Type III Environmental Product Declaration No. 414/2023

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Noise reducing panels filled with plastics sheets and tempered glass

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 preparing the EPD: 2023

Product standard: EN 1794-2, EN 1794-3

Service Life: 50 years

PCR: ITB-PCR A

Declared unit: 1 m^2

Reasons for performing LCA: B2B

Representativeness: Polish, European

MANUFACTURER

AKSOUND Sp. z o. o. Sp. j. has the location of manufacturing plant company situated in Łódź, 27 Piekarska Street.

Over the last 25 years Aksound has gained experience and knowledge on plastics, designing and manufacture of aluminum sections, as well as structures containing those materials. At the moment Aksound act on the basis of the head office situated in Łódź and branches in Warsaw and Poznań.

One of the main sectors of activity of Aksound is manufacturing of translucent panels for construction of acoustic baffles – road barriers restricting level of noise, under brand of Aksound.

PRODUCTS DESCRIPTION AND APPLICATION

The panels manufactured in Aksound plant have a frame constructions, made of systemic aluminum profiles Aksound. To fill the panels it was applied colourless acrylic or polycarbonate plates of European producers. Aksound offers technical support as far as material calculations based on received specifications and drawings.

Aksound company implemented the system of quality management and system of management of plant production control, according to standards EN 14388:2009 and ISO 9001:2008.

Products manufactured by Aksound have been examined in accredited laboratories and have necessary reports of strength, acoustic and fire examinations (Table 1).

Product types (Table 1):

- noise reducing panel filled with solid polycarbonate PC8 with UV protection
- noise reducing panel filled with solid polycarbonate PC12 with UV protection
- noise reducing panel filled with solid polycarbonate PC15 with UV protection
- noise reducing panel filled with acrylic sheet PMMA12
- noise reducing panel filled with acrylic sheet PMMA15
- noise reducing panel filled with acrylic sheet PMMA20
- noise reducing panel filled with reinforced acrylic with PA rods MR 15mm
- noise reducing panel filled with stainless metal reinforcement acrylic SMR15
- noise reducing panel filled with tempered glass ESG12

Table 1. Declared performances of noise reducing panels filled with plastics sheets and tempered glass.

Essential characteristics	Declared Performance									Test method or calculation
	PC8	PC12	PC15	PMMA 12	PMMA 15	PMMA 20	MR15	SMR15	ESG12	
Airborne sound insulation DLR	B3	B3	B3	B3	B3	B3	B3	B3	B3	EN 1793-2:2012
Danger of falling debris	Class 3	Class 3	Class 3	Class 3	Class 3	Class 3	Class 3	Class 3	Class 2	EN 1794-2:2003
	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2	Class 1	EN 1794-2:2011 EN 1794-2:2020
Light reflection 20°/60°/85°	Class 1	Class 1	Class 1	Class 1	Class 1	Class 1	Class 1	Class 1	Class 0	EN 1794-2:2011 EN 1794-2:2020
Reaction to fire	C-s3,d0	E	E	E	E	E	E	E	B-s1,d0	EN 13501 - 1+A1:2010
	Class 2 and 3	Class 2 and 3	Class 2 and 3	Class 2 and 3	Class 2 and 3	Class 2 and 3	Class 2 and 3	Class 2 and 3	Class 1 and 3	EN 1794-3:2016
Resistance to brushwood fire	Class 3	Class 3	Class 3	Class 3	Class 3	Class 3	Class 3	Class 3	Class 3	EN 1794-2:2003 EN 1794-2:2011 EN 1794-3:2016

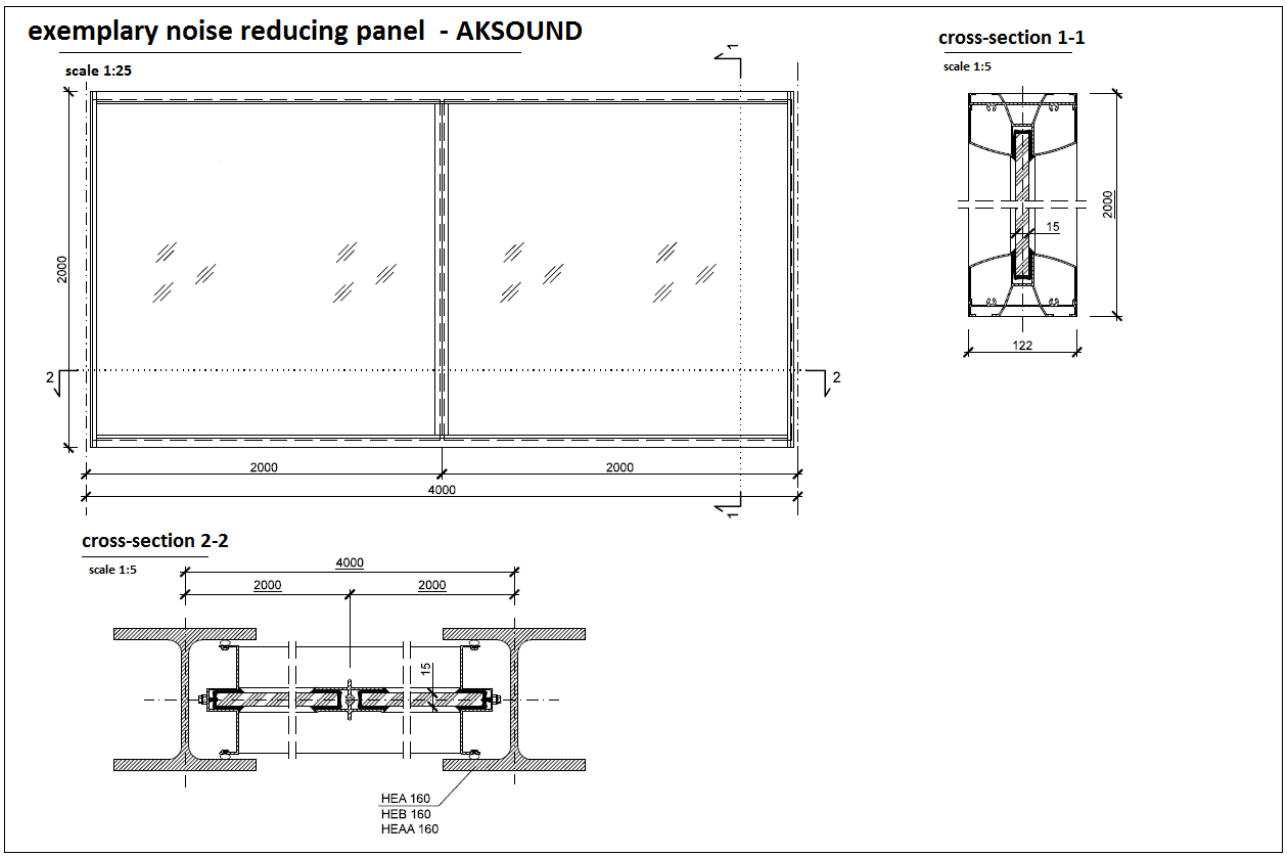

Figure 1. Illustrative pictures of exemplary noise reducing panel.

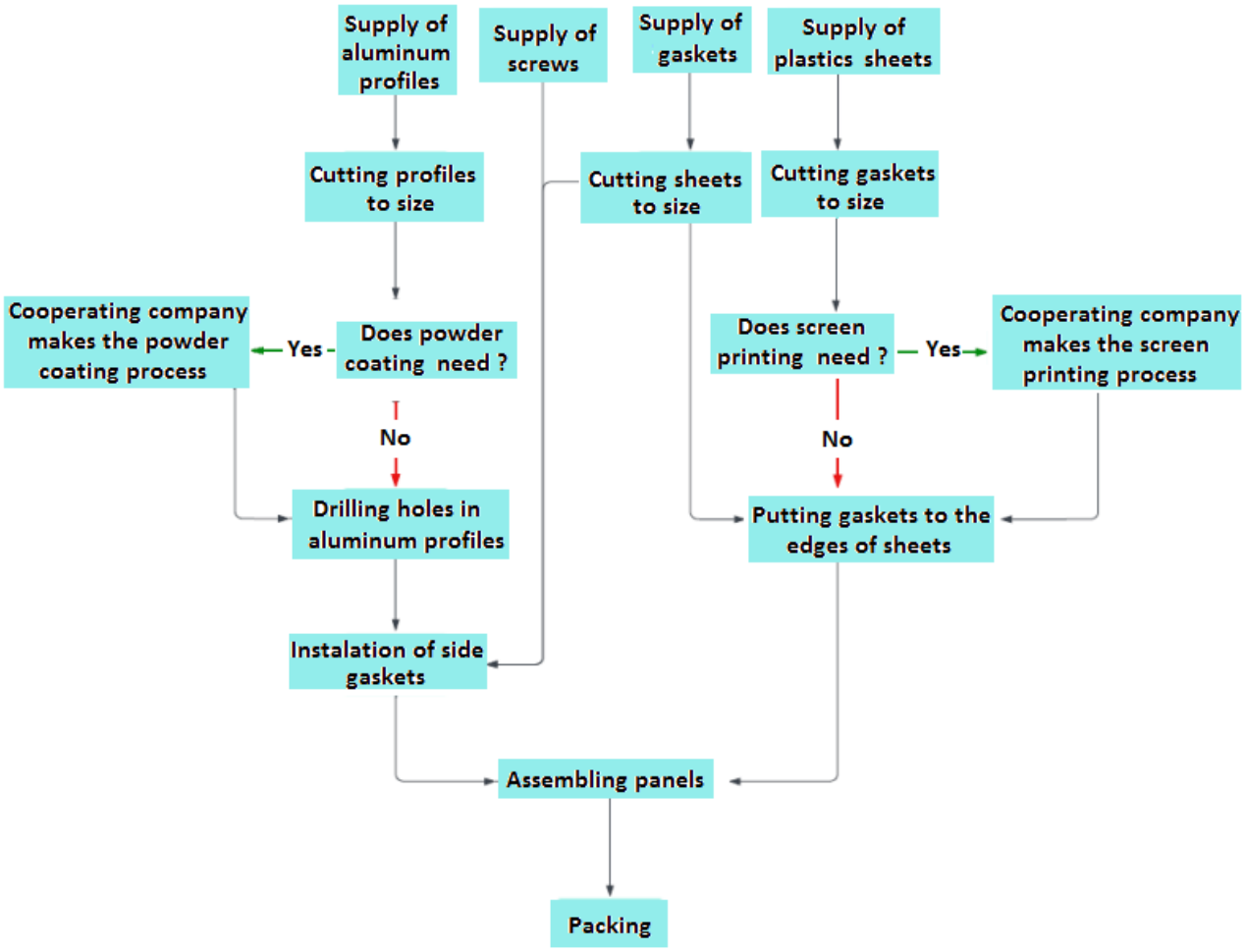

Figure 2. A schematic diagram of the noise reducing panels production process by Aksound.

More information about noise reducing panels filled with plastics sheets and tempered glass can be found on the Aksound website www.aksound.pl

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Declared unit

The declaration refers to declared unit (DU) – 1 m^2 of noise reducing panel manufactured by Aksound. The calculations were carried out with the specification of three groups of noise reducing panels filled with : solid polycarbonate, acrylic sheets and tempered glass.

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of noise reducing panels filled with plastics sheets and tempered glass is a line process conducted in the factory of Aksound, located in Łódź (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 global line production Aksound Sp. z o. o. Sp. j. were inventoried based on the annual production volume expressed in m^2 and tons (including ca. 80% acrylic, 19% polycarbonate and 1% tempered glass). 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 PCR A. 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*
Acrylic, polycarbonate, aluminum, tempered glass, gaskets, additives (like screws or drills) and packaging materials used to produce noise reducing panels come from external suppliers. Means of transport include small (<10 t) and big (>16 t) trucks are applied. Based on data provided by the manufacturer, all input of transport resources was inventoried in details.

Module A3: *Production*
A scheme of noise reducing panels production process by Aksound is presented in Figure 2.

Modules C1-C4 and D*: End-of-life (EoL)*
It is assumed that at the end-of-life, 100% of noise reducing panels is demounted using electric tools (module C1) and it is transported to waste processing plant distant by 50 km, on 16-32 t lorry (Euro 5) (module C2). It is assumed that 50% of the plastic materials (acrylic and polycarbonate) and 100% of aluminum are recycled. 50% plastic materials and 100% other inert mixed waste end up in construction and demolition waste landfills as their final stage and modelled as such in the LCA (C4). A potential credit resulting from the recycling of plastics and aluminum which were calculated using World Steel Association approach and are presented in module D.

Data quality
The data selected for LCA analysis originate from ITB-LCI questionnaires completed by Aksound using the inventory data, ITB and Ecoinvent database v. 3.9. 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 Aksound covers a period of 01.01.2021 – 31.12.2021 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Assumptions and estimates
Impacts were inventoried and calculated for all products of noise reducing panels filled with plastics sheets and tempered glass.

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 and ITB-Database. Specific data quality analysis was a part of external audit. Polish electricity mix used (production) is 0.698 kg CO_2/kWh (KOBiZE 2021). European electricity mix used is 0.430 kg CO_2/kWh for the end of life (Ecoinvent v. 3.8, RER).

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 m^2 of noise reducing panel manufactured by Aksound. 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 PCR A (Table 2). The calculations were carried out with the specification of three groups of noise reducing panels filled with: solid polycarbonate (Table 3-6), acrylic sheets (Table 7-10) and tempered glass (Table 11-14).

Table 2. System boundaries for the environmental characteristic of noise reducing panel production process by Aksound.

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**

Table 3. Life cycle assessment (LCA) results of noise reducing panel filled with solid polycarbonate manufactured by Aksound – environmental impacts (DU: 1 m^2)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO2	1.11E+02	8.36E-01	1.81E+00	1.14E+02	3.09E-02	2.36E+02	4.60E+00	9.04E-02	-2.54E+01
Greenhouse gas potential - fossil	eq. kg CO2	1.33E+02	8.33E-01	1.78E+00	1.35E+02	3.07E-02	2.35E+02	4.54E+00	8.95E-02	-2.48E+01
Greenhouse gas potential - biogenic	eq. kg CO2	-2.19E+01	2.86E-03	2.95E-02	-2.19E+01	1.64E-04	8.02E-01	5.10E-02	8.88E-04	-3.96E-01
Global warming potential - land use and land use change	eq. kg CO2	3.66E-01	3.28E-04	3.98E-04	3.67E-01	8.04E-06	9.21E-02	1.21E-03	3.18E-05	-2.62E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	1.18E-05	1.93E-07	4.46E-08	1.20E-05	5.54E-08	5.43E-05	8.91E-08	4.14E-08	-2.17E-06
Soil and water acidification potential	eq. mol H+	7.17E-01	3.38E-03	1.57E-02	7.36E-01	3.86E-04	9.53E-01	5.09E-03	8.57E-04	-3.07E-01
Eutrophication potential - freshwater	eq. kg P	4.45E-02	5.62E-05	2.56E-03	4.71E-02	1.91E-06	1.58E-02	2.44E-04	9.05E-06	-1.28E-02
Eutrophication potential - seawater	eq. kg N	1.20E-01	1.02E-03	2.68E-03	1.24E-01	4.64E-05	2.88E-01	1.80E-03	3.20E-04	-2.90E-02
Eutrophication potential - terrestrial	eq. mol N	1.19E+00	1.11E-02	2.01E-02	1.22E+00	5.04E-04	3.14E+00	1.81E-02	3.51E-03	-5.09E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	7.18E-01	3.41E-03	6.28E-03	7.28E-01	2.12E-04	9.61E-01	5.14E-03	1.00E-03	-7.90E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.19E-03	2.97E-06	2.88E-06	1.20E-03	3.37E-08	8.32E-04	1.74E-05	1.96E-07	-6.85E-04
Abiotic depletion potential - fossil fuels	MJ	2.82E+03	1.24E+01	3.08E+01	2.86E+03	3.26E+00	3.48E+03	9.80E+00	2.71E+00	-3.26E+02
Water deprivation potential	eq. m^3	9.19E+01	5.73E-02	5.72E-01	9.26E+01	3.95E-03	1.61E+01	7.57E-01	1.12E-02	-3.76E+01

Table 4. Life cycle assessment (LCA) results of noise reducing panel filled with solid polycarbonate manufactured by Aksound – additional impacts indicators (DU: 1 m^2)

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 noise reducing panel filled with solid polycarbonate manufactured by Aksound - environmental aspects related to resource use (DU: 1 m^2)

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	3.57E+02	1.78E-01	2.01E+00	3.59E+02	5.41E-02	5.00E+01	2.96E+00	4.91E-02	-7.34E+01
Consumption of renewable primary energy resources used as raw materials	MJ	2.18E+02	0.00E+00	0.00E+00	2.18E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	5.74E+02	1.78E-01	2.01E+00	5.77E+02	6.77E-03	5.00E+01	2.96E+00-	5.51E-02	-9.21E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.16E+03	1.24E+01	2.94E+01	2.20E+03	0.00E+00	3.48E+03	7.36E+02	-5.36E+02	-2.39E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	6.60E+02	0.00E+00	2.75E+00	6.63E+02	0.00E+00	0.00E+00	7.46E+02	5.39E+02	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	2.82E+03	1.24E+01	3.21E+01	2.87E+03	3.54E+00	3.48E+03	9.94E+00	2.71E+00	-3.26E+02
Consumption of secondary materials	kg	3.85E+00	4.16E-03	3.35E-03	3.86E+00	1.21E-04	1.17E+00	4.44E-02	6.11E-04	-5.49E+00
Consumption of renewable secondary fuels	MJ	5.23E+00	4.59E-05	1.84E-05	5.23E+00	9.48E-07	1.29E-02	5.69E-04	2.00E-05	-1.27E-02
Consumption of non-renewable secondary fuels	MJ	1.83E-02	0.00E+00	0.00E+00	1.83E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.83E-02
Net consumption of freshwater resources	m^3	2.12E+00	1.56E-03	-9.45E-03	2.11E+00	1.86E-05	4.38E-01	1.50E-02	3.30E-03	-9.21E-01

Table 6. Life cycle assessment (LCA) results of noise reducing panel filled with solid polycarbonate manufactured by Aksound - environmental information describing waste categories (DU: 1 m^2)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	8.16E+00	1.39E-02	3.15E-03	8.18E+00	8.83E-06	3.91E+00	1.67E-01	2.50E-03	-4.06E+00
Non-hazardous waste neutralised	kg	1.59E+02	2.47E-01	2.03E-01	1.60E+02	7.86E-04	6.94E+01	2.48E+00	1.44E+00	-2.54E+01
Radioactive waste	kg	6.14E-03	8.51E-05	2.02E-05	6.24E-03	2.37E-05	2.40E-02	6.68E-05	1.83E-05	-3.99E-03
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	3.20E-02	3.84E-05	1.71E-02	4.92E-02	2.96E-06	1.08E-02	1.59E+01	4.61E-06	-3.08E-03
Materials for energy recovery	kg	9.01E-04	3.10E-07	3.17E-07	9.01E-04	5.22E-08	8.72E-05	4.46E-06	5.92E-08	-8.96E-06
Energy exported	MJ	2.20E+00	1.37E-02	7.14E-02	2.28E+00	8.41E-04	3.87E+00	1.93E+01	5.71E-03	-7.28E-01

Table 7. Life cycle assessment (LCA) results of noise reducing panel filled with acrylic sheet manufactured by Aksound – environmental impacts (DU: 1 m^2)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO2	1.14E+02	8.36E-01	1.81E+00	1.16E+02	3.09E-02	1.64E+02	4.60E+00	9.04E-02	-2.54E+01
Greenhouse gas potential - fossil	eq. kg CO2	1.35E+02	8.33E-01	1.78E+00	1.38E+02	3.07E-02	1.63E+02	4.54E+00	8.95E-02	-2.48E+01
Greenhouse gas potential - biogenic	eq. kg CO2	-2.16E+01	2.86E-03	2.95E-02	- 2.16E+01	1.64E-04	5.59E-01	5.10E-02	8.88E-04	-3.96E-01
Global warming potential - land use and land use change	eq. kg CO2	2.74E-01	3.28E-04	3.98E-04	2.75E-01	8.04E-06	6.42E-02	1.21E-03	3.18E-05	-2.62E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	1.66E-06	1.93E-07	4.46E-08	1.89E-06	5.54E-08	3.78E-05	8.91E-08	4.14E-08	-2.17E-06
Soil and water acidification potential	eq. mol H+	8.78E-01	3.38E-03	1.57E-02	8.97E-01	3.86E-04	6.64E-01	5.09E-03	8.57E-04	-3.07E-01
Eutrophication potential - freshwater	eq. kg P	1.54E-02	5.62E-05	2.56E-03	1.80E-02	1.91E-06	1.10E-02	2.44E-04	9.05E-06	-1.28E-02
Eutrophication potential - seawater	eq. kg N	1.27E-01	1.02E-03	2.68E-03	1.31E-01	4.64E-05	2.00E-01	1.80E-03	3.20E-04	-2.90E-02
Eutrophication potential - terrestrial	eq. mol N	1.10E+00	1.11E-02	2.01E-02	1.13E+00	5.04E-04	2.18E+00	1.81E-02	3.51E-03	-5.09E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	7.16E-01	3.41E-03	6.28E-03	7.26E-01	2.12E-04	6.69E-01	5.14E-03	1.00E-03	-7.90E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.59E-04	2.97E-06	2.88E-06	2.65E-04	3.37E-08	5.80E-04	1.74E-05	1.96E-07	-6.85E-04
Abiotic depletion potential - fossil fuels	MJ	2.17E+03	1.24E+01	3.08E+01	2.21E+03	3.26E+00	2.43E+03	9.80E+00	2.71E+00	-3.26E+02
Water deprivation potential	eq. m^3	4.20E+01	5.73E-02	5.72E-01	4.26E+01	3.95E-03	1.12E+01	7.57E-01	1.12E-02	-3.76E+01

Table 8. Life cycle assessment (LCA) results of noise reducing panel filled with acrylic sheet manufactured by Aksound – additional impacts indicators (DU: 1 m^2)

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 noise reducing panel filled with acrylic sheet manufactured by Aksound - environmental aspects related to resource use (DU: 1 m^2)

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	2.70E+02	1.78E-01	2.01E+00	2.72E+02	5.41E-02	3.48E+01	2.96E+00	4.91E-02	-7.34E+01
Consumption of renewable primary energy resources used as raw materials	MJ	2.18E+02	0.00E+00	0.00E+00	2.18E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	4.87E+02	1.78E-01	2.01E+00	4.90E+02	6.77E-03	3.48E+01	2.96E+00-	5.51E-02	-9.21E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.79E+03	1.24E+01	2.94E+01	1.83E+03	0.00E+00	2.43E+03	7.36E+02	-5.36E+02	-2.39E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	3.84E+02	0.00E+00	2.75E+00	3.87E+02	0.00E+00	0.00E+00	7.46E+02	5.39E+02	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	2.17E+03	1.24E+01	3.21E+01	2.22E+03	3.54E+00	2.43E+03	9.94E+00	2.71E+00	-3.26E+02
Consumption of secondary materials	kg	3.48E+00	4.16E-03	3.35E-03	3.48E+00	1.21E-04	8.13E-01	4.44E-02	6.11E-04	-5.49E+00
Consumption of renewable secondary fuels	MJ	5.23E+00	4.59E-05	1.84E-05	5.23E+00	9.48E-07	8.96E-03	5.69E-04	2.00E-05	-1.27E-02
Consumption of non-renewable secondary fuels	MJ	1.83E-02	0.00E+00	0.00E+00	1.83E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.83E-02
Net consumption of freshwater resources	m^3	9.38E-01	1.56E-03	-9.45E-03	9.30E-01	1.86E-05	3.05E-01	1.50E-02	3.30E-03	-9.21E-01

Table 10. Life cycle assessment (LCA) results of noise reducing panel filled with acrylic sheet manufactured by Aksound - environmental information describing waste categories (DU: 1 m^2)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	5.72E+00	1.39E-02	3.15E-03	5.74E+00	8.83E-06	2.72E+00	1.67E-01	2.50E-03	-4.06E+00
Non-hazardous waste neutralised	kg	1.11E+01	2.47E-01	2.03E-01	1.16E+01	7.86E-04	4.83E+01	2.48E+00	1.44E+00	-2.54E+01
Radioactive waste	kg	3.55E-03	8.51E-05	2.02E-05	3.66E-03	2.37E-05	1.67E-02	6.68E-05	1.83E-05	-3.99E-03
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	8.12E-03	3.84E-05	1.71E-02	2.53E-02	2.96E-06	7.51E-03	1.59E+01	4.61E-06	-3.08E-03
Materials for energy recovery	kg	8.27E-04	3.10E-07	3.17E-07	8.27E-04	5.22E-08	6.08E-05	4.46E-06	5.92E-08	-8.96E-06
Energy exported	MJ	1.50E-01	1.37E-02	7.14E-02	2.35E-01	8.41E-04	2.69E+00	1.93E+01	5.71E-03	-7.28E-01

Table 11. Life cycle assessment (LCA) results of noise reducing panel filled with tempered glass manufactured by Aksound – environmental impacts (DU: 1 m^2)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO2	4.38E+00	8.36E-01	1.81E+00	7.02E+00	3.09E-02	3.47E+02	4.60E+00	9.04E-02	-2.54E+01
Greenhouse gas potential - fossil	eq. kg CO2	2.65E+01	8.33E-01	1.78E+00	2.91E+01	3.07E-02	3.45E+02	4.54E+00	8.95E-02	-2.48E+01
Greenhouse gas potential - biogenic	eq. kg CO2	-2.24E+01	2.86E-03	2.95E-02	-2.23E+01	1.64E-04	1.18E+00	5.10E-02	8.88E-04	-3.96E-01
Global warming potential - land use and land use change	eq. kg CO2	2.76E-01	3.28E-04	3.98E-04	2.76E-01	8.04E-06	1.35E-01	1.21E-03	3.18E-05	-2.62E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	1.68E-06	1.93E-07	4.46E-08	1.92E-06	5.54E-08	7.99E-05	8.91E-08	4.14E-08	-2.17E-06
Soil and water acidification potential	eq. mol H+	2.70E-01	3.38E-03	1.57E-02	2.89E-01	3.86E-04	1.40E+00	5.09E-03	8.57E-04	-3.07E-01
Eutrophication potential - freshwater	eq. kg P	1.15E-02	5.62E-05	2.56E-03	1.41E-02	1.91E-06	2.32E-02	2.44E-04	9.05E-06	-1.28E-02
Eutrophication potential - seawater	eq. kg N	3.58E-02	1.02E-03	2.68E-03	3.95E-02	4.64E-05	4.23E-01	1.80E-03	3.20E-04	-2.90E-02
Eutrophication potential - terrestrial	eq. mol N	3.51E-01	1.11E-02	2.01E-02	3.83E-01	5.04E-04	4.61E+00	1.81E-02	3.51E-03	-5.09E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	3.00E-01	3.41E-03	6.28E-03	3.10E-01	2.12E-04	1.41E+00	5.14E-03	1.00E-03	-7.90E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.94E-04	2.97E-06	2.88E-06	2.00E-04	3.37E-08	1.22E-03	1.74E-05	1.96E-07	-6.85E-04
Abiotic depletion potential - fossil fuels	MJ	4.33E+02	1.24E+01	3.08E+01	4.76E+02	3.26E+00	5.12E+03	9.80E+00	2.71E+00	-3.26E+02
Water deprivation potential	eq. m^3	2.39E+01	5.73E-02	5.72E-01	2.45E+01	3.95E-03	2.37E+01	7.57E-01	1.12E-02	-3.76E+01

Table 12. Life cycle assessment (LCA) results of noise reducing panel filled with tempered glass manufactured by Aksound – additional impacts indicators (DU: 1 m^2)

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 noise reducing panel filled with tempered glass manufactured by Aksound - environmental aspects related to resource use (DU: 1 m^2)

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	2.54E+02	1.78E-01	2.01E+00	2.56E+02	5.41E-02	7.35E+01	2.96E+00	4.91E-02	-7.34E+01
Consumption of renewable primary energy resources used as raw materials	MJ	2.18E+02	0.00E+00	0.00E+00	2.18E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	4.72E+02	1.78E-01	2.01E+00	4.74E+02	6.77E-03	7.35E+01	2.96E+00	5.51E-02	-9.21E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	4.18E+02	1.24E+01	2.94E+01	4.60E+02	0.00E+00	5.12E+03	-7.36E+02	-5.36E+02	-2.39E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.42E+01	0.00E+00	2.75E+00	1.70E+01	0.00E+00	0.00E+00	7.46E+02	5.39E+02	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	4.33E+02	1.24E+01	3.21E+01	4.77E+02	3.54E+00	5.12E+03	9.94E+00	2.71E+00	-3.26E+02
Consumption of secondary materials	kg	3.49E+00	4.16E-03	3.35E-03	3.50E+00	1.21E-04	1.72E+00	4.44E-02	6.11E-04	-5.49E+00
Consumption of renewable secondary fuels	MJ	5.23E+00	4.59E-05	1.84E-05	5.23E+00	9.48E-07	1.89E-02	5.69E-04	2.00E-05	-1.27E-02
Consumption of non-renewable secondary fuels	MJ	1.83E-02	0.00E+00	0.00E+00	1.83E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.83E-02
Net consumption of freshwater resources	m^3	5.20E-01	1.56E-03	-9.45E-03	5.12E-01	1.86E-05	6.45E-01	1.50E-02	3.30E-03	-9.21E-01

Table 14. Life cycle assessment (LCA) results of noise reducing panel filled with tempered glass manufactured by Aksound - environmental information describing waste categories (DU: 1 m^2)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	4.56E+00	1.39E-02	3.15E-03	4.57E+00	8.83E-06	5.75E+00	1.67E-01	2.50E-03	-4.06E+00
Non-hazardous waste neutralised	kg	1.13E+01	2.47E-01	2.03E-01	1.18E+01	7.86E-04	1.02E+02	2.48E+00	1.44E+00	-2.54E+01
Radioactive waste	kg	3.56E-03	8.51E-05	2.02E-05	3.67E-03	2.37E-05	3.53E-02	6.68E-05	1.83E-05	-3.99E-03
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	4.24E-03	3.84E-05	1.71E-02	2.14E-02	2.96E-06	1.59E-02	1.59E+01	4.61E-06	-3.08E-03
Materials for energy recovery	kg	8.45E-04	3.10E-07	3.17E-07	8.46E-04	5.22E-08	1.28E-04	4.46E-06	5.92E-08	-8.96E-06
Energy exported	MJ	2.44E-01	1.37E-02	7.14E-02	3.29E-01	8.41E-04	5.69E+00	1.93E+01	5.71E-03	-7.28E-01

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.) ☒ external ☐ 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: The declaration owner has the sole ownership. liability. and responsibility for the declaration. 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. For further information about comparability. see EN 15804 and ISO 14025.

Signature Not Verified
Dokument podpisany przez
Mateusz Kozicki; ITB
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Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006. Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+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
- PN-EN 15942:2012 Sustainability of construction works - Environmental product declarations - Communication format business-to-business
- EN 1794-2:2020 Road traffic noise reducing devices - Non-acoustic performance - Part 2: General safety and environmental requirements
- EN 1794-3:2016 Road traffic noise reducing devices - Non-acoustic performance - Part 3: Reaction to fire - Burning behaviour of noise reducing devices and classification
- EN 13501-1+A1:2010 Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
- EN 1793-2 Road traffic noise reducing devices - Test method for determining the acoustic performance - Part 2: Intrinsic characteristics of airborne sound insulation under diffuse sound field conditions

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

CERTIFICATE № 414/2023
of TYPE III ENVIRONMENTAL DECLARATION

Product:
Noise reducing panels filled with plastics sheets and tempered glass

Manufacturer:
Aksound Sp. z o.o. Sp. j.
ul. Piekarska 27, 91-314 Łódź, 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 for the first time on 7th March 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

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director
for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, March 2023