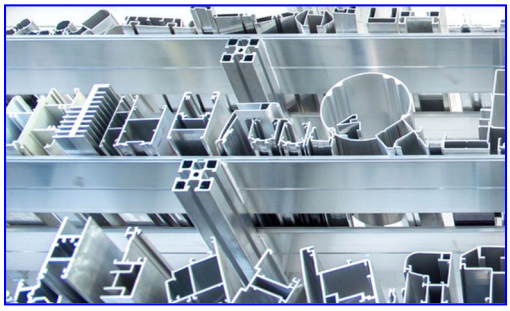
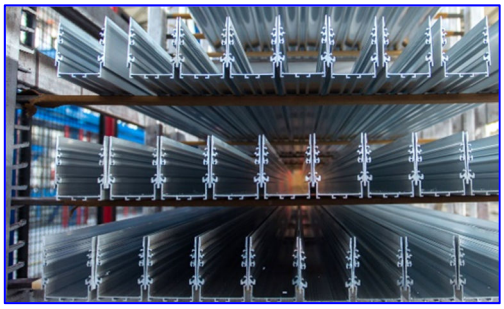
Environmental Product Declaration

Declaration Code: EPD-EAP-GB-62.0





EMERUS

EMERUS d.o.o.

Semi-finished products

Aluminium profiles

EPD
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Basis:

DIN EN ISO 14025
EN15804

Company EPD
Environmental
Product **D**eclaration

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Environmental Product Declaration

Declaration Code: EPD-EAP-GB-62.0

Programme operator	ift Rosenheim GmbH Theodor-Gietl-Straße 7-9 D-83026 Rosenheim		
Practitioner of the LCA	ift Rosenheim GmbH Theodor-Gietl-Straße 7-9 D-83026 Rosenheim		
Declaration holder	EMERUS d.o.o. Knespolje bb BIH-88220 Široki Brijeg www.emerus.eu		
Declaration code	EPD-EAP-GB-62.0		
Designation of declared product	Aluminium profiles		
Scope	Aluminium profile (bright), electrostatically powder-coated aluminium profile and anodized aluminium profile.		
Basis	This EPD was prepared on the basis of EN ISO 14025:2011 and DIN EN 15804:2012+A2:2019. In addition, the “Allgemeiner Leitfaden zur Erstellung von Typ III Umweltproduktdeklarationen” (Guidance on preparing Type III Environmental Product Declarations) applies. The Declaration is based on the PCR Document “PCR Part A" PCR-A-0.3:2018 and "Semi-finished products" PCR-HZ-2.2:2018.		
Validity	Publication date: 25.08.2022	Last revision: 12.09.2022	Next revision: 25.08.2027
	This verified Company Environmental Product Declaration (company EPD) applies solely to the specified products and is valid for a period of five years from the date of publication in accordance with DIN EN 15804.		
LCA basis	The LCA was prepared in accordance with DIN EN ISO 14040 and DIN EN ISO 14044. The base data include both the data collected at the EMERUS d.o.o. production site and the generic data derived from the "GaBi 10“ database. LCA calculations were carried out for the included “cradle to gate” life cycle including all upstream chains (e.g. raw material extraction, etc.).		
Notes	The “Conditions and Guidance on the Use of ift Test Documents” apply. The declaration holder assumes full liability for the underlying data, certificates and verifications.		

Christian Kehrer Head of Certification and Surveillance Body	Dr. Torsten Mielecke Chairman of Expert Committee ift-EPD and PCR	Patrick Wortner External verifier

1 General product information

Product definition

The EPD forms part of the product group “Semi-finished products” and applies to:

1 kg of aluminium profile made by EMERUS d.o.o.

They are subdivided into following product groups:

Product group (PG):	Designation*	Declared unit	Density
PG1	Aluminium profile (bright)	1 kg	2.7 g/cm³
PG2	Electrostatically powder-coated aluminium profile	1 kg	2.7 g/cm³
PG3	Anodized aluminium profile	1 kg	2.7 g/cm³

Table 1: Product groups

The average unit is declared as follows:
Directly used material flows are determined using the masses produced (kg) and assigned to the declared unit. All other inputs and outputs in the production were scaled to the declared unit in their entirety since no typical functional unit was available due to the great diversity of variants. The reference period is the year 2021/2022.

The validity of the EPD is restricted to the following models of different types and/or dimensions:
- A
- BT
- OE
- P
- PE
- PK
- PM
- PR
- PS
- T
- TQ
- TR
- TT
- U
- Z

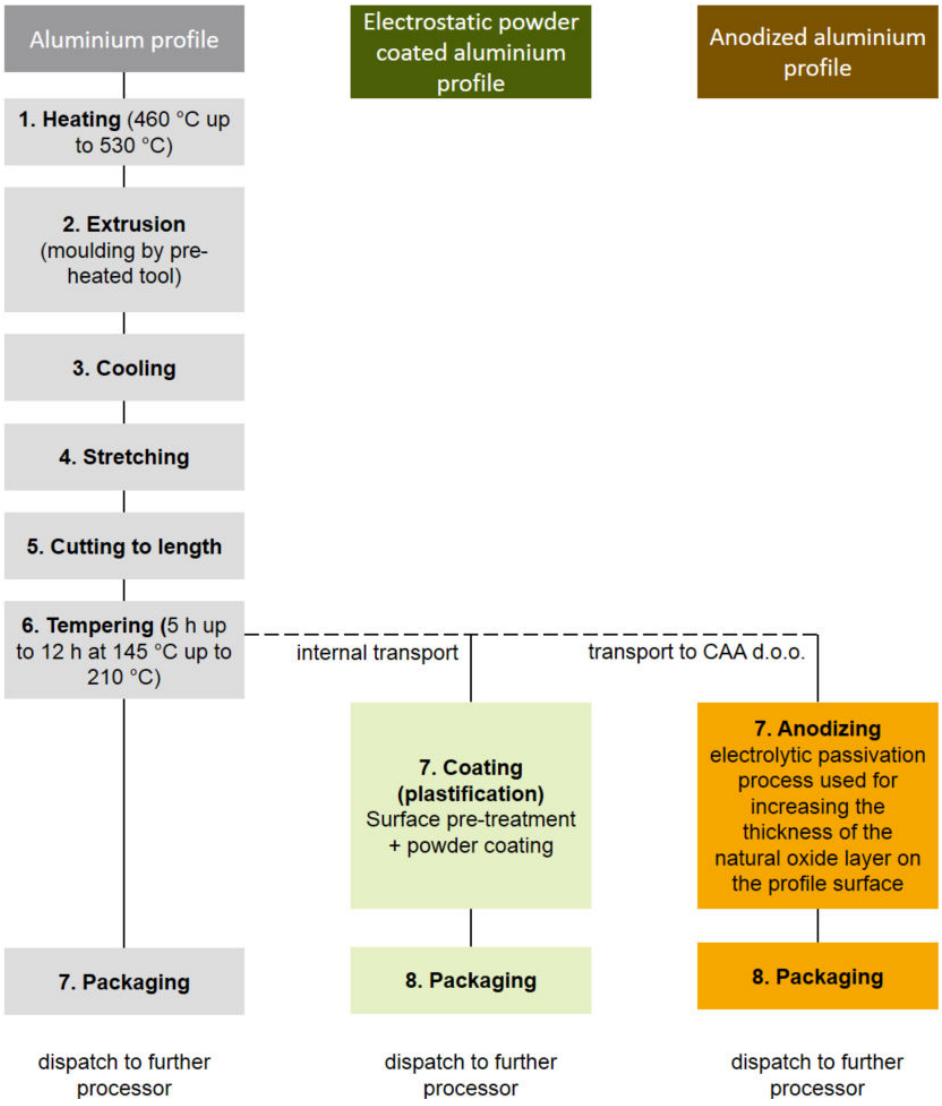
Product description

The aluminium profiles made by EMERUS d.o.o. are semi-finished products designed for the construction industry, for consumer and industrial goods, for automotive production or even the solar industry, The profiles are made from aluminium alloys, which consist of light metal

aluminium (Al) and different alloying components (silicon, copper, manganese, magnesium etc.). Depending on the customer's requirements, the uncoated aluminium profiles can be further processed in one or more machining steps before becoming the final product. Aluminium profiles are made from different aluminium alloys (EN-AW 1050, EN AW 6005, EN AW 6060, EN AW 6063, EN AW 6082 etc.). Extrusion does not change the chemical composition, it remains unchanged. The alloy used varies with the intended use of the profile. The mechanical characteristics of the profiles meet the requirements of the international standards, they have been tested and certified.

For a detailed product description refer to the manufacturer specifications or the product specifications of the respective offer/quotation.

Product manufacture



Scope

Aluminium profiles for further processing.

Management systems

The following management systems are in place:

- Quality management as per ISO 9001:2015
- Environmental management as per ISO 14001:2015

Additional information

For additional evidence of fitness for use or certificates of conformity, if applicable, refer to the CE marking and the documents accompanying the product.

Aluminium profiles fulfil the requirements set out in EN 15088 - Aluminium and aluminium alloys - Structural products for construction works.

In addition, they fulfil the following building physics performance characteristics:

- Chemical composition and form of products as per EN 573-3
- Mechanical characteristics as per EN 755-2
- Tolerances on dimensions and form as per EN 12020
- Profiles, tolerances on dimensions and form as per EN 755-9
- Design of aluminium structures as per EN 1999-1-1
- Design of aluminium structures. Structures susceptible to fatigue as per EN 1999-1-3

2 Materials used

Primary materials

The primary materials used are listed in the LCA (see Section 7).

Declarable substances

The product contains no substances from the REACH candidate list (declaration dated 12 May 2022).

All relevant safety data sheets are available from EMERUS d.o.o.

3 Construction process stage

Processing recommendations, installation

Observe the instructions for assembly/installation, operation, maintenance and disassembly, provided by the manufacturer. See www.emerus.eu

4 Use stage

Emissions to the environment

No emissions to indoor air, water and soil are known. There may be VOC emissions.

Reference service life (RSL)

No reference service life (RSL) can be determined for a “Cradle to gate” EPD with the Modules C1-C4 and Module D (A1-A3 + C + D), because no reference use conditions are stated.
The reference service life (RSL) of the aluminium profiles made by EMERUS d.o.o. is not specified because they are semi-finished products.

5 End-of-life stage

Possible end-of-life stages

The aluminium profiles are shipped to central collecting points. There the products are usually shredded and sorted into their original constituents. The end-of-life stage depends on the site where the products are used and is therefore subject to the local regulations. Observe the locally applicable regulatory requirements.

This EPD represents the end-of-life modules based on the current market situation.
95% of aluminium is recycled after demolition. Residual fractions are sent to landfill/disposed.

Disposal routes

The LCA includes the average disposal routes.

All life cycle scenarios are detailed in the Annex.

6 Life Cycle Assessment (LCA)

Environmental product declarations are based on life cycle assessments (LCAs) which use material and energy flows for the calculation and subsequent representation of environmental impacts.

As the basis for this, Life Cycle Assessments (LCAs) were prepared for aluminium profiles. The LCAs are in conformity with the requirements set out in DIN EN 15804 and the international standards DIN EN ISO 14040, DIN EN ISO 14044, ISO 21930 and EN ISO 14025.

The LCA is representative of the products presented in the Declaration and the specified reference period.

6.1 Definition of goal and scope

Goal

The goal of the LCA is to demonstrate the environmental impacts of the products. In accordance with DIN EN 15804, the environmental impacts covered by this Environmental Product Declaration are presented for the entire product life cycle in the form of basic information. No other additional environmental impacts are specified.

Data quality, data availability and geographical and time-related system boundaries

The specific data originate exclusively from the 2021/2022 fiscal years. They were collected on-site at the plant located in Široki Brijeg and originate in parts from company records and partly from values directly obtained by measurement. Validity of the data was checked by the ift Rosenheim.

The generic data originate from the “GaBi 10” professional and building materials databases. The last update of both databases was in 2022. Data from before this date originate also from these databases and are not more than ten years old. No other generic data were used for the calculation.

Data gaps were either filled with comparable data or conservative assumptions, or the data were cut off in compliance with the 1% rule.

The life cycle was modelled using the sustainability software tool “GaBi” for the development of life cycle assessments.

Scope / system boundaries

The system boundaries refer to the supply of raw materials and purchased parts, manufacture/production and end-of-life aluminium profiles (cradle to gate).
Additional data from the anodizing plant were taken into consideration for product group 3.

Cut-off criteria

All company data collected, i.e. all commodities, input and raw materials used, the thermal energy and electricity consumption, were taken into consideration.

The boundaries cover only the product-relevant data. Building sections/parts of facilities that are not relevant to the manufacture of the products, were excluded.

The transport distances of the pre-products were taken into consideration as a function of 100% of the mass of products.
The transport distances of the pre-products in the anodizing plant were not taken into account. They were covered by the transport mix. The transport mix is composed as follows and originates from the research project "EPDs für transparente Bauelemente" (EPDs for transparent building components).

- Truck, 26 – 28 t total weight / 18.4 t payload, Euro 6, freight, 85% capacity used, 100 km;
- Truck-trailer, 28– 34 t total weight / 22 t payload, Euro 6, 50% capacity used, 50 km;
- Freight train, electrical and diesel driven; D 60%, E 51% capacity used, 50 km
- Seagoing vessel, consumption mix, 50 km.

The criteria for the exclusion of inputs and outputs as set out in DIN EN 15804 are fulfilled. From the data analysis it can be assumed that the total of negligible processes per life cycle stage does not exceed 1% of the mass/primary energy. This way the total of negligible processes does not exceed 5% of the energy and mass input. The life cycle calculation also includes material and energy flows that account for less than 1%.

6.2 Inventory analysis

Goal

All material and energy flows are described below. The processes covered are presented as input and output parameters and refer to the declared/functional units.

Life cycle stages

The Annex shows the entire life cycle of the aluminium profiles. Product stage (A1- A3), end-of-life stage (C1- C4) and benefits and loads beyond the system boundaries (D) are considered.

Benefits

The below benefits have been defined as per DIN EN 15804:

- Benefits from recycling

Allocation of co-products

The manufacture of the product does not give rise to any allocations.

Allocations for re-use, recycling and recovery

If the products are re-used/recycled and recovered during the product stage (rejects), the components are shredded, if necessary and then sorted into their single constituents. This is done by various process plants, e.g. magnetic separators.
The system boundaries were set following their disposal, reaching the end-of-waste status.

Allocations beyond life cycle boundaries

Use of recycled materials in the manufacturing process was based on the current market-specific situation. In parallel to this, a recycling potential was taken into consideration that reflects the economic value of the product after recycling (recyclate) .
Secondary material included as inputs in the aluminium profiles is calculated as input without loads. No benefits are allocated to Module D, but consumption is allocated to Modules C3 and C4 (worst case consideration)
The system boundary set for the recycled material refers to collection.

Secondary material

The use of secondary material in Module A3 was considered for EMERUS d.o.o.. Secondary material is used.

Inputs

The LCA includes the following production-relevant inputs per 1 kg of aluminium profile (bright), electrostatically powder-coated aluminium profile, anodized aluminium profile:

Energy
The liquid gas (LPG) input material is based on “EU-28 liquid gas (LPG)“, the diesel input material is based on “EU-28 diesel Mix”. The electricity mix is based on “EMERUS d.o.o.” electricity mix (see Table 2).

Electricity disclosure	Shares in %
Hydro power	29.21
Biogas/mass, waste	69.43
Wind power, solar energy etc.	1.36

Table 2: “EMERUS d.o.o.” electricity mix (1)

Water
The water consumed by the individual process steps for the production amounts to a total of 7.03E-02 l per kg aluminium profile (bright), 6.79E-02 l per kg electrostatically powder-coated aluminium profile and 10.52 l per kg anodized aluminium profile.

The consumption of fresh water specified in Section 6.3 originates (among others) from the process chain of the pre-products and the process water used for cooling.

Raw material / pre-products
The chart below shows the share of raw materials/pre-products in %.

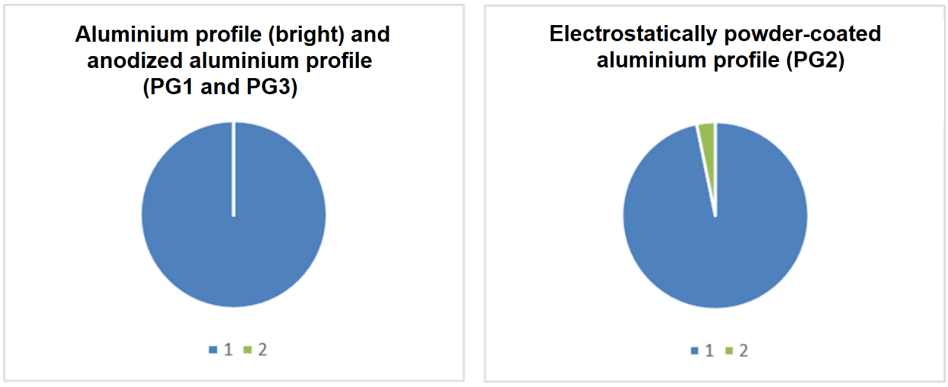


Figure 1: Percentage of individual materials per declared unit

No.	Material	Mass in % per kg		
		PG1	PG2	PG3
1	Aluminium	100.00	96.78	100.00
2	Powder coating	0.00	3.22	0.00

Table 3: Percentage of individual materials per declared unit

Ancillary materials and consumables
The amounts of ancillary materials and consumables used are as follows: 0.03 g per kg aluminium profile (bright), 0.05 g per kg electrostatically powder-coated aluminium profile and 0.26 g per kg anodized aluminium profile:

Product packaging
The amounts used for product packaging are as follows:

No.	Material	Mass in g per kg		
		PG1	PG2	PG3
1	Films and plastics	6.78	6.78	8.14
2	Paper and cartonboard	21.60	21.58	23.85
3	Wood	27.86	27.86	27.86

Table 4: Weight in g of packaging per declared unit

Biogenic carbon content
Only the biogenic carbon content of the associated packaging is specified, as the total mass of substances containing biogenic carbon is less than 5% of the total mass of the product and associated packaging. According to EN 16449, packaging produces the following amounts of biogenic carbon:

No.	Component	PG1	PG2	PG3
1	In the associated packaging in kg C per kg	2.02E-02	2.02E-02	2.10E-02
2	In the associated packaging in CO_2 eq. per kg	6.29E-02	6.28E-02	6.53E-02

Table 5: Biogenic carbon content of packaging at gate

Outputs

The LCA includes the following production-relevant outputs per 1 kg of aluminium profile (bright), electrostatically powder-coated aluminium profile, anodized aluminium profile:

Waste
Secondary raw materials were included in the benefits.
See Section 6.3 - Impact assessment

Waste water
No waste water is produced during the production in the EMERUS d.o.o. plant. The surface treatment of the aluminium profiles from Product Group 3 produces 8.18 l per kg of anodized aluminium profile.

6.3 Impact assessment

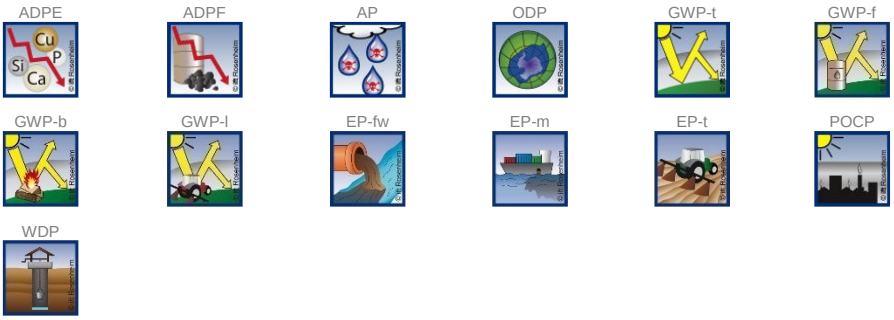
Goal

The impact assessment covers both inputs and outputs. The impact categories applied are named below:

Impact categories

The models for impact assessment were applied as described in DIN EN 15804-A2.
The impact categories presented in the EPD are as follows:

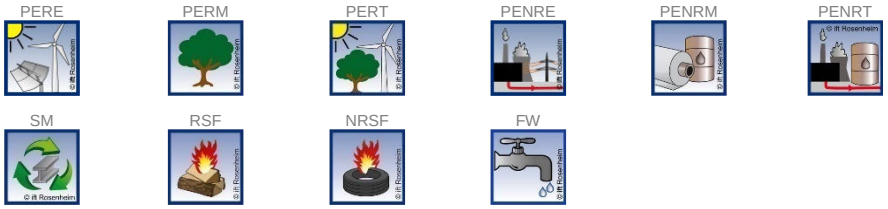
- depletion of abiotic resources – minerals and metals;
- depletion of abiotic resources– fossil fuels;
- acidification;
- ozone depletion;
- climate change – total;
- climate change - fossil;
- climate change - biogenic;
- climate change – land use and land use change
- eutrophication aquatic fresh water;
- eutrophication aquatic marine;
- eutrophication terrestrial;
- photochemical ozone creation;
- water use.



Use of resources

The models for impact assessment were applied as described in DIN EN 15804-A2.
The EPD presents the following indicators for the use of resources:

- renewable primary energy as energy resource;
- renewable primary energy for material use;
- total use of renewable primary energy;
- non-renewable primary energy as energy resource;
- renewable primary energy for material use;
- total use of non-renewable primary energy;
- use of secondary materials;
- use of renewable secondary fuels;
- use of non-renewable secondary fuels;
- net use of fresh water resources.



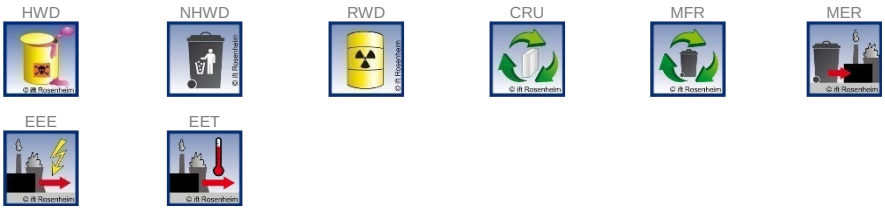
Waste

The waste generated during the production of 1kg aluminium profile (bright), electrostatically powder-coated aluminium profile, anodized aluminium profile is evaluated and shown separately for the fractions trade wastes, special wastes and radioactive wastes. Since waste handling is modelled within the system boundaries, the amounts shown refer to the deposited wastes. A portion of the waste indicated is generated during the manufacture of the pre-products.

The models for impact assessment were applied as described in DIN EN 15804-A2.
The waste categories and indicators for output material flows presented in the EPD are as follows:

- hazardous waste disposed;
- non-hazardous waste disposed;
- radioactive waste;
- components for further use;
- materials for recycling;
- materials for energy recovery;

- exported electrical energy;
- exported thermal energy.



Additional environmental impact indicators

The models for impact assessment were applied as described in DIN EN 15804-A2.
The additional impact categories presented in the EPD are as follows:

- particulate matter emissions
- ionizing radiation, human health
- eco-toxicity (fresh water)
- human toxicity - carcinogenic effect
- human toxicity - non-carcinogenic effect
- land use related impacts / soil quality

Results per 1 kg of aluminium profile (bright)																
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Core indicators																
GWP-t	kg CO_2 eq.	8.15	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.38E-03	4.91E-02	1.41E-03	-4.37
GWP-f	kg CO_2 eq.	8.21	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.37E-03	4.87E-02	1.45E-03	-4.36
GWP-b	kg CO_2 eq.	-6.43E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	-3.26E-06	4.38E-04	-4.31E-05	-1.04E-02
GWP-l	kg CO_2 eq.	2.03E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.32E-05	1.03E-05	2.69E-06	-9.88E-04
ODP	kg CFC -11 eq.	3.19E-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.41E-16	7.12E-13	3.42E-15	-2.69E-12
AP	mol H^+ eq.	4.08E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.74E-06	1.07E-04	1.03E-05	-2.19E-02
EP-fw	kg P eq	3.96E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	7.05E-09	1.42E-07	2.47E-09	-1.76E-06
EP-m	kg N eq.	5.28E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	9.62E-07	2.40E-05	2.64E-06	-2.81E-03
EP-t	mol N eq.	5.75E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.13E-05	2.51E-04	2.90E-05	-3.06E-02
POCP	kg NMVOC eq.	1.63E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.41E-06	6.48E-05	8.02E-06	-8.69E-03
ADPF*[2]	MJ	103.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.15E-02	0.88	1.91E-02	-55.00
ADPE*[2]	kg Sb eq.	5.48E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.97E-10	1.33E-08	1.49E-10	-3.05E-07
WDP*[2]	m^3 world eq. deprived	1.26	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.11E-05	1.11E-02	1.59E-04	-0.67
Use of resources																
PERE	MJ	51.13	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.79E-03	0.49	2.86E-03	-25.50
PERM	MJ	0.79	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
PERT	MJ	51.13	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.79E-03	0.49	2.86E-03	-25.50
PENRE	MJ	103.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.16E-02	0.88	1.91E-02	-55.10
PENRM	MJ	0.14	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
PENRT	MJ	103.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.16E-02	0.88	1.91E-02	-55.10
SM	kg	1.16E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.03E-06	4.67E-04	4.83E-06	-6.46E-02
NRSF	MJ	0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
Waste categories																
HWD	kg	1.09E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.51E-13	7.64E-11	9.80E-13	-2.96E-09
NHWD	kg	2.42	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	4.53E-06	6.65E-04	9.76E-02	-1.31
RWD	kg	6.15E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.89E-08	1.41E-04	2.12E-07	-3.31E-03
Output material flows																
CRU	kg	0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
MFR	kg	1.63E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.95	0.00	0.00
MER	kg	0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
EEE	MJ	1.10E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
EET	MJ	2.27E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00

Key:
GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - eutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*[2]** - abiotic depletion potential – fossil resources **ADPE*[2]** - abiotic depletion potential – minerals&metals **WDP*[2]** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **PENRT** - total use of non-renewable primary energy resources **SM** - use of secondary material **RSF** - use of renewable secondary fuels **NRSF** - use of non-renewable secondary fuels **FW** - net use of fresh water **HWD** - hazardous waste disposed **NHWD** - non-hazardous waste disposed **RWD** - radioactive waste disposed **CRU** - components for re-use **MFR** - materials for recycling **MER** - materials for energy recovery **EEE** - exported electrical energy **EET** - exported thermal energy

Results per 1 kg of aluminium profile (bright)															
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	4.26E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.65E-11	8.85E-10	1.27E-10	-2.26E-07
IRP*[1]	kBq U235 eq.	1.28	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	5.71E-06	2.39E-02	2.36E-05	-0.70
ETP-fw*[2]	CTUe	36.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.19E-02	0.39	1.07E-02	-19.40
HTP-c*[2]	CTUh	4.84E-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	4.41E-13	1.11E-11	1.63E-12	-2.53E-09
HTP-nc*[2]	CTUh	1.06E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.32E-11	4.06E-10	1.80E-10	-5.23E-08
SQP*[2]	Dimensionless	16.76	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.09E-02	0.32	3.97E-03	-1.92

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Eco-toxicity potential – freshwater **HTP-c*[2]** - Human toxicity potential – cancer effects **HTP-nc*[2]** - Human toxicity potential – non-cancer effects **SQP*[2]** – soil quality potential

Disclaimers

*1 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 building materials is also not measured by this indicator

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

Results per 1 kg of electrostatically powder-coated aluminium profile																
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Core indicators																
GWP-t	kg CO_2 eq.	8.20	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.38E-03	4.91E-02	1.41E-03	-4.37
GWP-f	kg CO_2 eq.	8.26	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.37E-03	4.87E-02	1.45E-03	-4.36
GWP-b	kg CO_2 eq.	-6.30E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	-3.26E-06	4.38E-04	-4.31E-05	-1.04E-02
GWP-l	kg CO_2 eq.	1.99E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.32E-05	1.03E-05	2.69E-06	-9.88E-04
ODP	kg CFC -11 eq.	6.39E-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.41E-16	7.12E-13	3.42E-15	-2.69E-12
AP	mol H^+ eq.	3.96E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.74E-06	1.07E-04	1.03E-05	-2.19E-02
EP-fw	kg P eq	4.27E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	7.05E-09	1.42E-07	2.47E-09	-1.76E-06
EP-m	kg N eq.	5.20E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	9.62E-07	2.40E-05	2.64E-06	-2.81E-03
EP-t	mol N eq.	5.66E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.13E-05	2.51E-04	2.90E-05	-3.06E-02
POCP	kg NMVOC eq.	1.62E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.41E-06	6.48E-05	8.02E-06	-8.69E-03
ADPF*[2]	MJ	101.95	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.15E-02	0.88	1.91E-02	-55.00
ADPE*[2]	kg Sb eq.	5.92E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.97E-10	1.33E-08	1.49E-10	-3.05E-07
WDP*[2]	m^3 world eq. deprived	1.23	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.11E-05	1.11E-02	1.59E-04	-0.67
PERE	MJ	51.79	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.79E-03	0.49	2.86E-03	-25.50
PERM	MJ	0.79	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
PERT	MJ	51.79	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.79E-03	0.49	2.86E-03	-25.50
PENRE	MJ	101.95	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.16E-02	0.88	1.91E-02	-55.10
PENRM	MJ	0.86	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	-0.68	-0.04	0.00
PENRT	MJ	101.95	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.16E-02	0.88	1.91E-02	-55.10
SM	kg	1.12E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.03E-06	4.67E-04	4.83E-06	-6.46E-02
NRSF	MJ	0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
HWD	kg	1.09E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.51E-13	7.64E-11	9.80E-13	-2.96E-09
NHWD	kg	2.39	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	4.53E-06	6.65E-04	9.76E-02	-1.31
RWD	kg	5.92E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.89E-08	1.41E-04	2.12E-07	-3.31E-03
CRU	kg	0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
MFR	kg	3.30E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.95	0.00	0.00
MER	kg	0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
EEE	MJ	1.49E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
EET	MJ	3.07E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00

Key:
GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - feutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*[2]** - abiotic depletion potential – fossil resources **ADPE*[2]** - abiotic depletion potential – minerals&metals **WDP*[2]** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **PENRT** - total use of non-renewable primary energy resources **SM** - use of secondary material **RSF** - use of renewable secondary fuels **NRSF** - use of non-renewable secondary fuels **FW** - net use of fresh water **HWD** - hazardous waste disposed **NHWD** - non-hazardous waste disposed **RWD** - radioactive waste disposed **CRU** - components for re-use **MFR** - materials for recycling **MER** - materials for energy recovery **EEE** - exported electrical energy **EET** - exported thermal energy

Results per 1 kg of electrostatically powder-coated aluminium profile																
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	4.15E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.65E-11	8.85E-10	1.27E-10	-2.26E-07
IRP*[1]	kBq U235 eq.	1.24	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	5.71E-06	2.39E-02	2.36E-05	-0.70
ETP-fw*[2]	CTUe	38.08	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.19E-02	0.39	1.07E-02	-19.40
HTP-c*[2]	CTUh	4.79E-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	4.41E-13	1.11E-11	1.63E-12	-2.53E-09
HTP-nc*[2]	CTUh	1.10E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.32E-11	4.06E-10	1.80E-10	-5.23E-08
SQP*[2]	Dimensionless	16.85	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.09E-02	0.32	3.97E-03	-1.92

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Eco-toxicity potential – freshwater **HTP-c*[2]** - Human toxicity potential – cancer effects **HTP-nc*[2]** - Human toxicity potential – non-cancer effects **SQP*[2]** – soil quality potential

Disclaimers

*1 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 building materials is also not measured by this indicator

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

	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Results per 1 kg of anodized aluminium profile																
Core indicators																
GWP-t	kg CO_2 eq.	8.33	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.38E-03	4.91E-02	1.41E-03	-4.37
GWP-f	kg CO_2 eq.	8.39	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.37E-03	4.87E-02	1.45E-03	-4.36
GWP-b	kg CO_2 eq.	-6.30E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	-3.26E-06	4.38E-04	-4.31E-05	-1.04E-02
GWP-l	kg CO_2 eq.	2.27E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.32E-05	1.03E-05	2.69E-06	-9.88E-04
ODP	kg CFC -11 eq.	9.91E-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.41E-16	7.12E-13	3.42E-15	-2.69E-12
AP	mol H^+ eq.	4.15E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.74E-06	1.07E-04	1.03E-05	-2.19E-02
EP-fw	kg P eq	9.89E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	7.05E-09	1.42E-07	2.47E-09	-1.76E-06
EP-m	kg N eq.	5.40E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	9.62E-07	2.40E-05	2.64E-06	-2.81E-03
EP-t	mol N eq.	5.86E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.13E-05	2.51E-04	2.90E-05	-3.06E-02
POCP	kg NMVOC eq.	1.67E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.41E-06	6.48E-05	8.02E-06	-8.69E-03
ADPF*[2]	MJ	109.69	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.15E-02	0.88	1.91E-02	-55.00
ADPE*[2]	kg Sb eq.	5.68E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.97E-10	1.33E-08	1.49E-10	-3.05E-07
WDP*[2]	m^3 world eq. deprived	1.39	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.11E-05	1.11E-02	1.59E-04	-0.67
PERE	MJ	56.42	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.79E-03	0.49	2.86E-03	-25.50
PERM	MJ	0.83	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
PERT	MJ	56.42	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.79E-03	0.49	2.86E-03	-25.50
PENRE	MJ	109.70	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.16E-02	0.88	1.91E-02	-55.10
PENRM	MJ	0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
PENRT	MJ	109.70	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.16E-02	0.88	1.91E-02	-55.10
SM	kg	1.16E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
RSF	MJ	4.10E-32	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.03E-06	4.67E-04	4.83E-06	-6.46E-02
NRSF	MJ	6.23E-31	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
HWD	kg	1.22E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.51E-13	7.64E-11	9.80E-13	-2.96E-09
NHWD	kg	2.43	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	4.53E-06	6.65E-04	9.76E-02	-1.31
RWD	kg	6.19E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	3.89E-08	1.41E-04	2.12E-07	-3.31E-03
CRU	kg	0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
MFR	kg	1.63E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.95	0.00	0.00
MER	kg	0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
EEE	MJ	2.17E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
EET	MJ	3.92E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00

Key:
GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - eutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*[2]** - abiotic depletion potential – fossil resources **ADPE*[2]** - abiotic depletion potential – minerals&metals **WDP*[2]** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **PENRT** - total use of non-renewable primary energy resources **SM** - use of secondary material **RSF** - use of renewable secondary fuels **NRSF** - use of non-renewable secondary fuels **FW** - net use of fresh water **HWD** - hazardous waste disposed **NHWD** - non-hazardous waste disposed **RWD** - radioactive waste disposed **CRU** - components for re-use **MFR** - materials for recycling **MER** - materials for energy recovery **EEE** - exported electrical energy **EET** - exported thermal energy

Results per 1 kg of anodized aluminium profile															
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	4.33E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.65E-11	8.85E-10	1.27E-10	-2.26E-07
IRP*[1]	kBq U235 eq.	1.29	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	5.71E-06	2.39E-02	2.36E-05	-0.70
ETP-fw*[2]	CTUe	41.99	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.19E-02	0.39	1.07E-02	-19.40
HTP-c*[2]	CTUh	5.07E-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	4.41E-13	1.11E-11	1.63E-12	-2.53E-09
HTP-nc*[2]	CTUh	1.13E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	2.32E-11	4.06E-10	1.80E-10	-5.23E-08
SQP*[2]	Dimensionless	17.84	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00	1.09E-02	0.32	3.97E-03	-1.92

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Eco-toxicity potential – freshwater **HTP-c*[2]** - Human toxicity potential – cancer effects **HTP-nc*[2]** - Human toxicity potential – non-cancer effects **SQP*[2]** – soil quality potential

Disclaimers

*1 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 building materials is also not measured by this indicator

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

6.4 Interpretation, LCA presentation and critical review

Evaluation

The environmental impacts of

- aluminium profiles (bright)
- electrostatically powder-coated aluminium profiles
- anodized aluminium profiles

differ in parts. As compared to bright aluminium profiles (PG1), the difference for electrostatically powder-coated aluminium profiles (PG2) results from the additional coating material. The difference to anodized aluminium profiles results from the additional transport to the anodizing plant, and to the material and energy required for anodizing.

The environmental impacts during the manufacture of all product groups result mainly from the use of primary aluminium.

For scenario C4 only marginal consumption arising from the physical pretreatment and management of the disposal site is expected. Allocation to individual products is almost impossible for site disposal. In terms of product recycling, about 51% of the environmental impacts during recycling can be assigned as benefits to scenario D for bright aluminium profiles, about 49% for electrostatically powder-coated aluminium profiles and about 41% for anodized aluminium profiles,.

The charts below show the distribution of the main environmental impacts.

The values obtained from the LCA calculation are suitable for the certification of buildings.

Charts

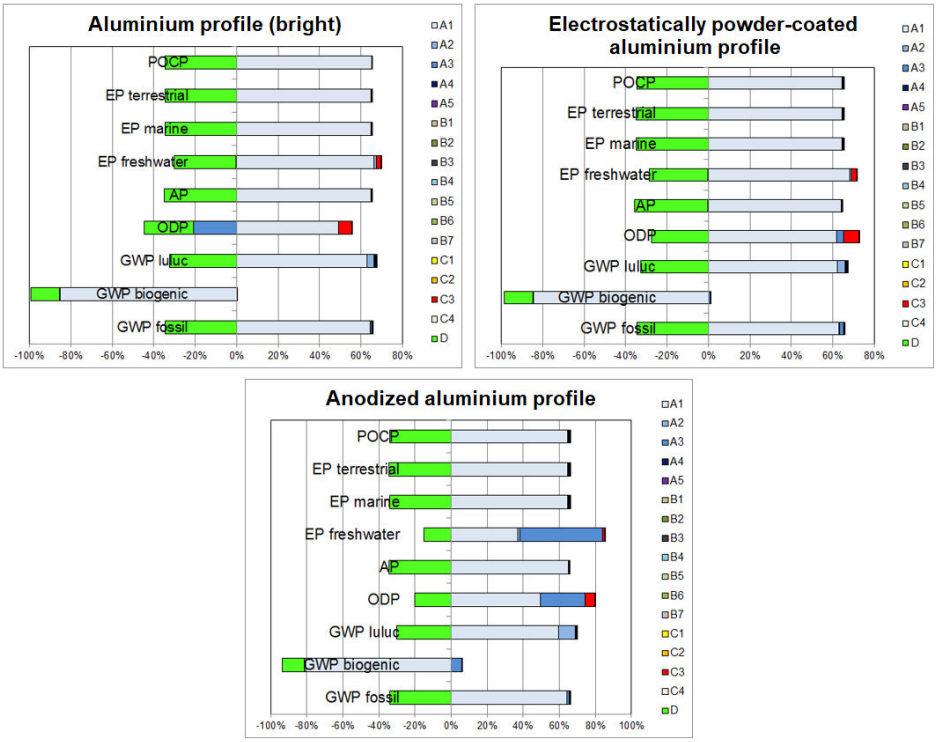


Figure 2: Percentage of the modules in selected environmental impact categories

Report

The LCA report underlying this EPD was developed according to the requirements of DIN EN ISO 14040 and DIN EN ISO 14044 as well as DIN EN 15804 and DIN EN ISO 14025. It is not addressed to third parties for reasons of confidentiality. It is deposited with the ift Rosenheim. The results and conclusions reported to the target group are complete, correct, without bias and transparent. The results of the study are not designed to be used for comparative statements intended for publication.

Critical review

The critical review of the LCA and of the report took place in the course of verification of the EPD and was carried out by Patrick Wortner, MBA and Eng., Dipl.-Ing, an external verifier.

7 General information regarding the EPD

Comparability

This EPD was prepared in accordance with DIN EN 15804 and is therefore only comparable to those EPDs that also comply with the requirements set out in DIN EN 15804.
Any comparison must refer to the building context and the same boundary conditions of the various life cycle stages.
For comparing EPDs of construction products, the rules set out in DIN EN 15804 (Clause 5.3) apply.

Identification of the product groups and the resulting variations are documented in the background report.

Communication

The communications format of this EPD meets the requirements of EN 15942:2012 and is therefore the basis for B2B communication. Only the nomenclature has been changed according to DIN EN 15804.

Verification

Verification of the Environmental Product Declaration is documented in accordance with the ift "Richtlinie zur Erstellung von Typ III Umweltproduktdeklarationen" (Guidance on preparing Type III Environmental Product Declarations) in accordance with the requirements set out in DIN EN ISO 14025.

The Declaration is based on the PCR Document “PCR Part A" PCR-A-0.3:2018 and "Semi-finished products" PCR-HZ-2.2:2018.

The European standard EN 15804 serves as the core PCR [a)]
Independent verification of the Declaration and statement according to EN ISO 14025:2010 ☐ internal ☒ external
Independent third party verifier: [b)] Patrick Wortner
[a)] Product category rules [b)] Optional for business-to-business communication Mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Revisions of this document

No.	Date	Note:	Practitioner of the LCA	Verifier
1	25.08.2022	External Verification	Pscherer	Wortner

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9 Annex

Description of life cycle scenarios for aluminium profiles

Product stage			Con-struction phase		Use stage							End-of-life stage				Benefits and loads from beyond the system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacture	Transport	Construction/installation process	Use	Maintenance	Repair	Replacement	Modification/refurbishment	Operational energy use	Operational water use	Deconstruction/demolition	Transport	Waste processing	Disposal	Re-use Recovery Recycling potential
✓	✓	✓	—	—	—	—	—	—	—	—	—	✓	✓	✓	✓	✓

The Modules A1-A3 are sufficiently detailed in the above documentation, no scenarios are established for these modules.

The scenarios were based on information provided by the manufacturer. The scenarios were furthermore based on EN 17213 and the research project "EPDs for transparent building components” [1])

Note: The standard scenarios selected are presented in bold type. They were also used for calculating the indicators in the summary table.

- ✓ Included in the LCA
- — Not included in the LCA

A5 Construction/Installation – (informative module)
Construction/installation forms part of site management and is covered at the building level.

No.	Scenario	Description
A5	**Disposal of packaging**	**Packaging is disposed according to the on-site waste management**

As aluminium profiles are installed only after additional processing steps, installation has not been taken into account here. Waste produced in A5 is not included in the LCA because it is within the system boundaries of the further processor.

C1 Deconstruction

No.	Scenario	Description
C1	**Deconstruction**	**Based on EN 17213:** **Deconstruction of glass-free materials 95%;** **Further deconstruction rates are possible, give adequate reasons.**

No relevant inputs or outputs apply to the scenario selected. The energy consumed for deconstruction is negligible. Any arising consumption is marginal.

Since only one scenario is used, the results are shown in the relevant summary table.

In case of deviating consumption the removal of the products forms part of the site management and is covered at the building level

C2 Transport

No.	Scenario	Description
C2	**Transport**	**Transport to collection point using 40 t truck (Euro 0-6 mix), diesel, 27 t payload, 80% capacity used, 50 km**

Since only one scenario is used, the results are shown in the relevant summary table.

C3 Waste management

No.	Scenario	Description
C3.1	**Current market situation**	**Share for recirculation of materials:** • **aluminium 95% in melt** (GDA, 2018) • **remainder to landfill/disposal**
C3.2	Recycling	100 % material recycling
C3.3	Thermal recycling	100 % for energy recovery
C3.4	Disposal	100 % sent to landfill/disposal

Electricity consumption of incineration plant: 0.5 MJ/kg.

As the products are placed on the European market, the disposal scenario is based on average European data sets.

The below table presents the disposal processes and their percentage by mass/weight. The calculation is based on the above mentioned shares in percent related to the declared unit of the product system.

C3.1 Disposal	Unit	PG1	PG2	PG3
Collection process, collected separately	kg	0.95	0.95	0.95
Collection process, collected as mixed construction waste	kg	0.05	0.05	0.05
Recovery system, for re-use	kg	0.00	0.00	0.00
Recovery system, for recycling	kg	0.95	0.95	0.95
Recovery system, for energy recovery	kg	0.00	0.00	0.00
Disposal	kg	0.05	0.05	0.05

The 100% scenarios differ from current average recycling (C3.1). The evaluation of the individual scenarios is presented in the underlying report.

Since only one scenario is used, the results are shown in the relevant summary table.

C4 Disposal

No.	Scenario	Description
C4.1	**Standard scenario**	**The non-recordable amounts and losses within the re-use/recycling chain (C1 and C3) are modelled as “disposed” (EU-28).**
C4.2	Recycling	100% material recycling in C3
C4.3	Thermal recycling	100% for energy recovery in C3
C4.4	Disposal	100% sent to landfill/disposal in C3

The consumption in scenario C4 results from physical pre-treatment, waste recycling and management of the disposal site. The benefits obtained here from the substitution of primary material production are allocated to Module D, e.g. electricity and heat from waste incineration.

The 100% scenarios differ from current average recycling (C4.1). The evaluation of the individual scenarios is presented in the underlying report.

Since only one scenario is used, the results are shown in the relevant summary table.

D Benefits and loads from beyond the system boundaries

No.	Scenario	Description
D1	**Recycling potential (current market situation)**	**Aluminium recyclate from C3 excluding the recyclate used in A3 replaces 60% of aluminium.**
D2	Recycling potential (recy-cling)	Aluminium recyclate from C3 excluding the recyclate used in A3 replaces 60% of aluminium.
D3	Recycling potential (thermal recycling)	Benefits from waste incineration: electricity replaces elec-tricity mix (EU-28); thermal energy replaces thermal energy from European natural gas (EU-28).

D4	Recycling potential (disposal/landfill)	The values result mainly from recycling of the packaging material in Module A5.
All values in Module “D” result from de-construction at the end of service life. The 100% scenarios differ from current average recycling (D1). The evaluation of the individual scenarios is presented in the underlying report. Since only one scenario is used, the results are shown in the relevant summary table.		

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Notes
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