



ARPANEL

STYLE. QUALITY. FUNCTION.



Environmental Product Declaration EPD

of ARPANEL Sandwich Panels with Mineral Wool Core

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ARPANEL Sandwich Panels with Mineral Wool Core

EPD details

This declaration is the type III Environmental Product Declaration (EPD) based on EN 15804 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment. Their aspects

were verified by the independent body according to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all compared data were created according to EN 15804 (point 5.3 of the standard).

Owner of the EPD	
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ITB is the verified member of The European Platform for EPD programme operators and LCA practitioner www.eco-platform.org

Basic information	
ECO EPD Reference Number	Ref. No. 00001351
Product name	ARPANEL Sandwich Panels with Mineral Wool Core
Life cycle analysis (LCA)	A1 - A3, C1 - C4 and D in accordance with EN 15804 (Cradle to Gate with options)
The year of preparing the EPD	2020
Date of issue	10.08.2020
Validity date	09.08.2025
Product standard	PN-EN 14509:2013
Service life	45 years
PCR	ITB-PCR A (PCR based on EN 15804)
Declared unit	m ²
Reasons for performing LCA	B2B
Country of origin	Poland



**ARPANEL
Production hall**

A view of the ARPANEL production hall in Strzelce Opolskie, Poland.

About the company

Adamietz Sp. z o.o. is a group of qualified employees belonging to various departments of the construction sector and more. The company specializes in the comprehensive realization of industrial, commercial and public facilities, focuses on offering products that meet the highest requirements of investors, users and designers. The capital group includes a sandwich panels production plant, cold-formed profiles (including flashings) and steel construction plant. In 2013 Adamietz Sp. z o.o. started the production of insulation sandwich panels for roofs and walls of various objects, and to steel and reinforced concrete structure. ARPANEL is more than sandwich panels. It is a complex system, which is the result of more than 20 years of experience in designing and

realizing light cladding systems, additionally supported by our deep analysis of European markets and the expectations of the contemporary world. The need of today's market is the introduction of ecological solutions that will reduce the negative impact of production on the environment. ARPANEL, as a priority and an important aspect of the sustainable functioning of the company, is determined to minimize side effects arising from the production of sandwich panels. Therefore, our goal is to optimize the occurrence of post-production waste, introduction of pro-ecological activities, make employees aware and educate them in the areas that have a significant impact on the future of our planet.



Horizontal facade system

Introduction

Sandwich panels are prefabricated units consisting of two metal facings (external and internal) and a structural-insulation core between them. The core of the panel guarantees thermal and acoustic insulation. Steel facings are protected against corrosion, and together with the core, give the panel high mechanical strength.

ARPANEL sandwich panels are divided into three main core types: polyurethane foam PUR, polyisocyanurate foam PIR and mineral wool MiWo. Our clients, depending of their requirements, can select PUR/PIR cores for excellent thermal insulation, or choose the mineral wool core to ensure outstanding fire protection

ARPANEL MiWo sandwich panels are made of the mineral wool core with density in the range of 105-113 kg/m³ and steel facings. Mineral wool named MiWo core is characterized by high material stiffness, durability and high

mechanical strength. ARPANEL sandwich panel with mineral wool insulation core provides high protection against fire as well as high acoustic insulation.

Investors are eager to choose ARPANEL wall and roof sandwich panels with mineral wool core for the construction of buildings with increased requirements in terms of fire resistance category and acoustic insulation. ARPANEL MiWo sandwich are also used as the building material for industrial, commercial, cubature, office, sports, agricultural, logistic and public utility buildings, production facilities, shopping centres, warehouses, hangars and containers, as well as wood drying rooms, energy and chemical industry facilities, and in food industry sector. Moreover, as a material to build fire compartment walls (external and internal), measuring and research tunnels and soundproof partitions known as acoustic partitions.

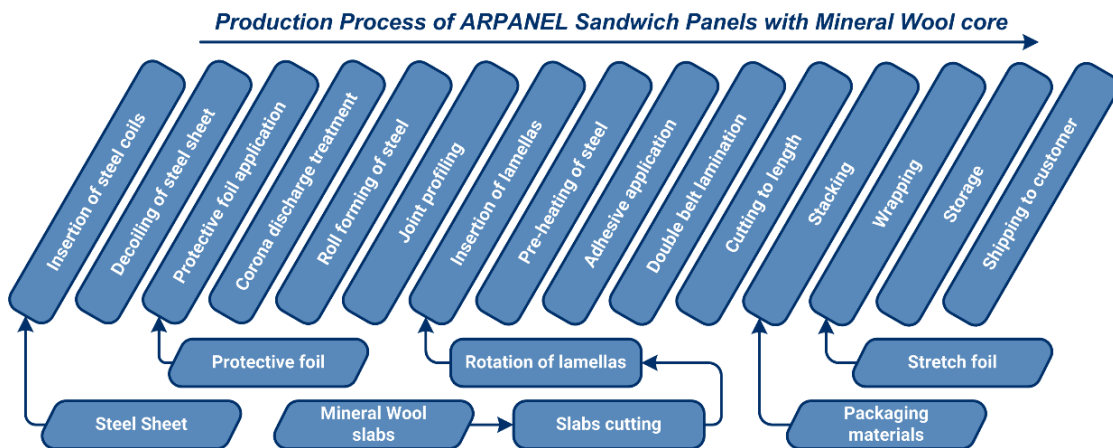


**ARPANEL
Production line**

Manufacturing site information

ARPANEL sandwich panels production facility is located in Strzelce Opolskie, Poland. Both types of ARPANEL sandwich panels, with mineral wool and PUR/PIR cores, can be

produced on the same, so-called “combi” line. The flow chart below presents the continuous production process of sandwich panels with PUR/PIR core.




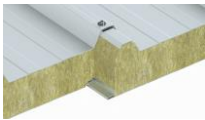
Products

In order to meet even the most sophisticated customer demands ARPANEL sandwich panels are offered in a large number of product varieties. This range is shown in the table below. All technical properties of ARPANEL MiWo sandwich panels including information about reaction to fire, fire resistance, acoustics, statics, thermal insulation etc. are given in the technical catalogue, and are available at <https://arpanel.eu/download/>.

Sandwich panels are manufactured in accordance with PN-EN 14509:2013,

CE marked and the Declaration of Performance is issued. The manufacturer of ARPANEL sandwich panels has obtained the Hygienic Certificate, which defines that the products are not harmful to human health and life. What is more, have not negative impact on the environment. By meeting the ecological requirements, ARPANEL has successfully received the PN-EN ISO 14001 certificate, the main target of which is to reduce the negative factors arising in the company that have a significant impact on the environment.

Types of ARPANEL sandwich panels with MiWo insulation core

Type of panel	wall	roof
Name	ARPANEL S MiWo	ARPANEL D MiWo
		
Insulation core	MiWo mineral wool	
Fastening system	standard	standard
Thickness [mm]	80, 100, 120, 150, 160, 180, 200, 220*, 240**	80/120, 100/140, 120/160, 150/190, 160/200, 180/220 200/240, 220/260*
Panel width [mm]	1000 / 1100 / 1150	1005
Thickness of facing [mm]	external 0.5 – 0.7 mm internal 0.4 – 0.7 mm	
External profiling	Micro 8 Micro 14 Micro 20 Linear Smooth	Trapezoid
Internal profiling	Linear Smooth Micro 20	

The basic product type technical data concerning the range of manufactured ARPANEL sandwich panels.

* For special order after consultation with the manufacturer. ** Commercial availability foreseen for 2021.

LIFE CYCLE ASSESSMENT (LCA) –

General rules applied

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of the ARPANEL sandwich panels is a line process in factory located in Strzelce Opolskie (Poland). Allocation for production A1-A3 (PUR/PIR core vs MiWo core production) is done on a production volume basis. All impacts from raw materials extraction and production (including: steel profiles production, mineral wool, adhesive, gasket, packaging and energy carriers and water) are allocated in the A1 module. 100% of the impacts from line production were inventoried and 31% were allocated to the MiWo sandwich panels production. Utilization of packaging (PE, PP, timber) material was taken into consideration. Module A2 includes transport of raw materials such as steel products, chemicals, additives and ancillary materials from their suppliers to the Strzelce Opolskie manufacturing plant. Municipal factory waste were allocated to module A3. The energy supply was inventoried for whole factory and 31% was allocated to the mineral wool based sandwich panels production (69% to PUR/PIR core panels). Emissions in the factory were estimated by using national conversion factors (KOBIZE, 2019) and were allocated to module A3.

System limits

The life cycle analysis of the declared products covers "Product Stage", A1 - A3, C1 - C4 and

D modules (Cradle to Gate with options) accordance with EN 15804+A1 and ITB PCR A. The input materials and energy consumption inventoried in factories and were included in the calculation. In the assessment, all significant parameters from gathered production data are considered, i.e. all material used per formulation, utilized thermal energy, internal fuel and electric power consumption. It is assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A1, machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

A1-A2 Module: Raw Materials Supply and Transport

In order to produce a sandwich panel, core insulation material and facings are required. In the case of the ARPANEL MiWo sandwich panels family a core material is a mineral wool mainly produced in Poland. Steel sheet coils are being sourced at domestic and foreign steel mills. The two largest steel delivery producers are Tata Steel and ARCELOR MITTAL and provide 85% of steel profiles. These producers have EPD data of their products (used for calculation). ARPANEL sandwich panels, the remaining ancillary materials such protective films, as well as all packaging materials are supplied by local producers. The transport to the factory has been fully inventoried (LCI questionnaire), taking into account the number

of deliveries, type of vehicles, the size of the delivery and the distance from the manufacturer to the factory for all materials and raw ancillary materials.

A3 Module: Manufacturing

ARPANEL sandwich panels are being produced in a continuous production process. Necessary stops are required for change overs between panel types. The production process itself can be divided into several stages.

Profiling of facings material

During this stage, designated steel coils are being unwound. One of the steel sheets will be used as a façade facing, while the other one as the internal facing. The protective foil is applied to prevent unwanted coating defects, that can appear during production or transport. Then the internal sides of each steel sheet are treated by corona discharge to improve the adhesion process at the subsequent gluing stage. At the end of this stage, the designed surface profile and the side profile (to form the panel joints) are formed.

Forming of the insulation core

Mineral wool is being delivered to production line in slabs, which are transported one by one and

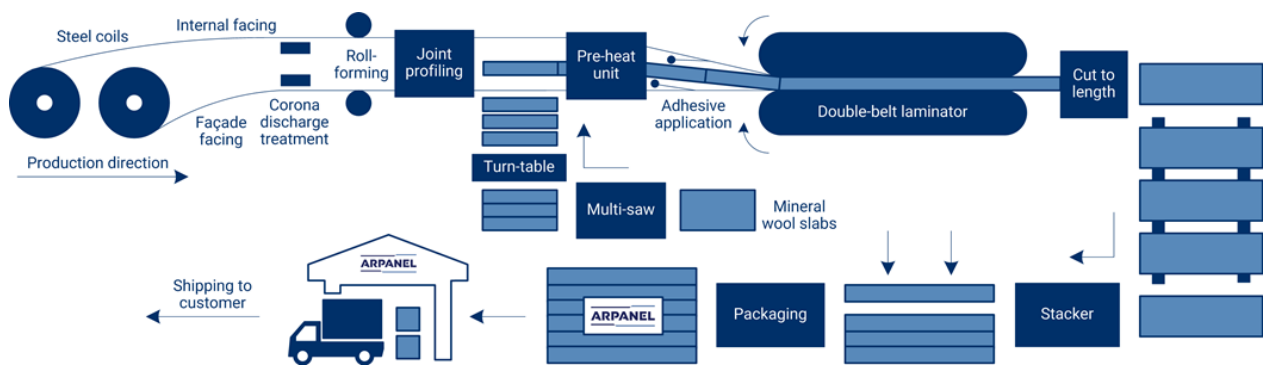
cut by multi saw to form lamellas of desired height. Next, lamellas are turned by 90 degrees (fibres must be perpendicular to facings) and arranged by pusher to form continuous core between metal facings. Then, polyurethane, 2-component adhesive is applied between metal facings and core material. Double belt laminator ensure dimension (thickness and width of sandwich panel), as well as necessary conditions for adhesive to harden and permanently connect facings to the mineral wool core.

Cutting to length and cool down

At this stage the panels are cut to length, according to the client's request, by a flying saw synchronised with the production line speed. Then, the panels are transported to the cooling buffer, where they spend the relevant time to reach a stable temperature.

Packaging

At the end of the process panels are stacked to form a parcel, which is subsequently wrapped with foil. Next, the parcels need to stabilise for 24 hours inside the warehouse. Finally, the parcels are loaded onto trucks and delivered to the clients.



A scheme of ARPANEL Sandwich Panels production process with MiWo core.

C1 – C4: End of life

The end of life scenario for a sandwich panel with MiWo core is provided in Table 1.

Table 1. End of life scenario (C modules) for a sandwich panel with MiWo core.

Parameter	Contribution
Collection rate	100%
Reuse	10%
Recycling steel	98% of facing
Landfilling steel	2% of facing
Recycling MiWo	20% of MiWo core
Landfill MiWo	80% of MiWo core

D: Re-use, recovery, recycling potential

Benefits beyond the system boundary were calculated for steel facing using a net scrap formulation proposed by the World Steel Association in the *Life cycle inventory methodology report (2017)* where the net scrap is determined as the difference between the amount of steel recycled at the end-of-life and the scrap input from the previous product life cycle. 10% of the “reuse benefit” is calculated from the A1-A3 values of sandwich MiWo panel production.

Data collection period

The data for manufacture of the declared products refer to 2019. The life cycle assessments were prepared for Poland as the reference area.

Data quality

The values determined to calculate the LCA originate from LCI verified inventory data provided by ARPANEL.

Assumptions and estimates

The impacts of the sandwich panels were aggregated using volume of production. Impacts were inventoried and calculated for all products of the sandwich panels.

Calculation rules

LCA was done in accordance with the ITB PCR A document.

Databases

The data for the processes come from the following databases: Ecoinvent v.3.5 (adhesive, gasket, packaging, water), specific EPDs (steel profile producers, mineral wool producer, Rockwool), Kobize/Tauron (energy carriers: electricity, diesel, natural gas and LPG). Specific data quality analysis was a part of the external ISO 14001 audit. Characterization factors are CML ver. 4.2 based on EN 15804:2013+A1 version (PN-EN 15804+A1:2014-04).

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared/functional unit

The declaration refers to functional unit (FU) – 1 m² of the sandwich panels (facing: 0.6 and 0.5 mm) manufactured by ARPANEL with selected thickness.

Table 2. System boundaries for the environmental characteristic of the sandwich panels with MiWo core.

Environmental assessment information (MNA – Module not assessed, MD – Module Declared, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life			Benefits and loads beyond the system boundary	
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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
MD	MD	MD	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MD	MD	MD	MD	MD

Table 3. Environmental product characteristic – 1 m² of ARPANEL sandwich panels with MiWo insulation core (80 mm).

Indicator	Environmental impacts: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Global warming potential	kg CO2 eq.	4.61E+01	9.60E-01	2.18E-01	1.57E-01	7.90E-02	1.41E-01	3.56E-02	-1.00E+01
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	4.57E-08	0.00E+00	1.20E-09	1.73E-09	0.00E+00	8.37E-08	1.08E-08	-2.16E-06
Acidification potential of soil and water	kg SO2 eq.	1.22E-01	7.02E-03	8.86E-05	1.38E-04	5.77E-04	5.24E-03	2.83E-04	-4.15E-02
Formation potential of tropospheric ozone	kg Ethene eq.	2.46E-02	5.08E-04	3.49E-05	7.17E-04	4.21E-05	3.74E-04	8.50E-06	-1.13E-02
Eutrophication potential	kg (PO4)3- eq.	1.23E-02	1.24E-03	8.89E-05	5.77E-06	1.02E-04	8.28E-03	4.46E-04	-5.09E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	7.72E-03	0.00E+00	8.07E-07	1.17E-03	0.00E+00	5.88E-04	2.37E-08	-4.62E-03
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	4.36E+02	9.32E+00	4.25E+00	1.80E+00	5.36E-01	9.19E+00	1.04E+00	-1.28E+02
Indicator	Environmental aspects: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	2.85E+01	6.52E-01	2.13E-01	2.70E-01	3.28E+02	2.40E-01	4.33E-02	-8.77E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	4.53E+01	9.78E+00	4.55E+00	1.98E+00	5.63E-01	9.79E+00	1.09E+00	-1.40E+02
Use of secondary material	kg	1.68E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-5.18E-01
Use of renewable secondary fuels	MJ	3.96E-02	4.89E-01	0.00E+00	0.00E+00	2.82E-02	0.00E+00	0.00E+00	-4.54E+00
Use of non-renewable secondary fuels	MJ	2.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.83E-04
Net use of fresh water	m3	4.81E-02	1.00E-06	0.00E+00	5.69E-04	5.09E-03	2.87E-04	2.42E-03	-5.65E-02
Indicator	Other environmental information describing waste categories: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	4.53E-03	4.60E-06	0.00E+00	2.40E-06	2.53E-08	2.76E-06	6.05E-02	-7.13E-04
Non-hazardous waste disposed	kg	8.09E-01	4.27E-03	1.07E-03	2.17E-02	2.35E-05	1.16E-02	6.12E+00	-2.82E+00
Radioactive waste disposed	kg	1.15E-05	0.00E+00	0.00E+00	2.40E-06	0.00E+00	5.17E-06	3.12E-07	-9.05E-06
Components for re-use	kg	3.20E-01	0.00E+00	3.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.15E-02
Materials for recycling	kg	3.20E-02	0.00E+00	7.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.77E-02
Materials for energy recover	kg	5.58E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-6.82E-03
Exported energy	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

Table 4. Environmental product characteristic – 1 m² of ARPANEL sandwich panels with MiWo insulation core (100 mm).

Indicator	Environmental impacts: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Global warming potential	kg CO2 eq.	4.67E+01	9.60E-01	2.18E-01	1.57E-01	7.90E-02	1.84E+00	4.16E-02	-1.08E+01
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	5.50E-08	0.00E+00	1.20E-09	1.73E-09	0.00E+00	2.50E-07	1.30E-08	-2.17E-06
Acidification potential of soil and water	kg SO2 eq.	1.26E-01	7.02E-03	8.86E-05	1.38E-04	5.77E-04	1.50E-02	3.29E-04	-4.48E-02
Formation potential of tropospheric ozone	kg Ethene eq.	2.56E-02	5.08E-04	3.49E-05	7.17E-04	4.21E-05	3.60E-05	1.01E-05	-1.20E-02
Eutrophication potential	kg (PO4)3- eq.	1.30E-02	1.24E-03	8.89E-05	5.77E-06	1.02E-04	2.73E-02	5.19E-04	-5.53E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	7.72E-03	0.00E+00	8.07E-07	1.17E-03	0.00E+00	2.72E-04	2.37E-08	-4.70E-03
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	4.46E+02	9.32E+00	4.25E+00	1.80E+00	5.36E-01	2.30E+01	1.26E+00	-1.37E+02
Indicator	Environmental aspects: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	2.95E+01	6.52E-01	2.13E-01	2.70E-01	3.28E+02	3.49E-01	5.39E-02	-9.51E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	4.63E+02	9.78E+00	4.55E+00	1.98E+00	5.63E-01	2.39E+01	1.31E+00	-1.50E+02
Use of secondary material	kg	1.76E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-5.75E-01
Use of renewable secondary fuels	MJ	3.96E-02	4.89E-01	0.00E+00	0.00E+00	2.82E-02	0.00E+00	0.00E+00	-4.54E+00
Use of non-renewable secondary fuels	MJ	2.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.03E-04
Net use of fresh water	m3	4.91E-02	1.00E-06	0.00E+00	5.69E-04	5.09E-03	6.80E-05	3.02E-03	-5.66E-02
Indicator	Other environmental information describing waste categories: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	4.59E-03	4.60E-06	0.00E+00	2.40E-06	2.53E-08	5.65E-06	7.56E-02	-7.87E-04
Non-hazardous waste disposed	kg	8.12E-01	4.27E-03	1.07E-03	2.17E-02	2.35E-05	1.54E-02	7.60E+00	-2.82E+00
Radioactive waste disposed	kg	1.15E-05	0.00E+00	0.00E+00	2.40E-06	0.00E+00	1.08E-05	3.12E-07	-9.17E-06
Components for re-use	kg	3.35E-01	0.00E+00	3.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.02E-01
Materials for recycling	kg	3.38E-02	0.00E+00	7.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.96E-02
Materials for energy recover	kg	5.62E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.58E-03
Exported energy	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

Table 5. Environmental product characteristic – 1 m² of ARPANEL sandwich panels with MiWo insulation core (120 mm).

Indicator	Environmental impacts: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Global warming potential	kg CO2 eq.	4.74E+01	9.60E-01	2.18E-01	1.57E-01	7.90E-02	8.19E+00	4.77E-02	-1.16E+01
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	6.42E-08	0.00E+00	1.20E-09	1.73E-09	0.00E+00	3.71E-07	1.52E-08	-2.17E-06
Acidification potential of soil and water	kg SO2 eq.	1.30E-01	7.02E-03	8.86E-05	1.38E-04	5.77E-04	2.04E-02	3.76E-04	-4.81E-02
Formation potential of tropospheric ozone	kg Ethene eq.	2.65E-02	5.08E-04	3.49E-05	7.17E-04	4.21E-05	4.05E-05	1.17E-05	-1.27E-02
Eutrophication potential	kg (PO4)3- eq.	1.36E-02	1.24E-03	8.89E-05	5.77E-06	1.02E-04	4.82E-02	5.93E-04	-5.97E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	7.72E-03	0.00E+00	8.07E-07	1.17E-03	0.00E+00	1.31E-03	2.37E-08	-4.77E-03
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	4.55E+02	9.32E+00	4.25E+00	1.80E+00	5.36E-01	2.78E+01	1.47E+00	-1.46E+02
Indicator	Environmental aspects: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	3.04E+01	6.52E-01	2.13E-01	2.70E-01	3.28E+02	6.43E-01	6.45E-02	-1.03E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	4.73E+02	9.78E+00	4.55E+00	1.98E+00	5.63E-01	2.69E+01	1.52E+00	-1.60E+02
Use of secondary material	kg	1.85E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-6.33E-01
Use of renewable secondary fuels	MJ	3.96E-02	4.89E-01	0.00E+00	0.00E+00	2.82E-02	0.00E+00	0.00E+00	-4.55E+00
Use of non-renewable secondary fuels	MJ	2.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.23E-04
Net use of fresh water	m3	5.01E-02	1.00E-06	0.00E+00	5.69E-04	5.09E-03	3.27E-04	3.63E-03	-5.66E-02
Indicator	Other environmental information describing waste categories: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	4.65E-03	4.60E-06	0.00E+00	2.40E-06	2.53E-08	1.16E-05	9.07E-02	-8.61E-04
Non-hazardous waste disposed	kg	8.14E-01	4.27E-03	1.07E-03	2.17E-02	2.35E-05	6.74E-02	9.08E+00	-2.83E+00
Radioactive waste disposed	kg	1.15E-05	0.00E+00	0.00E+00	2.40E-06	0.00E+00	1.21E-05	3.12E-07	-9.29E-06
Components for re-use	kg	3.49E-01	0.00E+00	3.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.12E-01
Materials for recycling	kg	3.56E-02	0.00E+00	7.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.16E-02
Materials for energy recover	kg	5.66E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.34E-03
Exported energy	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

Table 6. Environmental product characteristic – 1 m² of ARPANEL sandwich panels with MiWo insulation core (150 mm).

Indicator	Environmental impacts: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Global warming potential	kg CO2 eq.	4.83E+01	9.60E-01	2.18E-01	1.57E-01	7.90E-02	1.52E+01	5.68E-02	-1.27E+01
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	7.81E-08	0.00E+00	1.20E-09	1.73E-09	0.00E+00	5.17E-07	1.84E-08	-2.18E-06
Acidification potential of soil and water	kg SO2 eq.	1.36E-01	7.02E-03	8.86E-05	1.38E-04	5.77E-04	2.71E-02	4.47E-04	-5.30E-02
Formation potential of tropospheric ozone	kg Ethene eq.	2.79E-02	5.08E-04	3.49E-05	7.17E-04	4.21E-05	4.73E-05	1.41E-05	-1.37E-02
Eutrophication potential	kg (PO4)3- eq.	1.45E-02	1.24E-03	8.89E-05	5.77E-06	1.02E-04	7.25E-02	7.03E-04	-6.63E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	7.72E-03	0.00E+00	8.07E-07	1.17E-03	0.00E+00	2.45E-03	2.37E-08	-4.89E-03
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	4.70E+02	9.32E+00	4.25E+00	1.80E+00	5.36E-01	3.41E+01	1.79E+00	-1.60E+02
Indicator	Environmental aspects: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	3.18E+01	6.52E-01	2.13E-01	2.70E-01	3.28E+02	9.83E-01	8.04E-02	-1.14E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	4.88E+02	9.78E+00	4.55E+00	1.98E+00	5.63E-01	3.15E+01	1.85E+00	-1.75E+02
Use of secondary material	kg	1.97E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.19E-01
Use of renewable secondary fuels	MJ	3.96E-02	4.89E-01	0.00E+00	0.00E+00	2.82E-02	0.00E+00	0.00E+00	-4.56E+00
Use of non-renewable secondary fuels	MJ	2.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.54E-04
Net use of fresh water	m3	5.16E-02	1.00E-06	0.00E+00	5.69E-04	5.09E-03	6.12E-04	4.54E-03	-5.66E-02
Indicator	Other environmental information describing waste categories: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	4.74E-03	4.60E-06	0.00E+00	2.40E-06	2.53E-08	1.84E-05	1.13E-01	-9.71E-04
Non-hazardous waste disposed	kg	8.19E-01	4.27E-03	1.07E-03	2.17E-02	2.35E-05	1.25E-01	1.13E+01	-2.84E+00
Radioactive waste disposed	kg	1.16E-05	0.00E+00	0.00E+00	2.40E-06	0.00E+00	1.42E-05	3.12E-07	-9.47E-06
Components for re-use	kg	3.70E-01	0.00E+00	3.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.27E-01
Materials for recycling	kg	3.83E-02	0.00E+00	7.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.45E-02
Materials for energy recover	kg	5.73E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.47E-03
Exported energy	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

Table 7. Environmental product characteristic – 1 m² of ARPANEL sandwich panels with MiWo insulation core (160 mm).

Indicator	Environmental impacts: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Global warming potential	kg CO2 eq.	4.86E+01	9.60E-01	2.18E-01	1.57E-01	7.90E-02	2.16E+01	5.98E-02	-1.31E+01
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	8.27E-08	0.00E+00	1.20E-09	1.73E-09	0.00E+00	6.24E-07	1.95E-08	-2.18E-06
Acidification potential of soil and water	kg SO2 eq.	1.38E-01	7.02E-03	8.86E-05	1.38E-04	5.77E-04	3.16E-02	4.70E-04	-5.46E-02
Formation potential of tropospheric ozone	kg Ethene eq.	2.83E-02	5.08E-04	3.49E-05	7.17E-04	4.21E-05	4.96E-05	1.49E-05	-1.41E-02
Eutrophication potential	kg (PO4)3- eq.	1.48E-02	1.24E-03	8.89E-05	5.77E-06	1.02E-04	9.20E-02	7.40E-04	-6.85E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	7.72E-03	0.00E+00	8.07E-07	1.17E-03	0.00E+00	3.48E-03	2.37E-08	-4.93E-03
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	4.75E+02	9.32E+00	4.25E+00	1.80E+00	5.36E-01	3.75E+01	1.89E+00	-1.64E+02
Indicator	Environmental aspects: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	3.22E+01	6.52E-01	2.13E-01	2.70E-01	3.28E+02	1.26E+00	8.57E-02	-1.17E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	4.94E+02	9.78E+00	4.55E+00	1.98E+00	5.63E-01	3.30E+01	1.96E+00	-1.79E+02
Use of secondary material	kg	2.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.48E-01
Use of renewable secondary fuels	MJ	3.96E-02	4.89E-01	0.00E+00	0.00E+00	2.82E-02	0.00E+00	0.00E+00	-4.56E+00
Use of non-renewable secondary fuels	MJ	2.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.64E-04
Net use of fresh water	m3	5.21E-02	1.00E-06	0.00E+00	5.69E-04	5.09E-03	8.71E-04	4.84E-03	-5.66E-02
Indicator	Other environmental information describing waste categories: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	4.77E-03	4.60E-06	0.00E+00	2.40E-06	2.53E-08	2.41E-05	1.21E-01	-1.01E-03
Non-hazardous waste disposed	kg	8.20E-01	4.27E-03	1.07E-03	2.17E-02	2.35E-05	1.77E-01	1.20E+01	-2.84E+00
Radioactive waste disposed	kg	1.16E-05	0.00E+00	0.00E+00	2.40E-06	0.00E+00	1.48E-05	3.12E-07	-9.53E-06
Components for re-use	kg	3.78E-01	0.00E+00	3.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.32E-01
Materials for recycling	kg	3.92E-02	0.00E+00	7.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.55E-02
Materials for energy recover	kg	5.75E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.85E-03
Exported energy	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

Table 8. Environmental product characteristic – 1 m² of ARPANEL sandwich panels with MiWo insulation core (180 mm).

Indicator	Environmental impacts: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Global warming potential	kg CO2 eq.	4.92E+01	9.60E-01	2.18E-01	1.57E-01	7.90E-02	3.03E+01	6.58E-02	-1.39E+01
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	9.19E-08	0.00E+00	1.20E-09	1.73E-09	0.00E+00	7.80E-07	2.17E-08	-2.19E-06
Acidification potential of soil and water	kg SO2 eq.	1.42E-01	7.02E-03	8.86E-05	1.38E-04	5.77E-04	3.83E-02	5.17E-04	-5.79E-02
Formation potential of tropospheric ozone	kg Ethene eq.	2.93E-02	5.08E-04	3.49E-05	7.17E-04	4.21E-05	5.41E-05	1.65E-05	-1.48E-02
Eutrophication potential	kg (PO4)3- eq.	1.54E-02	1.24E-03	8.89E-05	5.77E-06	1.02E-04	1.20E-01	8.13E-04	-7.29E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	7.72E-03	0.00E+00	8.07E-07	1.17E-03	0.00E+00	4.90E-03	2.37E-08	-5.01E-03
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	4.84E+02	9.32E+00	4.25E+00	1.80E+00	5.36E-01	4.29E+01	2.10E+00	-1.74E+02
Indicator	Environmental aspects: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	3.32E+01	6.52E-01	2.13E-01	2.70E-01	3.28E+02	1.65E+00	9.63E-02	-1.25E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	5.03E+02	9.78E+00	4.55E+00	1.98E+00	5.63E-01	3.60E+01	2.18E+00	-1.89E+02
Use of secondary material	kg	2.10E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.06E-01
Use of renewable secondary fuels	MJ	3.96E-02	4.89E-01	0.00E+00	0.00E+00	2.82E-02	0.00E+00	0.00E+00	-4.57E+00
Use of non-renewable secondary fuels	MJ	2.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.84E-04
Net use of fresh water	m3	INA	INA	INA	INA	INA	INA	INA	INA
Indicator	Other environmental information describing waste categories: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	5.31E-03	1.00E-06	0.00E+00	5.69E-04	5.09E-03	1.22E-03	5.44E-03	-5.66E-02
Non-hazardous waste disposed	kg	4.82E-01	4.60E-06	0.00E+00	2.40E-06	2.53E-08	3.21E-05	1.36E-01	-1.08E-03
Radioactive waste disposed	kg	8.23E-05	4.27E-03	1.07E-03	2.17E-02	2.35E-05	2.48E-01	1.35E+01	-2.85E+00
Components for re-use	kg	1.16E-05	0.00E+00	0.00E+00	2.40E-06	0.00E+00	1.62E-05	3.12E-07	-9.65E-06
Materials for recycling	kg	3.92E-01	0.00E+00	3.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.42E-01
Materials for energy recover	kg	4.10E-02	0.00E+00	7.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.75E-02
Exported energy	MJ	5.79E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.06E-02

Table 9. Environmental product characteristic – 1 m² of ARPANEL sandwich panels with MiWo insulation core (200 mm).

Indicator	Environmental impacts: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Global warming potential	kg CO2 eq.	4.99E+01	9.60E-01	2.18E-01	1.57E-01	7.90E-02	4.03E+01	7.19E-02	-1.47E+01
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	1.01E-07	0.00E+00	1.20E-09	1.73E-09	0.00E+00	9.55E-07	2.39E-08	-2.19E-06
Acidification potential of soil and water	kg SO2 eq.	1.46E-01	7.02E-03	8.86E-05	1.38E-04	5.77E-04	4.58E-02	5.64E-04	-6.11E-02
Formation potential of tropospheric ozone	kg Ethene eq.	3.02E-02	5.08E-04	3.49E-05	7.17E-04	4.21E-05	5.87E-05	1.81E-05	-1.55E-02
Eutrophication potential	kg (PO4)3- eq.	1.61E-02	1.24E-03	8.89E-05	5.77E-06	1.02E-04	1.51E-01	8.87E-04	-7.72E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	7.72E-03	0.00E+00	8.07E-07	1.17E-03	0.00E+00	6.53E-03	2.37E-08	-5.08E-03
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	4.94E+02	9.32E+00	4.25E+00	1.80E+00	5.36E-01	4.88E+01	2.31E+00	-1.83E+02
Indicator	Environmental aspects: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	3.41E+01	6.52E-01	2.13E-01	2.70E-01	3.28E+02	2.09E+00	1.07E-01	-1.32E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	5.13E+02	9.78E+00	4.55E+00	1.98E+00	5.63E-01	3.90E+01	2.40E+00	-1.99E+02
Use of secondary material	kg	2.18E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.63E-01
Use of renewable secondary fuels	MJ	3.96E-02	4.89E-01	0.00E+00	0.00E+00	2.82E-02	0.00E+00	0.00E+00	-4.57E+00
Use of non-renewable secondary fuels	MJ	2.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.04E-04
Net use of fresh water	m3	5.41E-02	1.00E-06	0.00E+00	5.69E-04	5.09E-03	1.63E-03	6.05E-03	-5.66E-02
Indicator	Other environmental information describing waste categories: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	4.88E-03	4.60E-06	0.00E+00	2.40E-06	2.53E-08	4.12E-05	1.51E-01	-1.16E-03
Non-hazardous waste disposed	kg	8.26E-01	4.27E-03	1.07E-03	2.17E-02	2.35E-05	3.30E-01	1.50E+01	-2.85E+00
Radioactive waste disposed	kg	1.16E-05	0.00E+00	0.00E+00	2.40E-06	0.00E+00	1.76E-05	3.12E-07	-9.78E-06
Components for re-use	kg	4.06E-01	0.00E+00	3.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.52E-01
Materials for recycling	kg	4.28E-02	0.00E+00	7.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.94E-02
Materials for energy recover	kg	5.83E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.14E-02
Exported energy	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

Table 10. Environmental product characteristic – 1 m² of ARPANEL sandwich panels with MiWo insulation core (220* mm).

Indicator	Environmental impacts: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Global warming potential	kg CO2 eq.	5.05E+01	9.60E-01	2.18E-01	1.57E-01	7.90E-02	5.16E+01	7.79E-02	-1.54E+01
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	1.10E-07	0.00E+00	1.20E-09	1.73E-09	0.00E+00	1.15E-06	2.60E-08	-2.20E-06
Acidification potential of soil and water	kg SO2 eq.	1.50E-01	7.02E-03	8.86E-05	1.38E-04	5.77E-04	5.41E-02	6.11E-04	-6.44E-02
Formation potential of tropospheric ozone	kg Ethene eq.	3.11E-02	5.08E-04	3.49E-05	7.17E-04	4.21E-05	6.32E-05	1.97E-05	-1.62E-02
Eutrophication potential	kg (PO4)3- eq.	1.67E-02	1.24E-03	8.89E-05	5.77E-06	1.02E-04	1.86E-01	9.60E-04	-8.16E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	7.72E-03	0.00E+00	8.07E-07	1.17E-03	0.00E+00	8.38E-03	2.37E-08	-5.16E-03
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	5.04E+02	9.32E+00	4.25E+00	1.80E+00	5.36E-01	5.51E+01	2.53E+00	-1.92E+02
Indicator	Environmental aspects: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	3.50E+01	6.52E-01	2.13E-01	2.70E-01	3.28E+02	2.59E+00	1.17E-01	-1.40E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	5.24E+02	9.78E+00	4.55E+00	1.98E+00	5.63E-01	4.20E+01	2.62E+00	-2.09E+02
Use of secondary material	kg	2.27E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.21E-01
Use of renewable secondary fuels	MJ	3.96E-02	4.89E-01	0.00E+00	0.00E+00	2.82E-02	0.00E+00	0.00E+00	-4.58E+00
Use of non-renewable secondary fuels	MJ	2.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.25E-04
Net use of fresh water	m3	5.51E-02	1.00E-06	0.00E+00	5.69E-04	5.09E-03	2.10E-03	6.65E-03	-5.66E-02
Indicator	Other environmental information describing waste categories: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	4.94E-03	4.60E-06	0.00E+00	2.40E-06	2.53E-08	5.14E-05	1.66E-01	-1.23E-03
Non-hazardous waste disposed	kg	8.29E-01	4.27E-03	1.07E-03	2.17E-02	2.35E-05	4.22E-01	1.65E+01	-2.86E+00
Radioactive waste disposed	kg	1.16E-05	0.00E+00	0.00E+00	2.40E-06	0.00E+00	1.89E-05	3.12E-07	-9.90E-06
Components for re-use	kg	4.20E-01	0.00E+00	3.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.63E-01
Materials for recycling	kg	4.46E-02	0.00E+00	7.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.14E-02
Materials for energy recover	kg	5.87E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.21E-02
Exported energy	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

Table 11. Environmental product characteristic – 1 m² of ARPANEL sandwich panels with MiWo insulation core (240** mm).

Indicator	Environmental impacts: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Global warming potential	kg CO2 eq.	5.11E+01	9.60E-01	2.18E-01	1.57E-01	7.90E-02	6.43E+01	8.40E-02	-1.62E+01
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	1.20E-07	0.00E+00	1.20E-09	1.73E-09	0.00E+00	1.36E-06	2.82E-08	-2.20E-06
Acidification potential of soil and water	kg SO2 eq.	1.55E-01	7.02E-03	8.86E-05	1.38E-04	5.77E-04	6.31E-02	6.58E-04	-6.77E-02
Formation potential of tropospheric ozone	kg Ethene eq.	3.20E-02	5.08E-04	3.49E-05	7.17E-04	4.21E-05	6.78E-05	2.13E-05	-1.69E-02
Eutrophication potential	kg (PO4)3- eq.	1.73E-02	1.24E-03	8.89E-05	5.77E-06	1.02E-04	2.25E-01	1.03E-03	-8.60E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	7.72E-03	0.00E+00	8.07E-07	1.17E-03	0.00E+00	1.05E-02	2.37E-08	-5.24E-03
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	5.13E+02	9.32E+00	4.25E+00	1.80E+00	5.36E-01	6.18E+01	2.74E+00	-2.01E+02
Indicator	Environmental aspects: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	3.59E+01	6.52E-01	2.13E-01	2.70E-01	3.28E+02	3.14E+00	1.28E-01	-1.47E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	5.33E+02	9.78E+00	4.55E+00	1.98E+00	5.63E-01	4.51E+01	2.84E+00	-2.19E+02
Use of secondary material	kg	2.35E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.78E-01
Use of renewable secondary fuels	MJ	3.96E-02	4.89E-01	0.00E+00	0.00E+00	2.82E-02	0.00E+00	0.00E+00	-4.58E+00
Use of non-renewable secondary fuels	MJ	2.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.45E-04
Net use of fresh water	m ³	5.61E-02	1.00E-06	0.00E+00	5.69E-04	5.09E-03	2.61E-03	7.26E-03	-5.67E-02
Indicator	Other environmental information describing waste categories: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	5.00E-03	4.60E-06	0.00E+00	2.40E-06	2.53E-08	6.28E-05	1.81E-01	-1.30E-03
Non-hazardous waste disposed	kg	8.32E-01	4.27E-03	1.07E-03	2.17E-02	2.35E-05	5.26E-01	1.80E+01	-2.87E+00
Radioactive waste disposed	kg	1.16E-05	0.00E+00	0.00E+00	2.40E-06	0.00E+00	2.03E-05	3.12E-07	-1.00E-05
Components for re-use	kg	4.35E-01	0.00E+00	3.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.73E-01
Materials for recycling	kg	4.65E-02	0.00E+00	7.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.34E-02
Materials for energy recover	kg	5.91E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.29E-02
Exported energy	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

Table 12. Environmental product characteristic – 1 m2 of ARPANEL sandwich panels with MiWo insulation core (260** mm).

Indicator	Environmental impacts: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Global warming potential	kg CO2 eq.	5.18E+01	9.60E-01	2.18E-01	1.57E-01	7.90E-02	8.70E+01	9.00E-02	-1.70E+01
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	1.29E-07	0.00E+00	1.20E-09	1.73E-09	0.00E+00	1.73E-06	3.04E-08	-2.21E-06
Acidification potential of soil and water	kg SO2 eq.	1.59E-01	7.02E-03	8.86E-05	1.38E-04	5.77E-04	7.78E-02	7.04E-04	-7.09E-02
Formation potential of tropospheric ozone	kg Ethene eq.	3.30E-02	5.08E-04	3.49E-05	7.17E-04	4.21E-05	7.23E-05	2.29E-05	-1.76E-02
Eutrophication potential	kg (PO4)3- eq.	1.79E-02	1.24E-03	8.89E-05	5.77E-06	1.02E-04	2.93E-01	1.11E-03	-9.04E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	7.72E-03	0.00E+00	8.07E-07	1.17E-03	0.00E+00	1.42E-02	2.37E-08	-5.32E-03
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	5.23E+02	9.32E+00	4.25E+00	1.80E+00	5.36E-01	7.14E+01	2.95E+00	-2.10E+02
Indicator	Environmental aspects: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	3.69E+01	6.52E-01	2.13E-01	2.70E-01	3.28E+02	4.10E+00	1.39E-01	-1.54E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	5.43E+02	9.78E+00	4.55E+00	1.98E+00	5.63E-01	4.81E+01	3.06E+00	-2.29E+02
Use of secondary material	kg	2.44E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.04E+00
Use of renewable secondary fuels	MJ	3.96E-02	4.89E-01	0.00E+00	0.00E+00	2.82E-02	0.00E+00	0.00E+00	-4.59E+00
Use of non-renewable secondary fuels	MJ	2.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.65E-04
Net use of fresh water	m3	5.71E-02	1.00E-06	0.00E+00	5.69E-04	5.09E-03	3.54E-03	7.86E-03	-5.67E-02
Indicator	Other environmental information describing waste categories: (FU) 1 m ²								
	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	5.06E-03	4.60E-06	0.00E+00	2.40E-06	2.53E-08	8.28E-05	1.97E-01	-1.38E-03
Non-hazardous waste disposed	kg	8.34E-01	4.27E-03	1.07E-03	2.17E-02	2.35E-05	7.11E-01	1.95E+01	-2.87E+00
Radioactive waste disposed	kg	1.16E-05	0.00E+00	0.00E+00	2.40E-06	0.00E+00	2.16E-05	3.12E-07	-1.01E-05
Components for re-use	kg	4.49E-01	0.00E+00	3.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.83E-01
Materials for recycling	kg	4.83E-02	0.00E+00	7.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.53E-02
Materials for energy recover	kg	5.95E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.36E-02
Exported energy	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

Results interpretation

Interpretation of the results has been carried out considering the methodology, data-related assumptions and any limitations declared in the EPD.

The environmental impact of ARPANEL sandwich panels (cradle to gate with options) is mainly dependent on the energy-intensive production of steel facings on which the manufacturer has very little influence. The amount of carbon dioxide necessary to produce raw materials for production is almost 47 kg CO₂/m² for a 100 mm panel and the energy input is 450 MJ/m² (where steel itself gives the highest impact). These values (A1) are about several dozen times higher than the production process A3 itself. The production of steel for the facing alone A1 gives a value of about 90%

of the value of the impacts of the panel production A1-A3. This means that the search for improvement of the environmental quality of the products may take place through the purchase of ecological steel or, to a lesser extent, the purchase of an ecological insulation core. The impact of the MiWo insulation impact increases with the thickness of the panel. For the thickest panel variant, this value is 8.2 kg/m². The production A3 itself is not emissive. Only the electricity consumption of 0.77 kWh/m² seems worth noting. The production of steel as an input material (module A1), therefore, has the greatest impact on the environmental characteristic. The transport of raw materials from considerable distances is not significant to overall values. The sandwich panel products, due to the 10% potential for reuse and for high recycling potential for steel, has significant environmental gains - module D.

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-

period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804 and ITB PCR A	
Independent verification corresponding to ISO 14025 (subclause 8.1.3.)	
<input checked="" type="checkbox"/> external	<input type="checkbox"/> internal
External verification of EPD: Ph.D. Eng. Halina Prejzner LCA, LCI audit and input data verification: Ph.D. Eng. Michał Piasecki, m.piasecki@itb.pl Verification of LCA: Ph.D. Eng. Justyna Tomaszewska, j.tomaszewska@itb.pl	

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.

Normative references

- ITB PCR A General Product Category Rules for Construction Products;
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures;
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services;
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines;
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework;
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation;
- EN 15804:2012+A1:2013 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products;
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business;
- KOBiZE Wskaźniki emisyjności CO₂, SO₂, NO_x, CO i pyłu całkowitego dla energii elektrycznej, grudzień 2017;
- PN-EN 14509:2013-12 - Samonośne izolacyjno-konstrukcyjne płyty warstwowe z dwustronną okładziną metalową – Wyroby fabryczne – Specyfikacje;
- World Steel Association 2017 Life Cycle inventory methodology report for steel product.



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Thermal Physics, Acoustics and Environment Department
02-656 Warsaw, Ksawerów 21

CERTIFICATE No 125/2020
of TYPE III ENVIRONMENTAL DECLARATION

Product:

ARPANEL sandwich panels with mineral wool insulation core

Manufacturer:

ARPANEL - płyty warstwowe
Adamietz Sp. z o.o.

Braci Prankel 1, 47-100 Strzelce Opolskie, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

PN-EN 15804+A2

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued for the first time on 10th August 2020 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Deputy Head of the Thermal Physic, Acoustics
and Environment Department

Agnieszka Winkler-Skalna
Agnieszka Winkler-Skalna, PhD



Deputy Director
for Research and Innovation

Krzysztof Kuczyński
Krzysztof Kuczyński, PhD

Warsaw, August 2020