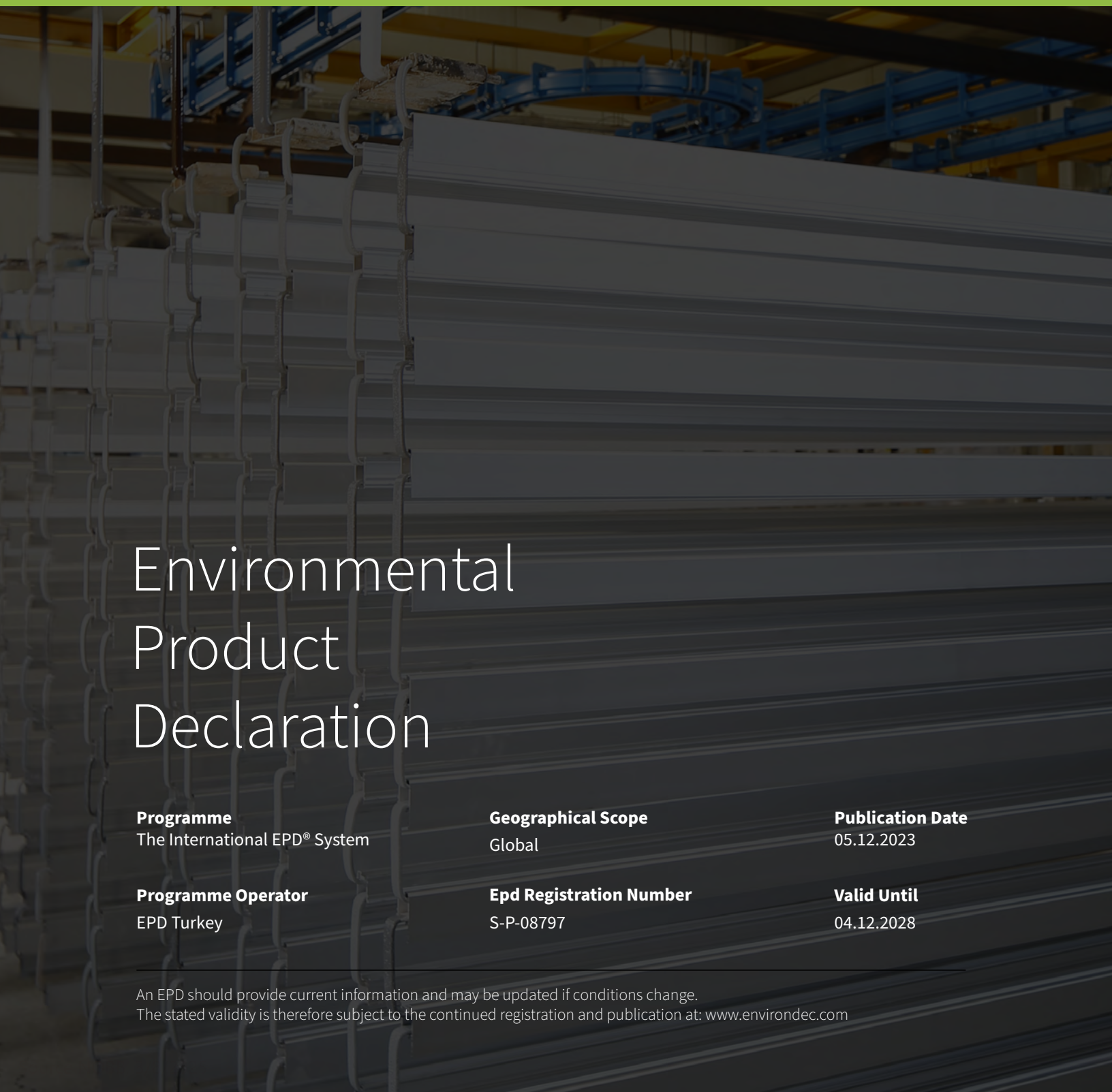
Anodized Aluminium Profile



Environmental Product Declaration

Programme
The International EPD® System

Geographical Scope
Global

Publication Date
05.12.2023

Programme Operator
EPD Turkey

Epd Registration Number
S-P-08797

Valid Until
04.12.2028

An EPD should provide current information and may be updated if conditions change.
The stated validity is therefore subject to the continued registration and publication at: www.environdec.com

General Information

Programme Information

Programme: The International EPD® System
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Programme Operator: EPD Turkey, managed and run by: SÜRATAM A.S. www.suratam.org
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Information about verification and reference PCR:
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product category rules (PCR)
Product Category Rules (PCR): <PCR 2019:14 Construction products (EN 15804:2012+A2.2019/AC:2021) Version 1.3 and UN CPC code(s) and 41532, Bars, rods and profiles, of aluminium

PCR review was conducted by
The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.

Independent verification of the declaration and data, according to ISO 14025:2021:

☐ EPD process verification ☑ EPD verification

Third party verifier
SIPL Pvt Ltd, New Delhi, India -
sunil@sipl-sustainability.com

Approved by
The International EPD® System Technical Committee, supported by the Secretariat

Procedure for follow-up of data during EPD validity involves third party verifier:

☐ Yes ☑ No

LCA Study & EPD Design Conducted by
Semtrio Sustainability Consulting
BUDOTEK Teknopark, No 8/27
Umraniye / Istanbul Turkey
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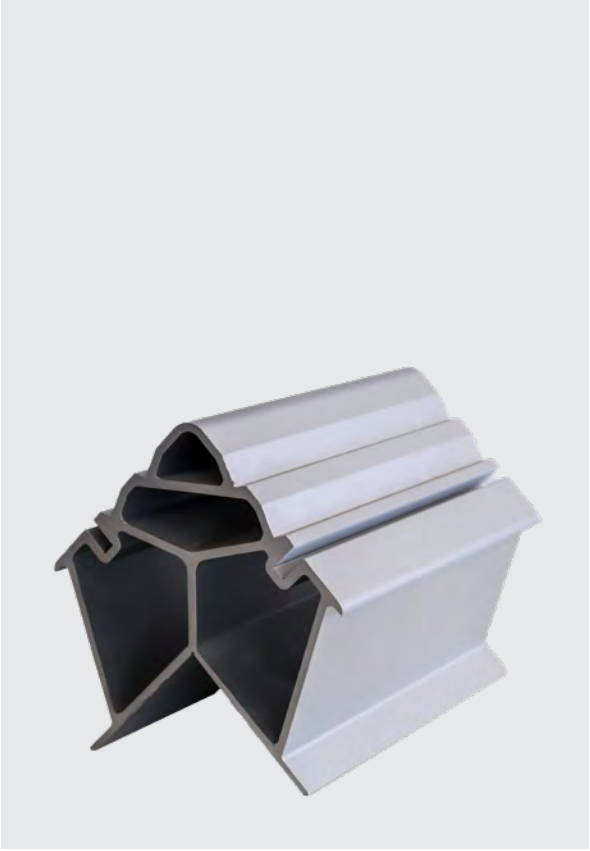
EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/ functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Product Information

Product Name
Anodized Aluminium Profile



The production process in the rolled aluminium profile facility begins with the supply of cylindrical aluminium billets. Once these aluminium billets arrive at the facility, they are first weighed, and then they are stacked within the raw material entry unit. Subsequently, these billets undergo a preparation phase tailored to meet customer requirements. Then, the prepared billets are conveyed to the loading machine and subsequently dispatched to the extrusion unit.

The production of aluminium profiles relies on the extrusion process, which consumes electricity, natural gas, and water. Our extrusion lines are utilized to manufacture aluminium profiles for a wide range of industries and applications.

The process starts with the heated billets sourced from the raw material input unit, reaching temperatures between 440-450°C in the billet furnace. The billets, heated in the furnace, are then precisely cut to meet the specific order requirements while being adhered to the mold with controlled pressure. The mold aids in shaping and producing the profile. The profiles emerging from the press are allowed to cool on designated benches, with any profiles exceeding 500°C being cooled using fans.

Once adequately cooled, the profiles undergo stretching in a dedicated machine, followed by flattening and transfer to the saw for precise cutting according to the customer's specified length. Subsequently, the profiles are subjected to hardening within a thermal (artificial aging) oven. Quality checks are performed to verify the hardness of the profiles upon exiting the thermal furnace, after which they are dispatched to the eloksal unit according to customer demand. Among the many types of coatings used, anodizing stands out as one of the most commonly utilized.

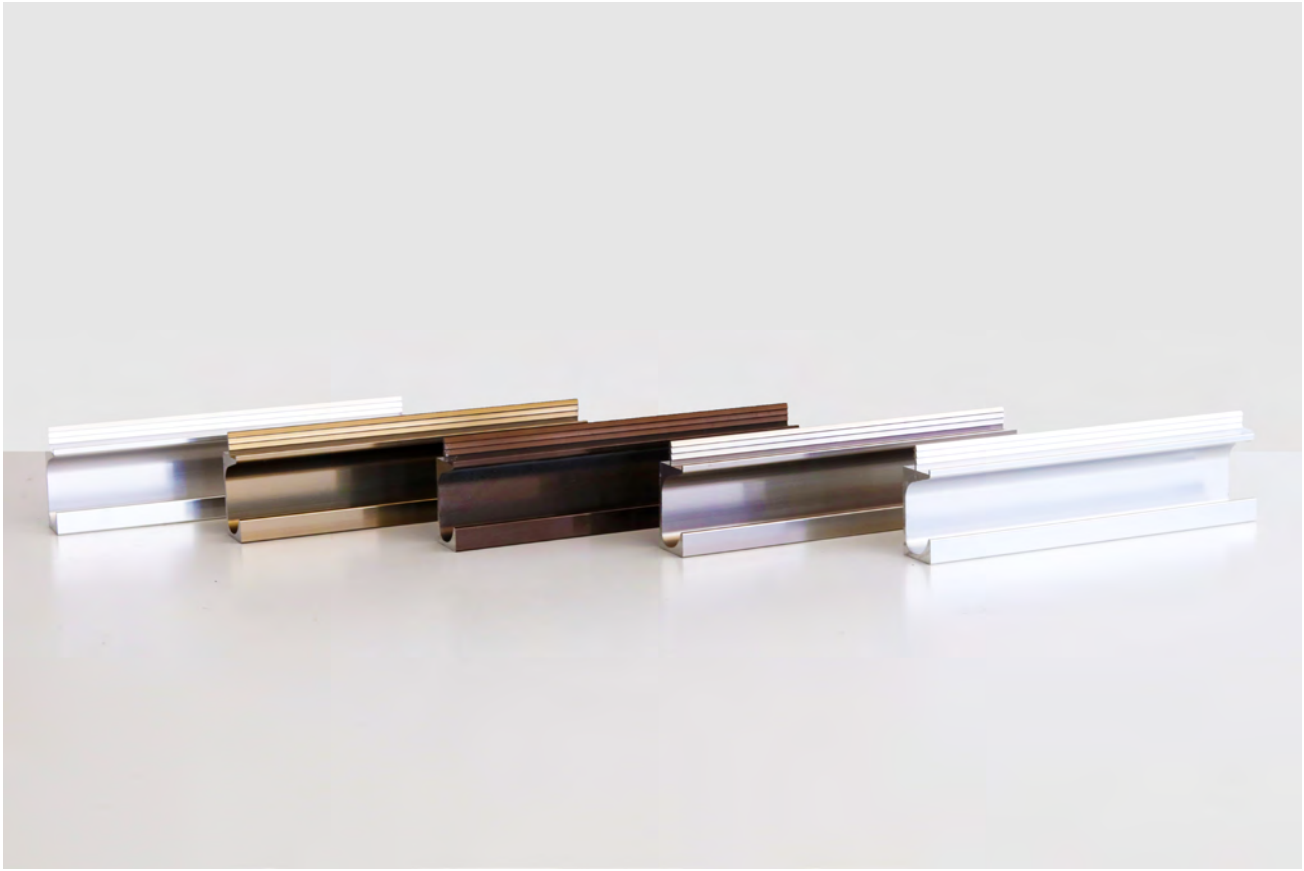
Anodizing is achieved through an electrochemical process that thickens and strengthens the thin natural oxide coating already present on the aluminium.

The anodizing process involves several essential steps. Initially, pretreatment is carried out using acid/alkali solutions to remove dirt, grease, and impurities from the surface. Subsequently, an etching process is applied to roughen the surface. Finally, the profiles to be coated are immersed in an electrolyte and passed through it using direct current. This process utilizes aluminium plates to create an aluminium oxide surface on the profiles. To ensure the quality of the products completed in the anodizing bath pools, the operator conducts measurements to check the coating thickness. Products meeting the quality standards are prepared for shipment in line with customer requests.

Anodizing is a preferred process for several reasons. Firstly, it enhances the corrosion resistance of the aluminium profiles, extending the product's lifespan. Additionally, the anodizing process offers an elegant appearance, with a wide range of color options available.

Intended Use of Product

We produce special or standard aluminum extrusion profiles for many different sectors. The most common applications of our aluminium are automotive, food processing, construction industries. It is used for structural glazing, glass houses, green buildings, structural buildings, partitions, doors, and windows.



Technical Specifications

Product-related Certifications:
Anodized Aluminium Profile Technical Specifications

UN CPC Code: 41532, Bars, rods and profiles, of aluminium

Product	Standards	Description
Anodized Aluminium Profile	QUALANOD	Specifications for the QUALANOD Quality Label for Sulfuric Acid-Based Anodizing of Aluminium
	TS EN ISO 2143	Anodizing of aluminium and its alloys - Estimation of loss of absorptive power of anodic oxidation coatings after sealing - Dye-spot test with prior acid treatment
	TS 545	Preparation of Standard Solutions for Volumetric Analysis
	TS 4922	Coating of aluminium or aluminium alloys by anodic oxidation process – Technical specifications
	TS EN 12152	Curtain walling - Air permeability - Performance requirements and classification
	TS EN 12154	Curtain walling - Watertightness - Performance requirements and classification
	TS EN 13116	Curtain walling - Resistance to wind load - Performance requirements
	TS EN 15088	Aluminium and aluminium alloys - Structural products for construction works - Technical conditions for inspection and delivery

LCA Information

Declared Unit
The declared unit is a 1 kg of Anodized Aluminium Profile

Reference Service Life
Not applicable

Time Representativeness
The production data in this LCA study represents the period of 1st January 2022 and 31st December 2022.

Database(s) and LCA software used
SimaPro v9.4.0.2 LCA software and Ecoinvent 3.7.0.1

Description of System Boundaries
Cradle to gate with modules
C1–C4 and module D (A1–A3 + C + D)

Cut-off Rules

The cut-off criteria adopted is as stated in ‘’EN 15804:2012+A2:2019’’. Life Cycle Inventory data was incorporated for at least 99% of the total inflows to the three life cycle stages have been included, and a 1% cut-off rule was implemented concerning energy, mass, and environmental significance. Where there is insufficient data or data gaps for a unit process, the cut-off criterion stands at 1% of the overall input for a unit process.

Data Quality and Data Collection

ISO 14044 standard was applied in terms of data collection and quality requirements. Data regarding all input and output flows were provided by Astaş Alüminyum.

According to EN 15804:2012+A2.2019/AC:2021, specific data for the A3 module (Processes over which the manufacturer has influence) was used and collected from the production facility. Specific data include actual product weights, amounts of raw materials used, product content, energy consumption, transportation figures, water consumption and waste amounts. Background data for these stages are taken from Ecoinvent v.3.7.0.1.

Allocation

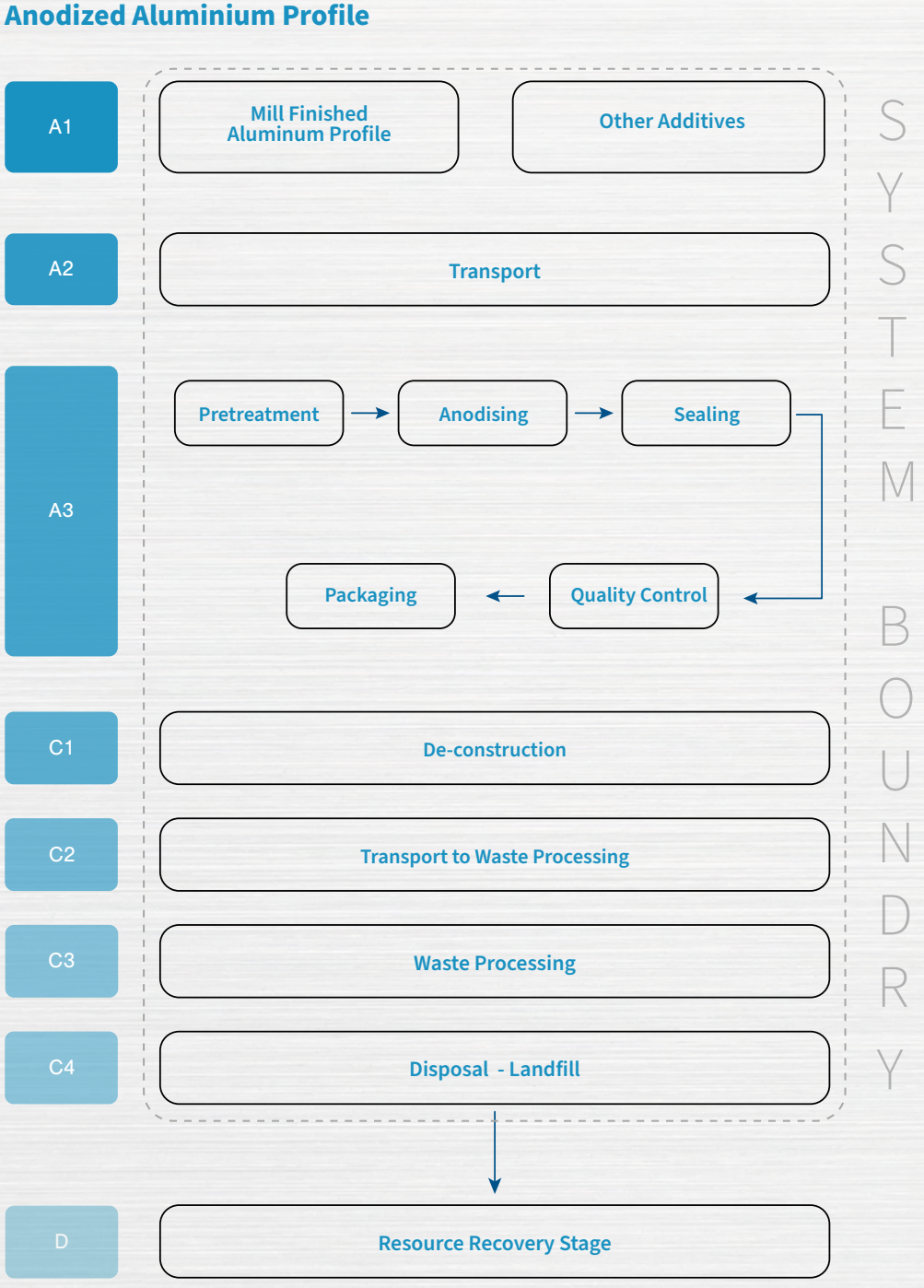
Allocation rules have been performed in accordance with the requirements of ISO 14044:2006.

The methodology for the allocation of mentioned data was mass allocation on the produced amount of products. For extruded profiles, natural gas, electricity and water consumptions, wastes and packaging products are allocated based on the mass of the final products.

Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintanence	Repair	Replacement	Refurbishment	Operaitional energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Recycling Potential
MODULES	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	TR	-	-	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific data used	>99%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-products	Not Relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-sites	Not Relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

System Diagram



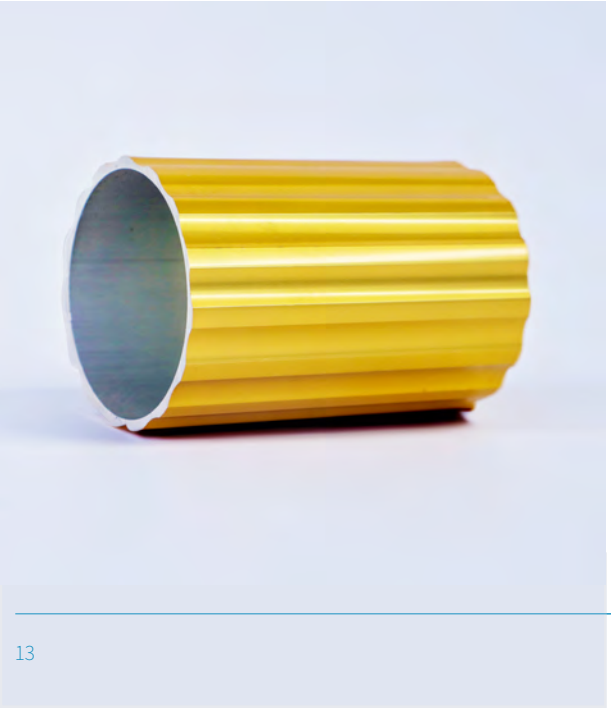
Description of Declared Modules

A1-A3 - Cradle to gate
The aggregation of the modules A1, A2 and A3 is allowed according to EN 15804:2012+A2.2019/AC:2021. This rule is applied in this EPD and denoted by A1-3. This module includes the extraction and processing of raw materials before production stage, transport to production sites, processing of raw materials at the facility and packaging of the final product.

Module A1 represents the extraction and processing of raw materials.

Module A2 covers transportation of the raw materials from supplier to factory gate. The transportation methods taken into account are sea transport and road transport.

Module A3 includes energy and water consumption during the manufacturing process. Additionally, packaging materials are covered in this module. The processing of any waste arising from this stage is also included.



C1 - De-construction
Demolition of the anodized aluminium profile from base construction was assumed to be done manually. Given the scenario that is assumed, environmental impact of de-construction process is not considered under the scope of this study.

C2 - Transport to waste processing
It has been assumed that the transportation to the sorting facility covers an average distance of 200 km.

C3 - Waste processing for reuse, recovery and/or recycling
This module includes the energy consumption required for the sorting of anodized aluminium profile in the recycling process.

C4 - Final disposal
For the end-of-life scenario, 99% of the product will be collected and sorted during de-construction. It is anticipated that 1% of the product will be lost during de-construction, while the remaining 99% will make its way to the sorting/recycling facility.

According to the EU Aluminum programme, for windows, doors and curtain walling, the collection rate of aluminum is 99%, shredding efficiency is 95% and scrap recycled through the refining process: 96.5%. As a result, the overall aluminum recycling rate is: 99%*95%*96.5%= 91%.

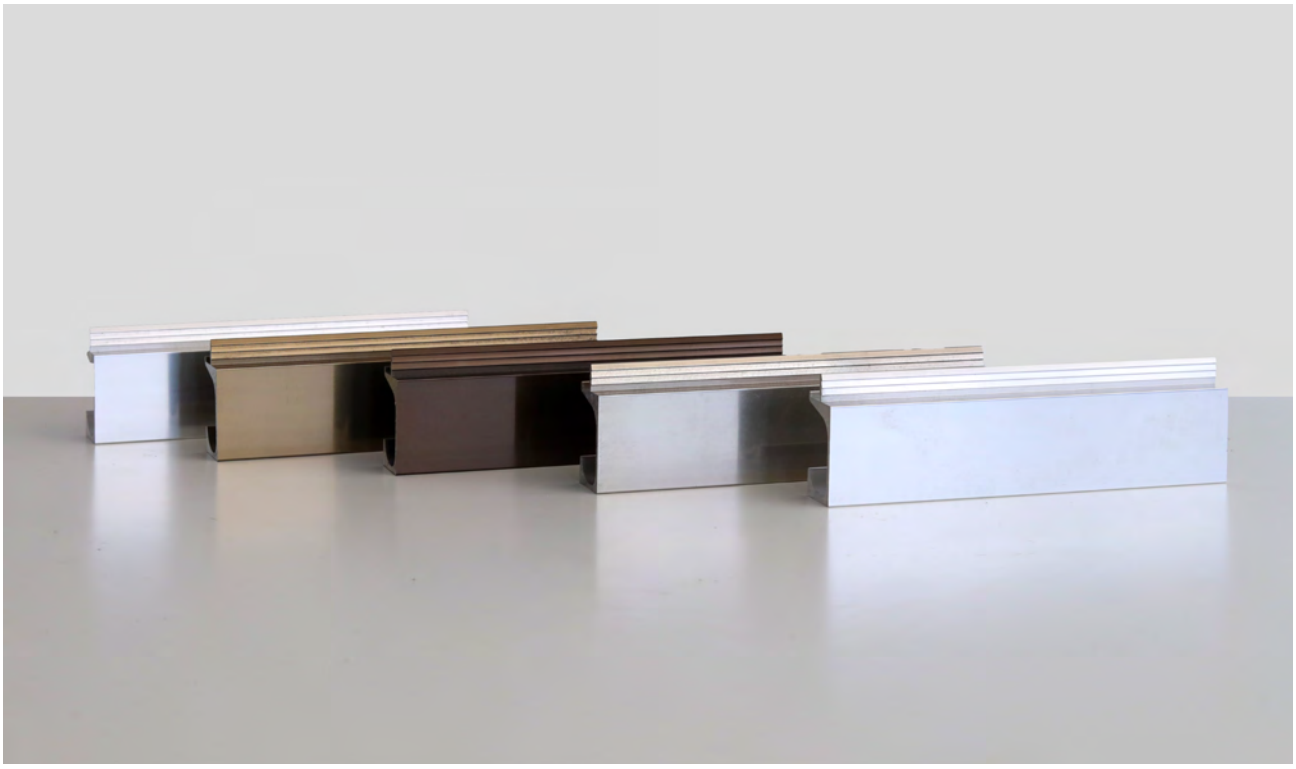
D - Reuse, recovery or recycling
Module D includes the environmental aspects of recycled scrap generated at the end-of-life minus that used Module A1, which stands for the extraction and processing during the production stage.

Anodized aluminium profile inputs to the production stage are subtracted from the construction to be recycled at end-of life in order to obtain the anodized aluminium profile from the product system. This remaining net anodized aluminium profile is then sent to recycling.

Content Declaration

Content Declaration of 1 kg Anodized Aluminium Profile

Product	Primary aluminium, %	Pre-consumer recycled materials, %	Additives, %	Renewable material weight, %	Biogenic carbon weight, %
Anodized Aluminium Profile	50-60	20-30	10-20	0	0-5



Packaging Materials

Content Declaration of Packaging Material, for 1 kg of Anodized Aluminium Profile

Anodized Aluminium Profile	Weight, %	Biogenic carbon, %
Wood	5-10	0-5
Packaging Tape	0-5	0-5
Nylon	0-5	0
Cardboard & Paper	0-5	0-5

Environmental Performance

Mandatory Impact Category Indicators According to EN 15804

Results per Functional or Declared Unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	9.72	0	0.032	0.057	0.004	-5.44
GWP-biogenic	kg CO_2 eq.	-0.179	0	0	1.79E-01	9.80E-05	-0.006
GWP- luluc	kg CO_2 eq.	0.138	0	1.10E-05	4.98E-05	3.43E-06	-0.113
GWP- total	kg CO_2 eq.	9.68	0	0.032	0.236	0.004	-5.56
ODP	kg CFC 11 eq.	7.29E-07	0	7.32E-09	6.62E-09	4.00E-10	-3.99E-07
AP	mol H+ eq.	0.070	0	8.96E-05	2.04E-04	2.39E-05	-0.044
EP-freshwater	kg P eq.	0.004	0	2.20E-06	2.36E-05	1.10E-06	-0.002
EP- marine	kg N eq.	0.010	0	1.87E-05	3.34E-05	5.97E-06	-0.006
EP-terrestrial	mol N eq.	0.103	0	2.03E-04	3.16E-04	6.41E-05	-0.058
POCP	kg NMVOC eq.	0.033	0	7.77E-05	9.46E-05	1.90E-05	-0.019
ADP-minerals&metals*	kg Sb eq.	6.08E-05	0	1.18E-07	6.51E-08	8.08E-09	-1.12E-05
ADP-fossil*	MJ	100	0	0.488	1.02	0.051	-52.5
WDP*	m^3	3.43	0	0.001	0.006	0.001	-1.41
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption						

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Environmental Performance

Additional Mandatory and Voluntary Impact Category Indicators

Results per Functional or Declared Unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	9.59	0	0.032	0.056	0.003	-5.53
Results according to EN 15804:2012+A2.2019/AC:2021 for 1 kg of Aluminium Profile							
PM	[disease inc.]	7.94E-07	0	2.03E-09	8.52E-10	3.42E-10	-5.35E-07
IRP	[kBq U235 eq]	0.797	0	0.003	0.014	3.00E-04	-0.594
ETP-fw	[CTUe]	287	0	0.375	0.328	57.3	-161
HT-C	[CTUh]	2.17E-08	0	1.33E-11	1.13E-11	3.44E-12	-1.62E-08
HT-nc	[CTUh]	3.29E-07	0	3.67E-10	2.61E-10	8.67E-11	-2.29E-07
SQP	[pt]	35.8	0	0.341	0.086	0.066	-9.48
Acronyms	GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology; PM = Potential incidence of disease due to PM emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw = Potential Comparative Toxic Unit for ecosystems; HT-C = Potential Comparative Toxic Unit for humans; HT-nc = Potential Comparative Toxic Unit for humans; SQP = Potential soil quality index (SQP)						

[1]*This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.*

** Disclaimers shall be added, if required by EN 15804.*

** Disclaimer 2: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.*

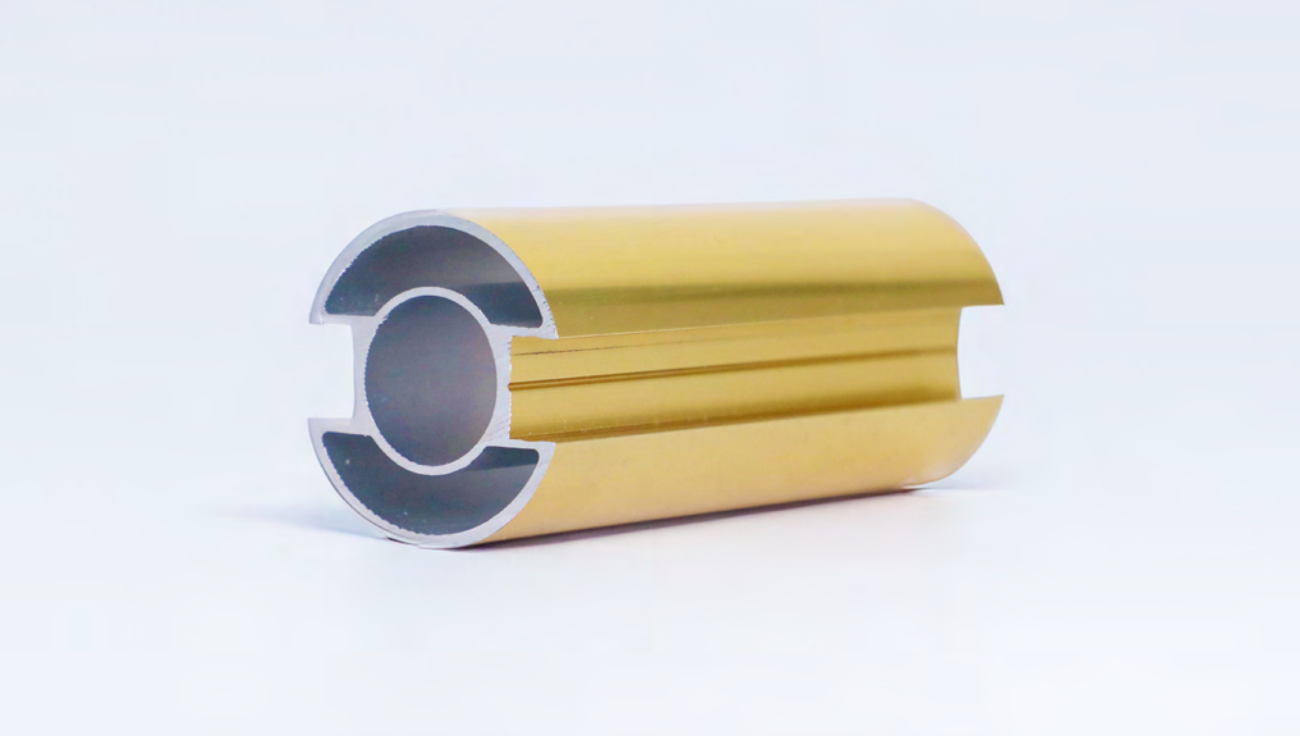
** Disclaimer 3: The results of this environmental impact*

Use of Resources

Results per Functional or Declared Unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	51.3	0	0.007	0.079	0.003	-39.6
PERM	MJ	0	0	0	0	0	0
PERT	MJ	51.3	0	0.007	0.079	0.003	-39.6
PENRE	MJ	106	0	0.518	1.10	0.055	-55.4
PENRM	MJ	0	0	0	0	0	0
PENRT	MJ	106	0	0.518	1.10	0.055	-55.4
SM	kg	0.336	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0
FW	m3	0.469	0	4.45E-04	0.005	1.72E-04	-0.247
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

Waste Production

Results per Functional or Declared Unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	0	0	0	0	0	0
Non-hazardous waste disposed	kg	0.011	0	0	0	0	0
Radioactive waste disposed	kg	0	0	0	0	0	0



Output Flows

Results per Functional or Declared Unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0	0	0	0	0	0
Material for recycling	kg	0	0	0	0	0	0
Materials for energy recovery	kg	0.052	0	0	0	0	0
Exported energy, electricity	MJ	0	0	0	0	0	0
Exported energy, thermal	MJ	0	0	0	0	0	0

References

ISO 14040 2021 Environmental management - Life cycle assessment - Principles and framework

ISO 14044 2021 Environmental management - Life cycle assessment - Requirements and guidelines

ISO 14025 2006 Environmental labels and declarations - Type III environmental declarations - Principles and procedures

ISO 14020 2000 Environmental labels and declarations - General principles

EN 15804:2012+A2.2019/AC:2021 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

The International EPD® System www.environdec.com

The International EPD® System The General Programme Instructions v4

The International EPD® System PCR 2019:14 Construction products v1.2.5 (EN 15804:2012+A2.2019/AC:2021)

Ecoinvent 3.7 www.ecoinvent.org

SimaPro LCA Software www.simapro.com

Astaş Alüminyum San. ve Tic. A.Ş. www.astasalu.com.tr

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