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Metal faced insulating panels with PIR core (Kingspan Karrier)



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

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 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 the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A3, C1-C4 and D modules in accordance with EN 15804+A2 (Cradle-to-Gate with options)

The year of preparing the EPD: 2023

Product standard: PN-EN 14509: 2013

Service Life: 50 years

PCR: ITB-PCR A

Declared unit: 1 m²

Reasons for performing LCA: B2B

Representativeness: Polish, European

MANUFACTURER

Kingspan Sp. z o.o. has been on the market since 2003 with the headquarters located in Lipsko (Fig.1). Kingspan exports products to almost 50 countries across five continents. The company specializes in the production of construction materials, including sandwich panels with both MW and PIR insulation core, modular coldrooms or coldstore doors. Moreover, Kingspan offers also a wide variety of ancillaries supplementing building envelope.



Figure 1. A view of the Kingspan production plant located in Lipsko (Poland).

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PRODUCTS DESCRIPTION AND APPLICATION

Sandwich panels with metal face and insulation core made of rigid polyisocyanurate foam density 37 kg/m³ are produced as external and internal walls or ceilings. Wall panels can be laid horizontally or vertically.

For multiwall application special Karrier systems are available comprising of a structural panel Karrier BK or Karrier KL with additional aluminium subconstruction ready to install various rainscreen systems.

Panel name	Thickness	Cover width	Face thickness	Coating type
Kingspan Karrier BK	60 – 170 mm	1000 mm	0,5 – 0,6 mm	SP;PVDF,PUR-PA
Kingspan Karrier KL	100 – 200 mm	1000 – 1150 mm	0,5 – 0,6 mm	SP;PVDF,PUR-PA

More information can be found on the Kingspan Sp. z o.o. website : <https://www.kingspan.com/>.

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 double metal faced insulating panels with PIR core is a line process conducted in the factory of Kingspan Sp. z o.o., located in Lipsko (Poland). Allocation was done on product mass basis. All impacts from raw materials extraction and processing are allocated in module A1 of the LCA. Impacts from the Kingspan Sp. z o.o. production were inventoried on the annual production volume expressed in m². Water and energy consumption, associated emissions and generated wastes are allocated to module A3. Packaging materials were taken into consideration.

System limits

The life cycle analysis (LCA) of the declared products covers: product stage – modules A1-A3, end of life – modules C1-C4 and benefits and loads beyond the system boundary – module D (cradle-to-gate with options) in accordance with EN 15804+A2 and ITB PCRA. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculations. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

Modules A1 and A2: Raw materials supply and transport

Raw materials such as steel, polyol, PVC membrane, catalysts, additives, ancillary materials and packaging materials come from both local and foreign suppliers. Means of transport include small trucks (< 10 t e.g. couriers) and big trucks (> 16 t).

Module A3: Production

A scheme of the sandwich panels with PIR core production process is presented in Figure 2. The facility is ISO 9001 and ISO 14001 certified.

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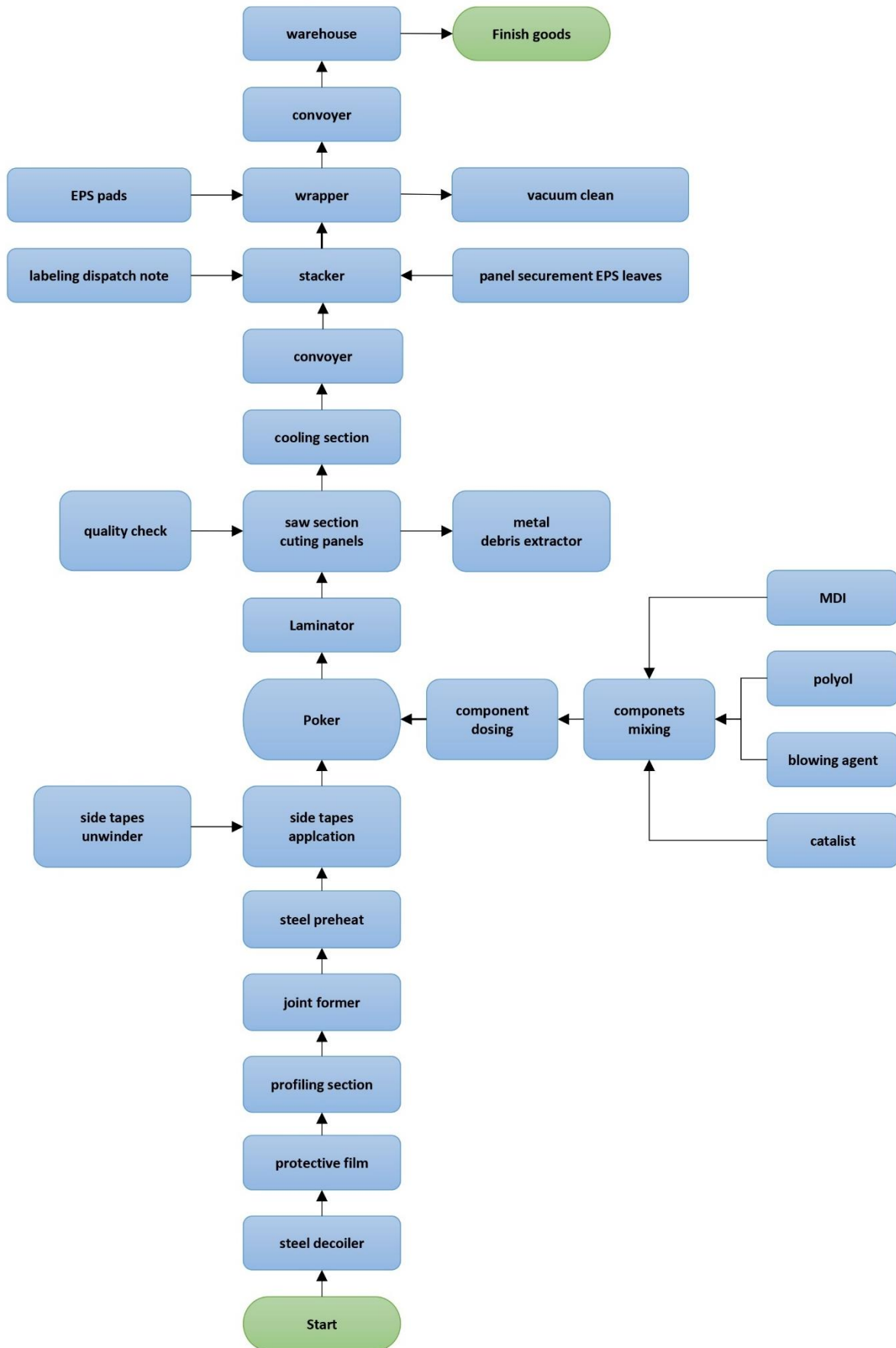


Figure 2. The scheme of metal faced insulating panels with PIR core production process by Kingspan Sp. z o.o.

Modules C1-C4 and D: End-of-life (EoL)

It is assumed that at the end-of-life, 100% of metal faced insulating panels with PIR core are demounted using electric tools (module C1) and is transported to waste processing plant which is 50 km away, on 16-32 t lorry EURO 5 (module C2). It is assumed that 98% of steel plates lining are recycled and 60% of the recovered PIR cores are re-used. The residue wastes are forwarded to a landfill in the form of mixed construction and demolition wastes (40% PIR and 2% steel plates). End-of-life scenario was summarized in Table 1. Environmental burdens declared in module C4 are associated with waste-specific emissions to air and groundwater. A potential credit resulting from the recycling of the steel scrap were calculated using World Steel Association approach and are presented in module D.

Table 1: End-of-life scenario for metal faced insulating panels with PIR core panels manufactured by Kingspan Sp. z o.o.

Material	Re-using	Recycling	Landfilling
PIR core	60%	0%	40%
Steel plates lining	0%	98%	2%

Data quality

The data selected for LCA analysis originates from ITB-LCI questionnaires completed by Kingspan Sp. z o.o. using the inventory data, ITB database, Ecoinvent database v. 3.9.1 and KOBiZE. KOBiZE data is supplemented with Ecoinvent v. 3.9.1 data on the national electricity mix impact where no specific indicator data is provided. No specific data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency are judged as good.

Assumptions and estimates

The impacts of the representative of metal faced insulating panels with PIR core panels were inventoried and calculated for all products presented in Tables 3-42 for density 37 kg/m³ and thicknesses of 40 mm, 60 mm, 80 mm, 100 mm, 120 mm, 140 mm, 150 mm, 160 mm, 170 mm and 200 mm.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN 15804 + A2.

Databases

The data for the processes comes from Ecoinvent v. 3.9.1 and ITB-Database. Specific data quality analysis was a part of external audit. Polish electricity mix used (production) is 0.761 kg CO₂/kWh (KOBiZE 2022).

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 m² of metal faced insulating panels with PIR core panels manufactured by Kingspan Sp. z o.o. for density 37 kg/m³ and thicknesses of 40 mm, 60 mm, 80 mm, 100 mm, 120 mm, 140 mm, 150 mm, 160 mm, 170 mm and 200 mm.

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Table 2. System boundaries for the environmental characteristic of metal faced insulating panels with PIR core panels production process by Kingspan Sp. z o.o.

Environmental assessment information (MD – Module Declared, MND – Module Not 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	MND	MND	MND	MND	MND	MND	MND	MND	MND	MD	MD	MD	MD	MD

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Table 3. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 40 mm manufactured by Kingspan Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	1.69E+01	1.73E+00	8.16E-01	1.94E+01	2.86E-02	8.88E-02	2.56E+00	5.61E-03	-1.45E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	1.68E+01	1.72E+00	7.48E-01	1.92E+01	2.81E-02	8.84E-02	2.56E+00	5.60E-03	-1.44E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	1.26E-01	5.87E-03	1.29E-02	1.44E-01	5.07E-04	3.02E-04	3.67E-04	2.94E-06	-9.97E-02
Global warming potential - land use and land use change	eq. kg CO ₂	8.88E-03	6.79E-04	1.78E-04	9.74E-03	6.60E-06	3.47E-05	2.74E-05	3.38E-06	-7.51E-03
Stratospheric ozone depletion potential	eq. kg CFC 11	6.73E-07	3.98E-07	1.24E-07	1.19E-06	5.38E-10	2.05E-08	4.98E-08	1.62E-10	-4.80E-07
Soil and water acidification potential	eq. mol H ⁺	7.67E-02	7.15E-03	3.75E-02	1.21E-01	2.98E-04	3.59E-04	1.41E-03	4.22E-05	-6.40E-02
Eutrophication potential - freshwater	eq. kg P	7.07E-03	1.16E-04	1.14E-03	8.33E-03	5.10E-05	5.94E-06	9.55E-06	4.66E-07	-6.36E-03
Eutrophication potential - seawater	eq. kg N	2.05E-02	2.15E-03	1.07E-03	2.37E-02	4.23E-05	1.08E-04	5.81E-04	1.62E-05	-1.69E-02
Eutrophication potential - terrestrial	eq. mol N	1.58E-01	2.35E-02	9.23E-03	1.91E-01	3.63E-04	1.18E-03	6.27E-03	1.74E-04	-1.35E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	7.60E-02	7.17E-03	3.13E-03	8.63E-02	1.02E-04	3.62E-04	1.75E-03	6.05E-05	-6.30E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	7.87E-05	6.10E-06	9.79E-07	8.58E-05	4.05E-08	3.14E-07	1.68E-07	7.89E-09	-5.87E-05
Abiotic depletion potential - fossil fuels	MJ	2.67E+02	2.56E+01	1.68E+01	3.09E+02	4.58E-01	1.31E+00	3.18E+00	1.41E-01	-2.12E+02
Water deprivation potential	eq. m ³	9.91E+00	1.18E-01	2.20E-01	1.02E+01	9.32E-03	6.07E-03	2.46E-02	4.37E-04	-7.90E+00

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Table 4. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 40 mm manufactured by Kingspan Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 5. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 40 mm manufactured by Kingspan Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.57E+01	3.66E-01	7.42E-01	1.68E+01	3.33E-02	1.88E-02	2.39E-02	1.18E-03	-1.29E+01
Consumption of renewable primary energy resources used as raw materials	MJ	9.24E-02	0.00E+00	0.00E+00	9.24E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	1.58E+01	3.66E-01	7.56E-01	1.69E+01	3.33E-02	1.88E-02	2.39E-02	1.18E-03	-1.29E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.23E+02	2.56E+01	1.08E+01	2.60E+02	4.85E-01	1.31E+00	-2.52E+01	1.41E-01	-1.85E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	4.39E+01	0.00E+00	0.00E+00	4.39E+01	0.00E+00	0.00E+00	2.86E+01	0.00E+00	-2.69E+01
Total consumption of non-renewable primary energy resources	MJ	2.67E+02	2.56E+01	1.79E+01	3.11E+02	4.85E-01	1.31E+00	3.43E+00	1.41E-01	-2.12E+02
Consumption of secondary materials	kg	6.24E+00	8.58E-03	1.09E-03	6.25E+00	3.70E-05	4.40E-04	1.47E-03	3.39E-05	-6.11E+00
Consumption of renewable secondary fuels	MJ	3.86E-03	9.43E-05	6.49E-06	3.96E-03	2.02E-07	4.85E-06	4.59E-06	7.27E-07	-8.37E-04
Consumption of non-renewable secondary fuels	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	0.00E+00
Net consumption of freshwater resources	m ³	2.37E-01	3.21E-03	3.49E-03	2.43E-01	1.49E-04	1.65E-04	4.48E-04	1.45E-04	-1.90E-01

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Table 6. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 40 mm manufactured by Kingspan Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	1.51E+00	2.87E-02	2.56E-04	1.54E+00	9.49E-08	1.47E-03	1.91E-02	6.75E-05	-1.45E+00
Non-hazardous waste neutralised	kg	2.07E+01	5.09E-01	1.19E-01	2.13E+01	2.71E-03	2.62E-02	7.65E-01	2.02E-03	-1.95E+01
Radioactive waste	kg	3.19E-04	1.76E-04	5.64E-05	5.51E-04	3.94E-07	9.04E-06	2.18E-05	1.91E-07	-2.54E-04
Components for re-use	kg	0.00E+00	0.00E+00	1.62E-01	1.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	3.63E-03	8.71E-05	5.26E-02	5.63E-02	2.78E-06	4.06E-06	1.05E-05	6.30E-07	-3.11E-03
Materials for energy recovery	kg	7.68E-06	6.40E-07	8.40E-02	8.40E-02	3.90E-09	3.29E-08	7.36E-08	2.27E-09	-6.53E-06
Energy exported	MJ	6.13E-01	2.83E-02	3.16E-02	6.73E-01	1.33E-03	1.46E-03	1.36E-02	1.25E-05	-4.86E-01

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Table 7. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 60 mm manufactured by Kingspan Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	1.99E+01	1.73E+00	8.16E-01	2.24E+01	2.86E-02	9.49E-02	3.72E+00	7.86E-03	-2.00E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	1.97E+01	1.72E+00	7.48E-01	2.22E+01	2.81E-02	9.46E-02	3.72E+00	7.85E-03	-1.98E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	1.76E-01	5.87E-03	1.29E-02	1.94E-01	5.07E-04	3.23E-04	4.51E-04	4.12E-06	-1.92E-01
Global warming potential - land use and land use change	eq. kg CO ₂	1.04E-02	6.79E-04	1.78E-04	1.12E-02	6.60E-06	3.71E-05	2.96E-05	4.74E-06	-1.03E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	8.67E-07	3.98E-07	1.24E-07	1.39E-06	5.38E-10	2.19E-08	5.03E-08	2.27E-10	-8.40E-07
Soil and water acidification potential	eq. mol H ⁺	9.54E-02	7.15E-03	3.75E-02	1.40E-01	2.98E-04	3.84E-04	1.54E-03	5.91E-05	-9.85E-02
Eutrophication potential - freshwater	eq. kg P	8.01E-03	1.16E-04	1.14E-03	9.27E-03	5.10E-05	6.36E-06	1.08E-05	6.53E-07	-8.10E-03
Eutrophication potential - seawater	eq. kg N	2.61E-02	2.15E-03	1.07E-03	2.93E-02	4.23E-05	1.16E-04	6.48E-04	2.27E-05	-2.73E-02
Eutrophication potential - terrestrial	eq. mol N	1.89E-01	2.35E-02	9.23E-03	2.22E-01	3.63E-04	1.26E-03	6.96E-03	2.43E-04	-1.92E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	8.90E-02	7.17E-03	3.13E-03	9.93E-02	1.02E-04	3.87E-04	1.94E-03	8.47E-05	-8.70E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.11E-04	6.10E-06	9.79E-07	1.18E-04	4.05E-08	3.35E-07	1.92E-07	1.11E-08	-1.18E-04
Abiotic depletion potential - fossil fuels	MJ	3.36E+02	2.56E+01	1.68E+01	3.79E+02	4.58E-01	1.40E+00	3.23E+00	1.97E-01	-3.39E+02
Water deprivation potential	eq. m ³	1.30E+01	1.18E-01	2.20E-01	1.33E+01	9.32E-03	6.49E-03	3.28E-02	6.12E-04	-1.36E+01

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Table 8. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 60 mm manufactured by Kingspan Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 9. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 60 mm manufactured by Kingspan Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.94E+01	3.66E-01	7.42E-01	2.05E+01	3.33E-02	2.01E-02	2.70E-02	1.65E-03	-1.98E+01
Consumption of renewable primary energy resources used as raw materials	MJ	9.24E-02	0.00E+00	0.00E+00	9.24E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	1.95E+01	3.66E-01	7.56E-01	2.06E+01	3.33E-02	2.01E-02	2.70E-02	1.65E-03	-1.98E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.74E+02	2.56E+01	1.08E+01	3.11E+02	4.85E-01	1.40E+00	-3.94E+01	1.97E-01	-2.79E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	6.21E+01	0.00E+00	0.00E+00	6.21E+01	0.00E+00	0.00E+00	4.29E+01	0.00E+00	-6.06E+01
Total consumption of non-renewable primary energy resources	MJ	3.36E+02	2.56E+01	1.79E+01	3.80E+02	4.85E-01	1.40E+00	3.49E+00	1.97E-01	-3.40E+02
Consumption of secondary materials	kg	6.25E+00	8.58E-03	1.09E-03	6.26E+00	3.70E-05	4.71E-04	1.61E-03	4.75E-05	-6.12E+00
Consumption of renewable secondary fuels	MJ	3.93E-03	9.43E-05	6.49E-06	4.03E-03	2.02E-07	5.19E-06	4.91E-06	1.02E-06	-9.71E-04
Consumption of non-renewable secondary fuels	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	0.00E+00
Net consumption of freshwater resources	m ³	3.10E-01	3.21E-03	3.49E-03	3.16E-01	1.49E-04	1.77E-04	6.44E-04	2.04E-04	-3.25E-01

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Table 10. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 60 mm manufactured by Kingspan Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	1.56E+00	2.87E-02	2.56E-04	1.59E+00	9.49E-08	1.58E-03	2.86E-02	9.46E-05	-1.54E+00
Non-hazardous waste neutralised	kg	2.12E+01	5.09E-01	1.19E-01	2.18E+01	2.71E-03	2.80E-02	1.15E+00	2.83E-03	-2.04E+01
Radioactive waste	kg	3.40E-04	1.76E-04	5.64E-05	5.73E-04	3.94E-07	9.67E-06	2.19E-05	1.99E-07	-2.94E-04
Components for re-use	kg	0.00E+00	0.00E+00	1.62E-01	1.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	4.31E-03	8.71E-05	5.26E-02	5.70E-02	2.78E-06	4.35E-06	1.37E-05	8.83E-07	-4.38E-03
Materials for energy recovery	kg	8.90E-06	6.40E-07	8.40E-02	8.40E-02	3.90E-09	3.52E-08	7.76E-08	3.18E-09	-8.78E-06
Energy exported	MJ	8.31E-01	2.83E-02	3.16E-02	8.91E-01	1.33E-03	1.56E-03	1.36E-02	1.76E-05	-8.89E-01

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Table 11. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 80 mm manufactured by Kingspan Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	2.29E+01	1.73E+00	8.16E-01	2.54E+01	2.86E-02	1.01E-01	4.89E+00	1.01E-02	-2.78E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	2.26E+01	1.72E+00	7.48E-01	2.51E+01	2.81E-02	1.01E-01	4.89E+00	1.01E-02	-2.74E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	2.26E-01	5.87E-03	1.29E-02	2.44E-01	5.07E-04	3.44E-04	5.36E-04	5.30E-06	-3.22E-01
Global warming potential - land use and land use change	eq. kg CO ₂	1.19E-02	6.79E-04	1.78E-04	1.28E-02	6.60E-06	3.95E-05	3.19E-05	6.10E-06	-1.42E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	1.06E-06	3.98E-07	1.24E-07	1.58E-06	5.38E-10	2.33E-08	5.07E-08	2.92E-10	-1.34E-06
Soil and water acidification potential	eq. mol H ⁺	1.14E-01	7.15E-03	3.75E-02	1.59E-01	2.98E-04	4.09E-04	1.67E-03	7.61E-05	-1.47E-01
Eutrophication potential - freshwater	eq. kg P	8.95E-03	1.16E-04	1.14E-03	1.02E-02	5.10E-05	6.77E-06	1.20E-05	8.40E-07	-1.05E-02
Eutrophication potential - seawater	eq. kg N	3.17E-02	2.15E-03	1.07E-03	3.49E-02	4.23E-05	1.23E-04	7.14E-04	2.92E-05	-4.19E-02
Eutrophication potential - terrestrial	eq. mol N	2.20E-01	2.35E-02	9.23E-03	2.53E-01	3.63E-04	1.35E-03	7.64E-03	3.13E-04	-2.72E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.02E-01	7.17E-03	3.13E-03	1.12E-01	1.02E-04	4.12E-04	2.12E-03	1.09E-04	-1.21E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.42E-04	6.10E-06	9.79E-07	1.49E-04	4.05E-08	3.57E-07	2.16E-07	1.42E-08	-2.00E-04
Abiotic depletion potential - fossil fuels	MJ	4.05E+02	2.56E+01	1.68E+01	4.48E+02	4.58E-01	1.50E+00	3.28E+00	2.53E-01	-5.18E+02
Water deprivation potential	eq. m ³	1.60E+01	1.18E-01	2.20E-01	1.64E+01	9.32E-03	6.91E-03	4.10E-02	7.88E-04	-2.15E+01

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Table 12. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 80 mm manufactured by Kingspan Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 13. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 80 mm manufactured by Kingspan Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.31E+01	3.66E-01	7.42E-01	2.42E+01	3.33E-02	2.14E-02	3.01E-02	2.13E-03	-2.94E+01
Consumption of renewable primary energy resources used as raw materials	MJ	9.24E-02	0.00E+00	0.00E+00	9.24E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	2.32E+01	3.66E-01	7.56E-01	2.43E+01	3.33E-02	2.14E-02	3.01E-02	2.13E-03	-2.94E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.25E+02	2.56E+01	1.08E+01	3.61E+02	4.85E-01	1.50E+00	-5.37E+01	2.53E-01	-4.11E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	8.03E+01	0.00E+00	0.00E+00	8.03E+01	0.00E+00	0.00E+00	5.72E+01	0.00E+00	-1.08E+02
Total consumption of non-renewable primary energy resources	MJ	4.06E+02	2.56E+01	1.79E+01	4.49E+02	4.85E-01	1.50E+00	3.54E+00	2.53E-01	-5.19E+02
Consumption of secondary materials	kg	6.26E+00	8.58E-03	1.09E-03	6.27E+00	3.70E-05	5.01E-04	1.74E-03	6.11E-05	-6.15E+00
Consumption of renewable secondary fuels	MJ	4.00E-03	9.43E-05	6.49E-06	4.10E-03	2.02E-07	5.52E-06	5.24E-06	1.31E-06	-1.16E-03
Consumption of non-renewable secondary fuels	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	0.00E+00
Net consumption of freshwater resources	m ³	3.83E-01	3.21E-03	3.49E-03	3.89E-01	1.49E-04	1.88E-04	8.40E-04	2.62E-04	-5.15E-01

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Table 14. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 80 mm manufactured by Kingspan Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	1.62E+00	2.87E-02	2.56E-04	1.65E+00	9.49E-08	1.68E-03	3.81E-02	1.22E-04	-1.68E+00
Non-hazardous waste neutralised	kg	2.17E+01	5.09E-01	1.19E-01	2.23E+01	2.71E-03	2.98E-02	1.53E+00	3.64E-03	-2.17E+01
Radioactive waste	kg	3.62E-04	1.76E-04	5.64E-05	5.94E-04	3.94E-07	1.03E-05	2.19E-05	2.08E-07	-3.50E-04
Components for re-use	kg	0.00E+00	0.00E+00	1.62E-01	1.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	5.00E-03	8.71E-05	5.26E-02	5.77E-02	2.78E-06	4.63E-06	1.69E-05	1.14E-06	-6.14E-03
Materials for energy recovery	kg	1.01E-05	6.40E-07	8.40E-02	8.40E-02	3.90E-09	3.74E-08	8.15E-08	4.09E-09	-1.19E-05
Energy exported	MJ	1.05E+00	2.83E-02	3.16E-02	1.11E+00	1.33E-03	1.66E-03	1.37E-02	2.26E-05	-1.45E+00

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Table 15. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 100 mm manufactured by Kingspan Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	2.59E+01	1.73E+00	8.16E-01	2.84E+01	2.86E-02	1.07E-01	6.05E+00	1.24E-02	-3.77E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	2.53E+01	1.72E+00	7.48E-01	2.78E+01	2.81E-02	1.07E-01	6.05E+00	1.23E-02	-3.72E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	2.75E-01	5.87E-03	1.29E-02	2.93E-01	5.07E-04	3.65E-04	6.21E-04	6.47E-06	-4.88E-01
Global warming potential - land use and land use change	eq. kg CO ₂	1.37E-02	6.79E-04	1.78E-04	1.46E-02	6.60E-06	4.20E-05	3.42E-05	7.45E-06	-1.92E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	1.26E-06	3.98E-07	1.24E-07	1.78E-06	5.38E-10	2.47E-08	5.12E-08	3.58E-10	-1.99E-06
Soil and water acidification potential	eq. mol H ⁺	1.32E-01	7.15E-03	3.75E-02	1.77E-01	2.98E-04	4.34E-04	1.80E-03	9.30E-05	-2.09E-01
Eutrophication potential - freshwater	eq. kg P	9.89E-03	1.16E-04	1.14E-03	1.11E-02	5.10E-05	7.18E-06	1.32E-05	1.03E-06	-1.37E-02
Eutrophication potential - seawater	eq. kg N	3.72E-02	2.15E-03	1.07E-03	4.04E-02	4.23E-05	1.31E-04	7.81E-04	3.57E-05	-6.06E-02
Eutrophication potential - terrestrial	eq. mol N	2.49E-01	2.35E-02	9.23E-03	2.82E-01	3.63E-04	1.43E-03	8.33E-03	3.83E-04	-3.75E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.12E-01	7.17E-03	3.13E-03	1.22E-01	1.02E-04	4.37E-04	2.30E-03	1.33E-04	-1.64E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.74E-04	6.10E-06	9.79E-07	1.81E-04	4.05E-08	3.79E-07	2.41E-07	1.74E-08	-3.06E-04
Abiotic depletion potential - fossil fuels	MJ	4.69E+02	2.56E+01	1.68E+01	5.11E+02	4.58E-01	1.59E+00	3.33E+00	3.10E-01	-7.49E+02
Water deprivation potential	eq. m ³	1.91E+01	1.18E-01	2.20E-01	1.94E+01	9.32E-03	7.34E-03	4.92E-02	9.63E-04	-3.17E+01

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Table 16. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 100 mm manufactured by Kingspan Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 17. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 100 mm manufactured by Kingspan Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.66E+01	3.66E-01	7.42E-01	2.77E+01	3.33E-02	2.28E-02	3.32E-02	2.60E-03	-4.17E+01
Consumption of renewable primary energy resources used as raw materials	MJ	9.11E-02	0.00E+00	0.00E+00	9.11E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	2.67E+01	3.66E-01	7.56E-01	2.78E+01	3.33E-02	2.28E-02	3.32E-02	2.60E-03	-4.17E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.73E+02	2.56E+01	1.08E+01	4.09E+02	4.85E-01	1.59E+00	-6.80E+01	3.10E-01	-5.80E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	9.61E+01	0.00E+00	0.00E+00	9.61E+01	0.00E+00	0.00E+00	7.15E+01	0.00E+00	-1.68E+02
Total consumption of non-renewable primary energy resources	MJ	4.69E+02	2.56E+01	1.79E+01	5.13E+02	4.85E-01	1.59E+00	3.59E+00	3.10E-01	-7.49E+02
Consumption of secondary materials	kg	6.26E+00	8.58E-03	1.09E-03	6.27E+00	3.70E-05	5.32E-04	1.87E-03	7.47E-05	-6.17E+00
Consumption of renewable secondary fuels	MJ	4.07E-03	9.43E-05	6.49E-06	4.17E-03	2.02E-07	5.86E-06	5.56E-06	1.60E-06	-1.40E-03
Consumption of non-renewable secondary fuels	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	0.00E+00
Net consumption of freshwater resources	m ³	4.55E-01	3.21E-03	3.49E-03	4.61E-01	1.49E-04	2.00E-04	1.04E-03	3.20E-04	-7.58E-01

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Table 18. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 100 mm manufactured by Kingspan Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	1.67E+00	2.87E-02	2.56E-04	1.70E+00	9.49E-08	1.78E-03	4.77E-02	1.49E-04	-1.86E+00
Non-hazardous waste neutralised	kg	2.22E+01	5.09E-01	1.19E-01	2.28E+01	2.71E-03	3.16E-02	1.91E+00	4.45E-03	-2.33E+01
Radioactive waste	kg	3.47E-04	1.76E-04	5.64E-05	5.79E-04	3.94E-07	1.09E-05	2.20E-05	2.16E-07	-4.21E-04
Components for re-use	kg	0.00E+00	0.00E+00	1.62E-01	1.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	5.68E-03	8.71E-05	5.26E-02	5.84E-02	2.78E-06	4.91E-06	2.01E-05	1.39E-06	-8.41E-03
Materials for energy recovery	kg	1.13E-05	6.40E-07	8.40E-02	8.40E-02	3.90E-09	3.97E-08	8.55E-08	5.00E-09	-1.60E-05
Energy exported	MJ	1.27E+00	2.83E-02	3.16E-02	1.33E+00	1.33E-03	1.76E-03	1.37E-02	2.76E-05	-2.18E+00

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Table 19. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 120 mm manufactured by Kingspan Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	2.88E+01	1.73E+00	8.16E-01	3.14E+01	2.86E-02	1.13E-01	7.22E+00	1.46E-02	-4.99E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	2.85E+01	1.72E+00	7.48E-01	3.10E+01	2.81E-02	1.13E-01	7.22E+00	1.46E-02	-4.91E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	3.25E-01	5.87E-03	1.29E-02	3.44E-01	5.07E-04	3.86E-04	7.05E-04	7.65E-06	-6.91E-01
Global warming potential - land use and land use change	eq. kg CO ₂	1.49E-02	6.79E-04	1.78E-04	1.58E-02	6.60E-06	4.44E-05	3.64E-05	8.81E-06	-2.53E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	1.45E-06	3.98E-07	1.24E-07	1.97E-06	5.38E-10	2.62E-08	5.17E-08	4.23E-10	-2.78E-06
Soil and water acidification potential	eq. mol H ⁺	1.51E-01	7.15E-03	3.75E-02	1.96E-01	2.98E-04	4.59E-04	1.93E-03	1.10E-04	-2.85E-01
Eutrophication potential - freshwater	eq. kg P	1.08E-02	1.16E-04	1.14E-03	1.21E-02	5.10E-05	7.60E-06	1.45E-05	1.21E-06	-1.75E-02
Eutrophication potential - seawater	eq. kg N	4.30E-02	2.15E-03	1.07E-03	4.62E-02	4.23E-05	1.38E-04	8.48E-04	4.22E-05	-8.34E-02
Eutrophication potential - terrestrial	eq. mol N	2.82E-01	2.35E-02	9.23E-03	3.14E-01	3.63E-04	1.51E-03	9.01E-03	4.52E-04	-5.01E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.28E-01	7.17E-03	3.13E-03	1.38E-01	1.02E-04	4.63E-04	2.49E-03	1.58E-04	-2.17E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.06E-04	6.10E-06	9.79E-07	2.13E-04	4.05E-08	4.01E-07	2.65E-07	2.06E-08	-4.36E-04
Abiotic depletion potential - fossil fuels	MJ	5.44E+02	2.56E+01	1.68E+01	5.86E+02	4.58E-01	1.68E+00	3.39E+00	3.66E-01	-1.03E+03
Water deprivation potential	eq. m ³	2.22E+01	1.18E-01	2.20E-01	2.25E+01	9.32E-03	7.76E-03	5.74E-02	1.14E-03	-4.42E+01

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Table 20. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 120 mm manufactured by Kingspan Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 21. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 120 mm manufactured by Kingspan Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.05E+01	3.66E-01	7.42E-01	3.16E+01	3.33E-02	2.41E-02	3.63E-02	3.08E-03	-5.68E+01
Consumption of renewable primary energy resources used as raw materials	MJ	9.24E-02	0.00E+00	0.00E+00	9.24E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	3.06E+01	3.66E-01	7.56E-01	3.17E+01	3.33E-02	2.41E-02	3.63E-02	3.08E-03	-5.68E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	4.27E+02	2.56E+01	1.08E+01	4.63E+02	4.85E-01	1.68E+00	-8.22E+01	3.66E-01	-7.88E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.17E+02	0.00E+00	0.00E+00	1.17E+02	0.00E+00	0.00E+00	8.58E+01	0.00E+00	-2.42E+02
Total consumption of non-renewable primary energy resources	MJ	5.44E+02	2.56E+01	1.79E+01	5.88E+02	4.85E-01	1.68E+00	3.64E+00	3.66E-01	-1.03E+03
Consumption of secondary materials	kg	6.27E+00	8.58E-03	1.09E-03	6.28E+00	3.70E-05	5.62E-04	2.01E-03	8.83E-05	-6.21E+00
Consumption of renewable secondary fuels	MJ	4.15E-03	9.43E-05	6.49E-06	4.25E-03	2.02E-07	6.20E-06	5.89E-06	1.89E-06	-1.70E-03
Consumption of non-renewable secondary fuels	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	0.00E+00
Net consumption of freshwater resources	m ³	5.29E-01	3.21E-03	3.49E-03	5.36E-01	1.49E-04	2.11E-04	1.23E-03	3.79E-04	-1.06E+00

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Table 22. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 120 mm manufactured by Kingspan Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	1.72E+00	2.87E-02	2.56E-04	1.75E+00	9.49E-08	1.88E-03	5.72E-02	1.76E-04	-2.07E+00
Non-hazardous waste neutralised	kg	2.27E+01	5.09E-01	1.19E-01	2.33E+01	2.71E-03	3.34E-02	2.29E+00	5.26E-03	-2.53E+01
Radioactive waste	kg	4.05E-04	1.76E-04	5.64E-05	6.37E-04	3.94E-07	1.16E-05	2.21E-05	2.24E-07	-5.09E-04
Components for re-use	kg	0.00E+00	0.00E+00	1.62E-01	1.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	6.36E-03	8.71E-05	5.26E-02	5.91E-02	2.78E-06	5.19E-06	2.34E-05	1.64E-06	-1.12E-02
Materials for energy recovery	kg	1.26E-05	6.40E-07	8.40E-02	8.40E-02	3.90E-09	4.20E-08	8.95E-08	5.91E-09	-2.10E-05
Energy exported	MJ	1.49E+00	2.83E-02	3.16E-02	1.55E+00	1.33E-03	1.86E-03	1.38E-02	3.26E-05	-3.07E+00

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Table 23. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 140 mm manufactured by Kingspan Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	3.14E+01	1.73E+00	8.16E-01	3.40E+01	2.86E-02	1.19E-01	8.38E+00	1.69E-02	-6.42E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	3.10E+01	1.72E+00	7.48E-01	3.35E+01	2.81E-02	1.18E-01	8.38E+00	1.68E-02	-6.32E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	3.78E-01	5.87E-03	1.29E-02	3.96E-01	5.07E-04	4.04E-04	7.90E-04	8.83E-06	-9.32E-01
Global warming potential - land use and land use change	eq. kg CO ₂	1.61E-02	6.79E-04	1.78E-04	1.70E-02	6.60E-06	4.64E-05	3.87E-05	1.02E-05	-3.26E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	1.64E-06	3.98E-07	1.24E-07	2.17E-06	5.38E-10	2.74E-08	5.21E-08	4.88E-10	-3.72E-06
Soil and water acidification potential	eq. mol H ⁺	1.69E-01	7.15E-03	3.75E-02	2.13E-01	2.98E-04	4.80E-04	2.06E-03	1.27E-04	-3.75E-01
Eutrophication potential - freshwater	eq. kg P	1.17E-02	1.16E-04	1.14E-03	1.30E-02	5.10E-05	7.95E-06	1.57E-05	1.40E-06	-2.20E-02
Eutrophication potential - seawater	eq. kg N	4.83E-02	2.15E-03	1.07E-03	5.15E-02	4.23E-05	1.45E-04	9.15E-04	4.87E-05	-1.10E-01
Eutrophication potential - terrestrial	eq. mol N	3.09E-01	2.35E-02	9.23E-03	3.42E-01	3.63E-04	1.58E-03	9.69E-03	5.22E-04	-6.49E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.37E-01	7.17E-03	3.13E-03	1.48E-01	1.02E-04	4.84E-04	2.67E-03	1.82E-04	-2.79E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.37E-04	6.10E-06	9.79E-07	2.44E-04	4.05E-08	4.19E-07	2.89E-07	2.37E-08	-5.89E-04
Abiotic depletion potential - fossil fuels	MJ	6.01E+02	2.56E+01	1.68E+01	6.44E+02	4.58E-01	1.76E+00	3.44E+00	4.23E-01	-1.36E+03
Water deprivation potential	eq. m ³	2.51E+01	1.18E-01	2.20E-01	2.54E+01	9.32E-03	8.12E-03	6.56E-02	1.31E-03	-5.89E+01

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Table 24. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 140 mm manufactured by Kingspan Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 25. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 140 mm manufactured by Kingspan Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.37E+01	3.66E-01	7.42E-01	3.48E+01	3.33E-02	2.52E-02	3.95E-02	3.55E-03	-7.46E+01
Consumption of renewable primary energy resources used as raw materials	MJ	9.11E-02	0.00E+00	0.00E+00	9.11E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	3.38E+01	3.66E-01	7.56E-01	3.50E+01	3.33E-02	2.52E-02	3.95E-02	3.55E-03	-7.46E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	4.72E+02	2.56E+01	1.08E+01	5.08E+02	4.85E-01	1.76E+00	-9.65E+01	4.23E-01	-1.03E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.30E+02	0.00E+00	0.00E+00	1.30E+02	0.00E+00	0.00E+00	1.00E+02	0.00E+00	-3.30E+02
Total consumption of non-renewable primary energy resources	MJ	6.02E+02	2.56E+01	1.79E+01	6.46E+02	4.85E-01	1.76E+00	3.69E+00	4.23E-01	-1.36E+03
Consumption of secondary materials	kg	6.28E+00	8.58E-03	1.09E-03	6.29E+00	3.70E-05	5.88E-04	2.14E-03	1.02E-04	-6.25E+00
Consumption of renewable secondary fuels	MJ	1.97E-03	9.43E-05	6.49E-06	2.07E-03	2.02E-07	6.48E-06	6.21E-06	2.18E-06	-2.05E-03
Consumption of non-renewable secondary fuels	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	0.00E+00
Net consumption of freshwater resources	m ³	5.99E-01	3.21E-03	3.49E-03	6.06E-01	1.49E-04	2.21E-04	1.43E-03	4.37E-04	-1.41E+00

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Table 26. Life cycle assessment (LCA) results of metal faced insulating panels with density of 37 kg/m³ and thickness of 140 mm manufactured by Kingspan Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	1.77E+00	2.87E-02	2.56E-04	1.80E+00	9.49E-08	1.97E-03	6.68E-02	2.03E-04	-2.32E+00
Non-hazardous waste neutralised	kg	2.29E+01	5.09E-01	1.19E-01	2.35E+01	2.71E-03	3.50E-02	2.67E+00	6.07E-03	-2.77E+01
Radioactive waste	kg	3.85E-04	1.76E-04	5.64E-05	6.17E-04	3.94E-07	1.21E-05	2.21E-05	2.32E-07	-6.12E-04
Components for re-use	kg	0.00E+00	0.00E+00	1.62E-01	1.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	7.00E-03	8.71E-05	5.26E-02	5.97E-02	2.78E-06	5.43E-06	2.66E-05	1.89E-06	-1.45E-02
Materials for energy recovery	kg	1.36E-05	6.40E-07	8.40E-02	8.40E-02	3.90E-09	4.39E-08	9.35E-08	6.81E-09	-2.68E-05
Energy exported	MJ	1.70E+00	2.83E-02	3.16E-02	1.76E+00	1.33E-03	1.95E-03	1.39E-02	3.77E-05	-4.12E+00

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Table 27. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 150 mm manufactured by Kingspan Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	3.33E+01	1.73E+00	8.16E-01	3.59E+01	2.86E-02	1.23E-01	8.96E+00	1.80E-02	-7.23E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	3.29E+01	1.72E+00	7.48E-01	3.54E+01	2.81E-02	1.22E-01	8.96E+00	1.80E-02	-7.11E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	4.00E-01	5.87E-03	1.29E-02	4.19E-01	5.07E-04	4.18E-04	8.32E-04	9.42E-06	-1.07E+00
Global warming potential - land use and land use change	eq. kg CO ₂	1.72E-02	6.79E-04	1.78E-04	1.80E-02	6.60E-06	4.80E-05	3.98E-05	1.08E-05	-3.66E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	1.74E-06	3.98E-07	1.24E-07	2.26E-06	5.38E-10	2.83E-08	5.23E-08	5.20E-10	-4.24E-06
Soil and water acidification potential	eq. mol H ⁺	1.79E-01	7.15E-03	3.75E-02	2.24E-01	2.98E-04	4.96E-04	2.13E-03	1.35E-04	-4.25E-01
Eutrophication potential - freshwater	eq. kg P	1.22E-02	1.16E-04	1.14E-03	1.35E-02	5.10E-05	8.22E-06	1.63E-05	1.50E-06	-2.45E-02
Eutrophication potential - seawater	eq. kg N	5.14E-02	2.15E-03	1.07E-03	5.46E-02	4.23E-05	1.50E-04	9.48E-04	5.20E-05	-1.26E-01
Eutrophication potential - terrestrial	eq. mol N	3.28E-01	2.35E-02	9.23E-03	3.61E-01	3.63E-04	1.63E-03	1.00E-02	5.57E-04	-7.32E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.47E-01	7.17E-03	3.13E-03	1.58E-01	1.02E-04	5.00E-04	2.76E-03	1.94E-04	-3.14E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.54E-04	6.10E-06	9.79E-07	2.61E-04	4.05E-08	4.33E-07	3.01E-07	2.53E-08	-6.74E-04
Abiotic depletion potential - fossil fuels	MJ	6.47E+02	2.56E+01	1.68E+01	6.90E+02	4.58E-01	1.81E+00	3.46E+00	4.51E-01	-1.55E+03
Water deprivation potential	eq. m ³	2.68E+01	1.18E-01	2.20E-01	2.71E+01	9.32E-03	8.39E-03	6.97E-02	1.40E-03	-6.71E+01

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Table 28. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 150 mm manufactured by Kingspan Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 29. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 150 mm manufactured by Kingspan Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.60E+01	3.66E-01	7.42E-01	3.72E+01	3.33E-02	2.60E-02	4.10E-02	3.79E-03	-8.46E+01
Consumption of renewable primary energy resources used as raw materials	MJ	9.24E-02	0.00E+00	0.00E+00	9.24E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	3.61E+01	3.66E-01	7.56E-01	3.73E+01	3.33E-02	2.60E-02	4.10E-02	3.79E-03	-8.46E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	5.03E+02	2.56E+01	1.08E+01	5.40E+02	4.85E-01	1.81E+00	-1.04E+02	4.51E-01	-1.17E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.44E+02	0.00E+00	0.00E+00	1.44E+02	0.00E+00	0.00E+00	1.07E+02	0.00E+00	-3.79E+02
Total consumption of non-renewable primary energy resources	MJ	6.48E+02	2.56E+01	1.79E+01	6.91E+02	4.85E-01	1.81E+00	3.72E+00	4.51E-01	-1.55E+03
Consumption of secondary materials	kg	6.29E+00	8.58E-03	1.09E-03	6.30E+00	3.70E-05	6.08E-04	2.21E-03	1.09E-04	-6.27E+00
Consumption of renewable secondary fuels	MJ	4.25E-03	9.43E-05	6.49E-06	4.36E-03	2.02E-07	6.70E-06	6.37E-06	2.33E-06	-2.24E-03
Consumption of non-renewable secondary fuels	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	0.00E+00
Net consumption of freshwater resources	m ³	6.39E-01	3.21E-03	3.49E-03	6.45E-01	1.49E-04	2.28E-04	1.53E-03	4.66E-04	-1.60E+00

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Table 30. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 150 mm manufactured by Kingspan Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	1.80E+00	2.87E-02	2.56E-04	1.83E+00	9.49E-08	2.04E-03	7.15E-02	2.17E-04	-2.47E+00
Non-hazardous waste neutralised	kg	2.34E+01	5.09E-01	1.19E-01	2.40E+01	2.71E-03	3.62E-02	2.86E+00	6.48E-03	-2.90E+01
Radioactive waste	kg	4.37E-04	1.76E-04	5.64E-05	6.69E-04	3.94E-07	1.25E-05	2.21E-05	2.36E-07	-6.70E-04
Components for re-use	kg	0.00E+00	0.00E+00	1.62E-01	1.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	7.38E-03	8.71E-05	5.26E-02	6.01E-02	2.78E-06	5.62E-06	2.82E-05	2.02E-06	-1.63E-02
Materials for energy recovery	kg	1.44E-05	6.40E-07	8.40E-02	8.40E-02	3.90E-09	4.54E-08	9.55E-08	7.27E-09	-3.01E-05
Energy exported	MJ	1.81E+00	2.83E-02	3.16E-02	1.87E+00	1.33E-03	2.01E-03	1.39E-02	4.02E-05	-4.70E+00

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Table 31. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 160 mm manufactured by Kingspan Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	3.48E+01	1.73E+00	8.16E-01	3.74E+01	2.86E-02	1.26E-01	9.54E+00	1.91E-02	-8.08E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	3.44E+01	1.72E+00	7.48E-01	3.68E+01	2.81E-02	1.25E-01	9.54E+00	1.91E-02	-7.95E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	4.25E-01	5.87E-03	1.29E-02	4.44E-01	5.07E-04	4.28E-04	8.74E-04	1.00E-05	-1.21E+00
Global warming potential - land use and land use change	eq. kg CO ₂	1.79E-02	6.79E-04	1.78E-04	1.88E-02	6.60E-06	4.92E-05	4.10E-05	1.15E-05	-4.10E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	1.84E-06	3.98E-07	1.24E-07	2.36E-06	5.38E-10	2.90E-08	5.26E-08	5.53E-10	-4.80E-06
Soil and water acidification potential	eq. mol H ⁺	1.89E-01	7.15E-03	3.75E-02	2.33E-01	2.98E-04	5.09E-04	2.19E-03	1.44E-04	-4.79E-01
Eutrophication potential - freshwater	eq. kg P	1.27E-02	1.16E-04	1.14E-03	1.40E-02	5.10E-05	8.42E-06	1.69E-05	1.59E-06	-2.72E-02
Eutrophication potential - seawater	eq. kg N	5.42E-02	2.15E-03	1.07E-03	5.74E-02	4.23E-05	1.54E-04	9.81E-04	5.52E-05	-1.42E-01
Eutrophication potential - terrestrial	eq. mol N	3.43E-01	2.35E-02	9.23E-03	3.76E-01	3.63E-04	1.67E-03	1.04E-02	5.92E-04	-8.20E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.54E-01	7.17E-03	3.13E-03	1.64E-01	1.02E-04	5.13E-04	2.85E-03	2.06E-04	-3.52E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.70E-04	6.10E-06	9.79E-07	2.77E-04	4.05E-08	4.44E-07	3.14E-07	2.69E-08	-7.66E-04
Abiotic depletion potential - fossil fuels	MJ	6.82E+02	2.56E+01	1.68E+01	7.24E+02	4.58E-01	1.86E+00	3.49E+00	4.79E-01	-1.75E+03
Water deprivation potential	eq. m ³	2.83E+01	1.18E-01	2.20E-01	2.86E+01	9.32E-03	8.60E-03	7.38E-02	1.49E-03	-7.59E+01

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Table 32. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 160 mm manufactured by Kingspan Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 33. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 160 mm manufactured by Kingspan Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.79E+01	3.66E-01	7.42E-01	3.90E+01	3.33E-02	2.67E-02	4.26E-02	4.02E-03	-9.52E+01
Consumption of renewable primary energy resources used as raw materials	MJ	9.24E-02	0.00E+00	0.00E+00	9.24E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	3.80E+01	3.66E-01	7.56E-01	3.91E+01	3.33E-02	2.67E-02	4.26E-02	4.02E-03	-9.52E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	5.29E+02	2.56E+01	1.08E+01	5.65E+02	4.85E-01	1.86E+00	-1.11E+02	4.79E-01	-1.32E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.53E+02	0.00E+00	0.00E+00	1.53E+02	0.00E+00	0.00E+00	1.14E+02	0.00E+00	-4.31E+02
Total consumption of non-renewable primary energy resources	MJ	6.83E+02	2.56E+01	1.79E+01	7.26E+02	4.85E-01	1.86E+00	3.74E+00	4.79E-01	-1.75E+03
Consumption of secondary materials	kg	6.29E+00	8.58E-03	1.09E-03	6.30E+00	3.70E-05	6.24E-04	2.27E-03	1.16E-04	-6.30E+00
Consumption of renewable secondary fuels	MJ	4.29E-03	9.43E-05	6.49E-06	4.39E-03	2.02E-07	6.87E-06	6.54E-06	2.48E-06	-2.45E-03
Consumption of non-renewable secondary fuels	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	0.00E+00
Net consumption of freshwater resources	m ³	6.75E-01	3.21E-03	3.49E-03	6.82E-01	1.49E-04	2.34E-04	1.62E-03	4.95E-04	-1.81E+00

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Table 34. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 160 mm manufactured by Kingspan Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	1.83E+00	2.87E-02	2.56E-04	1.86E+00	9.49E-08	2.09E-03	7.63E-02	2.30E-04	-2.62E+00
Non-hazardous waste neutralised	kg	2.36E+01	5.09E-01	1.19E-01	2.43E+01	2.71E-03	3.71E-02	3.05E+00	6.88E-03	-3.05E+01
Radioactive waste	kg	4.48E-04	1.76E-04	5.64E-05	6.80E-04	3.94E-07	1.28E-05	2.22E-05	2.41E-07	-7.31E-04
Components for re-use	kg	0.00E+00	0.00E+00	1.62E-01	1.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	7.72E-03	8.71E-05	5.26E-02	6.04E-02	2.78E-06	5.76E-06	2.98E-05	2.15E-06	-1.83E-02
Materials for energy recovery	kg	1.50E-05	6.40E-07	8.40E-02	8.40E-02	3.90E-09	4.66E-08	9.75E-08	7.72E-09	-3.36E-05
Energy exported	MJ	1.92E+00	2.83E-02	3.16E-02	1.98E+00	1.33E-03	2.06E-03	1.39E-02	4.27E-05	-5.33E+00

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Table 35. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 170 mm manufactured by Kingspan Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	3.63E+01	1.73E+00	8.16E-01	3.89E+01	2.86E-02	1.29E-01	1.01E+01	2.02E-02	-8.99E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	3.58E+01	1.72E+00	7.48E-01	3.83E+01	2.81E-02	1.28E-01	1.01E+01	2.02E-02	-8.85E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	4.50E-01	5.87E-03	1.29E-02	4.69E-01	5.07E-04	4.39E-04	9.16E-04	1.06E-05	-1.36E+00
Global warming potential - land use and land use change	eq. kg CO ₂	1.87E-02	6.79E-04	1.78E-04	1.95E-02	6.60E-06	5.04E-05	4.21E-05	1.22E-05	-4.56E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	1.94E-06	3.98E-07	1.24E-07	2.46E-06	5.38E-10	2.97E-08	5.28E-08	5.85E-10	-5.39E-06
Soil and water acidification potential	eq. mol H ⁺	1.98E-01	7.15E-03	3.75E-02	2.43E-01	2.98E-04	5.21E-04	2.26E-03	1.52E-04	-5.36E-01
Eutrophication potential - freshwater	eq. kg P	1.32E-02	1.16E-04	1.14E-03	1.44E-02	5.10E-05	8.63E-06	1.75E-05	1.68E-06	-3.01E-02
Eutrophication potential - seawater	eq. kg N	5.70E-02	2.15E-03	1.07E-03	6.02E-02	4.23E-05	1.57E-04	1.01E-03	5.85E-05	-1.59E-01
Eutrophication potential - terrestrial	eq. mol N	3.59E-01	2.35E-02	9.23E-03	3.91E-01	3.63E-04	1.72E-03	1.07E-02	6.27E-04	-9.14E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.60E-01	7.17E-03	3.13E-03	1.71E-01	1.02E-04	5.25E-04	2.94E-03	2.18E-04	-3.91E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.86E-04	6.10E-06	9.79E-07	2.93E-04	4.05E-08	4.55E-07	3.26E-07	2.85E-08	-8.63E-04
Abiotic depletion potential - fossil fuels	MJ	7.16E+02	2.56E+01	1.68E+01	7.59E+02	4.58E-01	1.91E+00	3.51E+00	5.07E-01	-1.96E+03
Water deprivation potential	eq. m ³	2.98E+01	1.18E-01	2.20E-01	3.02E+01	9.32E-03	8.81E-03	7.79E-02	1.58E-03	-8.53E+01

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Table 36. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 170 mm manufactured by Kingspan Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 37. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 170 mm manufactured by Kingspan Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.98E+01	3.66E-01	7.42E-01	4.09E+01	3.33E-02	2.73E-02	4.41E-02	4.26E-03	-1.07E+02
Consumption of renewable primary energy resources used as raw materials	MJ	9.24E-02	0.00E+00	0.00E+00	9.24E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	3.98E+01	3.66E-01	7.56E-01	4.10E+01	3.33E-02	2.73E-02	4.41E-02	4.26E-03	-1.07E+02
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	5.54E+02	2.56E+01	1.08E+01	5.91E+02	4.85E-01	1.91E+00	-1.18E+02	5.07E-01	-1.47E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.62E+02	0.00E+00	0.00E+00	1.62E+02	0.00E+00	0.00E+00	1.22E+02	0.00E+00	-4.86E+02
Total consumption of non-renewable primary energy resources	MJ	7.17E+02	2.56E+01	1.79E+01	7.61E+02	4.85E-01	1.91E+00	3.77E+00	5.07E-01	-1.96E+03
Consumption of secondary materials	kg	6.30E+00	8.58E-03	1.09E-03	6.30E+00	3.70E-05	6.39E-04	2.34E-03	1.22E-04	-6.32E+00
Consumption of renewable secondary fuels	MJ	4.33E-03	9.43E-05	6.49E-06	4.43E-03	2.02E-07	7.04E-06	6.70E-06	2.62E-06	-2.67E-03
Consumption of non-renewable secondary fuels	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	0.00E+00
Net consumption of freshwater resources	m ³	7.12E-01	3.21E-03	3.49E-03	7.18E-01	1.49E-04	2.40E-04	1.72E-03	5.24E-04	-2.04E+00

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Table 38. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 170 mm manufactured by Kingspan Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	1.85E+00	2.87E-02	2.56E-04	1.88E+00	9.49E-08	2.14E-03	8.11E-02	2.44E-04	-2.78E+00
Non-hazardous waste neutralised	kg	2.39E+01	5.09E-01	1.19E-01	2.45E+01	2.71E-03	3.80E-02	3.24E+00	7.29E-03	-3.20E+01
Radioactive waste	kg	4.59E-04	1.76E-04	5.64E-05	6.91E-04	3.94E-07	1.31E-05	2.22E-05	2.45E-07	-7.97E-04
Components for re-use	kg	0.00E+00	0.00E+00	1.62E-01	1.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	8.06E-03	8.71E-05	5.26E-02	6.08E-02	2.78E-06	5.90E-06	3.14E-05	2.27E-06	-2.03E-02
Materials for energy recovery	kg	1.56E-05	6.40E-07	8.40E-02	8.40E-02	3.90E-09	4.77E-08	9.95E-08	8.18E-09	-3.73E-05
Energy exported	MJ	2.03E+00	2.83E-02	3.16E-02	2.09E+00	1.33E-03	2.11E-03	1.39E-02	4.52E-05	-5.99E+00

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Table 39. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 200 mm manufactured by Kingspan Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	4.08E+01	1.73E+00	8.16E-01	4.33E+01	2.86E-02	1.38E-01	1.19E+01	2.36E-02	-1.21E+02
Greenhouse gas potential - fossil	eq. kg CO ₂	4.02E+01	1.72E+00	7.48E-01	4.27E+01	2.81E-02	1.38E-01	1.19E+01	2.36E-02	-1.19E+02
Greenhouse gas potential - biogenic	eq. kg CO ₂	5.25E-01	5.87E-03	1.29E-02	5.44E-01	5.07E-04	4.70E-04	1.04E-03	1.24E-05	-1.87E+00
Global warming potential - land use and land use change	eq. kg CO ₂	2.09E-02	6.79E-04	1.78E-04	2.18E-02	6.60E-06	5.40E-05	4.55E-05	1.42E-05	-6.10E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	2.23E-06	3.98E-07	1.24E-07	2.75E-06	5.38E-10	3.18E-08	5.35E-08	6.83E-10	-7.39E-06
Soil and water acidification potential	eq. mol H ⁺	2.26E-01	7.15E-03	3.75E-02	2.71E-01	2.98E-04	5.59E-04	2.45E-03	1.78E-04	-7.27E-01
Eutrophication potential - freshwater	eq. kg P	1.46E-02	1.16E-04	1.14E-03	1.58E-02	5.10E-05	9.25E-06	1.94E-05	1.96E-06	-3.97E-02
Eutrophication potential - seawater	eq. kg N	6.54E-02	2.15E-03	1.07E-03	6.87E-02	4.23E-05	1.69E-04	1.11E-03	6.82E-05	-2.17E-01
Eutrophication potential - terrestrial	eq. mol N	4.05E-01	2.35E-02	9.23E-03	4.38E-01	3.63E-04	1.84E-03	1.17E-02	7.31E-04	-1.23E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.80E-01	7.17E-03	3.13E-03	1.90E-01	1.02E-04	5.63E-04	3.22E-03	2.55E-04	-5.25E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	3.33E-04	6.10E-06	9.79E-07	3.40E-04	4.05E-08	4.88E-07	3.62E-07	3.32E-08	-1.19E-03
Abiotic depletion potential - fossil fuels	MJ	8.20E+02	2.56E+01	1.68E+01	8.62E+02	4.58E-01	2.04E+00	3.59E+00	5.92E-01	-2.67E+03
Water deprivation potential	eq. m ³	3.44E+01	1.18E-01	2.20E-01	3.48E+01	9.32E-03	9.44E-03	9.02E-02	1.84E-03	-1.17E+02

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Table 40. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 200 mm manufactured by Kingspan Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 41. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 200 mm manufactured by Kingspan Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	4.53E+01	3.66E-01	7.42E-01	4.64E+01	3.33E-02	2.93E-02	4.88E-02	4.97E-03	-1.45E+02
Consumption of renewable primary energy resources used as raw materials	MJ	9.24E-02	0.00E+00	0.00E+00	9.24E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	4.54E+01	3.66E-01	7.56E-01	4.65E+01	3.33E-02	2.93E-02	4.88E-02	4.97E-03	-1.45E+02
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	6.31E+02	2.56E+01	1.08E+01	6.67E+02	4.85E-01	2.04E+00	-1.39E+02	5.92E-01	-1.99E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.89E+02	0.00E+00	0.00E+00	1.89E+02	0.00E+00	0.00E+00	1.43E+02	0.00E+00	-6.73E+02
Total consumption of non-renewable primary energy resources	MJ	8.21E+02	2.56E+01	1.79E+01	8.64E+02	4.85E-01	2.04E+00	3.85E+00	5.92E-01	-2.67E+03
Consumption of secondary materials	kg	6.31E+00	8.58E-03	1.09E-03	6.32E+00	3.70E-05	6.85E-04	2.54E-03	1.43E-04	-6.41E+00
Consumption of renewable secondary fuels	MJ	4.44E-03	9.43E-05	6.49E-06	4.54E-03	2.02E-07	7.55E-06	7.19E-06	3.06E-06	-3.42E-03
Consumption of non-renewable secondary fuels	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	0.00E+00
Net consumption of freshwater resources	m ³	8.21E-01	3.21E-03	3.49E-03	8.28E-01	1.49E-04	2.57E-04	2.02E-03	6.12E-04	-2.79E+00

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Table 42. Life cycle assessment (LCA) results of metal faced insulating panels with PIR core panels with density of 37 kg/m³ and thickness of 200 mm manufactured by Kingspan Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	1.93E+00	2.87E-02	2.56E-04	1.96E+00	9.49E-08	2.29E-03	9.54E-02	2.84E-04	-3.32E+00
Non-hazardous waste neutralised	kg	2.46E+01	5.09E-01	1.19E-01	2.53E+01	2.71E-03	4.07E-02	3.81E+00	8.50E-03	-3.70E+01
Radioactive waste	kg	4.91E-04	1.76E-04	5.64E-05	7.23E-04	3.94E-07	1.41E-05	2.23E-05	2.57E-07	-1.02E-03
Components for re-use	kg	0.00E+00	0.00E+00	1.62E-01	1.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	9.09E-03	8.71E-05	5.26E-02	6.18E-02	2.78E-06	6.32E-06	3.62E-05	2.65E-06	-2.73E-02
Materials for energy recovery	kg	1.74E-05	6.40E-07	8.40E-02	8.40E-02	3.90E-09	5.11E-08	1.05E-07	9.54E-09	-4.99E-05
Energy exported	MJ	2.36E+00	2.83E-02	3.16E-02	2.42E+00	1.33E-03	2.27E-03	1.40E-02	5.28E-05	-8.23E+00

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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+A2 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: Halina Prejzner, PhD Eng	
LCA, LCI audit and input data verification: Mateusz Kozicki, PhD	
Verification of LCA: Michał Piasecki, PhD. DSc. Eng	

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Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (17065/17025 certified). ITB-EPD program is recognized and registered member of The European Platform – Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

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
- ISO 20915:2018 Life cycle inventory calculation methodology for steel products
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases - Carbon footprint of products — Requirements and guidelines for quantification
- EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- KOBIZE Emissions (CO₂, SO₂, NO_x, CO and total dust) from electricity, 2022



Instytut Techniki Budowlanej

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Thermal Physics, Acoustics and Environment Department

02-656 Warsaw, Ksawerów 21

CERTIFICATE № 573/2023
of TYPE III ENVIRONMENTAL DECLARATION

Products:

Metal faced insulating panels with PIR core (Kingspan Karrier)

Manufacturer:

Kingspan Sp. z o.o.

ul. Przemysłowa 20, 27-300 Lipsko, Poland

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

EN 15804+A2

Sustainability of construction works.

Environmental product declarations.

Core rules for the product category of construction products.


This certificate, issued on 12th December 2023 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics
and Environment Department


Agnieszka Winkler-Skalna, PhD



Deputy Director
for Research and Innovation


Krzysztof Kuczyński, PhD

Warsaw, December 2023