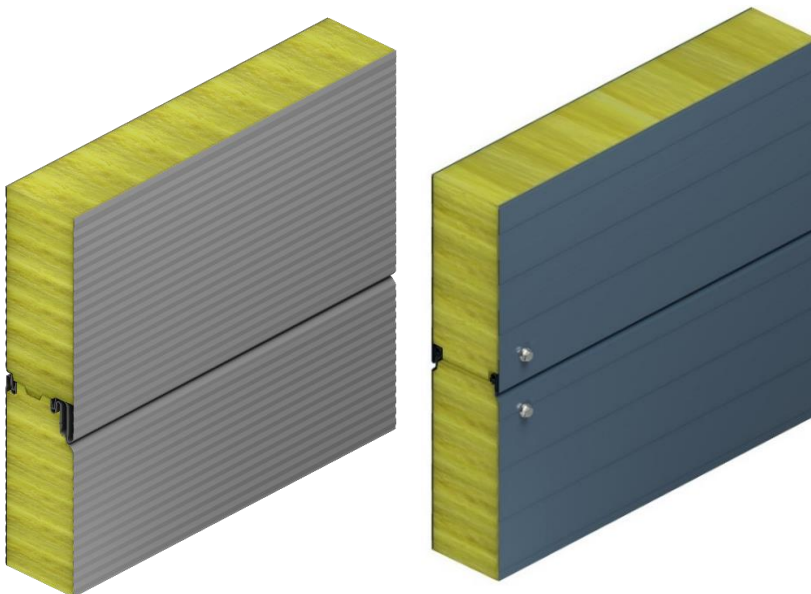




Issuance date: 21.11.2023
Validation date: 23.10.2024
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Metal faced insulating panels with mineral wool core



Owner of the EPD:

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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 EPD preparing: 2023

The year of EPD validation: 2024 (update of product description section)

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 stone wool density 85 kg/m³ are produced as external and internal walls or ceiling systems with through or secret fix option. They can be laid vertically or horizontally. For wide variety of industrial applications KS RH C and KS RF C are dedicated.

Panel name	Thickness	Cover width	Face thickness	Coating type
KS RF C wall panel	80 - 240 mm	1000 – 1200 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA
KS RH C wall panel	80 - 240 mm	600 – 1000 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA

For multiwall application special Karrier systems are available comprising of a structural panel Karrier KT or Karrier KS with additional aluminium subconstruction ready to install various rain screen systems.

Panel name	Thickness	Cover width	Face thickness	Coating type
K-roc® Karrier KT	80 - 240 mm	1000 – 1200 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA
K-roc® Karrier KS	80 - 240 mm	600 – 1000 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA

Another variant of wall system compromising mechanical properties of a regular sandwich panel and resemblance of standard cassettes is Kingspan Matrix and Matrix lite.

Panel name	Thickness	Cover width	Face thickness	Coating type
Kingspan Martrix MX	80 - 240 mm	500 – 1180 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA
Kingspan Matrix Lite	80 - 240 mm	500 – 1200 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA

Sandwich panels with metal face and insulation core made of stone wool density 115 kg/m³ are produced as external and internal walls or ceiling systems with through or secret fix option. They can be laid vertically or horizontally. For wide variety of industrial applications KS RH F and KS RF F are dedicated. Wall system Hoesch isorock HP fulfill the requirements of German market. In response to special application requirements of the market roof panels KS RP are in offer.

Panel name	Thickness	Cover width	Face thickness	Coating type
KS RF F wall panel	80 - 240 mm	1000 – 1200 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA
KS RH F wall panel	80 - 240 mm	600 – 1000 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA
KS RP roof systems	175 - 240 mm	1000 – 1200 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA
Hoesch isorock HP	80 – 200 mm	1000 – 1200 mm	0,5 - 0,75 mm	SP;PVDF, PUR-PA

For the building industry with acoustic performance requirements there are sandwich panels where one metal facer is perforated. Together with insulation core made of stone wool density 115 kg/m³ it creates special variant of panel with sound insulation and absorption characteristics. These panels can be assembled as external, internal walls and ceiling with through fix option. They can be laid vertically or horizontally. Products are offered under Kingspan brand: KS AF K-Roc as well Hoesch brand: Hoesch isorock Akustik HP (AH).

Panel name	Thickness	Cover width	Face thickness	Coating type
KS AF K-Roc®	80 - 150 mm	1000 – 1200 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA
Hoesch isorock Akustik HP (AH)	80 - 150 mm	1000 – 1000 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA

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Sandwich panels with metal face and insulation core made of stone wool density 100 kg/m³ are produced as external wall with secret fix option. They can be laid vertically or horizontally. For wide variety of industrial applications KS RH M is dedicated. Wall system Hoesch isorock vario type S1 fulfils the requirements of German market.

Panel name	Thickness	Cover width	Face thickness	Coating type
KS RH M wall panel	80 - 200 mm	600 – 1000 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA
Hoesch isorock vario typ S1	80 – 200 mm	600 – 100 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA

Sandwich panels with metal face and insulation core made of stone wool density 135 kg/m³ are produced as external wall with secret fix option. They can be laid vertically or horizontally. For wide variety of industrial applications KS RH Y is dedicated. Wall system Hoesch isorock vario type S2 fulfils the requirements of German market.

Panel name	Thickness	Cover width	Face thickness	Coating type
KS RH Y wall panel	80 - 200 mm	600 – 1000 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA
Hoesch isorock vario type S2	80 – 200 mm	600 – 100 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA

Sandwich panels with metal face and insulation core made of stone wool density 120 kg/m³ are produced as roof covering member. For industrial applications KS FF roof minimum 5° inclination is dedicated. Roof system Hoesch Thermorock Dach FG fulfils the requirements of German market.

Panel name	Thickness	Cover width	Face thickness	Coating type
KS FF roof panel	100 - 200 mm	1000 mm	0,5 – 0,70 mm	SP;PVDF, PUR-PA
Hoesch Thermorock Dach FG	80 – 200 mm	600 – 100 mm	0,5 – 0,70 mm	SP;PVDF, PUR-PA

Panelized systems made of metal faced panels with stone wool insulation of density 127 kg/m³ type Kingspan Matrix and Matix Lite are produced for special applications to ensure sophisticated view and mechanical resistance.

Panel name	Thickness	Cover width	Face thickness	Coating type
Kingspan Martrix MX	80 - 220 mm	500 – 1180 mm	0,5 – 0,75 mm	SP;PVDF, PUR-PA
Kingspan Matrix Lite	80 - 220 mm	500 – 1200 mm	0,5 – 0,75 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 mineral wool 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,

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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, mineral wool, polyol, isocyanate, 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 mineral wool core production process is presented in Figure 2. The facility is ISO 9001 and ISO 14001 certified.

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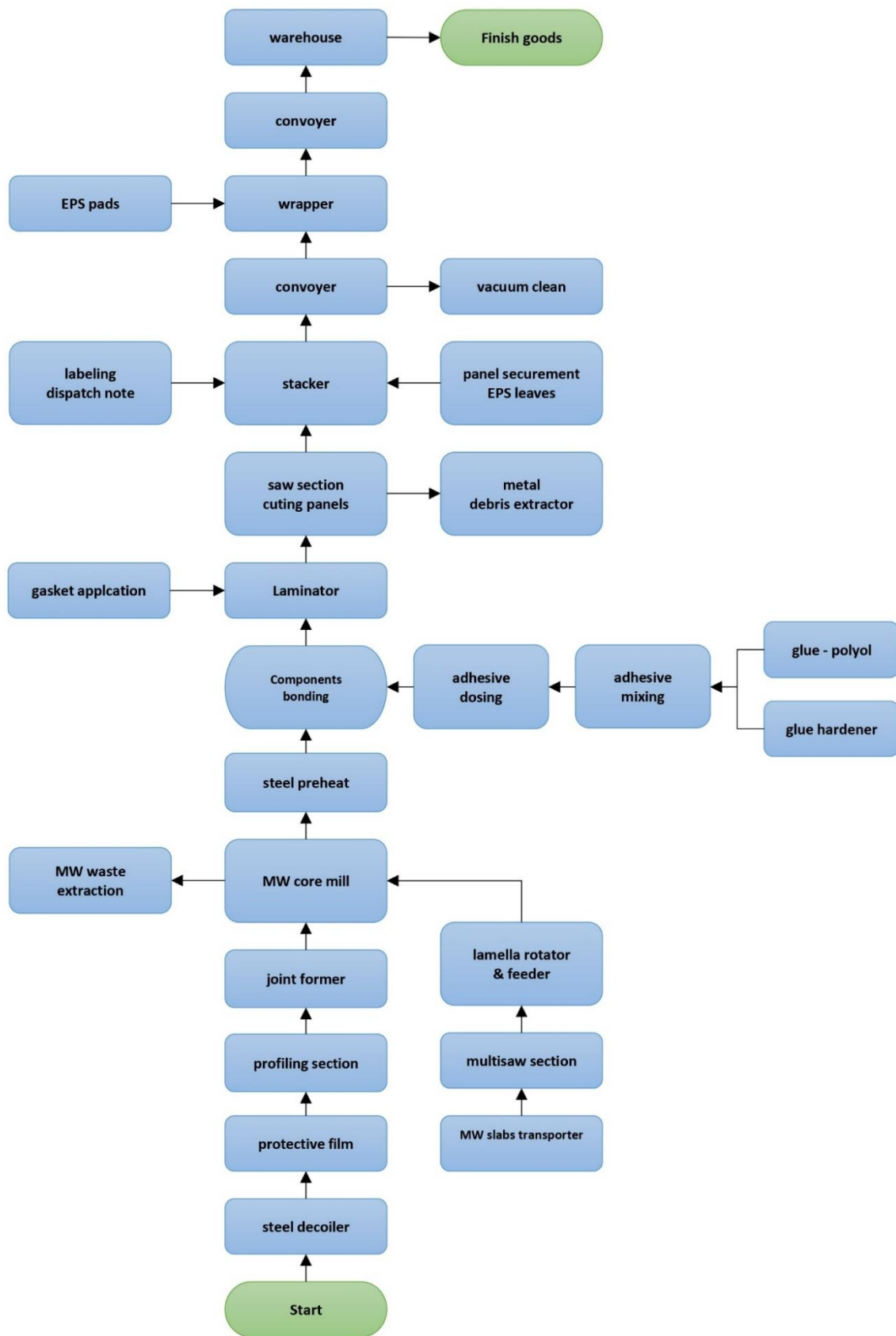


Figure 2. The scheme of metal faced insulating panels with mineral wool core production process by Kingspan Sp. z o.o.

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 mineral wool 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 mineral wool cores are re-used. The residue wastes are forwarded to a landfill in the form of mixed construction and demolition wastes (40% mineral wool 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 mineral wool core panels manufactured by Kingspan Sp. z o.o.

Material	Re-using	Recycling	Landfilling
Mineral wool	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.

Data collection period

Primary data provided by Kingspan Sp. z o.o. covers a period of 01.01.2022 – 31.12.2022 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Assumptions and estimates

The impacts of the representative of metal faced insulating panels with mineral wool core panels were inventoried and calculated for all products presented in Tables 4-27 for the mineral wool densities of 85 kg/m³, 100 kg/m³, 115 kg/m³, 120 kg/m³, 127 kg/m³ and 135 kg/m³ and average thickness (150 mm). Conversion factors for different panel thicknesses are presented in Table 2.

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Table 2: Conversion of panel thickness factors for the estimation of environmental impact for different mineral wool densities. Multiply the LCA-result of each impact category in the environmental impact table with the corresponding factors.

Conversion of panel thickness factors for individual mineral wool densities						
	85 kg/m ³	100 kg/m ³	115 kg/m ³	120 kg/m ³	127 kg/m ³	135 kg/m ³
80 mm	0.74	0.72	0.71	0.70	0.70	0.69
100 mm	0.82	0.80	0.79	0.79	0.78	0.78
120 mm	0.89	0.88	0.87	0.87	0.87	0.87
140 mm	0.96	0.96	0.96	0.96	0.96	0.96
150 mm	1.00	1.00	1.00	1.00	1.00	1.00
160 mm	1.04	1.04	1.04	1.04	1.04	1.04
175 mm	1.09	1.10	1.10	1.11	1.11	1.11
200 mm	1.18	1.20	1.21	1.21	1.22	1.22
220 mm	1.26	1.28	1.29	1.30	1.30	1.31
240 mm	1.33	1.36	1.38	1.38	1.39	1.40

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 mineral wool core panels manufactured by Kingspan Sp. z o.o. for the mineral wool densities of 85 kg/m³, 100 kg/m³, 115 kg/m³, 120 kg/m³, 127 kg/m³ and 135 kg/m³ and average thickness (150 mm). Conversion factors for different panel thickness are presented above (Table 2).

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Table 3: System boundaries for the environmental characteristic of metal faced insulating panels with mineral wool 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 4. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 85 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	2,79E+01	2,52E+00	9,40E-01	3,14E+01	2,86E-02	1,90E-01	2,77E-01	3,22E-02	-2,24E+02
Greenhouse gas potential - fossil	eq. kg CO ₂	2,94E+01	2,51E+00	8,86E-01	3,28E+01	2,81E-02	1,89E-01	2,77E-01	3,21E-02	-2,35E+02
Greenhouse gas potential - biogenic	eq. kg CO ₂	-1,47E+00	8,34E-03	1,58E-02	-1,45E+00	5,07E-04	6,46E-04	2,22E-04	1,68E-05	1,12E+01
Global warming potential - land use and land use change	eq. kg CO ₂	1,56E-02	1,01E-03	2,09E-04	1,68E-02	6,60E-06	7,41E-05	5,09E-05	1,94E-05	-1,25E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	5,16E-07	5,67E-07	5,16E-08	1,14E-06	5,38E-10	4,37E-08	5,02E-08	9,30E-10	-4,15E-06
Soil and water acidification potential	eq. mol H ⁺	1,76E-01	1,19E-02	8,77E-03	1,97E-01	2,98E-04	7,67E-04	1,50E-03	2,42E-04	-1,39E+00
Eutrophication potential - freshwater	eq. kg P	9,82E-03	1,67E-04	1,44E-03	1,14E-02	5,10E-05	1,27E-05	1,10E-05	2,67E-06	-8,03E-02
Eutrophication potential - seawater	eq. kg N	2,80E-02	3,49E-03	1,25E-03	3,27E-02	4,23E-05	2,31E-04	5,82E-04	9,29E-05	-2,23E-01
Eutrophication potential - terrestrial	eq. mol N	3,62E-01	3,82E-02	1,07E-02	4,11E-01	3,63E-04	2,52E-03	6,35E-03	9,96E-04	-2,87E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	1,30E-01	1,15E-02	3,11E-03	1,45E-01	1,02E-04	7,73E-04	1,89E-03	3,47E-04	-1,04E+00
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1,17E-04	8,74E-06	1,17E-06	1,27E-04	4,05E-08	6,70E-07	1,85E-07	4,53E-08	-9,10E-04
Abiotic depletion potential - fossil fuels	MJ	3,68E+02	3,71E+01	1,51E+01	4,20E+02	4,58E-01	2,80E+00	4,24E+00	8,07E-01	-2,93E+03
Water deprivation potential	eq. m ³	1,05E+01	1,70E-01	2,68E-01	1,09E+01	9,32E-03	1,30E-02	1,19E-02	2,51E-03	-8,35E+01

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Table 5. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 85 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 6. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 85 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	1,46E+02	5,27E-01	9,37E-01	1,47E+02	3,33E-02	4,02E-02	2,75E-02	6,77E-03	-1,12E+03
Consumption of renewable primary energy resources used as raw materials	MJ	1,30E+01	0,00E+00	0,00E+00	1,30E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-9,94E+01
Total consumption of renewable primary energy resources	MJ	1,59E+02	5,27E-01	9,42E-01	1,61E+02	3,33E-02	4,02E-02	2,75E-02	6,77E-03	-1,23E+03
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3,34E+02	3,71E+01	1,37E+01	3,85E+02	4,85E-01	2,80E+00	4,50E+00	8,07E-01	-2,67E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	3,40E+01	0,00E+00	0,00E+00	3,40E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,60E+02
Total consumption of non-renewable primary energy resources	MJ	3,68E+02	3,71E+01	1,59E+01	4,21E+02	4,85E-01	2,80E+00	4,50E+00	8,07E-01	-2,93E+03
Consumption of secondary materials	kg	8,92E+00	1,26E-02	1,14E-03	8,94E+00	3,70E-05	9,40E-04	1,49E-03	1,94E-04	-7,45E+01
Consumption of renewable secondary fuels	MJ	1,05E-01	1,35E-04	6,38E-06	1,05E-01	2,02E-07	1,04E-05	9,97E-06	4,17E-06	-8,07E-01
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	2,44E-01	4,61E-03	3,66E-03	2,52E-01	1,49E-04	3,53E-04	1,26E-03	8,34E-04	-1,95E+00

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Table 7. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 85 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	2,17E+00	4,12E-02	2,07E-04	2,22E+00	9,49E-08	3,15E-03	5,69E-04	3,87E-04	-1,80E+01
Non-hazardous waste neutralised	kg	4,04E+01	7,32E-01	1,19E-01	4,13E+01	2,71E-03	5,59E-02	2,09E-02	1,16E-02	-3,29E+02
Radioactive waste	kg	9,20E-04	2,50E-04	2,67E-05	1,20E-03	3,94E-07	1,93E-05	2,19E-05	2,94E-07	-7,27E-03
Components for re-use	kg	0,00E+00	0,00E+00	1,15E+00	1,15E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	6,06E-03	2,01E-04	3,39E-02	4,01E-02	2,78E-06	8,68E-06	9,33E-06	3,61E-06	-4,85E-02
Materials for energy recovery	kg	3,34E-05	9,23E-07	1,10E-02	1,11E-02	3,90E-09	7,02E-08	8,44E-08	1,30E-08	-2,61E-04
Energy exported	MJ	5,46E-01	4,03E-02	3,82E-02	6,25E-01	1,33E-03	3,11E-03	1,35E-02	7,19E-05	-4,35E+00

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Table 8. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 100 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	3,05E+01	2,52E+00	9,40E-01	3,39E+01	2,86E-02	2,08E-01	2,86E-01	3,76E-02	-2,85E+02
Greenhouse gas potential - fossil	eq. kg CO ₂	3,22E+01	2,51E+00	8,86E-01	3,56E+01	2,81E-02	2,08E-01	2,85E-01	3,76E-02	-3,00E+02
Greenhouse gas potential - biogenic	eq. kg CO ₂	-1,75E+00	8,34E-03	1,58E-02	-1,72E+00	5,07E-04	7,10E-04	2,27E-04	1,97E-05	1,57E+01
Global warming potential - land use and land use change	eq. kg CO ₂	1,72E-02	1,01E-03	2,09E-04	1,84E-02	6,60E-06	8,15E-05	5,58E-05	2,27E-05	-1,60E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	5,62E-07	5,67E-07	5,16E-08	1,18E-06	5,38E-10	4,80E-08	5,05E-08	1,09E-09	-5,26E-06
Soil and water acidification potential	eq. mol H ⁺	1,98E-01	1,19E-02	8,77E-03	2,19E-01	2,98E-04	8,43E-04	1,56E-03	2,83E-04	-1,82E+00
Eutrophication potential - freshwater	eq. kg P	1,05E-02	1,67E-04	1,44E-03	1,21E-02	5,10E-05	1,40E-05	1,16E-05	3,13E-06	-1,00E-01
Eutrophication potential - seawater	eq. kg N	3,06E-02	3,49E-03	1,25E-03	3,53E-02	4,23E-05	2,54E-04	6,06E-04	1,09E-04	-2,84E-01
Eutrophication potential - terrestrial	eq. mol N	4,05E-01	3,82E-02	1,07E-02	4,54E-01	3,63E-04	2,77E-03	6,60E-03	1,17E-03	-3,74E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	1,42E-01	1,15E-02	3,11E-03	1,57E-01	1,02E-04	8,50E-04	1,98E-03	4,06E-04	-1,32E+00
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1,32E-04	8,74E-06	1,17E-06	1,42E-04	4,05E-08	7,36E-07	1,96E-07	5,30E-08	-1,20E-03
Abiotic depletion potential - fossil fuels	MJ	4,01E+02	3,71E+01	1,51E+01	4,53E+02	4,58E-01	3,08E+00	4,45E+00	9,44E-01	-3,72E+03
Water deprivation potential	eq. m ³	1,11E+01	1,70E-01	2,68E-01	1,16E+01	9,32E-03	1,42E-02	1,25E-02	2,93E-03	-1,04E+02

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Table 9. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 100 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 10. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 100 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	1,70E+02	5,27E-01	9,37E-01	1,71E+02	3,33E-02	4,42E-02	2,92E-02	7,92E-03	-1,53E+03
Consumption of renewable primary energy resources used as raw materials	MJ	1,52E+01	0,00E+00	0,00E+00	1,52E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,37E+02
Total consumption of renewable primary energy resources	MJ	1,86E+02	5,27E-01	9,42E-01	1,87E+02	3,33E-02	4,42E-02	2,92E-02	7,92E-03	-1,68E+03
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3,64E+02	3,71E+01	1,37E+01	4,15E+02	4,85E-01	3,08E+00	4,70E+00	9,44E-01	-3,39E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	3,65E+01	0,00E+00	0,00E+00	3,65E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-3,29E+02
Total consumption of non-renewable primary energy resources	MJ	4,01E+02	3,71E+01	1,59E+01	4,54E+02	4,85E-01	3,08E+00	4,70E+00	9,44E-01	-3,72E+03
Consumption of secondary materials	kg	9,36E+00	1,26E-02	1,14E-03	9,37E+00	3,70E-05	1,03E-03	1,54E-03	2,27E-04	-9,05E+01
Consumption of renewable secondary fuels	MJ	1,23E-01	1,35E-04	6,38E-06	1,23E-01	2,02E-07	1,14E-05	1,10E-05	4,88E-06	-1,11E+00
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	2,59E-01	4,61E-03	3,66E-03	2,67E-01	1,49E-04	3,88E-04	1,47E-03	9,75E-04	-2,42E+00

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Table 11. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 100 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	2,29E+00	4,12E-02	2,07E-04	2,33E+00	9,49E-08	3,46E-03	6,68E-04	4,53E-04	-2,20E+01
Non-hazardous waste neutralised	kg	4,39E+01	7,32E-01	1,19E-01	4,48E+01	2,71E-03	6,14E-02	2,39E-02	1,36E-02	-4,15E+02
Radioactive waste	kg	1,03E-03	2,50E-04	2,67E-05	1,30E-03	3,94E-07	2,12E-05	2,19E-05	3,14E-07	-9,48E-03
Components for re-use	kg	0,00E+00	0,00E+00	1,15E+00	1,15E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	6,67E-03	2,01E-04	3,39E-02	4,07E-02	2,78E-06	9,54E-06	1,02E-05	4,23E-06	-6,22E-02
Materials for energy recovery	kg	3,83E-05	9,23E-07	1,10E-02	1,11E-02	3,90E-09	7,72E-08	8,77E-08	1,52E-08	-3,50E-04
Energy exported	MJ	5,57E-01	4,03E-02	3,82E-02	6,36E-01	1,33E-03	3,42E-03	1,36E-02	8,41E-05	-5,18E+00

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Table 12. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 115 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	3,30E+01	2,52E+00	9,40E-01	3,65E+01	2,86E-02	2,27E-01	2,94E-01	4,31E-02	-3,52E+02
Greenhouse gas potential - fossil	eq. kg CO ₂	3,50E+01	2,51E+00	8,86E-01	3,84E+01	2,81E-02	2,26E-01	2,93E-01	4,31E-02	-3,73E+02
Greenhouse gas potential - biogenic	eq. kg CO ₂	-2,02E+00	8,34E-03	1,58E-02	-2,00E+00	5,07E-04	7,73E-04	2,31E-04	2,26E-05	2,09E+01
Global warming potential - land use and land use change	eq. kg CO ₂	1,87E-02	1,01E-03	2,09E-04	2,00E-02	6,60E-06	8,88E-05	6,08E-05	2,60E-05	-1,99E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	6,08E-07	5,67E-07	5,16E-08	1,23E-06	5,38E-10	5,24E-08	5,07E-08	1,25E-09	-6,49E-06
Soil and water acidification potential	eq. mol H ⁺	2,20E-01	1,19E-02	8,77E-03	2,41E-01	2,98E-04	9,18E-04	1,62E-03	3,25E-04	-2,32E+00
Eutrophication potential - freshwater	eq. kg P	1,13E-02	1,67E-04	1,44E-03	1,29E-02	5,10E-05	1,52E-05	1,23E-05	3,58E-06	-1,22E-01
Eutrophication potential - seawater	eq. kg N	3,31E-02	3,49E-03	1,25E-03	3,79E-02	4,23E-05	2,77E-04	6,30E-04	1,25E-04	-3,52E-01
Eutrophication potential - terrestrial	eq. mol N	4,48E-01	3,82E-02	1,07E-02	4,97E-01	3,63E-04	3,02E-03	6,86E-03	1,34E-03	-4,73E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	1,54E-01	1,15E-02	3,11E-03	1,69E-01	1,02E-04	9,26E-04	2,06E-03	4,65E-04	-1,64E+00
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1,47E-04	8,74E-06	1,17E-06	1,57E-04	4,05E-08	8,02E-07	2,08E-07	6,07E-08	-1,53E-03
Abiotic depletion potential - fossil fuels	MJ	4,34E+02	3,71E+01	1,51E+01	4,86E+02	4,58E-01	3,36E+00	4,66E+00	1,08E+00	-4,60E+03
Water deprivation potential	eq. m ³	1,18E+01	1,70E-01	2,68E-01	1,22E+01	9,32E-03	1,55E-02	1,32E-02	3,36E-03	-1,25E+02

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Table 13. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 115 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 14. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 115 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	1,93E+02	5,27E-01	9,37E-01	1,95E+02	3,33E-02	4,82E-02	3,09E-02	9,08E-03	-2,01E+03
Consumption of renewable primary energy resources used as raw materials	MJ	1,74E+01	0,00E+00	0,00E+00	1,74E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,80E+02
Total consumption of renewable primary energy resources	MJ	2,12E+02	5,27E-01	9,42E-01	2,13E+02	3,33E-02	4,82E-02	3,09E-02	9,08E-03	-2,20E+03
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3,95E+02	3,71E+01	1,37E+01	4,45E+02	4,85E-01	3,36E+00	4,91E+00	1,08E+00	-4,20E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	3,90E+01	0,00E+00	0,00E+00	3,90E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-4,04E+02
Total consumption of non-renewable primary energy resources	MJ	4,34E+02	3,71E+01	1,59E+01	4,87E+02	4,85E-01	3,36E+00	4,91E+00	1,08E+00	-4,60E+03
Consumption of secondary materials	kg	9,79E+00	1,26E-02	1,14E-03	9,81E+00	3,70E-05	1,13E-03	1,59E-03	2,61E-04	-1,08E+02
Consumption of renewable secondary fuels	MJ	1,41E-01	1,35E-04	6,38E-06	1,41E-01	2,02E-07	1,24E-05	1,21E-05	5,59E-06	-1,46E+00
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	2,74E-01	4,61E-03	3,66E-03	2,82E-01	1,49E-04	4,23E-04	1,69E-03	1,12E-03	-2,92E+00

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Table 15. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 115 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	2,40E+00	4,12E-02	2,07E-04	2,45E+00	9,49E-08	3,77E-03	7,66E-04	5,19E-04	-2,63E+01
Non-hazardous waste neutralised	kg	4,75E+01	7,32E-01	1,19E-01	4,83E+01	2,71E-03	6,69E-02	2,69E-02	1,55E-02	-5,11E+02
Radioactive waste	kg	1,13E-03	2,50E-04	2,67E-05	1,41E-03	3,94E-07	2,31E-05	2,20E-05	3,35E-07	-1,20E-02
Components for re-use	kg	0,00E+00	0,00E+00	1,15E+00	1,15E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	7,29E-03	2,01E-04	3,39E-02	4,13E-02	2,78E-06	1,04E-05	1,12E-05	4,84E-06	-7,76E-02
Materials for energy recovery	kg	4,32E-05	9,23E-07	1,10E-02	1,11E-02	3,90E-09	8,41E-08	9,11E-08	1,74E-08	-4,52E-04
Energy exported	MJ	5,68E-01	4,03E-02	3,82E-02	6,46E-01	1,33E-03	3,73E-03	1,36E-02	9,63E-05	-6,04E+00

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Table 16. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 120 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	3,38E+01	2,52E+00	9,40E-01	3,73E+01	2,86E-02	2,33E-01	2,97E-01	4,49E-02	-3,76E+02
Greenhouse gas potential - fossil	eq. kg CO ₂	3,59E+01	2,51E+00	8,86E-01	3,93E+01	2,81E-02	2,33E-01	2,96E-01	4,49E-02	-3,98E+02
Greenhouse gas potential - biogenic	eq. kg CO ₂	-2,11E+00	8,34E-03	1,58E-02	-2,09E+00	5,07E-04	7,95E-04	2,32E-04	2,35E-05	2,28E+01
Global warming potential - land use and land use change	eq. kg CO ₂	1,93E-02	1,01E-03	2,09E-04	2,05E-02	6,60E-06	9,13E-05	6,24E-05	2,71E-05	-2,14E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	6,24E-07	5,67E-07	5,16E-08	1,24E-06	5,38E-10	5,38E-08	5,08E-08	1,30E-09	-6,93E-06
Soil and water acidification potential	eq. mol H ⁺	2,28E-01	1,19E-02	8,77E-03	2,48E-01	2,98E-04	9,44E-04	1,65E-03	3,38E-04	-2,50E+00
Eutrophication potential - freshwater	eq. kg P	1,15E-02	1,67E-04	1,44E-03	1,31E-02	5,10E-05	1,56E-05	1,25E-05	3,74E-06	-1,29E-01
Eutrophication potential - seawater	eq. kg N	3,40E-02	3,49E-03	1,25E-03	3,87E-02	4,23E-05	2,85E-04	6,37E-04	1,30E-04	-3,76E-01
Eutrophication potential - terrestrial	eq. mol N	4,62E-01	3,82E-02	1,07E-02	5,11E-01	3,63E-04	3,11E-03	6,94E-03	1,39E-03	-5,08E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	1,58E-01	1,15E-02	3,11E-03	1,73E-01	1,02E-04	9,52E-04	2,09E-03	4,84E-04	-1,75E+00
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1,52E-04	8,74E-06	1,17E-06	1,62E-04	4,05E-08	8,24E-07	2,12E-07	6,32E-08	-1,65E-03
Abiotic depletion potential - fossil fuels	MJ	4,45E+02	3,71E+01	1,51E+01	4,97E+02	4,58E-01	3,45E+00	4,72E+00	1,13E+00	-4,91E+03
Water deprivation potential	eq. m ³	1,20E+01	1,70E-01	2,68E-01	1,24E+01	9,32E-03	1,60E-02	1,34E-02	3,50E-03	-1,33E+02

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Table 17. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 120 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 18. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 120 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	2,01E+02	5,27E-01	9,37E-01	2,03E+02	3,33E-02	4,95E-02	3,15E-02	9,46E-03	-2,18E+03
Consumption of renewable primary energy resources used as raw materials	MJ	1,82E+01	0,00E+00	0,00E+00	1,82E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,96E+02
Total consumption of renewable primary energy resources	MJ	2,20E+02	5,27E-01	9,42E-01	2,22E+02	3,33E-02	4,95E-02	3,15E-02	9,46E-03	-2,39E+03
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	4,05E+02	3,71E+01	1,37E+01	4,55E+02	4,85E-01	3,45E+00	4,98E+00	1,13E+00	-4,48E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	3,99E+01	0,00E+00	0,00E+00	3,99E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-4,31E+02
Total consumption of non-renewable primary energy resources	MJ	4,45E+02	3,71E+01	1,59E+01	4,98E+02	4,85E-01	3,45E+00	4,98E+00	1,13E+00	-4,91E+03
Consumption of secondary materials	kg	9,94E+00	1,26E-02	1,14E-03	9,95E+00	3,70E-05	1,16E-03	1,60E-03	2,72E-04	-1,14E+02
Consumption of renewable secondary fuels	MJ	1,47E-01	1,35E-04	6,38E-06	1,47E-01	2,02E-07	1,28E-05	1,25E-05	5,82E-06	-1,59E+00
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	2,79E-01	4,61E-03	3,66E-03	2,87E-01	1,49E-04	4,34E-04	1,76E-03	1,16E-03	-3,10E+00

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Table 19. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 120 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	2,44E+00	4,12E-02	2,07E-04	2,48E+00	9,49E-08	3,87E-03	7,99E-04	5,41E-04	-2,78E+01
Non-hazardous waste neutralised	kg	4,87E+01	7,32E-01	1,19E-01	4,95E+01	2,71E-03	6,88E-02	2,78E-02	1,62E-02	-5,45E+02
Radioactive waste	kg	1,17E-03	2,50E-04	2,67E-05	1,45E-03	3,94E-07	2,38E-05	2,20E-05	3,41E-07	-1,29E-02
Components for re-use	kg	0,00E+00	0,00E+00	1,15E+00	1,15E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	7,49E-03	2,01E-04	3,39E-02	4,15E-02	2,78E-06	1,07E-05	1,15E-05	5,05E-06	-8,31E-02
Materials for energy recovery	kg	4,48E-05	9,23E-07	1,10E-02	1,11E-02	3,90E-09	8,64E-08	9,22E-08	1,82E-08	-4,89E-04
Energy exported	MJ	5,71E-01	4,03E-02	3,82E-02	6,50E-01	1,33E-03	3,83E-03	1,36E-02	1,00E-04	-6,34E+00

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Table 20. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 127 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	3,50E+01	2,52E+00	9,40E-01	3,85E+01	2,86E-02	2,42E-01	3,00E-01	4,75E-02	-4,11E+02
Greenhouse gas potential - fossil	eq. kg CO ₂	3,72E+01	2,51E+00	8,86E-01	4,06E+01	2,81E-02	2,41E-01	3,00E-01	4,74E-02	-4,36E+02
Greenhouse gas potential - biogenic	eq. kg CO ₂	-2,24E+00	8,34E-03	1,58E-02	-2,22E+00	5,07E-04	8,25E-04	2,34E-04	2,49E-05	2,56E+01
Global warming potential - land use and land use change	eq. kg CO ₂	2,00E-02	1,01E-03	2,09E-04	2,12E-02	6,60E-06	9,47E-05	6,48E-05	2,86E-05	-2,34E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	6,45E-07	5,67E-07	5,16E-08	1,26E-06	5,38E-10	5,58E-08	5,09E-08	1,37E-09	-7,57E-06
Soil and water acidification potential	eq. mol H ⁺	2,38E-01	1,19E-02	8,77E-03	2,59E-01	2,98E-04	9,79E-04	1,67E-03	3,57E-04	-2,76E+00
Eutrophication potential - freshwater	eq. kg P	1,18E-02	1,67E-04	1,44E-03	1,34E-02	5,10E-05	1,62E-05	1,29E-05	3,95E-06	-1,40E-01
Eutrophication potential - seawater	eq. kg N	3,52E-02	3,49E-03	1,25E-03	3,99E-02	4,23E-05	2,96E-04	6,49E-04	1,37E-04	-4,11E-01
Eutrophication potential - terrestrial	eq. mol N	4,82E-01	3,82E-02	1,07E-02	5,31E-01	3,63E-04	3,22E-03	7,06E-03	1,47E-03	-5,60E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	1,64E-01	1,15E-02	3,11E-03	1,78E-01	1,02E-04	9,87E-04	2,14E-03	5,12E-04	-1,92E+00
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1,59E-04	8,74E-06	1,17E-06	1,68E-04	4,05E-08	8,55E-07	2,17E-07	6,68E-08	-1,82E-03
Abiotic depletion potential - fossil fuels	MJ	4,60E+02	3,71E+01	1,51E+01	5,12E+02	4,58E-01	3,58E+00	4,82E+00	1,19E+00	-5,37E+03
Water deprivation potential	eq. m ³	1,23E+01	1,70E-01	2,68E-01	1,28E+01	9,32E-03	1,66E-02	1,37E-02	3,70E-03	-1,44E+02

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Table 21. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 127 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 22. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 127 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	2,12E+02	5,27E-01	9,37E-01	2,14E+02	3,33E-02	5,14E-02	3,23E-02	1,00E-02	-2,44E+03
Consumption of renewable primary energy resources used as raw materials	MJ	1,92E+01	0,00E+00	0,00E+00	1,92E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,19E+02
Total consumption of renewable primary energy resources	MJ	2,33E+02	5,27E-01	9,42E-01	2,34E+02	3,33E-02	5,14E-02	3,23E-02	1,00E-02	-2,67E+03
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	4,19E+02	3,71E+01	1,37E+01	4,70E+02	4,85E-01	3,58E+00	5,08E+00	1,19E+00	-4,90E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	4,11E+01	0,00E+00	0,00E+00	4,11E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-4,69E+02
Total consumption of non-renewable primary energy resources	MJ	4,60E+02	3,71E+01	1,59E+01	5,13E+02	4,85E-01	3,58E+00	5,08E+00	1,19E+00	-5,37E+03
Consumption of secondary materials	kg	1,01E+01	1,26E-02	1,14E-03	1,02E+01	3,70E-05	1,20E-03	1,63E-03	2,87E-04	-1,22E+02
Consumption of renewable secondary fuels	MJ	1,55E-01	1,35E-04	6,38E-06	1,56E-01	2,02E-07	1,32E-05	1,29E-05	6,15E-06	-1,78E+00
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	2,86E-01	4,61E-03	3,66E-03	2,94E-01	1,49E-04	4,51E-04	1,86E-03	1,23E-03	-3,35E+00

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Table 23. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 127 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	2,50E+00	4,12E-02	2,07E-04	2,54E+00	9,49E-08	4,02E-03	8,46E-04	5,72E-04	-2,99E+01
Non-hazardous waste neutralised	kg	5,03E+01	7,32E-01	1,19E-01	5,12E+01	2,71E-03	7,13E-02	2,92E-02	1,71E-02	-5,94E+02
Radioactive waste	kg	1,22E-03	2,50E-04	2,67E-05	1,50E-03	3,94E-07	2,47E-05	2,20E-05	3,51E-07	-1,42E-02
Components for re-use	kg	0,00E+00	0,00E+00	1,15E+00	1,15E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	7,78E-03	2,01E-04	3,39E-02	4,18E-02	2,78E-06	1,11E-05	1,19E-05	5,34E-06	-9,10E-02
Materials for energy recovery	kg	4,71E-05	9,23E-07	1,10E-02	1,11E-02	3,90E-09	8,97E-08	9,37E-08	1,92E-08	-5,43E-04
Energy exported	MJ	5,76E-01	4,03E-02	3,82E-02	6,55E-01	1,33E-03	3,97E-03	1,36E-02	1,06E-04	-6,75E+00

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Table 24. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 135 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	3,64E+01	2,52E+00	9,40E-01	3,98E+01	2,86E-02	2,52E-01	3,05E-01	5,04E-02	-4,52E+02
Greenhouse gas potential - fossil	eq. kg CO ₂	3,87E+01	2,51E+00	8,86E-01	4,21E+01	2,81E-02	2,51E-01	3,04E-01	5,04E-02	-4,81E+02
Greenhouse gas potential - biogenic	eq. kg CO ₂	-2,39E+00	8,34E-03	1,58E-02	-2,37E+00	5,07E-04	8,59E-04	2,37E-04	2,64E-05	2,90E+01
Global warming potential - land use and land use change	eq. kg CO ₂	2,09E-02	1,01E-03	2,09E-04	2,21E-02	6,60E-06	9,86E-05	6,74E-05	3,04E-05	-2,59E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	6,70E-07	5,67E-07	5,16E-08	1,29E-06	5,38E-10	5,81E-08	5,10E-08	1,46E-09	-8,33E-06
Soil and water acidification potential	eq. mol H ⁺	2,50E-01	1,19E-02	8,77E-03	2,70E-01	2,98E-04	1,02E-03	1,71E-03	3,79E-04	-3,07E+00
Eutrophication potential - freshwater	eq. kg P	1,22E-02	1,67E-04	1,44E-03	1,38E-02	5,10E-05	1,69E-05	1,32E-05	4,19E-06	-1,54E-01
Eutrophication potential - seawater	eq. kg N	3,66E-02	3,49E-03	1,25E-03	4,13E-02	4,23E-05	3,08E-04	6,61E-04	1,46E-04	-4,53E-01
Eutrophication potential - terrestrial	eq. mol N	5,05E-01	3,82E-02	1,07E-02	5,54E-01	3,63E-04	3,36E-03	7,20E-03	1,56E-03	-6,23E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	1,70E-01	1,15E-02	3,11E-03	1,85E-01	1,02E-04	1,03E-03	2,18E-03	5,43E-04	-2,11E+00
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1,66E-04	8,74E-06	1,17E-06	1,76E-04	4,05E-08	8,91E-07	2,23E-07	7,09E-08	-2,03E-03
Abiotic depletion potential - fossil fuels	MJ	4,77E+02	3,71E+01	1,51E+01	5,29E+02	4,58E-01	3,73E+00	4,93E+00	1,26E+00	-5,91E+03
Water deprivation potential	eq. m ³	1,27E+01	1,70E-01	2,68E-01	1,31E+01	9,32E-03	1,72E-02	1,40E-02	3,93E-03	-1,57E+02

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Table 25. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 135 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 26. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 135 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	2,25E+02	5,27E-01	9,37E-01	2,27E+02	3,33E-02	5,35E-02	3,33E-02	1,06E-02	-2,74E+03
Consumption of renewable primary energy resources used as raw materials	MJ	2,04E+01	0,00E+00	0,00E+00	2,04E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,47E+02
Total consumption of renewable primary energy resources	MJ	2,47E+02	5,27E-01	9,42E-01	2,48E+02	3,33E-02	5,35E-02	3,33E-02	1,06E-02	-3,00E+03
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	4,35E+02	3,71E+01	1,37E+01	4,86E+02	4,85E-01	3,73E+00	5,19E+00	1,26E+00	-5,40E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	4,24E+01	0,00E+00	0,00E+00	4,24E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-5,15E+02
Total consumption of non-renewable primary energy resources	MJ	4,77E+02	3,71E+01	1,59E+01	5,30E+02	4,85E-01	3,73E+00	5,19E+00	1,26E+00	-5,91E+03
Consumption of secondary materials	kg	1,04E+01	1,26E-02	1,14E-03	1,04E+01	3,70E-05	1,25E-03	1,65E-03	3,05E-04	-1,32E+02
Consumption of renewable secondary fuels	MJ	1,65E-01	1,35E-04	6,38E-06	1,65E-01	2,02E-07	1,38E-05	1,35E-05	6,53E-06	-2,00E+00
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	2,94E-01	4,61E-03	3,66E-03	3,02E-01	1,49E-04	4,69E-04	1,97E-03	1,31E-03	-3,66E+00

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Table 27. Life cycle assessment (LCA) results of metal faced insulating panels with mineral wool density of 135 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	2,56E+00	4,12E-02	2,07E-04	2,60E+00	9,49E-08	4,18E-03	8,98E-04	6,07E-04	-3,25E+01
Non-hazardous waste neutralised	kg	5,22E+01	7,32E-01	1,19E-01	5,30E+01	2,71E-03	7,43E-02	3,08E-02	1,82E-02	-6,53E+02
Radioactive waste	kg	1,28E-03	2,50E-04	2,67E-05	1,55E-03	3,94E-07	2,57E-05	2,20E-05	3,61E-07	-1,58E-02
Components for re-use	kg	0,00E+00	0,00E+00	1,15E+00	1,15E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	8,10E-03	2,01E-04	3,39E-02	4,22E-02	2,78E-06	1,15E-05	1,24E-05	5,66E-06	-1,01E-01
Materials for energy recovery	kg	4,97E-05	9,23E-07	1,10E-02	1,11E-02	3,90E-09	9,34E-08	9,55E-08	2,04E-08	-6,08E-04
Energy exported	MJ	5,82E-01	4,03E-02	3,82E-02	6,60E-01	1,33E-03	4,14E-03	1,36E-02	1,13E-04	-7,24E+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. m.kozicki@itb.pl	
Verification of LCA: Michał Piasecki. PhD. DSc. Eng	

Note 1: The declaration owner has the sole ownership, liability and responsibility for the information provided and contained in EPD. Declarations within the same product category but from different programmes may not be comparable. Declarations of construction products may not be comparable if they do not comply with EN 15804 + A2. For further information about comparability, see EN 15804 + A2 and ISO 14025. Depending on the application, a corresponding conversion factor such as the specific weight per surface area must be taken into consideration.

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

LCA, LCI audit and input data verification
Mateusz Kozicki, PhD

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CERTIFICATE No 551/2023 of TYPE III ENVIRONMENTAL DECLARATION

Products:

Metal faced insulating panels with mineral wool core

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.

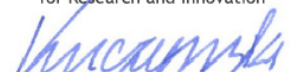
This certificate, issued on 21st November 2023 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics
and Environment Department


Agnieszka Winkler-Skalna, PhD



Deputy Director
for Research and Innovation


Krzysztof Kuczyński, PhD

Warsaw, November 2023