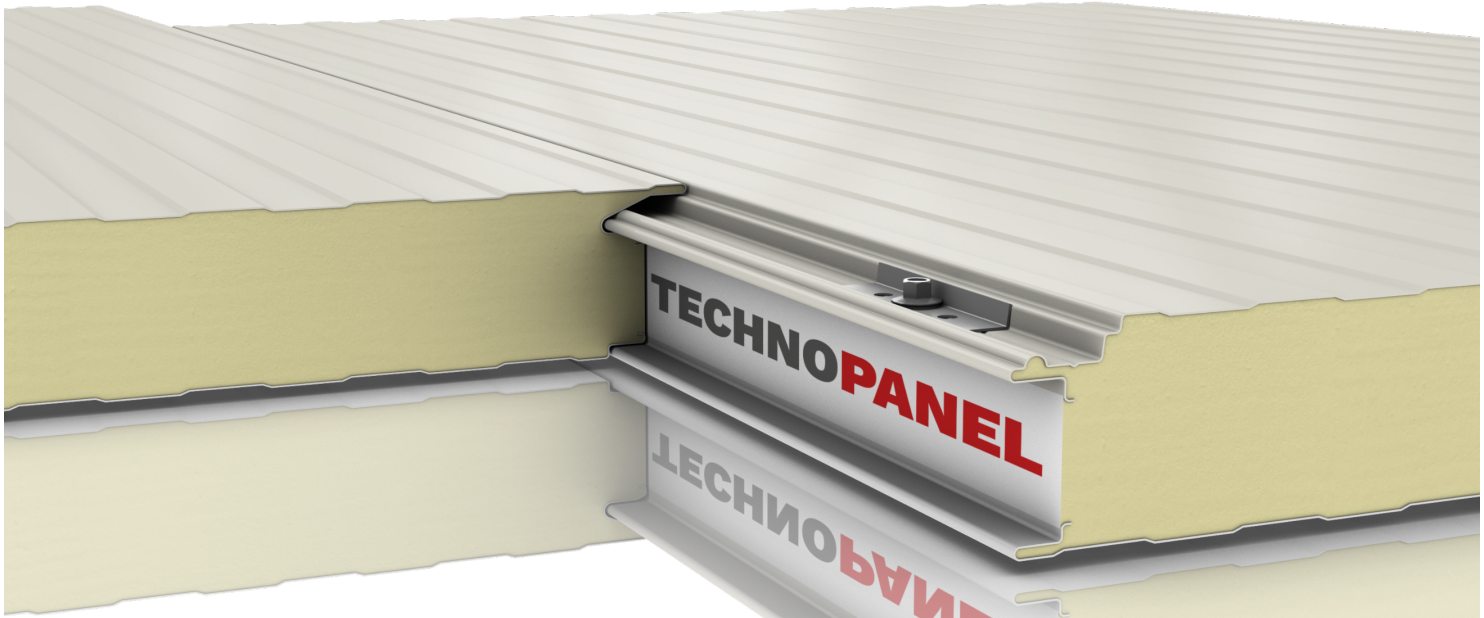
an EPD of a representative product covering product lines TFACE T, TFACE S and TTOP

from

Technopanel EAD

Programme:	The International EPD System, www.environdec.com
Programme operator:	EPD International AB
Type of EPD:	EPD of multiple products from a company, based on the representative results of the product group
EPD registration number:	EPD-IES-0027398:002
Version date:	2026-03-24
Validity date:	2031-01-26

An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com



GENERAL INFORMATION

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

Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
PCR 2019:14 "Construction products", v2.0.1 **UN CPC 421 - Structural metal products and parts thereof**
PCR review was conducted by: *Rob Rouwette (chair), Noa Meron (co-chair). The Technical Committee of the International EPD System. A full list of members is available on www.environdec.com. The review panel may be contacted via support@environdec.com*

Third-party Verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ **Individual EPD verification without a pre-verified LCA/EPD tool** Third-party verifier: *Ms. Mari Kirss, Meetripuu OÜ* Approved by: International EPD System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

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

EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison.
For further information about comparability, see EN 15804 and ISO 14025.

INFORMATION ABOUT EPD OWNER

Owner of the EPD: Technopanel EAD
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Address and contact information of the LCA practitioner commissioned by the EPD owner:

Lead LCA Expert: Dr. Nikolay Minkov (nikolay@greentability.com)
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Description of the organisation:
Technopanel is a Bulgarian company specializing in the design and production of roof and façade systems composed sandwich panels with insulation core of polyurethane rigid foam (PUR), polyisocyanurate rigid foam (PIR) or rock/mineral wool (MW) for industrial, commercial, and public buildings. Established in 2007, the company is part of the industrial holding BS Group of Companies.

The production facility and warehouse base are located in Bulgaria, 1805 Yana, 1 Zavodska Street on a site of over 61 000 m^2, equipped with a continuous line for the manufacturing of composed sandwich panels for consistent quality and efficiency across all product ranges.

Technopanel serves both the domestic and international markets, exporting to many European countries. Its panels are used in logistics centres, production halls, commercial buildings, agricultural facilities and public infrastructure projects.

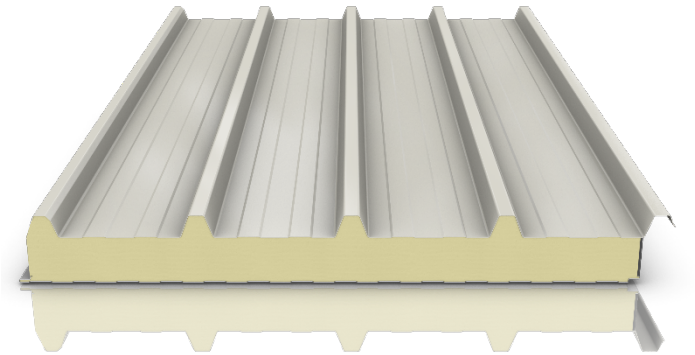
Product-related or management system-related certifications:
Technopanel EAD manufactures products under EN 14509 (requirements for factory made, self-supporting, double skin metal faced insulating sandwich panels) and EN 13501 (fire classification of construction products and building elements) certification. The organization is certified under ISO 9001, ISO 14001 and ISO 45001.

PRODUCT INFORMATION

Product name: TTOP PUR 100 (representative product)

Product identification: TTOP PUR 100 is a sandwich panel consisting of two profiled steel facings and a thermally insulating core made of PUR with thickness of 100 mm. The panel combines structural function, thermal insulation and weather protection.

Visual representation of the product:



UN CPC code: 421 - Structural metal products and parts thereof

Product description:

PUR and PIR panels are factory-made, metal-faced sandwich panel with a rigid PUR or PIR insulation core, designed for different applications, having have nominal width 1 000 mm and lengths up to 16 000 mm:

- TTOP – roof panels designed for a wide range of roofing applications and thicknesses from 30 to 160 mm
- TFACE – wall panels present in various profiles (T, V, F, W, D) with thickness from 40 to 200 mm designed for different installation methods:
  - Visible fixing (T)
  - Hidden Fixing (S)
  - Labyrinth joint (L) (not included in this EPD)

TTOP PUR 100 is selected as the representative product for the PUR and PUR sandwich panel family. While thinner panel configurations (e.g., 40 mm) show higher unit sales, the 100 mm thickness class is more widely used in applications where EPDs are requested (industrial building envelopes, insulated roofs and walls). Selecting TTOP 100 therefore ensures applicability of the representative model to the primary market use cases of PUR/PIR panels. Additionally, the 100 mm configuration is positioned near the middle of the product thickness range, making it an appropriate basis for comparison of the two extreme ranges, i.e. best/worst.

The representative product is identified by its series designation (TTOP), core type (PUR), fixing system (T – visible fixing) and nominal panel thickness of 100 mm. TTOP PUR 100 consists of two profiled and coated galvanized steel facings bonded to a rigid PUR insulation core. This configuration represents the

typical construction and technical characteristics of the manufacturer's PUR and PIR sandwich panel product group.

Key performance characteristics of the representative product:

- Thermal conductivity of core: 0.022 W/mK
- Fire reaction class: Ds3, d0 // BROOF (t1)
- Fire resistance: -
- U-value (100 mm thickness): 0.21 W/m²K
- Steel facing thickness: 0.4 / 0.4 mm

Variations of PUR panels included in the EPD and their technical features:

TTOP											
panel thickness		mm	30	40	50	60	80	100	120	150	160
metal sheet thickness	external	mm	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	internal		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
panel weight		kg/m^2	8.33	8.69	9.05	9.41	10.13	10.85	11.57	12.65	13.01
thermal conductivity coefficient		W/mK		λ = 0.022							
thermal transfer coefficient		W/m^{2}K	0.67	0.51	0.41	0.35	0.26	0.21	0.17	0.14	0.13
fire reaction class				Ds3, d0 // BROOF (t1)							
fire resistance		min	-	-	-	-	-	-	-	-	-

TFACE S									
panel thickness		mm	40	50	60	80	100	120	150
metal sheet thickness	external	mm	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	internal		0.4	0.4	0.4	0.4	0.4	0.4	0.4
panel weight		kg/m^2	9.40	9.77	10.14	10.88	11.62	12.36	13.47
thermal conductivity coefficient		W/mK	λ = 0.022						
thermal transfer coefficient		W/m^{2}K	0.5	0.41	0.35	0.26	0.21	0.18	0.14
fire reaction class			Bs2, d0						
fire resistance		min	-	-	-	EI15	EI15	EI15	EI15

TFACE T													
panel thickness		mm	40	50	60	80	100	120	140	150	160	180	200
metal sheet thickness	external	mm	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	internal		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
panel weight		kg/m^2	8.13	8.50	8.87	9.61	10.35	11.09	11.83	12.20	12.57	13.31	14.05
thermal conductivity coefficient		W/mK	λ = 0.022										
thermal transfer coefficient		W/m^{2}K	0.49	0.4	0.34	0.26	0.21	0.17	0.15	0.14	0.13	0.12	0.11
fire reaction class			Ds3, d0										
fire resistance		min	-	-	-	EI20	EII20	E20	EI20	EI20	EI20	EI20	EI20

Variations of PIR panels included in the EPD and their technical features:

TTOP											
panel thickness		mm	30	40	50	60	80	100	120	150	160
metal sheet thickness	external	mm	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	internal		-	-	0.4	0.4	0.4	0.4	0.4	0.4	0.4
panel weight		kg/m^2	-	-	10.29	10.70	11.52	12.34	13.16	14.39	14.80
thermal conductivity coefficient		W/mK	λ = 0.022								
thermal transfer coefficient		W/m^{2}K	-	-	0.42	0.35	0.27	0.22	0.18	0.15	0.14
fire reaction class			Bs2, d0								
fire resistance		min	-	-	REI20	REI20	REI30	REI30	REI30	REI30	REI30

TFACE S									
panel thickness		mm	40	50	60	80	100	120	150
metal sheet thickness	external	mm	-	0.6	0.6	0.6	0.6	0.6	0.6
	internal		-	0.4	0.4	0.4	0.4	0.4	0.4
panel weight		kg/m^2	-	11.08	11.53	12.43	13.33	14.23	15.58
thermal conductivity coefficient		W/mK	λ = 0.022						
thermal transfer coefficient		W/m^2K	-	0.41	0.35	0.27	0.21	0.18	0.14
fire reaction class			Bs2, d0						
fire resistance		min	-	-	EI20-EI60	EI20-EI60	EI30-60	EI30-60	EI30-60

TFACE T												
panel thickness		mm	40	50	60	80	100	120	140	150	160	180	200
metal sheet thickness	external	mm	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	internal		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
panel weight		kg/m^2	-	9.73	10.18	11.08	11.98	12.88	13.78	14.23	14.68	15.58	16.48
thermal conductivity coefficient		W/mK	λ = 0.022										
thermal transfer coefficient		W/m^2K	-	0.44	0.37	0.29	0.23	0.19	0.17	0.16	0.15	0.13	0.12
fire reaction class			Bs2, d0										
fire resistance		min	-	-	-	EI30	EI30	EI30	EI30	EI45	EI45	EI45	EI60

PUR and PIR sandwich panels are produced on a continuous manufacturing line. Steel coils are uncoiled, profiled and surface-treated to form the panel facings, after which the PUR or PIR insulation core is formed in situ between the steel facings by continuous dosing and foaming. The assembled panel passes through a curing and pressing section to achieve mechanical strength and dimensional stability, after which it is cut to customer-specific lengths, quality-checked and packaged for distribution.

Name and location of production site: Bulgaria, 1805 Yana, 1 Zavodska Street

More information or explanatory materials: https://www.technopanel.com/en/home/p1/.html?

CONTENT DECLARATION

The mass (weight) of one unit of a product, as purchased or per declared unit: 10.76 kg/m^2

Content of the product:

Ingredient	Range in product portfolio [%]	Representative product [%]	Representative product [kg/m^2]
Metal sheets	44-87	64.0	6.89
Insulating core (PUR)	13-56	36.0	3.87
Packaging	0.4-0.8	0.6	0.06
	TOTAL (product)	100	10.76

Information on the environmental and hazardous/toxic properties of a substances contained in the product: There is no substance in the candidate list of Substances of Very High Concern (SVHCs) which exceeds the limits for registration with the European Chemicals Agency (i.e. does not constitute more than 0.1% of the weight of the product)

The declared share of biogenic/recycled materials:

Product content	Mass, kg	Post-consumer recycled material, mass-% of product	Biogenic material, mass-% of product	Biogenic material, kg C/product or declared unit
Metal sheets	6.89	25.62%	0%	0.00
Insulating core (PUR)	3.87	0.00%	0%	0.00

Packaging materials	Mass, kg	Mass-% (versus the product)	Biogenic material, kg C/product or declared unit
Cutting tape	0.001	0.01%	0.00
LDPE foil	0.025	0.23%	0.00
PS board	0.035	0.33%	0.00
TOTAL	0.062	0.57%	0.00

1 kg biogenic carbon in the product/packaging is equivalent to the uptake of 44/12 kg of CO_2.

LCA INFORMATION

Declared unit: 1 m² of PUR insulated sandwich panel (representative product TTOP 100)

Conversion factor to mass: 10.76 kg/m²

Reference service life: N/A

Time representativeness: 1 January 2024 – 31 December 2024

Geographical scope:

- A1-A2 Global
- A3 Bulgaria
- A4, A5, C1-C4 Europe

Database and LCA software used: OpenLCA v2.5.0 + ecoinvent v3.11 (EN 15804+A2 add on), EF 3.1

Description of system boundaries:
The EPD is Type b) Cradle-to-gate with options, module C1-C4, module D and optional modules A4 and A5

The following life cycle stages are considered:

A1 Raw materials supply
This module includes the extraction, processing and production of all raw materials, semi-finished products, and energy inputs used in the manufacturing of the sandwich panels. The treatment of secondary materials prior to their use (e.g., recycling of scrap steel) is included in this stage. Upstream transport associated with these processes is also included within the respective background datasets.

A2 Transport to manufacturing
This module covers transportation of all raw materials, auxiliary materials, and packaging materials to the manufacturing facility. Transport is modelled based on typical supplier distances and modal splits recorded by the manufacturer for the reference period.

A3 Manufacturing
Once raw materials are delivered, the manufacturing of the products takes place in this stage. Here the consumption of energy (electricity and LPG) and water is also included. Manufacturing of packaging is modelled here, too, along with the generation and disposal of different effluents (mostly solid waste).

A4 Distribution
This module represents transportation from the factory gate to the construction site. An EU-average delivery scenario is assumed, based on transport by road (16-32 t Euro 6 truck), consistent with typical regional distribution.

A5 Installation
This stage includes the installation of panels at the construction site. The use of lifting and handling equipment is modelled through diesel consumption. Disposal of product packaging is included. No additional materials (e.g., fixing screws, sealing tapes) are included, as their contribution is considered negligible compared to the panel mass and is in line with PCR allowances for minor installation inputs.

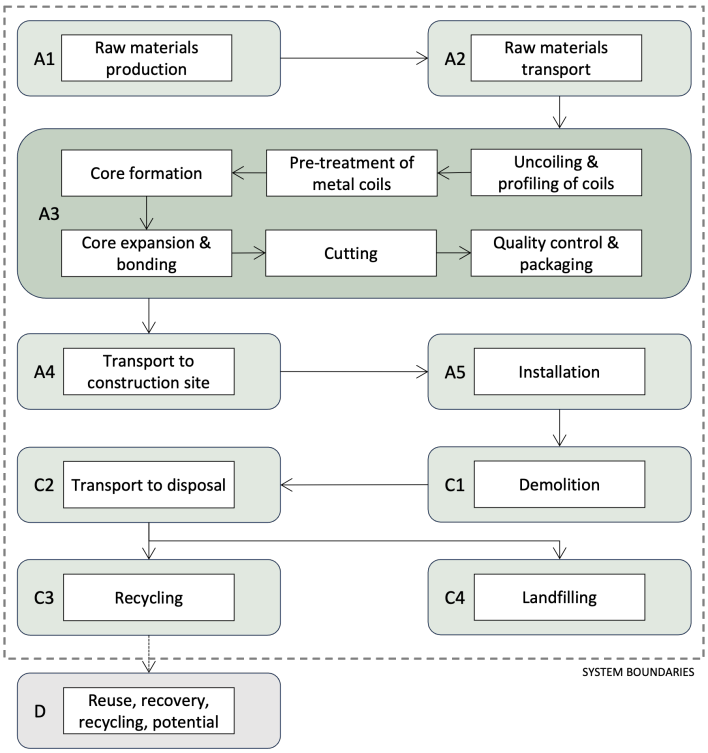
B1-B7 Use stage
Sandwich panels are passive building envelope elements and do not require energy or water during use. No planned maintenance, repair, replacement, refurbishment, or cleaning is expected under normal operating conditions. Therefore, Modules B1-B7 are not declared (MND).

C1-C4 End-of-life stage
Sandwich panels reach their end-of-life (EoL) with the building. In the C-modules the EoL of the products are modelled, including the demolition of the building, transport to disposal site, further waste processing and eventual landfilling.

Overall, the declared modules beyond the factory gate follow the European Association for Panels and Profiles e. V. (PPA-Europe)'s Annex for double skin steel faced sandwich panels (PPA-Europe, 2024). All steel sheets are assumed to be recovered and recycled (100%), while the PUR/PIR core is assumed to be fully thermally threated (100%).

D Beyond product life cycle
Module D reports potential benefits or burdens associated with the recovery and recycling of materials at EoL, namely steel from the metal sheets (C3) and metal scrap (A3), plastic and cardboard packaging (A3 & A5). Benefits are calculated using the net-scrap method, following EN 15804+A2, and reflect only the net amount of recovered material that reaches end-of-waste status. No benefits are included within A1-A3.

<u>Process flow diagram:</u>
Process flow diagram of the product system, divided into the life-cycle stages and modules (or other division of the product life cycle, if defined in the PCR), showing the main processes included and the system boundary of the LCA. The diagram shall make it clear when the end-of-waste state is reached for main input flows of reused/recycled materials and recovered energy, and for output flows of reused/recycled materials and recovered energy exiting the end-of-life stage.



More information:

- Cut off criteria: data has been collected to the best of knowledge of the manufacturer. Besides the excluded process as listed below, the study includes all major raw materials and energy consumption. There is no neglected unit process more than 1% of the total mass and energy flows. The total excluded input and output flows do not exceed 5% of energy usage or mass. The following flows were cut-off due to their expected negligible effects on the overall results:
  - Auxiliaries for equipment maintenance (e.g. lubricants)
  - Municipal waste generated at the production site
  - Wastewater generated at the production site (there is not production wastewater, but only hygienic)

- The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

- Allocation: co-product allocation is not applied as it is not relevant; in the foreground system, the total annual energy consumption (electricity and LPG) and solid wastes are broken down to the production of 1 m^2 (DU) of product, based on the total production volume (produced m^2), i.e. mass-based allocation

- Allocation of waste: During PUR/PIR sandwich panel production, production scrap consisting mainly of steel offcuts and cured PUR/PIR foam residues is generated. These residues are not reintegrated into the same product system. Steel scrap is sent for recycling, while PUR/PIR foam residues are treated as production waste. The environmental burdens associated with the generation of production scrap remain fully within modules A1-A3 of the studied PUR/PIR product system.

- Secondary materials are used as input. For the steel substrate, the dataset “steel production, low-alloyed, hot rolled” (GLO market) was applied. This process includes approximately 40% secondary (recycled) material. Due to the large number of steel sheet suppliers and the inconsistent reporting of secondary material content among them, it was decided not to modify the secondary material content in the original dataset, assuming a conservative estimate. For the PUR/PIR production, recycled polymer content is assumed in the core material, in line with the datasets used in the LCA study and current industrial practices.

- To model the production emissions, the 2023 Bulgarian residual mix was used, as the latest available mix in ecoinvent (based on 2023 AIB data). Its CO_2 intensity equals 0.639 kg CO_2e/kWh.

- The data quality rating outlined in the UN Environment Global Guidance on LCA database development as referred to in appendix E of EN 15804+A2 was applied.

- The data collection period of primary data is based on one-year average for 2024.

- The data quality information has been provided according to the requirements of EN 15941.

- Data quality regarding primary data is considered as “Very good”, whereas quality regarding secondary data is mostly considered as “Good”, with exceptions: The steel facing is modelled as a combination of Steel, low-alloyed (hot-rolled), Zinc coating, and Powder coating. Each of these datasets is rated as average (3) for TeR. This composite material is the dominant contributor to several core indicators (notably GWP-fossil, ADP-minerals, and EP-freshwater), due to the high mass share of steel per declared unit. No supplier-specific coil-coating or galvanizing datasets were available during the reference period. The selected datasets correspond to GLO average industrial processes, consistent with geographical and technological representativeness of the manufacturer’s supply chain. It is recognized that primary data from the steel supplier would further improve data quality and internal consistency. The manufacturer intends to evaluate the feasibility of obtaining such data in future updates of the EPD.

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

	Product stage			Distribution/ installation stage			Use stage						End-of-life stage				Beyond product life cycle
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	BG	EU	EU	ND	ND	ND	ND	ND	ND	ND	EU	EU	EU	EU	EU
Share of primary data*	8.2%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	-39%/+27%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	ND			-	-	-	-	-	-	-	-	-	-	-	-	-	-

* The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

Share of primary data of GWP-GHG results for A1-A3 (PUR system) is evaluated as follows:

Process	Source type	Source	Reference year	Data category	Share of primary data
Production of raw materials	Database	Ecoinvent v3.11	1993-2024	Secondary data	0.0%
Transport	Database	Ecoinvent v3.11	2024	Primary data	5.4%
Generation of electricity	Collected data	Ecoinvent v3.11	2024	Primary data	2.8%
Production of raw materials	Database	Ecoinvent v3.11	1993-2024	Secondary data	0.0%
Total share of primary data, of GWP-GHG results for A1-A3					8.2%

ENVIRONMENTAL PERFORMANCE

LCA results of the product(s) - main environmental performance results

The results of the study are presented as aggregated for modules A1-A3. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

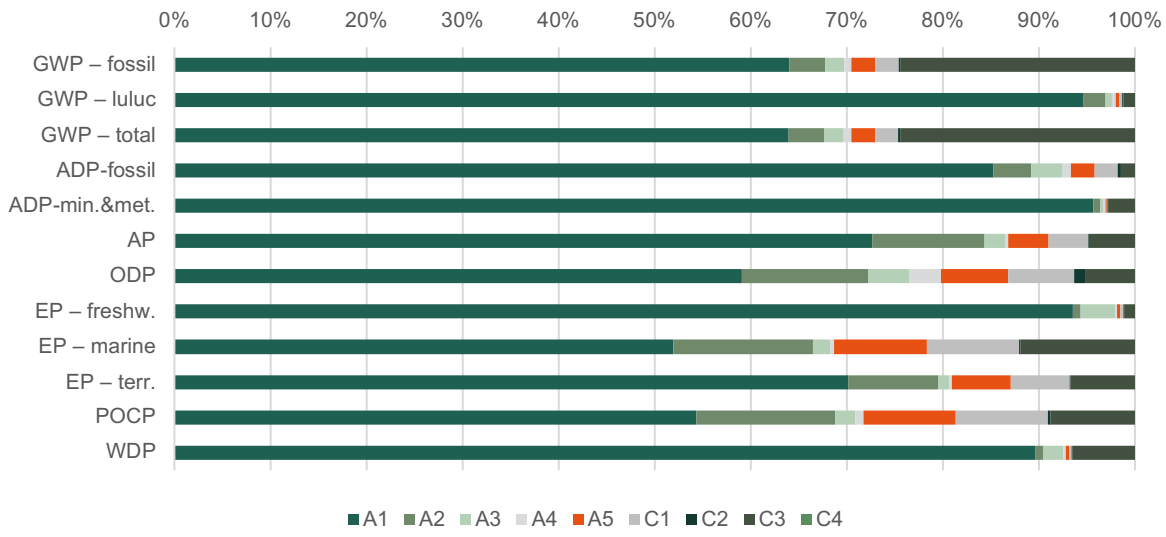
The results of the EoL stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3).

Mandatory impact category indicators according to EN 15804

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq.	3.05E+01	3.30E-01	1.08E+00	1.06E+00	1.10E-01	1.06E+01	0.00E+00	-1.02E+01
GWP-fossil	kg CO_2 eq.	3.05E+01	3.30E-01	1.08E+00	1.06E+00	1.10E-01	1.06E+01	0.00E+00	-1.02E+01
GWP-biogenic	kg CO_2 eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP-luluc	kg CO_2 eq.	3.16E-02	1.20E-04	1.20E-04	1.10E-04	4.10E-05	3.80E-04	0.00E+00	-6.78E-03
ODP	kg CFC 11 eq.	1.75E-07	7.49E-09	1.59E-08	1.58E-08	2.50E-09	1.19E-08	0.00E+00	-1.49E-07
AP	mol H^+ eq.	1.99E-01	8.00E-04	9.56E-03	9.51E-03	2.70E-04	1.10E-02	0.00E+00	-3.77E-02
EP-freshwater	kg P eq.	1.16E-03	2.60E-06	4.01E-06	3.72E-06	8.66E-07	1.31E-05	0.00E+00	-5.61E-04
EP-marine	kg N eq.	3.14E-02	2.10E-04	4.43E-03	4.42E-03	6.89E-05	5.49E-03	0.00E+00	-7.11E-03
EP-terrestrial	mol N eq.	6.41E-01	2.29E-03	4.86E-02	4.85E-02	7.60E-04	5.34E-02	0.00E+00	-8.21E-02
POCP	kg NMVOC eq.	1.48E-01	1.34E-03	1.46E-02	1.45E-02	4.50E-04	1.33E-02	0.00E+00	-2.95E-02
ADP-minerals&metals*	kg Sb eq.	4.25E-04	9.86E-07	4.59E-07	3.91E-07	3.29E-07	1.22E-05	0.00E+00	-9.07E-05
ADP-fossil*	MJ	5.28E+02	5.01E+00	1.40E+01	1.39E+01	1.67E+00	8.39E+00	0.00E+00	-1.38E+02
WDP*	m^3	1.14E+01	2.91E-02	3.85E-02	3.57E-02	9.71E-03	8.03E-01	0.00E+00	-2.73E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption								

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

Relative contribution of life cycle modules to the mandatory LCIA category indicators[1] (informative)



Additional mandatory and voluntary impact category indicators

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[2]	kg CO_2 eq.	3.05E+01	3.30E-01	1.08E+00	1.06E+00	1.10E-01	1.06E+01	0.00E+00	-1.02E+01

[1] Excluding GWP-biogenic, as it equals to zero.

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

Resource use indicators[3]

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	3.46E+01	7.73E-02	9.52E-02	8.72E-02	2.58E-02	5.13E-01	0.00E+00	-1.72E+01
PERM	MJ	1.36E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	3.47E+01	7.73E-02	9.52E-02	8.72E-02	2.58E-02	5.13E-01	0.00E+00	-1.72E+01
PENRE	MJ	4.21E+02	5.01E+00	1.40E+01	1.39E+01	1.67E+00	8.39E+00	0.00E+00	-1.38E+02
PENRM	MJ	1.07E+02	0.00E+00	-1.78E+00	0.00E+00	0.00E+00	-1.05E+02	0.00E+00	0.00E+00
PENRT	MJ	5.28E+02	5.01E+00	1.22E+01	1.39E+01	1.67E+00	-9.67E+01	0.00E+00	-1.38E+02
SM	kg	3.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	2.43E-01	6.80E-04	9.50E-04	8.90E-04	2.30E-04	1.61E-02	0.00E+00	-5.37E-02
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

Waste indicators

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	5.35E+00	5.21E-03	1.33E-02	1.24E-02	1.74E-03	1.76E-01	0.00E+00	-1.68E+00
Non-hazardous waste disposed	kg	4.66E+01	4.83E-02	1.13E-01	9.09E-02	1.61E-02	4.44E+00	0.00E+00	-8.77E+00
Radioactive waste disposed	kg	2.79E-04	1.38E-06	1.54E-06	1.45E-06	4.59E-07	6.05E-06	0.00E+00	-2.66E-04

[3] Primary energy indicators reported according to Annex 3, Option B (PCR 2019:14)

Output flow indicators

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	2.00E+00	3.89E-03	6.95E-03	6.54E-03	1.30E-03	1.36E-02	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.64E-03	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.97E-03	0.00E+00	0.00E+00

Additional LCA results of the product

The EPD is of multiple products that does not claim compliance with ISO 21930. Herewith, the variation of each impact indicator from the representative product for which the variation is above 10% is included.

Results per declared unit				
Indicator	**Unit**	**Best**	**A1-A3**	**Worst**
GWP-total	kg CO_2 eq.	-39%	3.05E+01	27%
GWP-fossil	kg CO_2 eq.	-39%	3.05E+01	27%
GWP-luluc	kg CO_2 eq.	-28%	3.16E-02	23%
ODP	kg CFC 11 eq.	-17%	1.75E-07	11%
AP	mol H^+ eq.	-15%	1.99E-01	17%
EP-freshwater	kg P eq.	-12%	1.16E-03	14%
EP-marine	kg N eq.	-22%	3.14E-02	20%
EP-terrestrial	mol N eq.	-15%	6.41E-01	17%
POCP	kg NMVOC eq.	-23%	1.48E-01	20%
ADP-minerals&metals	kg Sb eq.	-12%	4.25E-04	15%
ADP-fossil	MJ	-62%	5.28E+02	34%
WDP	m^3	-25%	1.14E+01	22%
GWP-GHG	kg CO_2 eq.	-39%	3.05E+01	27%

ADDITIONAL ENVIRONMENTAL INFORMATION

The environmental results declared in this EPD are based on a representative product configuration, as defined in the LCA study. Additional conversion factors (CF) are provided to support practical application of the results for other product variants within the declared product range.

These factors allow the user to estimate the cradle-to-gate environmental impact (modules A1-A3) for alternative panel configurations by scaling the declared results of the representative product PUR TTOP 100. The conversion approach is limited to the GWP-total indicator and reflects the linear relationship between panel configuration parameters and material-related environmental impacts.

Conversion formulae for product series:

$GWP\ (t) = CF\ (t) * GWP\ (t_ref)$

$CF\ (t) = (k * t + b) / (k * t_ref + b)$

Where:

- t is the selected thickness of a particular product
- t_ref is the reference thickness of the representative product – 100 [mm]
- $GWP\ (t_ref)$ is the GWP-total of the representative product – 30.5 [kg CO_2e/m^2]
- $CF\ (t)$ is the conversion factor for a particular thickness
- k is a coefficient representing the change in the environmental indicator per unit increase in core insulation thickness
- b is a constant term representing the thickness-independent contribution of the product

Variations of PUR panels included in the EPD and their technical features:

PUR TTOP									
panel thickness (t)	mm	40	50	60	80	100	120	150	160
conversion factor (CF)	-	0.80	0.84	0.87	0.93	1.00	1.07	1.16	1.20

PUR TFACE S								
panel thickness (t)	mm	40	50	60	80	100	120	150
conversion factor (CF)	-	0.80	0.83	0.87	0.93	1.03	1.07	1.17

PUR TFACE T												
panel thickness (t)	mm	40	50	60	80	100	120	140	150	160	180	200
conversion factor (CF)	-	0.77	0.81	0.85	0.92	0.93	1.08	1.15	1.19	1.23	1.30	1.38

PIR TTOP									
panel thickness (t)	mm	40	50	60	80	100	120	150	160
conversion factor (CF)	-	0.80	0.84	0.87	0.93	1.14	1.15	1.16	1.20

PIR TFACE S								
panel thickness (t)	mm	40	50	60	80	100	120	150
conversion factor (CF)	-	0.79	0.83	0.86	0.93	1.08	1.07	1.17

PIR TFACE T												
panel thickness (t)	mm	40	50	60	80	100	120	140	150	160	180	200
conversion factor (CF)	-	0.78	0.82	0.85	0.93	1.05	1.07	1.15	1.18	1.22	1.29	1.37

The CFs are intended for informational and design-support purposes only and do not replace the verified results presented in the main environmental performance section of the EPD.

ABBREVIATIONS

BOM	Bill of materials
CO_2e	Carbon dioxide equivalents
EoL	End-of-Life
GHG	Greenhouse gas
ISO	International Organization for Standardization
ISOPA	European Diisocyanate and Polyol Producers Association
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
LDPE	Low-density polyethylene
LHV	Lower heating value
LPG	Liquefied petroleum gas
MW	Mineral wool
PIR	Polyisocyanurate
PPA-Europe	European Association for Panels and Profiles e. V.
PS	Polystyrene
PUR	Polyurethane

REFERENCES

- ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework
- ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines
- ISO 14020:2000 Environmental labels and declarations - General principles
- ISO 14025:2006 Environmental labels and declarations - Type III environmental declarations
- General Programme Instructions (GPI) of The International EPD® System v.5.0.1
- EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- EN 15941:2024 Sustainability of construction works - Data quality for environmental assessment of products and construction work - Selection and use of data
- PCR 2019:14 Construction products, v2.0.1 (The International EPD® System)
- PPA-Europe, 2024, Annex for double skin steel faced sandwich panels with a core made of mineral wool and polyurethane, available at: www.ibu-epd.com

VERSION HISTORY

Original Version of the EPD, 2026-01-27

Revision 1, 2026-03-24
Differences versus the previous published version:

- Update of company logo
- Minor editorial updates of technical specifications on p.4 and p.5

INTERNATIONAL EPD SYSTEM

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