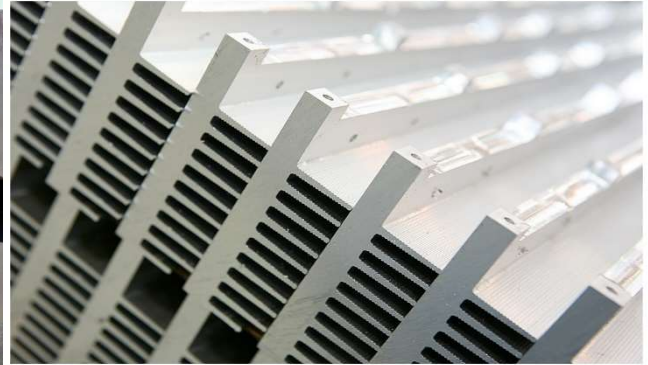




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Aluminium profiles from the 6xxx series



EPD Program Operator:

Instytut Techniki Budowlanej (ITB)
Address: Filtrowa 1, 00-611 Warsaw, Poland
Website: www.itb.pl
Contact: Michał Piasecki
m.piasecki@itb.pl, energia@itb.pl

Owner of the EPD:

Grupa Kęty S.A.
Ul. Kościuszki 111
32-650 Kęty, Poland
Contact: +48 784397250
kety@grupakety.com
Website: www.grupakety.com

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 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 (see point 5.3 of the standard).

Life cycle analysis (LCA): A1-A3 modules, C2-C4 and D in accordance with EN 15804 (Cradle to Gate with options)

The year of preparing the EPD: 2022

Service Life: not declared, SL shall vary depending on a specific scenario of application

PCR: ITB-PCR A (PCR based on EN 15804)

Declared unit: 1 kg of product

Reasons for performing LCA: B2B

Representativeness: manufactured in Poland, year 2021

BASIC INFORMATION

The declaration covers aluminum profiles manufactured in manufacturing plants located in Kęty and Tychy (Poland), including aluminium billets production in Kęty (as input for profiles production). This EPD is the basis for B2B communication, intended users are clients and relevant stakeholders within several industry sectors.

The Capital Group of Grupa Kęty S.A. comprises three different business segments related to aluminium processing. The group consists of companies producing extruded products, aluminium construction systems and flexible packaging. The Holding has been operating continuously since 1953. The Extruded Products Segment, which bears the trademark of Grupa Kęty, produces aluminium profiles and components. The headquarters of the Extruded Products Segment is located in Kęty, in the south of Poland. Produced aluminium profiles and components are used in many industries, including: building and



constructions, automotive and road transport, railways, electrical engineering, engineering, household appliances. The company has a foundry consisting of four lines and can produce up to 50,000 tons billets a year. The plant is particularly designed to cast billets of varied elemental compositions. Profiles are extruded from the input coming from own foundry or from selected and proven suppliers.

PRODUCTS DESCRIPTION

This assessment covers production of 6000 series aluminium billets (6xxx alloy) that are intermediate products which feed next processing steps for the production of aluminium profile products covered by this EPD document. The production process of input material includes the melting process, pre-consumer and post-consumer scrap and primary ingots use and the following casting process. During the process, impurities are removed and alloying elements are added, if needed, to adjust the chemical composition and to reach the quality standard. Aluminium billet is used as an input to produce extrusion profiles mainly for the building & construction sector, but also in sectors such as automobile, transportation, infrastructure, industrial design, electronics, HVAC, solar and energy or general engineering.

This EPD covers a wide range of aluminum extrusion products manufactured by Kęty S.A. in the form of wide variety of shapes. Aluminium profiles can be produced as standard or customer design so there is a wide variety of profiles. Therefore, the composition of the final product can also be very different between designs. This EPD covers several product groups with an average composition for LCA calculation purposes.

All specific product technical data (ingots and profiles) is available at manufacturer website, <https://profile.grupakety.com>.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is the production of 1 kg of the aluminium profile, representative for a wide range of products. A provided data is representative of 6000 series aluminium alloys (6xxx alloy), which is the predominant production.

System boundary

The life cycle analysis of the declared product covers “Product Stage” A1-A3, C2-C4+D modules in accordance with EN 15804 and ITB PCRA (cradle to gate with options).

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. The results are the average representative of all aluminium profiles produced in Tychy and Kęty. Averages are obtained through the weighted average. Allocation of impacts is done on product mass basis in both plants. Aluminium ingots production rate is 62.51% of total production in Kęty, aluminium profiles is 36.22% in Kęty and 38.22% in Tychy. All impacts from aluminium ingots production are allocated in A1 module (see table 2). Minimum 99% of the impacts from a line production were allocated to the products covered by this declaration. Module A2 includes products specific transport of aluminium ingots from Kęty to Tychy plant (39 km). Municipal wastes of the factories were allocated to module A3. Emissions in the factories were assessed using Ecoinvent v3.8. data for energy carriers.

System limits

Minimum 99% input materials and 100% energy consumption (electricity, gas, ON, heat) were inventoried in Kęty and Tychy 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 taken into account. Substances with a percentage share of less than 1% of total mass were excluded from the calculations. It is assumed that the total sum of omitted processes does not exceed 0.5% of all impact categories. All packaging products are excluded in the analysis. In accordance with EN 15804 machines and facilities required for and during production are excluded, as is transportation of employees.

A1 and A2 Modules: Raw materials supply and transport

The modules A1 and A2 represent the extraction and processing of raw materials (primary ingots) and aluminium scrap, the transport to the production sites. Because that the whole foundry charge is intended solely for own manufacturing needs packaging circulates almost in a closed cycle (therefore it is not included in LCA). Module A1 represents the impact of the production of ingots used further in the production of sections at the Kęty Plant (on site) or in Tychy (distance of 39 km). For A2 calculation purposes, European averages for fuel data are applied.

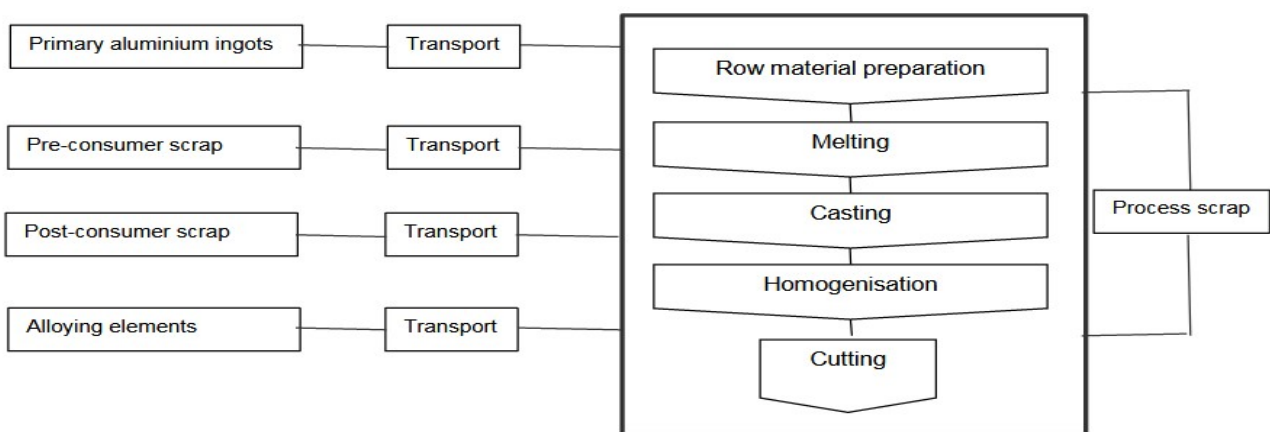


Figure 1. A schematic diagram of the industrial process (aluminium billets) in Kęty plant, A1 module.

Specific impacts for the production of 1 kg of aluminium billet (used for aluminium profiles production) is presented as A1 module.

A3: Production

The product specific production process (Kęty and Tychy plant) is presented in Figure 2. Profiles are extruded from the batch mass coming from own foundry and processed (shaping, cutting, maturing). Electricity and gas are consumed in the process.

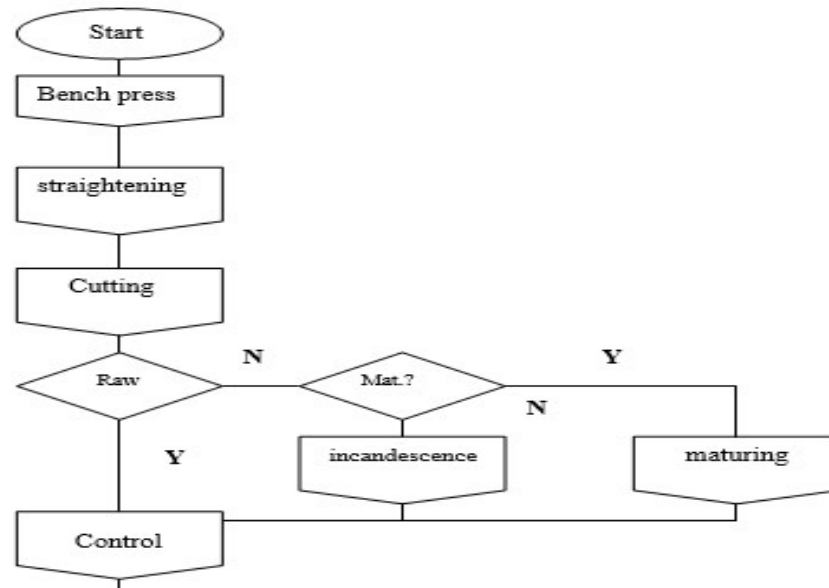


Figure 2. A schematic diagram of the industrial process (aluminium profiles) in Kęty and Tychy plant (A3 module).

C1: Dismantling

No information is available for the dismantling operations of average aluminium profiles regarding the impacts during the operations in building sector or in any other. Then, no contribution on impact categories of this module is declared and module is not assessed.

C2: Transport to waste processing

A distance of 50 km (lorry, diesel, 25 t) has been assumed for the transport to a waste processing plant.

C3 - Waste processing for reuse, recovery and/or recycling

It has been assumed that during the scrapping operations the electricity is consumed (0,02 kWh/kg).

C4 - Final disposal

Recovery rates for aluminium during building dismantling are modelled based on figures reported by the European Aluminium Association. It was assumed a 95% for recovery rate while the remaining 5% goes to landfill.

D - Allocation by reuse, recovery or recycling

In order to obtain the net post-consumer scrap output from the product system, the input of post-consumer scrap present in assessed product is subtracted from post-consumer scrap to be recycled at end of life. Module D reports the burdens and benefits of the recycling of this remaining net scrap. Benefits are assessed at the point of functional equivalence, i.e. where the substitution of primary aluminium takes place. In the recycling process, smelting yield for post-consumer scrap was taken into account.

Data collection period

The data of manufacturing of the declared products refer to period between 01.01.2021 – 31.12.2021 (1 year). The life cycle assessments were done for Poland as reference area.

Data quality - production

The values determined to calculate A1-A3 originate from verified process LCI inventory data from each plant. A1 values were prepared considering input products characteristics based on Ecoinvent data. The carbon data for input aluminium production is based on the JRS Technical Report published in 2021. The energy consumption of production and its impact on the production lines of Kęty (billets, profiles) and Tychy (profiles) were separately inventoried and calculated. In accordance with Annex E of the EN 15804 + A2, a data quality assessment was performed. For technical representativeness, processes with a quality level of "very good"

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account for 99% of the value for climate change indicator. For geographical and time representativeness, processes level of "very good" is obtained.

Assumptions and estimates

The impacts of the representative product were aggregated using a weighted average. Process scrap from extrusion billets is considered that has never fulfilled its purpose as a product and is remelted once more. According to the data adopted from the Ecoinvent 3.8 database, the , pre-consumer and post-consumer scrap is not burdened with the environmental impacts, however, scrap processing impacts eq. 0.6 kg CO₂/kg were included (EEA).

Calculation rules

LCA was done in accordance with ITB PCR A document. Characterization factors are CML ver. 4.2 based on EN 15804+A2. ITB-LCA own algorithms were used for impact calculations. A1 was calculated based on data from the specific data from Kęty manufacturing plant and using database (European Area) for resources (primary ingots, oils, mixed alloys). A3 and A2 are calculated based on the specific input data.

Databases

The background data for the processes come from the following databases: Ecoinvent v.3.8 (primary billets, mixed alloys, lubricants, scrap processing, transport, energy carriers, heat, diesel, gas) and KOBIZE (Polish electricity mix and combustion factors for fuels). KOBIZE data is supplemented with Ecoinvent data on the Polish electricity mix impact where no specific indicator data is provided. Specific (LCI) data quality analysis was a part of the input data verification. The time related quality of the data used is valid (5 years).

Additional information

Polish electricity mix used is 0.698 kg CO₂/kWh (2021). Kęty products meet the applicable regulations, including REACH Regulation (EC) 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals and directive 2011/65/EU of the European Parliament and of the Council (RoHS 2 Directive) which lays down rules on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) with a view to contributing to the protection of human health and the environment, including the environmentally sound recovery and disposal of waste EEE. Taking into consideration this justification the additional indicators (including Eco and Human toxicity) related were not included in the assessment.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to the declared unit DU – 1 kg of aluminium profiles (table 2-5). The following life cycle modules are included in the declaration (table 1).

Table 1. System boundaries (life stage modules included) in a product environmental assessment

Environmental assessment information (MA – Module assessed, MNA – Module not assessed, 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 sites	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
MA	MA	MA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MD	MD	MD	MD

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Table 2. Life cycle assessment (LCA) results of aluminium profiles manufactured by Kęty S.A. – the environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	2.95E+00	7.03E-04	3.47E-01	3.30E+00	2.73E-03	5.61E-02	2.60E-04	-1.11E+00
Greenhouse gas potential - fossil	eq. kg CO ₂	2.88E+00	6.95E-04	3.42E-01	3.23E+00	2.70E-03	2.09E-02	2.60E-04	-1.09E+00
Greenhouse gas potential - biogenic	eq. kg CO ₂	2.63E-02	2.16E-06	7.33E-03	3.36E-02	8.40E-06	3.52E-02	6.50E-07	-7.49E-03
Global warming potential - land use and land use change	eq. kg CO ₂	5.15E-02	2.52E-07	9.08E-05	5.16E-02	9.78E-07	1.76E-05	2.49E-07	-1.47E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	2.90E-07	1.68E-10	2.00E-08	3.10E-07	6.51E-10	9.69E-10	1.07E-10	-8.25E-08
Soil and water acidification potential	eq. mol H ⁺	3.73E-02	2.86E-06	2.87E-03	4.02E-02	1.11E-05	9.50E-05	2.45E-06	-1.06E-02
Eutrophication potential - freshwater	eq. kg P	1.88E-03	4.53E-08	4.72E-04	2.35E-03	1.76E-07	8.74E-06	2.45E-08	-5.35E-04
Eutrophication potential - seawater	eq. kg N	3.53E-03	8.49E-07	4.39E-04	3.97E-03	3.30E-06	4.85E-05	8.50E-07	-1.01E-03
Eutrophication potential - terrestrial	eq. mol N	3.50E-02	9.27E-06	3.82E-03	3.88E-02	3.60E-05	2.47E-04	9.00E-05	-9.97E-03
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.22E-02	3.09E-06	1.08E-03	1.32E-02	1.20E-05	6.94E-05	2.74E-06	-3.46E-03
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.38E-05	1.64E-09	1.24E-06	2.50E-05	6.39E-09	6.63E-07	6.00E-09	-6.78E-06
Abiotic depletion potential - fossil fuels	MJ	4.83E+01	1.07E-02	5.79E+00	5.41E+01	4.17E-02	1.52E-02	7.20E-03	-1.38E+01
Water deprivation potential	eq. m ³	3.89E+00	4.94E-05	8.93E-02	3.98E+00	1.92E-04	5.13E-03	2.25E-05	-1.11E+00

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Table 3. Life cycle assessment (LCA) results of aluminium profiles manufactured by Kęty S.A. – the environmental aspects (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.47E+01	1.39E-04	3.16E-01	1.50E+01	5.40E-04	2.47E-02	6.00E-05	-4.19E+00
Consumption of renewable primary energy resources used as raw materials	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
Total consumption of renewable primary energy resources	MJ	1.47E+01	1.39E-04	3.16E-01	1.50E+01	5.40E-04	2.47E-02	6.00E-05	-4.19E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	4.83E+01	1.07E-02	5.81E+00	5.41E+01	4.17E-02	1.57E-01	7.00E-03	-1.38E+01
Consumption of non-renewable primary energy resources used as raw materials	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
Total consumption of non-renewable primary energy resources	MJ	4.83E+01	1.07E-02	5.81E+00	5.41E+01	4.17E-02	1.57E-01	7.00E-03	-1.38E+01
Consumption of secondary materials	kg	6.80E-01	3.01E-06	4.81E-04	1.62E-02	1.17E-05	2.76E-04	1.52E-06	-4.48E-03
Consumption of renewable secondary fuels	MJ	1.08E-04	2.66E-08	2.31E-06	1.10E-04	1.04E-07	2.28E-05	3.95E-08	-3.07E-05
Consumption of non-renewable secondary fuels	MJ	3.67E-03	0.00E+00	3.40E-03	7.07E-03	0.00E+00	0.00E+00	0.00E+00	-1.05E-03
Net consumption of freshwater resources	m ³	8.49E-02	1.39E-06	1.20E-03	8.61E-02	5.40E-06	1.24E-04	7.50E-06	-2.42E-02

Table 4. Life cycle assessment (LCA) results of aluminium profiles manufactured by Kęty S.A. - environmental information describing waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Hazardous waste, neutralized	kg	8.57E-01	1.16E-05	4.10E-04	8.57E-01	4.50E-05	1.90E-03	7.50E-06	-2.44E-01
Non-hazardous waste, neutralised	kg	5.50E-01	2.01E-04	7.35E-03	5.57E-01	7.80E-04	5.56E-02	1.00E-04	-1.57E-01
Radioactive waste	kg	7.00E-04	7.31E-06	3.17E-06	7.11E-04	2.84E-05	7.79E-07	2.65E-10	-2.00E-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
Materials for recycling	kg	2.73E-04	3.47E-08	4.76E-06	2.77E-04	1.35E-07	9.42E-01	1.40E-08	-7.77E-05
Materials for energy recovery	kg	1.18E-06	2.46E-10	4.44E-08	1.22E-06	9.57E-10	2.47E-08	1.70E-10	-3.35E-07

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Table 5. Life cycle assessment (LCA) results of aluminium profiles manufactured by Kęty S.A. – additional indicators (DU: 1kg)

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Particulate matter	disease incidence	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
Potential comparative toxic unit for ecosystems	CTUe	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
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA

VERIFICATION

The process of verification of this EPD was 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.)	
<input checked="" type="checkbox"/> external	internal <input type="checkbox"/>
External verification of EPD: Ph.D. Eng. Halina Prejzner LCA. LCI audit and input data verification: Ph.D, D.Sc.Eng. Michał Piasecki. m.piasecki@itb.pl Verification of LCA: Ph.D. Eng. Justyna Tomaszewska. j.tomaszewska@itb.pl	

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

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- EN 15381: 2008 Geotextiles and geotextile-related products - Characteristics required for use in pavements and asphalt overlays
- 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.
- KOBIZE Wskaźniki emisyjności CO₂, SO₂, NO_x, CO i pyłu całkowitego dla energii elektrycznej, 2021
- JRC Technical Report, Sustainability aspects of Bauxite and Aluminium, 2021



Instytut Techniki Budowlanej

00-611 Warsaw, Filitrowa 1

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

CERTIFICATE No 348/2022 of TYPE III ENVIRONMENTAL DECLARATION

Product:
Aluminium profiles from the 6xxx series

Manufacturer:
Grupa Kęty S.A.
ul. Tadeusza Kościuszki 111, 32-650 Kęty, 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 30th June 2022 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, June 2022