Type III Environmental Product Declaration No. 533/2023

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Aluminium profiles

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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 and their aspects verified by the independent body according to ISO 14025. Basically, 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, A4-A5, C1-C4 and D modules in accordance with EN 15804+A2 (Cradle-to-Gate with options)
Product standard: PN-EN 755-1:2016
The year of preparing the EPD: 2023
Service Life: 25 years
PCR: ITB-PCR A (2023)
Declared unit: 1 kg
Reasons for performing LCA: B2B
Representativeness: Poland, 2022

MANUFACTURER

Figure 1 The view of manufacturing plant

FINAL S.A. is a modern company with over 20 years of experience in the production of aluminium profiles, lacquering with the use of the newest trends, and in prefabricating. The company's registered office is located in Katowice Special Economic Zone, in Sosnowiec-Dąbrowa Subzone (Poland). The company is specialised in the production of extruded profiles from the aluminium alloys as well broadly understood processing. The company offer covers various products made of aluminium, which are intended for such industries as construction, machinery, automotive, or industries related to interior design and the introduction of the newest architectonic solutions. Aluminium profiles are manufactured on three modern production lines equipped with the press with a capacity of 2000 tons, 1800 tons, and 1600 tons, respectively.

The company annual production capacity is as much as 26 thousand tons of aluminium profiles. The company lines are equipped with control systems enabling fully automated operation cycles. FINAL utilizes a pyrometric system for measuring the temperature of the charge and extruded profiles, system for the generating the protective atmosphere around extruded profiles, and cooling systems. In the production, company uses aluminium alloys series 1070, 6060, 6063, 6005, and 6082 with the chemical composition compliant with PN-EN 573-3. The use of high-quality raw material allows to manufacture the best-class finished goods with strength properties in conformity with the requirements of PN-EN 755-2 for class T4 to T66. Production plants covered by this EPD are located at Dabrowa Górnicza, Herby and Kuchary (Poland).

PRODUCTS DESCRIPTION

The extrusion of the profiles (covered by this EPD) is conducted with high quality aluminium alloys: 1070, 6060, 6063, 6005, 6106 and 6082, whose chemical composition fulfills the standard EN 573-3. The standard length of the covered profiles is between 4 and 7 metres. The anodizing process offered by FINAL allows service up to 7.7 m. Company offers a wide range of standard colours: Natural (C-0), gold (C-23), inox (C-23), champagne (C-32), olive (C-33), bronze (C-34), black (C-35). Additionally production also cover shot blasting before anodisation, which gives the surface high decorative values. Anodizing aluminum (anodization) is a chemical process of aluminum treatment that allows for the creation of a resistant layer of aluminum oxide on the surfaces of elements and profiles, protecting against various factor. The maximum length of the profiles for machining on the CNC centres is 7700 mm, and the profile size is 275 x 210 mm. The company vertical coating line makes the coating of profiles with a length of up to 7,5 m possible. The powder coating services are within the complete RAL colour range, in all types of gloss, facture and structure of the coating layers as well as metallized layers.The surface for coating is prepared by yellow chroming or chromium-free treatment. There is a separate line for coating profiles with wood-effect layers. This treatment is for profiles with lengths up to 7 m and delivers an aesthetic and solid layer, imitating natural wood. The quality of thecoating services is confirmed by the quality sign Qualicoat SeaSide.The high quality of products, environmental consciousness as well as care for the safety of the employees and guests are confirmed by certified management systems (according to ISO 9001: 2015, ISO 14001: 2015).
All additional technical information about the product is available on the manufacturer's website and catalogues.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 kg of product (rods, pipes and sections extruded from aluminum with coatings) representative for a wide range of products from 3 manufacturing plants (Poland).

System boundary

The life cycle analysis of the declared products covers “Product Stage” A1-A3, A4-A5, C1-C4+D modules in accordance with EN 15804 and ITB PCR A (cradle to gate with options). Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculation. 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.

Allocation

The allocation rules used for this EPD are based on general ITB’s document PCR A (2023). Production of the covered aluminium products is a line process (as presented in Figure 2) conducted in the 3 manufacturing plants located in Dąbrowa Górnicza, Herby and Kuchary (Poland). Input and output data from the production is inventoried and allocated to the production on the mass basis. The declaration covers a wide range of aluminium products. Their production resources and processing stages are basicly similar, so it is possible to average the production by product weight. A weighted average of 3 plants was used to calculate the environmental footprint of products.

System limits

Minimum 99.0% input materials and 100% energy consumption (electricity, gas, LPG, other) were inventoried in a processing plants and were included in the calculation. In the assessment, all significant parameters from gathered production data are considered, i.e. all material used per formulation, utilized thermal energy, and electric power consumption, direct production waste and available emission measurements. Tires consumption for transport was not considered. Substances with a percentage share of less than 0.1% of total mass were excluded from the calculations. The packaging products (wooden pallets) are included. Packing assessment were icnluded.

Modules A1 and A2: *Raw materials supply and transport*

The modules A1 and A2 represent the extraction and processing of raw materials (mainly aluminium elements) and transport to the production site. The aluminium are semi-products commonly used to produce rods, pipes and sections. Aluminium used come from a specific suppliers worldwide. For A2 module (transport) European averages for fuel data are applied. To calculate the environmental footprint of aluminum for production, a weighted average of aluminum from various sources was used based on verified data and production reports.

Module A3: *Production*

The product specific manufacturing process line is presented in Figure 2, an input aluminium shafts is processed to a dedicated shape. The production process is partially automated and is based on receiving metallurgical materials for production (aluminium shafts), followed by hot processing of the aluminium. Extrusion is followed by other additional processes, as shown in Figure 2.

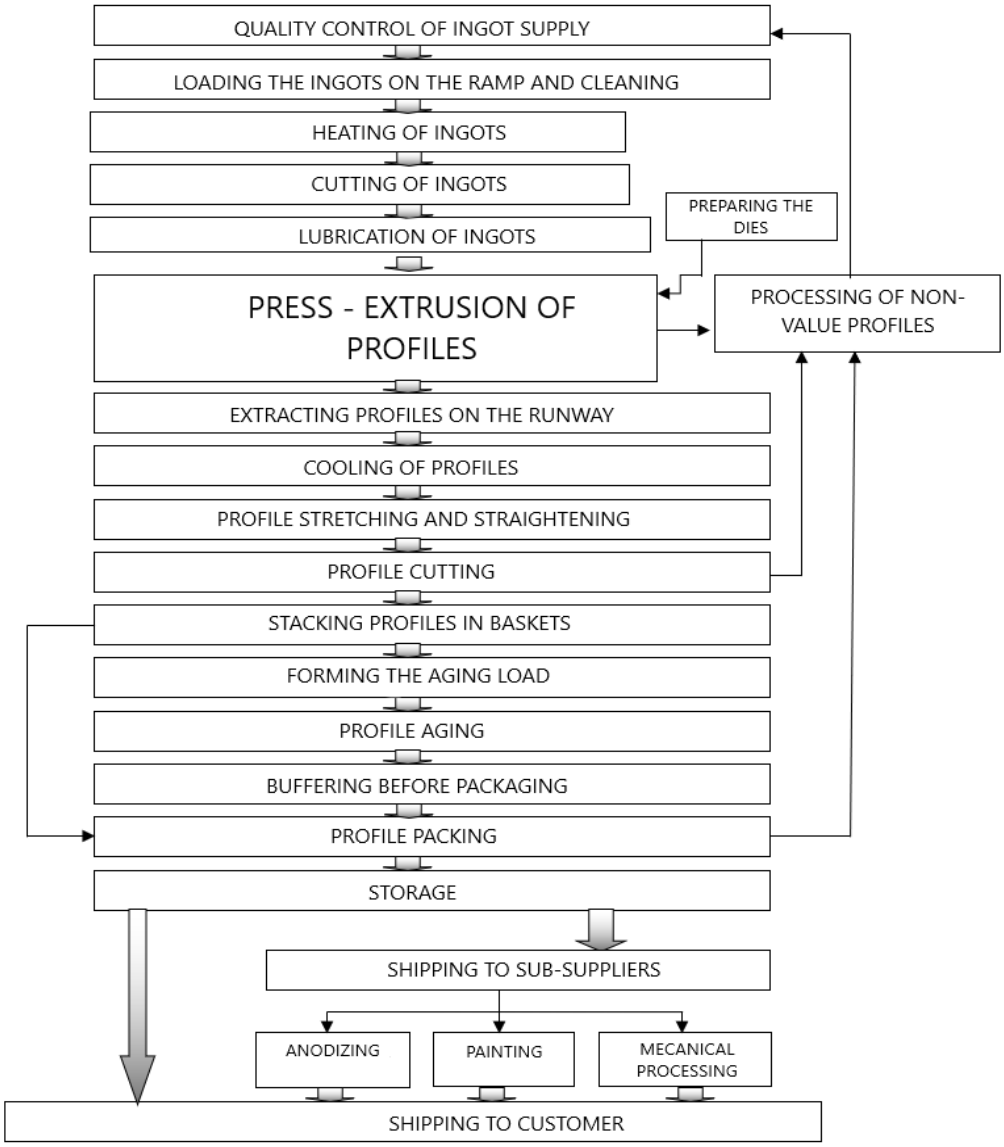

Figure 2 Manufacturing process scheme (A3)

Module A4: transport to consumer

Vehicle transport at distance 100 km is considered (emission standrad: Euro 5) with 100% load capacity.

Modules *C and D: End-of-life (EOL)*

It is assumed that at the End-of-Life, the aluminium profiles are dismantled using power tools. Recovered material is transported to waste processing plant distant of about 200 km using > 24t lorry with 85% capacity utilization and fuel consumption of 35 L per 100 km (module C2). About 98% of the resulting aluminium scrap undergo recycling after shredding (C3) while the remaining 2% of them is forwarded to landfill in the form of mixed construction and demolition waste. Environmental burdens declared in module C4 are associated with treatment of aluminium scrap, prepared for recycling at refiner and waste-specific emissions to air and groundwater via landfill. A potential credit resulting from the recycling of the aluminium scrap are presented in module D (calculated for the primary aluminium content).

Table 1 End-of-life scenario for the aluminium profiles

Material	Material recovery	Recycling	Landfilling
aluminium profiles	100%	98%	2%

Electricity at end-of-life (module C) has been modelled using an average Polish electricity mix as the location where the product reaches end-of-life is unknown.

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2022 – 31.12.2022 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Data quality

The data selected for LCA originate from ITB-LCI questionnaires completed by FINAL S.A. and verified during data audit. No data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency is judged as good. The background data for the processes come from the following resources database Ecoinvent v.3.9.1 (aluminium (partly), sodium hydroxide, sulfuric acid, cleaning consumables, ammonia, soda ash, packaging film, structural timber, carton, paper, polyethylene terephthalate, polyethylene, polystyrene, polypropylene) and specific Epds for aluminium input material. Specific (LCI) data quality analysis was a part of the input data verification. Where no background data was available, data gaps were complemented by manufacturer information and literature research.

Assumptions and estimates

The impacts of the representative products were aggregated using weighted average. Process scrap from extrusion billets is considered that has never fulfilled its purpose as a product and may be remelted once more.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN15804+A2. Emission of greenhouse gases was calculated using the IPCC 2013 GWP method with a 100-year horizon. Emission of acidifying substances, Emission of substances to water contributing to oxygen depletion, Emission of gases that contribute to the creation of ground-level ozone, Abiotic depletion, and ozone depletion emissions where all calculated with the CML-IA baseline method

Additional information

Polish electricity (Ecoinvent v.3.9.1 supplemented by actual national KOBiZE data) emission factor used is 0.702 kg CO_2/kWh. As a general rule, no particular environmental or health protection measures other than those specified by law are necessary.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 kg of Aluminium profiles. The following life cycle modules (Table 2) were included in the analysis. The following tables 3-6 show the environmental impacts of the life cycle of selected modules (A1-A5+C1-C4+D).

Table 2 System boundaries for the environmental characteristic of the product.

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	MD	MD	MND	MND	MND	MND	MND	MND	MND	MD	MD	MD	MD	MD

Table 3 Life cycle assessment (LCA) results for specific product – environmental impacts – 3 manufacturing plants average (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO_2	6.69E+00	1.45E-01	4.38E-01	7.27E+00	1.67E-02	5.82E-03	3.49E-03	3.54E-02	2.94E-01	1.06E-04	-1.09E+00
Greenhouse potential - fossil	eq. kg CO_2	6.80E+00	1.45E-01	4.32E-01	7.38E+00	1.66E-02	5.71E-03	3.42E-03	3.52E-02	2.94E-01	1.05E-04	-1.07E+00
Greenhouse potential - biogenic	eq. kg CO_2	-7.87E-02	3.51E-04	9.79E-03	-6.85E-02	5.68E-05	1.67E-04	1.00E-04	1.20E-04	8.43E-03	2.68E-07	-7.34E-03
Global warming potential - land use and land use change	eq. kg CO_2	6.17E-02	7.20E-05	1.21E-04	6.19E-02	6.52E-06	2.00E-06	1.20E-06	1.38E-05	1.01E-04	9.94E-08	-1.44E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	3.82E-07	3.20E-08	1.83E-08	4.32E-07	3.85E-09	1.17E-10	7.00E-11	8.15E-09	5.90E-09	4.26E-11	-8.09E-08
Soil and water acidification potential	eq. mol H+	4.79E-02	1.87E-03	3.80E-03	5.36E-02	6.75E-05	6.33E-05	3.80E-05	1.43E-04	3.20E-03	9.90E-07	-1.04E-02
Eutrophication potential - freshwater	eq. kg P	2.80E-03	8.18E-06	6.30E-04	3.43E-03	1.12E-06	1.08E-05	6.50E-06	2.37E-06	5.48E-04	9.81E-09	-5.24E-04
Eutrophication potential - seawater	eq. kg N	4.76E-03	4.83E-04	5.59E-04	5.80E-03	2.04E-05	9.17E-06	5.50E-06	4.32E-05	4.64E-04	3.45E-07	-9.86E-04
Eutrophication potential - terrestrial	eq. mol N	4.65E-02	5.34E-03	4.73E-03	5.66E-02	2.22E-04	7.75E-05	4.65E-05	4.71E-04	3.92E-03	3.77E-06	-9.77E-03
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.59E-02	1.44E-03	1.36E-03	1.87E-02	6.80E-05	2.17E-05	1.30E-05	1.44E-04	1.10E-03	1.10E-06	-3.39E-03
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	3.03E-05	4.16E-07	1.69E-06	3.24E-05	5.89E-08	2.78E-08	1.67E-08	1.25E-07	1.41E-06	2.42E-10	-6.65E-06
Abiotic depletion potential - fossil fuels	MJ	6.47E+01	2.05E+00	7.08E+00	7.38E+01	2.47E-01	9.67E-02	5.80E-02	5.23E-01	4.89E+00	2.89E-03	-1.35E+01
Water deprivation potential	eq. m^3	4.89E+00	8.52E-03	1.19E-04	4.90E+00	1.14E-03	2.00E-03	1.20E-03	2.42E-03	1.01E-01	9.16E-06	-1.09E+00

Table 4 Life cycle assessment (LCA) results for specific product – additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1-A3	A4-A5	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA

Table 5 Life cycle assessment (LCA) results for specific product - the resource use – 3 manufacturing plants average (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.78E+01	2.12E-02	4.16E-01	1.82E+01	3.54E-03	7.17E-03	4.30E-03	7.50E-03	3.62E-01	2.51E-05	-4.10E+00
Consumption of renewable primary energy resources used as raw materials	MJ	6.72E-01	7.40E-03	3.53E-03	6.83E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	1.84E+01	2.86E-02	4.19E-01	1.89E+01	3.54E-03	7.17E-03	4.30E-03	7.50E-03	3.62E-01	2.51E-05	-4.10E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	6.47E+01	1.48E+00	5.62E+00	7.18E+01	2.47E-01	9.70E-02	5.82E-02	5.23E-01	4.90E+00	0.00E+00	-1.35E+01
Consumption of non-renewable primary energy resources used as raw materials	MJ	9.13E-02	6.12E-01	1.63E+00	2.34E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	6.48E+01	2.09E+00	7.26E+00	7.41E+01	2.47E-01	9.70E-02	5.82E-02	5.23E-01	4.90E+00	2.89E-03	-1.35E+01
Consumption of secondary materials	kg	1.71E-01	4.96E-04	6.29E-04	1.72E-01	8.27E-05	8.83E-06	5.30E-06	1.75E-04	4.47E-04	6.07E-07	-4.39E-03
Consumption of renew. secondary fuels	MJ	3.20E-03	5.47E-06	3.12E-06	3.21E-03	9.11E-07	4.92E-08	2.95E-08	1.93E-06	2.49E-06	1.59E-08	-3.01E-05
Consumption of non-renewable secondary fuels	MJ	8.34E-03	0.00E+00	4.54E-03	1.29E-02	0.00E+00	7.83E-05	4.70E-05	0.00E+00	3.96E-03	0.00E+00	-1.03E-03
Net consumption of freshwater	m^3	1.03E-01	1.98E-04	2.05E-03	1.05E-01	3.10E-05	2.63E-05	1.58E-05	6.58E-05	1.33E-03	3.16E-06	-2.37E-02

Table 6 Life cycle assessment (LCA) results for specific product – waste categories – 3 manufacturing plants average (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste	kg	1.01E-02	1.66E-03	2.01E-02	3.19E-02	2.77E-04	1.00E-06	6.00E-07	5.87E-04	0.00E+00	3.07E-06	-2.39E-02
Non-hazardous waste	kg	7.65E-01	3.09E-02	8.28E-03	8.05E-01	4.92E-03	5.20E-05	3.12E-05	1.04E-02	5.06E-02	4.32E-05	-1.54E-01
Radioactive waste	kg	8.40E-04	4.11E-06	5.22E-06	8.50E-04	1.84E-08	7.25E-08	4.35E-08	3.90E-08	2.63E+00	1.92E-08	-1.96E-04
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	3.67E-06	0.00E+00	0.00E+00
Materials for recycling	kg	3.74E-04	4.58E-06	2.30E-01	2.30E-01	7.64E-07	1.00E-07	6.00E-08	1.62E-06	0.00E+00	5.78E-09	-7.61E-05
Materials for energy recovery	kg	2.55E-05	3.71E-08	6.12E-08	2.56E-05	6.18E-09	8.75E-10	5.25E-10	1.31E-08	5.06E-06	6.85E-11	-3.28E-07
Exported Energy	MJ	5.90E-02	0.00E+00	1.75E-02	7.65E-02	0.00E+00	2.88E-04	1.73E-04	0.00E+00	0.00E+00	0.00E+00	-9.73E-03

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804 and ITB PCR A
Independent verification corresponding to ISO 14025 (sub clause 8.1.3.) [x] external [ ] internal
External verification of EPD: Halina Prejzner, PhD. Eng. LCI audit and verification: Michał Chwedaczuk, M.Sc. Eng. LCA, LCI audit and input data verification: Michał Piasecki, PhD., D.Sc., eng.

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the for the information provided and contained in EPD. 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.

Note 2: Note: 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 (ISO 17025/17065/17029). 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 (2023)
- PN-EN 755-1:2016-07 - Aluminium i stopy aluminium -- Pręty, rury i kształtowniki wyciskane -- Część 1: Warunki techniczne kontroli i dostawy
- EN 1090-2:2018 - Execution of steel structures and aluminium structures - Technical requirements for steel structures
- PN-EN 1090-1+A1:2012 - Wykonanie konstrukcji stalowych i aluminiowych -- Część 1: Zasady oceny zgodności elementów konstrukcyjnych
- ITB PCR A General Product Category Rules for Construction Products (2023, v1.6)
- 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
- EN 15804+A2 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- CRU Group. Carbon footprint by cold metal by country - https://www.crugroup.com/about-cru/
- EAA 2020 - Circular Aluminium Action Plan - A strategy for achieving aluminium's full potential for circular economy by 2030.
- European Life Cycle Database. ELCD 3.2. http://eplca.jrc.ec.europa.eu/ELCD3/index.xhtml?stock=default
- Ecoinvent Database. http://www.ecoinvent.org/database/.
- Life-Cycle inventory data for aluminium production and transformation processes in Europe. Environmental Profile Report. February 2018.
- Aluminium Recycling in LCA – European Aluminium Association, 2013.
- https://ecoinvent.org/
- KOBiZE Wskaźniki emisyjności CO_2, SO_2, NO_x, CO i pyłu całkowitego dla energii elektrycznej. December 2021

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Thermal Physics, Acoustics and Environment Department
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CERTIFICATE № 533/2023
of TYPE III ENVIRONMENTAL DECLARATION

Products:

Aluminium profiles

Manufacturer:

FINAL S.A.

ul. Koksownicza 9, 42-523 Dąbrowa Górnicza, 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 27th October 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, October 2023