

## ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN  
15804:2012 + A2:2019 for:

### PRIMARY ALUMINIUM PROFILES

**MÄKELÄ ALU OY**

Programme:	The International EPD® System, <a href="http://www.environdec.com">www.environdec.com</a>
Programme operator:	EPD International AB
EPD registration number:	S-P-06257
Publication date:	2022-06-13
EPD updated:	2024-10-31
Valid until:	2027-06-13



## 1. General information

### Company information

#### Owner of the EPD

Mäkelä Alu Oy  
Mäkeläntie 2  
62830 Luoma-aho  
Finland

#### Description of the organization

Mäkelä Alu Oy is a Finnish family business with more than 80 years of history in the metal industry. Since 1991, Mäkelä Alu has focused on pressing and surface treatment of aluminum profiles. The company also has own foundry.

#### Additional information

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[posti@makelaalu.fi](mailto:posti@makelaalu.fi)  
<https://www.makelaalu.fi/>

### Product information

#### Product name

Primary aluminium profiles: raw, anodized & painted.

#### Place of production

Alajärvi (Luoma-aho), Finland

### Programme information

#### Program operator, publisher

The International EPD® System, [www.environdec.com](http://www.environdec.com)

#### Program information

EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden,  
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#### Standards and Product Category Rules

The declaration has been prepared in accordance with standards ISO 14025 and EN 15804:2012+A2:2019 and the additional requirements stated in the PCR for Construction products (version 1.11 dated 2021-02-05).


#### Author of the life cycle assessment and declaration

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Practitioner environmental consultants:  
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#### Date of publication and validity

Declaration issue date 2022-06-15. The declaration is valid 5 years, 2022-06-13 - 2027-06-13.

## Verification

Product category rules (PCR): <i>Construction products. Version 1.11 dated 2021-02-05., UN CPC code 4153.</i>	
PCR review was conducted by:	PCR moderator: Martin Erlandsson, IVL Swedish Environmental Research Institute PCR committee: IVL Swedish Environmental Research Institute Secretariat of the International EPD® System
Independent third-party verification of the declaration and data, according to ISO 14025:2006: <input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification	
Third party verifier: Håkan Stripple (IVL Swedish Environmental Research Institute) E-mail: Hakan.Stripple@IVL.se External independent verification Signature of the third-party verifier: 	
Approved by: The International EPD® System	
Procedure for follow-up of data during EPD validity involves third party verifier: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

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](http://www.environdec.com).

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

## 2. Product information

### Products included in the EPD

This EPD concerns three different variants of primary aluminium profile: extruded primary aluminium, extruded and anodized primary aluminium and extruded and painted primary aluminium. The three product variants are modelled, and their results are presented separately. More information on the products is available at <https://www.makelaalu.fi/>.

### Description of product and its use

Aluminum profiles are manufactured for many different applications, e.g. for various uses in the construction industry, the marine and automotive industries, the electronics and electrical industries, and various interior decoration applications.

### Certifications and labels

The Management System of Mäkelä Alu Oy follows standards ISO 14001:2015, ISO 45001:2018, ISO 9001:2015. Mäkelä Alu Oy is also certified to standards EN 15088:2006, GSB, The Marine Equipment Directive 2014/90/EU module D and Module B.

### UN CPC code

In the UN CPC system, the product is classified as 4153 Semi-finished products of aluminium or aluminium alloys.

### 3. Content declaration

#### Raw materials of the product

The main material of the products is aluminium (> 99 weight-%).

#### Information about recycled materials

The recycled material content for aluminium supplied by Sunndal Casthouse, Kubal, and Alcoa Lista are 5.5 %, 14 % and 11 % respectively. The secondary material content was included in the assessment accordingly.

#### Information about packaging

The product is sold in cages made of aluminium. Also, timber, plastic, cardboard and plywood board are used as packaging materials.

#### List of EU Chemicals Agency (ECHA) REACH SVHC substances contained in the product

The products do not contain substances which exceed the limits for registration with the European Chemicals Agency regarding the "Candidate List of Substances of Very High Concern for Authorisation".

## 4. LCA information

### Declared unit

The declared unit is set to 1 tonne (1000 kg) of finished aluminium profile.

### Time representativeness

The data used to model product manufacturing corresponds to year 2021. The data from generic databases are from 2014 – 2021, apart from one dataset for plastic packaging from 2005.

### Geographical scope

This EPD is site specific (products produced only in Luoma-aho, Finland).

### Database(s) and LCA software used

The LCA was modelled using the LCA software GaBi 10 Professional and the life cycle inventory datasets provided by Sphera and Ecoinvent.

### Cut-off criteria

No flows had to be excluded from this assessment due to lack of detailed data.

### Allocation

In this study, the input data on materials (A1) were collected directly concerning different materials consumption in kg per declared unit, so no allocation was necessary. The input data concerning packaging material supply (A1) and manufacturing inputs and outputs (A3) – electricity, heating, fuel, water use and production waste – and product transport distance (A4) were allocated based on the shares from production volumes (kg) in the studied period. Numerical values on which the allocation was based are presented below.

Studied product	Share of production volume
Primary aluminium: extruded (raw)	25 %
Primary aluminium: extruded and anodized	11 %
Primary aluminium: extruded and painted	35 %
Secondary aluminium: extruded (raw)	10 %
Secondary aluminium: extruded and anodized	4 %
Secondary aluminium: extruded and painted	14 %

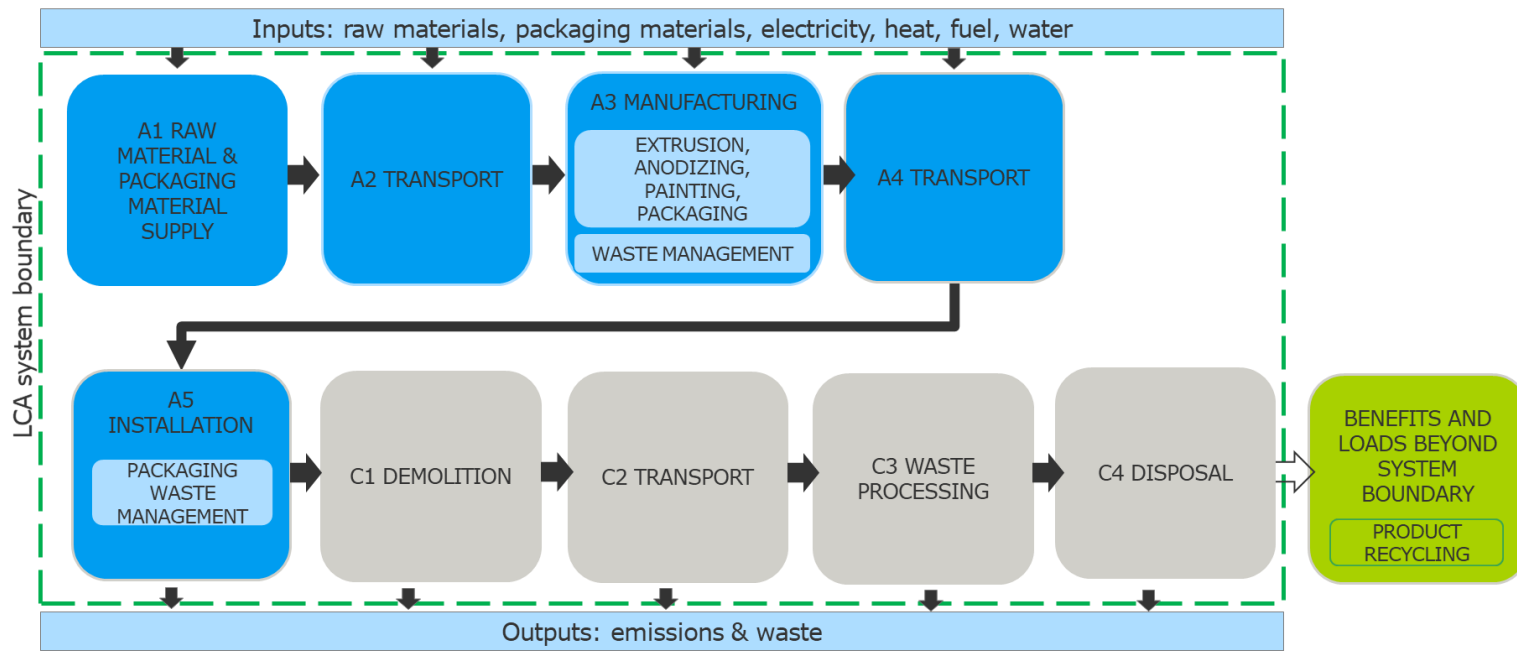
No other allocations were made in this assessment.

**Data quality**

Site-specific production data have been collected for 2021 from the production site. The upstream and downstream processes have been modelled based on environmental data from generic databases (Sphera and Ecoinvent). The collected data were reviewed in terms of consistency, and it is estimated as good quality.

**System diagram**

The product system to be studied consists of the whole life cycle for the aluminium profiles. The assessment covers the product stage (A1-A3), transport to the building site of the construction process stage (A4), packaging waste management from the installation stage (A5), the end-of-life stage (C1-C4) and benefits and loads beyond the system boundary (D). Modules B1-B7 are considered not relevant. Machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.



**Product life cycle**

**Production (A1-A3)**

The product stage takes into account the manufacture of raw materials, their transport to the production plant and the stages of the product manufacturing process.

**A1:** The production of raw materials includes the environmental impacts arising from the procurement, processing, and manufacture of all raw materials used in the products. The ratio of aluminium suppliers has been valid for the last 20 years, so it represents a typical average.

**A2:** Transportation of the raw materials to the production facility of Mäkelä Alu in Luoma-aho, Finland. Specific transportation methods (truck or ferry) and actual distances are taken into account.

**A3:** Manufacturing and packaging of the aluminium profiles at the production site. There are three different manufacturing stages: extrusion, anodization, and painting. All manufacturing involves extrusion, but not all profiles are anodized or painted. The assessment covers the electricity, heating, fuel and water use needed during the production process and the transport and management of production waste. The electricity is modelled as site-specific energy mix provided by local energy company. Fuel and water use are modelled as actual consumption figures allocated for each product type by their mass.

#### **Transportation (A4)**

Transportation of the finished products from the production facility. Real distances between the production facility and destinations are used.

#### **Installation (A5)**

In the installation waste, the recycling of packaging waste is included in the assessment.

#### **End of life cycle (C1-C4)**

**C1:** The dismantling of the product is excluded from the assessment, because no assumption could be made of the typical deconstruction practice due to the various different applications where aluminium profile may be used. However, the impact of this life cycle phase is presumably marginal.

**C2:** Transportation of the dismantled product for processing was assessed based on average waste transportation distance in Finland.

**C3:** In the end-of-life scenario, it was assumed that aluminium will be recycled as material. Following the current recycling practices, the life cycle assessment has been made on the assumption that 100 % of aluminium will be recycled as material.

**C4:** No waste is assumed to end up in final deposition.

#### **Benefits and loads beyond the system boundary (D)**

Materials delivered for material recycling can be used to make secondary material, thus avoiding the use of virgin raw material. The life cycle assessment has been made on the assumption that 100 % of the products' material ends up in material recovery at the end of the life cycle. Secondary metal content has been deducted from the materials sent to material recovery to avoid double-counting of benefits as it has already been recovered from a previous system.



## System boundaries

The system boundary was set at cradle to gate with options, including modules A1-A3, A4, A5, module C1-C4 and module D. The life cycle stages included are described in the table below:

	Product stage			Construction stage		Use stage							End-of-life stage				Non-life cycle impacts		
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
Modules declared	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ND	ND	ND	ND	ND	ND	ND	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Module	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement of	Extensive	Use of energy	Use of water	Demolition	Transport	Waste processing	Waste disposal	Reuse	Recovery	Recycling
Geography	Glo, EU	Glo, EU	FI, EU	Glo, EU	FI	-	-	-	-	-	-	-	-	Glo, EU	EU	-	EU		
Specific data used	>75%	100%	100%	100%	100%	-	-	-	-	-	-	-	-	>90%	100%	-	100%		
Variation - products	Not relevant (results presented product-specifically, not averaged)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	Not relevant (site-specific EPD)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = Module declared ND = Not declared

	Compulsory modules in cradle to gate with options
	Optional modules by scenario

## 5. Environmental and resource use indicators

In the following tables the potential environmental impacts are reported per the declared unit and per life cycle stage. The impact categories presented here are consistent with the reference PCR.

The results are presented in scientific form. Data interpretation example:  $1.31E^{-2} = 1.31 \cdot 10^{-2} = 0.0131$

According to the EN 15804 standard, environmental declarations for construction products may not be comparable if they have not been prepared in accordance with that standard or if a different notified unit has been used.

### 5.1 Primary raw aluminium products

Environmental impact category	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Global warming potential (GWP) – fossil	kg CO <sub>2</sub> eq.	5.61E+03	5.99E+01	1.03E+01	5.68E+03	4.07E+00	1.30E+01	0.00E+00	1.10E+01	2.59E+00	0.00E+00	-6.86E+03
Global warming potential (GWP) – biogenic	kg CO <sub>2</sub> eq.	1.48E+01	4.54E-01	4.57E+00	1.99E+01	1.78E-01	6.28E-04	0.00E+00	4.82E-01	4.43E-04	0.00E+00	0.00E+00
Global warming potential (GWP) – luluc	kg CO <sub>2</sub> eq.	4.91E+01	3.73E-01	1.46E-02	4.95E+01	2.75E-02	1.68E-04	0.00E+00	7.43E-02	1.20E-02	0.00E+00	-1.55E+00
Global warming potential (GWP) – total	kg CO <sub>2</sub> eq.	5.67E+03	6.07E+01	1.48E+01	5.75E+03	4.28E+00	1.30E+01	0.00E+00	1.15E+01	2.60E+00	0.00E+00	-6.86E+03
Ozone depletion (ODP)	kg CFC11 eq.	5.12E-04	6.13E-12	5.09E-11	5.12E-04	4.01E-13	2.08E-12	0.00E+00	1.08E-12	3.85E-12	0.00E+00	-4.23E-09
Acidification (AP)	mol H <sup>+</sup> eq.	2.35E+01	3.34E-01	4.50E-02	2.39E+01	7.65E-03	1.27E-02	0.00E+00	2.14E-02	1.34E-02	0.00E+00	-3.45E+01
Eutrophication (EP) – freshwater	kg PO <sub>4</sub> eq.	2.02E+00	2.00E-04	1.14E-04	2.02E+00	1.46E-05	1.03E-06	0.00E+00	3.94E-05	7.43E-06	0.00E+00	-2.78E-03
Eutrophication (EP) – marine	kg N eq.	2.28E+00	1.02E-01	1.85E-02	2.40E+00	3.09E-03	4.03E-03	0.00E+00	8.74E-03	6.11E-03	0.00E+00	-4.42E+00
Eutrophication (EP) – terrestrial	mol N eq.	2.31E+01	1.13E+00	1.97E-01	2.44E+01	3.54E-02	5.87E-02	0.00E+00	9.99E-02	6.74E-02	0.00E+00	-4.82E+01

Environmental impact category	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Photochemical ozone formation (POCP)	kg NMVOC eq.	1.66E+01	2.62E-01	4.80E-02	1.69E+01	6.79E-03	1.06E-02	0.00E+00	1.90E-02	1.66E-02	0.00E+00	-1.37E+01
Depletion of abiotic resources (ADP) – minerals & metals	kg Sb eq.	1.77E-02	6.03E-06	1.44E-06	1.77E-02	4.11E-07	8.93E-08	0.00E+00	1.11E-06	2.87E-06	0.00E+00	-4.80E-04
Depletion of abiotic resources (ADP) – fossil fuels	MJ	6.76E+04	8.76E+02	1.01E+02	6.86E+04	5.36E+01	1.23E+01	0.00E+00	1.45E+02	5.06E+01	0.00E+00	-8.66E+04
Water deprivation potential (WDP)	m <sup>3</sup> e depr.	1.85E+06	6.41E-01	-6.40E-01	1.85E+06	4.57E-02	5.20E+00	0.00E+00	1.23E-01	4.99E-01	0.00E+00	-1.05E+03

## Resource use

Resource use indicators	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	4.05E+04	5.09E+01	2.57E+01	4.06E+04	3.71E+00	2.70E+00	0.00E+00	1.00E+01	4.06E+00	0.00E+00	-4.02E+04
Use of renewable primary energy resources used as raw materials (PERM)	MJ	3.92E+04	0.00E+00	0.00E+00	3.92E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	7.97E+04	5.09E+01	2.57E+01	7.98E+04	3.71E+00	2.70E+00	0.00E+00	1.00E+01	4.06E+00	0.00E+00	-4.02E+04
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1.05E+05	8.79E+02	1.01E+02	1.06E+05	5.38E+01	1.23E+01	0.00E+00	1.45E+02	5.07E+01	0.00E+00	-8.67E+04
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	1.89E+04	0.00E+00	0.00E+00	1.89E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	1.24E+05	8.79E+02	1.01E+02	1.25E+05	5.38E+01	1.23E+01	0.00E+00	1.45E+02	5.07E+01	0.00E+00	-8.67E+04
Use of secondary material (SM)	kg	4.63E+01	0.00E+00	0.00E+00	4.63E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	1.28E+01	0.00E+00	0.00E+00	1.28E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Use of non-renewable secondary fuels (NRSF)	MJ	2.99E+01	0.00E+00	0.00E+00	2.99E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (FW)	m <sup>3</sup>	2.03E+04	5.90E-02	-1.89E-03	2.03E+04	4.29E-03	1.23E-01	0.00E+00	1.16E-02	1.42E-02	0.00E+00	-1.02E+02

## Waste categories

Waste category	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	5.63E+02	4.41E-09	-2.40E+01	5.39E+02	2.85E-10	1.44E-09	0.00E+00	7.69E-10	6.34E-10	0.00E+00	-4.66E-06
Non-hazardous waste disposed (NHWD)	kg	3.50E+03	1.33E-01	2.67E+01	3.53E+03	8.76E-03	7.68E-01	0.00E+00	2.37E-02	1.34E-02	0.00E+00	-2.06E+03
Radioactive waste disposed (RWD)	kg	5.22E-01	1.52E-03	2.53E-03	5.26E-01	9.98E-05	8.05E-04	0.00E+00	2.70E-04	6.68E-04	0.00E+00	-5.22E+00

## Environmental information describing output flows

Indicator	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Components for reuse (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling (MFR)	kg	0.00E+00	0.00E+00	1.44E+00	1.44E+00	0.00E+00	1.64E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for energy recovery (MER)	kg	0.00E+00	0.00E+00	1.93E+00	1.93E+00	0.00E+00	2.61E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity (EE)	MJ	0.00E+00	0.00E+00	2.34E+00	2.34E+00	0.00E+00	8.48E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal (EET)	MJ	0.00E+00	0.00E+00	5.54E+00	5.54E+00	0.00E+00	3.13E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

### Additional environmental indicators

Indicator	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Particulate matter	Disease incidences	7.03E-05	4.59E-06	2.72E-07	7.51E-05	4.70E-08	7.20E-08	0.00E+00	1.30E-07	2.53E-07	0.00E+00	-3.56E-04
Ionising radiation, human health	kBq U235 eq.	1.21E+02	2.29E-01	2.37E-01	1.21E+02	1.51E-02	8.07E-02	0.00E+00	4.07E-02	1.09E-01	0.00E+00	-1.10E+03
Ecotoxicity, freshwater	CTUe	4.93E+03	6.19E+02	6.84E+01	5.61E+03	3.80E+01	5.36E+00	0.00E+00	1.03E+02	3.38E+01	0.00E+00	-3.05E+04
Human toxicity, cancer	CTUh	2.30E-06	1.25E-08	7.25E-07	3.03E-06	7.82E-10	4.81E-10	0.00E+00	2.11E-09	7.26E-10	0.00E+00	-3.99E-06
Human toxicity, non-cancer	CTUh	4.84E-04	6.79E-07	8.56E-05	5.70E-04	4.40E-08	3.25E-08	0.00E+00	1.19E-07	3.88E-08	0.00E+00	-8.22E-05
Land Use	Pt	2.58E+04	3.08E+02	2.78E+01	2.62E+04	2.27E+01	3.77E+00	0.00E+00	6.13E+01	1.14E+01	0.00E+00	-3.03E+03

### Biogenic carbon content

Biogenic carbon content	Amount per declared unit
The amount of biogenic carbon in the product	0 kg C
Amount of biogenic carbon in packaging	0.837 kg C

## 5.2 Primary anodized aluminium products

### Potential environmental impacts

Environmental impact category	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Global warming potential (GWP) – fossil	kg CO <sub>2</sub> eq.	5.81E+03	6.33E+01	1.05E+01	5.88E+03	4.07E+00	1.30E+01	0.00E+00	1.10E+01	2.59E+00	0.00E+00	-6.86E+03
Global warming potential (GWP) – biogenic	kg CO <sub>2</sub> eq.	2.30E+01	2.46E+00	4.60E+00	3.01E+01	1.78E-01	6.28E-04	0.00E+00	4.82E-01	4.43E-04	0.00E+00	0.00E+00
Global warming potential (GWP) – luluc	kg CO <sub>2</sub> eq.	4.92E+01	3.96E-01	1.46E-02	4.96E+01	2.75E-02	1.68E-04	0.00E+00	7.43E-02	1.20E-02	0.00E+00	-1.55E+00
Global warming potential (GWP) – total	kg CO <sub>2</sub> eq.	5.88E+03	6.62E+01	1.51E+01	5.96E+03	4.28E+00	1.30E+01	0.00E+00	1.15E+01	2.60E+00	0.00E+00	-6.86E+03
Ozone depletion (ODP)	kg CFC11 eq.	5.12E-04	6.47E-12	5.17E-11	5.12E-04	4.01E-13	2.08E-12	0.00E+00	1.08E-12	3.85E-12	0.00E+00	-4.23E-09
Acidification (AP)	mol H <sup>+</sup> eq.	2.63E+01	3.40E-01	4.53E-02	2.67E+01	7.65E-03	1.27E-02	0.00E+00	2.14E-02	1.34E-02	0.00E+00	-3.45E+01
Eutrophication (EP) – freshwater	kg PO <sub>4</sub> eq.	2.02E+00	2.12E-04	1.40E-04	2.02E+00	1.46E-05	1.03E-06	0.00E+00	3.94E-05	7.43E-06	0.00E+00	-2.78E-03
Eutrophication (EP) – marine	kg N eq.	2.90E+00	1.04E-01	1.87E-02	3.02E+00	3.09E-03	4.03E-03	0.00E+00	8.74E-03	6.11E-03	0.00E+00	-4.42E+00
Eutrophication (EP) – terrestrial	mol N eq.	2.99E+01	1.16E+00	1.98E-01	3.13E+01	3.54E-02	5.87E-02	0.00E+00	9.99E-02	6.74E-02	0.00E+00	-4.82E+01
Photochemical ozone formation (POCP)	kg NMVOC eq.	1.86E+01	2.68E-01	4.83E-02	1.89E+01	6.79E-03	1.06E-02	0.00E+00	1.90E-02	1.66E-02	0.00E+00	-1.37E+01
Depletion of abiotic resources (ADP) – minerals & metals	kg Sb eq.	2.40E-02	6.37E-06	1.46E-06	2.40E-02	4.11E-07	8.93E-08	0.00E+00	1.11E-06	2.87E-06	0.00E+00	-4.80E-04
Depletion of abiotic resources (ADP) – fossil fuels	MJ	7.03E+04	9.22E+02	1.03E+02	7.14E+04	5.36E+01	1.23E+01	0.00E+00	1.45E+02	5.06E+01	0.00E+00	-8.66E+04
Water deprivation potential (WDP)	m <sup>3</sup> e depr.	1.85E+06	6.78E-01	9.90E+01	1.85E+06	4.57E-02	5.20E+00	0.00E+00	1.23E-01	4.99E-01	0.00E+00	-1.05E+03

## Resource use

Resource use indicators	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	5.17E+04	5.40E+01	2.61E+01	5.18E+04	3.71E+00	2.70E+00	0.00E+00	1.00E+01	4.06E+00	0.00E+00	-4.02E+04
Use of renewable primary energy resources used as raw materials (PERM)	MJ	3.92E+04	0.00E+00	0.00E+00	3.92E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	9.09E+04	5.40E+01	2.61E+01	9.10E+04	3.71E+00	2.70E+00	0.00E+00	1.00E+01	4.06E+00	0.00E+00	-4.02E+04
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1.08E+05	9.25E+02	1.04E+02	1.09E+05	5.38E+01	1.23E+01	0.00E+00	1.45E+02	5.07E+01	0.00E+00	-8.67E+04
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	1.89E+04	0.00E+00	0.00E+00	1.89E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	1.27E+05	9.25E+02	1.04E+02	1.28E+05	5.38E+01	1.23E+01	0.00E+00	1.45E+02	5.07E+01	0.00E+00	-8.67E+04
Use of secondary material (SM)	kg	4.63E+01	0.00E+00	0.00E+00	4.63E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	1.28E+01	0.00E+00	0.00E+00	1.28E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF)	MJ	2.99E+01	0.00E+00	0.00E+00	2.99E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (FW)	m <sup>3</sup>	2.03E+04	6.26E-02	2.32E+00	2.03E+04	4.29E-03	1.23E-01	0.00E+00	1.16E-02	1.42E-02	0.00E+00	-1.02E+02



## Waste categories

Waste category	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	5.63E+02	4.65E-09	- 2.40E+01	5.39E+02	2.85E-10	1.44E-09	0.00E+00	7.69E-10	6.34E-10	0.00E+00	-4.66E-06
Non-hazardous waste disposed (NHWD)	kg	3.51E+03	1.40E-01	2.73E+01	3.53E+03	8.76E-03	7.68E-01	0.00E+00	2.37E-02	1.34E-02	0.00E+00	- 2.06E+03
Radioactive waste disposed (RWD)	kg	5.96E-01	1.61E-03	2.61E-03	6.00E-01	9.98E-05	8.05E-04	0.00E+00	2.70E-04	6.68E-04	0.00E+00	- 5.22E+00

## Environmental information describing output flows

Indicator	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Components for reuse (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling (MFR)	kg	0.00E+00	0.00E+00	1.44E+00	1.44E+00	0.00E+00	1.64E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for energy recovery (MER)	kg	0.00E+00	0.00E+00	1.93E+00	1.93E+00	0.00E+00	2.61E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity (EE)	MJ	0.00E+00	0.00E+00	2.34E+00	2.34E+00	0.00E+00	8.48E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal (EET)	MJ	0.00E+00	0.00E+00	5.54E+00	5.54E+00	0.00E+00	3.13E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

### Additional environmental indicators

Indicator	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Particulate matter	Disease incidences	9.05E-05	4.62E-06	2.79E-07	9.54E-05	4.70E-08	7.20E-08	0.00E+00	1.30E-07	2.53E-07	0.00E+00	-3.56E-04
Ionising radiation, human health	kBq U235 eq.	1.33E+02	2.42E-01	2.51E-01	1.33E+02	1.51E-02	8.07E-02	0.00E+00	4.07E-02	1.09E-01	0.00E+00	-1.10E+03
Ecotoxicity, freshwater	CTUe	7.17E+03	6.51E+02	7.27E+01	7.89E+03	3.80E+01	5.36E+00	0.00E+00	1.03E+02	3.38E+01	0.00E+00	-3.05E+04
Human toxicity, cancer	CTUh	2.43E-06	1.32E-08	7.25E-07	3.17E-06	7.82E-10	4.81E-10	0.00E+00	2.11E-09	7.26E-10	0.00E+00	-3.99E-06
Human toxicity, non-cancer	CTUh	4.92E-04	7.16E-07	8.56E-05	5.78E-04	4.40E-08	3.25E-08	0.00E+00	1.19E-07	3.88E-08	0.00E+00	-8.22E-05
Land Use	Pt	5.81E+04	3.27E+02	2.81E+01	5.84E+04	2.27E+01	3.77E+00	0.00E+00	6.13E+01	1.14E+01	0.00E+00	-3.03E+03

### Biogenic carbon content

Biogenic carbon content	Amount per declared unit
The amount of biogenic carbon in the product	0 kg C
Amount of biogenic carbon in packaging	0.837 kg C

### 5.3 Primary painted aluminium products

#### Potential environmental impacts

Environmental impact category	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Global warming potential (GWP) – fossil	kg CO <sub>2</sub> eq.	6.15E+03	6.29E+01	1.89E+01	6.23E+03	4.07E+00	1.30E+01	0.00E+00	1.10E+01	2.59E+00	0.00E+00	-6.86E+03
Global warming potential (GWP) – biogenic	kg CO <sub>2</sub> eq.	2.30E+01	2.44E+00	9.05E+00	3.45E+01	1.78E-01	6.28E-04	0.00E+00	4.82E-01	4.43E-04	0.00E+00	0.00E+00
Global warming potential (GWP) – luluc	kg CO <sub>2</sub> eq.	4.92E+01	3.94E-01	1.58E-02	4.96E+01	2.75E-02	1.68E-04	0.00E+00	7.43E-02	1.20E-02	0.00E+00	-1.55E+00
Global warming potential (GWP) – total	kg CO <sub>2</sub> eq.	6.22E+03	6.58E+01	2.80E+01	6.31E+03	4.28E+00	1.30E+01	0.00E+00	1.15E+01	2.60E+00	0.00E+00	-6.86E+03
Ozone depletion (ODP)	kg CFC11 eq.	5.16E-04	6.43E-12	5.43E-11	5.16E-04	4.01E-13	2.08E-12	0.00E+00	1.08E-12	3.85E-12	0.00E+00	-4.23E-09
Acidification (AP)	mol H <sup>+</sup> eq.	2.48E+01	3.40E-01	5.16E-02	2.52E+01	7.65E-03	1.27E-02	0.00E+00	2.14E-02	1.34E-02	0.00E+00	-3.45E+01
Eutrophication (EP) – freshwater	kg PO <sub>4</sub> eq.	2.13E+00	2.11E-04	1.16E-04	2.13E+00	1.46E-05	1.03E-06	0.00E+00	3.94E-05	7.43E-06	0.00E+00	-2.78E-03
Eutrophication (EP) – marine	kg N eq.	2.62E+00	1.04E-01	2.10E-02	2.74E+00	3.09E-03	4.03E-03	0.00E+00	8.74E-03	6.11E-03	0.00E+00	-4.42E+00
Eutrophication (EP) – terrestrial	mol N eq.	2.67E+01	1.16E+00	2.28E-01	2.81E+01	3.54E-02	5.87E-02	0.00E+00	9.99E-02	6.74E-02	0.00E+00	-4.82E+01
Photochemical ozone formation (POCP)	kg NMVOC eq.	1.77E+01	2.67E-01	5.45E-02	1.81E+01	6.79E-03	1.06E-02	0.00E+00	1.90E-02	1.66E-02	0.00E+00	-1.37E+01
Depletion of abiotic resources (ADP) – minerals & metals	kg Sb eq.	2.80E-02	6.34E-06	1.54E-06	2.80E-02	4.11E-07	8.93E-08	0.00E+00	1.11E-06	2.87E-06	0.00E+00	-4.80E-04
Depletion of abiotic resources (ADP) – fossil fuels	MJ	8.89E+04	9.16E+02	1.11E+02	9.00E+04	5.36E+01	1.23E+01	0.00E+00	1.45E+02	5.06E+01	0.00E+00	-8.66E+04
Water deprivation potential (WDP) <sup>1</sup>	m <sup>3</sup> e depr.	1.85E+06	6.75E-01	1.67E+00	1.85E+06	4.57E-02	5.20E+00	0.00E+00	1.23E-01	4.99E-01	0.00E+00	-1.05E+03

## Resource use

Resource use indicators	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	4.38E+04	5.37E+01	2.80E+01	4.39E+04	3.71E+00	2.70E+00	0.00E+00	1.00E+01	4.06E+00	0.00E+00	- 4.02E+04
Use of renewable primary energy resources used as raw materials (PERM)	MJ	3.92E+04	0.00E+00	0.00E+00	3.92E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	8.30E+04	5.37E+01	2.80E+01	8.31E+04	3.71E+00	2.70E+00	0.00E+00	1.00E+01	4.06E+00	0.00E+00	- 4.02E+04
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1.15E+05	9.19E+02	1.11E+02	1.16E+05	5.38E+01	1.23E+01	0.00E+00	1.45E+02	5.07E+01	0.00E+00	- 8.67E+04
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	1.89E+04	0.00E+00	0.00E+00	1.89E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	1.34E+05	9.19E+02	1.11E+02	1.35E+05	5.38E+01	1.23E+01	0.00E+00	1.45E+02	5.07E+01	0.00E+00	- 8.67E+04
Use of secondary material (SM)	kg	4.63E+01	0.00E+00	0.00E+00	4.63E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	1.28E+01	0.00E+00	0.00E+00	1.28E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF)	MJ	2.99E+01	0.00E+00	0.00E+00	2.99E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (FW)	m <sup>3</sup>	2.03E+04	6.22E-02	5.18E-02	2.03E+04	4.29E-03	1.23E-01	0.00E+00	1.16E-02	1.42E-02	0.00E+00	- 1.02E+02

## Waste categories

Waste category	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	5.63E+02	4.62E-09	-2.40E+01	5.39E+02	2.85E-10	1.44E-09	0.00E+00	7.69E-10	6.34E-10	0.00E+00	-4.66E-06
Non-hazardous waste disposed (NHWD)	kg	3.52E+03	1.39E-01	2.81E+01	3.55E+03	8.76E-03	7.68E-01	0.00E+00	2.37E-02	1.34E-02	0.00E+00	-2.06E+03
Radioactive waste disposed (RWD)	kg	6.03E-01	1.60E-03	2.99E-03	6.08E-01	9.98E-05	8.05E-04	0.00E+00	2.70E-04	6.68E-04	0.00E+00	-5.22E+00

## Environmental information describing output flows

Indicator	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Components for reuse (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling (MFR)	kg	0.00E+00	0.00E+00	2.55E+00	2.55E+00	0.00E+00	1.64E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for energy recovery (MER)	kg	0.00E+00	0.00E+00	9.37E+00	9.37E+00	0.00E+00	2.61E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity (EE)	MJ	0.00E+00	0.00E+00	1.13E+01	1.13E+01	0.00E+00	8.48E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal (EET)	MJ	0.00E+00	0.00E+00	4.12E+01	4.12E+01	0.00E+00	3.13E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## Additional environmental indicators

Indicator	Unit	A1	A2	A3	A1-A3 total	A4	A5	C1	C2	C3	C4	D
Particulate matter	Disease incidences	7.78E-05	4.62E-06	3.38E-07	8.27E-05	4.70E-08	7.20E-08	0.00E+00	1.30E-07	2.53E-07	0.00E+00	-3.56E-04
Ionising radiation, human health	kBq U235 eq.	1.30E+02	2.40E-01	2.96E-01	1.30E+02	1.51E-02	8.07E-02	0.00E+00	4.07E-02	1.09E-01	0.00E+00	-1.10E+03
Ecotoxicity, freshwater	CTUe	9.26E+03	6.47E+02	7.46E+01	9.98E+03	3.80E+01	5.36E+00	0.00E+00	1.03E+02	3.38E+01	0.00E+00	-3.05E+04
Human toxicity, cancer	CTUh	2.59E-06	1.31E-08	7.34E-07	3.34E-06	7.82E-10	4.81E-10	0.00E+00	2.11E-09	7.26E-10	0.00E+00	-3.99E-06
Human toxicity, non-cancer	CTUh	5.10E-04	7.11E-07	8.67E-05	5.97E-04	4.40E-08	3.25E-08	0.00E+00	1.19E-07	3.88E-08	0.00E+00	-8.22E-05
Land Use	Pt	3.81E+04	3.25E+02	3.11E+01	3.84E+04	2.27E+01	3.77E+00	0.00E+00	6.13E+01	1.14E+01	0.00E+00	-3.03E+03

## Biogenic carbon content

Biogenic carbon content	Amount per declared unit
The amount of biogenic carbon in the product	0 kg C
Amount of biogenic carbon in packaging	0.837 kg C

## 6. Scenarios and additional technical information

### Additional technical information, energy use in manufacturing (A3)

Variable	Amount
Quality of electricity information	Supplier specific information: 100 % biomass
CO <sub>2</sub> emission factor for electricity	0.0202 kg CO <sub>2</sub> eq. /kWh
Quality of heating data	Generic information: Thermal energy from LPG Thermal energy from Natural Gas
CO <sub>2</sub> emission factor for heating	0.304 kg CO <sub>2</sub> eq. /kWh for LPG 0.237 kg CO <sub>2</sub> eq. /kWh for natural gas

### Additional technical information, transport to the site (A4)

Variable	Amount	Data quality
Fuel type and consumption of the vehicle used or type of vehicle, e.g. truck, ship, etc. dm <sup>3</sup> /km or vehicle type	diesel 0.02 kg/tonne*km	Truck, Euro 0 - 6 mix, more than 32 tonne gross weight / 24.7 tonne payload capacity
Transportation distance (declared average or exact data)	1 284 768 km	total transport distance
Capacity utilization rate	Truck: 61 %	
Bulk density of transported products	varies according to the product	
Volume capacity utilization factor (factor = 1 or <1 or ≥1 for compressed or nested packaged products)	not applicable	

## 7. References

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