

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	Hammerer Aluminium Industries Santana S.R.L.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-HAA-20230201-IBA1-EN
Issue date	15.09.2023
Valid to	14.09.2028

Aluminium billets

Hammerer Aluminium Industries Santana S.R.L.

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1. General Information

Hammerer Aluminium Industries Santana S.R.L.

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-HAA-20230201-IBA1-EN

This declaration is based on the product category rules:

Products of aluminium and aluminium alloys, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

15.09.2023

Valid to

14.09.2028



Dipl.-Ing. Hans Peters
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Aluminium billets

Owner of the declaration

Hammerer Aluminium Industries Santana S.R.L.
Calea Hammerer 5
317280 Santana
Romania

Declared product / declared unit

The declared product is 1 kg of aluminium billets.

Scope:

This product declaration refers to a declared unit of 1 kg of aluminium billets produced in one production facility in Sântana, Romania. The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR	
Independent verification of the declaration and data according to ISO 14025:2011	
☐	internally
☒	externally



Dr. Eva Schmincke,
(Independent verifier)

2. Product

2.1 Product description/Product definition

This EPD refers to 1 kg of aluminium billets consisting of primary and recycled aluminium, reinforced by alloying elements.

For the use and application of the product, the respective national provisions at the place of use apply.

2.2 Application

The final aluminium product (aluminium billets) is used for creating different aluminium products, for industry, building and construction, and automotive industries.

2.3 Technical Data

The physical properties correspond to aluminium billets products. The chemical composition of the aluminium billets is based on the EN AW-6060 specifications.

The final product has the characteristics described in the table below.

Constructional data

Name	Value	Unit
Gross density	2700	kg/m ³
Melting point	650	°C
Electrical conductivity at 20°C	-	m/Ωmm ²
Thermal conductivity	220	W/(mK)
Coefficient of thermal expansion	23.4	10 ⁻⁶ K ⁻¹
Modulus of elasticity	69500	N/mm ²
Shear modulus	26100	N/mm ²
Specific heat capacity	0.898	kJ/kgK
Hardness	75	HB
Yield strength Rp 0,2 min.	160	N/mm ²
Tensile strength Rm min.	215	N/mm ²
Tensile stress at break	14	%

Note that the values for Hardness, Yield strength Rp 0,2 min., Tensile strength Rm min. and Tensile stress at break, are the maximum ones. The mechanical properties after extrusion and heat treatment, depend on temper.

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

2.4 Delivery status

The aluminium billets are delivered on the desired length and diameter. The most common length is 7 meters. The billets are secured during transport by being tied together using plastic bands and placed on rectangular wooden bars.

2.5 Base materials/Ancillary materials

The main constituent of the aluminium billets is aluminium with a share of around 99% and alloying metals in a percentage of around 1 %.

The share of aluminium in the product consists of about 21 % primary aluminium and around 78 % of recycled aluminium and scrap.

From the total amount of primary aluminium, HAI purchases around 71 % of it from a supplier that provides a low carbon aluminium.

The product/at least part of the product **does not contain** substances on the ECHA list of Substances of Very High

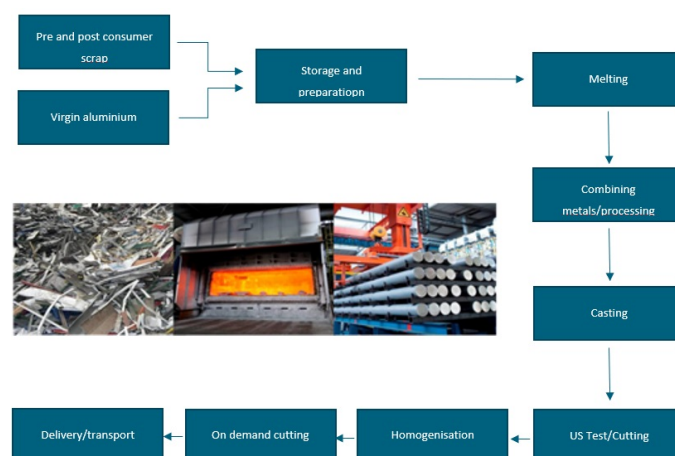
Concern (SVHC) above 0.1 mass %.

The product/at least one sub-product **does not contain** other carcinogenic, mutagenic, reprotoxic (CMR) substances of category 1A or 1B not on the candidate list above 0.1 mass % in at least one sub-product.

No biocidal products have been added to the present construction product or it has been treated with biocidal products (it is thus a treated product within the meaning of the Biocidal Products Regulation (EU) No 528/2012).

2.6 Manufacture

The main technological flow in Hammerer Aluminium Industries is the development of secondary aluminium by recycling aluminium waste in melting furnaces. The casting activity is carried out in several stages, as follows:



There are two production lines: Line 1, where aluminium waste with high aluminium quantities is melted and casted in semi-finished products and Line 2, where aluminium waste with lower aluminium quantities and dross (slag) is melted and casted. In addition to that, aluminium ingots of primary aluminium are delivered to the furnaces, where they are heated and mixed with secondary aluminium, originating from pre- and post-consumer scrap and aluminium-rich waste from Line 2. The industrial products made are intended for the Business-to-business market segment.

The company has implemented a certified quality management system, IATF 16949, which monitors the entire manufacturing process.

2.7 Environment and health during manufacturing

The production facility has an environmental management system in accordance with ISO 14001, an energy management in accordance with ISO 50001 and an occupational health and safety management system in accordance with ISO 45001 in order to ensure environmental protection and occupational health and safety in the production process.

2.8 Product processing/Installation

The aluminium billets are delivered to different industries and the processing/installation depends on each individual industry. Some of the processing activities of aluminium billets are, but not limited to extrusion and forging.

2.9 Packaging

The billets are tied together with plastic straps and placed on rectangular wooden bars. The number of billets tied together and the length may differ, based on customers' requests.

Both the wooden bars and the plastic straps can be recycled by the customer.

2.10 Condition of use

The aluminium billets are produced based on EN AW-6060 specifications.

There are no special features of the material composition for the period of use.

2.11 Environment and health during use

If the aluminium billets are used as intended, no hazards to air, water and soil as well as to human health can arise.

No harmful substances are incorporated in the product.

The environmental impact during the use phase depends on the design of the end product since aluminium billets are not finished products.

2.12 Reference service life

The aluminium billets are not a final product and they are used for different industries as input material where it can have multiple applications, therefore **no** reference service life (RSL) is declared for aluminium billets.

The aluminium billets are not a finished product and they are used as inputs for different industries. Each industry might treat the aluminium based on the properties of the environment where the finished products will stand. The treatment will influence the ageing of the final product.

2.13 Extraordinary effects

Fire

Aluminium billets meet the requirements of building material

class A "non-combustible" according to DIN 4102-4. The melting point of aluminium is approx. 650° C.

The toxicity of fire gases is not applicable.

Fire protection

Name	Value
Building material class	A1
Burning droplets	Not applicable
Smoke gas development	Not applicable

Water

The exposure of the aluminium billets to water does not alter the product and has no negative impact on the environment (water).

Mechanical destruction

Unforeseen mechanical destruction of the aluminium billets is not relevant.

2.14 Re-use phase

The aluminium billets are 100 % recyclable. The material does not suffer any loss of quality and can be recycled forever. The scrap resulting in the production process is processed into new aluminium billets.

The aluminium scrap from demolition can be separated, collected and recycled by the recycling industry.

2.15 Disposal

According to the European Waste Catalog (EWC), the disposal code depends on the end product.

Given its high value, the aluminium scrap it's not disposed but used as a raw material in the recycling industry.

2.16 Further information

For more information, visit: <https://www.hai-aluminium.com/>

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit refers to 1 kg of aluminium billets, from a single major production line (Remelting and Casting). The product consists of primary and recycled aluminium (99 %), reinforced by alloying elements (~1 %). There are no by-products formed from the production line subject to this study.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	kg

Data used in calculations represent site-specific production volumes for 2022 of the main product line.

3.2 System boundary

The LCA for aluminium billets is a cradle-to-gate assessment of the environmental impacts with options.

The following life cycle phases are considered in the analysis:

Module A1-A3 | Product stage

The following processes were considered:

- The purchase of the raw materials and the ancillary materials such as primary aluminium, recycled aluminium as well as ancillary materials such as alloying metals and packaging.
- The transport of the raw and ancillary materials was calculated based on the actual distances of the suppliers.
- The energy consists of diesel used in the manufacturing process and natural gas which is supplied from the

national grid.

- The electricity is 100 % green electricity based on the contract concluded between HAI and the electricity supplier.

Module C2 | Transport to waste processing

Module C2 declares the environmental impacts resulting from transporting the waste aluminium to a waste processing facility at an assumed distance of 50 km.

Module C3 | Waste processing

Module C3 declares the environmental impacts resulting from the treatment of aluminium scrap by collecting, sorting, cleaning and pressing (90 % of the product).

Module C4 | Disposal

Module C4 declares the environmental impacts resulting from landfilling (10 % of the product).

Module D | Credits and loads outside the system boundary

In Module D, the substitution potential of primary aluminium through a recycling scenario (90 % of the product) is presented.

3.3 Estimates and assumptions

This study analysis is based mainly on on-site specific data related to product manufacturing. Study results are valid for the technological process specified, geographical area and time period mentioned.

Furthermore, the following estimates have been made:

- Alloys – for the purpose of calculations all alloys are assumed to

be pure substances, thus containing 100 % of a given substance (e.g. Mg, Zn). The alloys contribute about 1 % to the final product.

- Starting with 2021, HAI is purchasing only green electricity. The actual energy mix will be published after this study was performed. A 75 % hydro-power and 25 % wind power was assumed as electricity mix.
- It was assumed that soft sawn wood with a density of 540 kg/m³ is used for wood packaging.
- The use of Euro 6 trucks is assumed for the transport, due to the prevalence of this type of Euro trucks in the fleet transporting materials.
- For all inputs a dataset representative for the European market was selected (if available) or a global market dataset in case a European dataset was not available.
- Only the environmental burden from collection, sorting and transportation of Al scrap used as an input is accounted for.
- All waste outputs such as mixed plastic, wood, cardboard, are accounted for by selecting datasets representative for the market, where transport is already included in the final assessment of the impacts. Respective types of waste treatment have been selected (preparation for recycling, incineration, landfilling).
- The amount of used water is accounted as tap water from municipal supply or underground water without treatment depending on the reported quantities.
- In 2022 part of the production of the same line was a specific different product (specific customer requirement). The technological process is identical to the studied product, the only difference being the share of alloys, especially the share of magnesium in its content. As this product is not representative for the studied product, the quantity of magnesium used in this study was adjusted to reflect the production of the studied product. The production process is identical and no other inputs needed adjustments.

3.4 Cut-off criteria

All inputs and outputs from background system to foreground system processes, with significant potential impact, are included in the calculation, as company specific data is available. Cut-off criteria are set to be not more than 1% of renewable and non-renewable primary energy usage and not more than 1% of the total mass flow for a single flow and 99% of all flows are considered.

4. LCA: Scenarios and additional technical information

Characteristic product properties biogenic carbon

Biogenic carbon is present only in the wooden packaging and it is not reported since the wood packaging represents less than 1 % from the total inputs of packaging.

End of life (C1-C4)

For the end-of-life scenario used in this study the following assumptions and thus follows the most recent data on aluminium recycling published by the European Aluminium

3.5 Background data

Calculations were performed using Simapro 9.4.0.2, where inputs and outputs are listed. The LCA impacts were calculated using characterization factors from Ecoinvent 3.8 database, applying the EN 15804 + A2 Method V1.03 / EF 3.0 normalization and weighting set.

3.6 Data quality

Data reliability is ensured by the manufacturer's data management systems and expert knowledge of plant engineers. Additional questions regarding reported values (e.g., type of material, materials use, waste management techniques, transportation distances, etc.) were answered and clarified by plant engineers.

3.7 Period under review

Site-specific data is collected for all flows according to the set cut-off criteria. Data collected is representative of one and the same technology for the period between the 1st of January 2022 to the 31st of December 2022. All the collected data is based on the actual quantities used and produced during this period.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's lifespan: Europe

3.9 Allocation

In this study there are no by-products and thus no relevant allocation is considered necessary since all inputs are converted to the main product described above and waste outflows.

The total environmental burden is associated with the products delivered to the customers

3.10 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

Calculations were performed using Simapro 9.4.0.2, where inputs and outputs are listed. The LCA impacts were calculated using characterization factors from Ecoinvent 3.8 database.

Association.

Name	Value	Unit
Recycling	0.9	kg
Landfilling	0.1	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Recycling	90	%

5. LCA: Results

The following table shows the LCA results for the declared unit of 1 kg of aluminium billets.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg aluminium billets

Parameter	Unit	A1-A3	C2	C3	C4	D
Global Warming Potential total (GWP-total)	kg CO ₂ eq	1.93E+00	1.07E-02	2.4E-01	5.56E-03	-1.74E+00
Global Warming Potential fossil fuels (GWP-fossil)	kg CO ₂ eq	1.88E+00	1.07E-02	2.38E-01	5.52E-03	-1.7E+00
Global Warming Potential biogenic (GWP-biogenic)	kg CO ₂ eq	3.32E-03	1.03E-05	1.72E-03	3.92E-05	-5.82E-03
Global Warming Potential luluc (GWP-luluc)	kg CO ₂ eq	3.95E-02	5.04E-06	3.2E-04	5.09E-06	-3.33E-02
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	1.41E-07	2.41E-09	1.11E-08	7.62E-10	-1.2E-07
Acidification potential of land and water (AP)	mol H ⁺ eq	2E-02	3.02E-05	9.57E-04	3.4E-05	-1.31E-02
Eutrophication potential aquatic freshwater (EP-freshwater)	kg P eq	1.96E-04	8.05E-07	6.74E-05	1.3E-06	-7.74E-04
Eutrophication potential aquatic marine (EP-marine)	kg N eq	3.88E-03	5.9E-06	1.35E-04	9.08E-06	-1.72E-03
Eutrophication potential terrestrial (EP-terrestrial)	mol N eq	2.18E-02	6.42E-05	1.49E-03	9.81E-05	-1.71E-02
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	6.93E-03	2.46E-05	4.28E-04	2.93E-05	-5.71E-03
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	5.85E-06	4.88E-08	1.1E-05	1.39E-08	1.42E-05
Abiotic depletion potential for fossil resources (ADPF)	MJ	2.72E+01	1.6E-01	1.56E+00	7.88E-02	-2.14E+01
Water use (WDP)	m ³ world eq deprived	4.24E-01	5.3E-04	2.02E-02	1.53E-03	-2.71E-01

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg aluminium billets

Parameter	Unit	A1-A3	C2	C3	C4	D
Renewable primary energy as energy carrier (PERE)	MJ	1.33E+01	2.7E-03	2.09E-01	4.05E-03	-8.16E+00
Renewable primary energy resources as material utilization (PERM)	MJ	7.74E-03	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ	1.33E+01	2.7E-03	2.09E-01	4.05E-03	-8.16E+00
Non renewable primary energy as energy carrier (PENRE)	MJ	2.72E+01	1.6E-01	1.57E+00	7.88E-02	-2.14E+01
Non renewable primary energy as material utilization (PENRM)	MJ	0	0	0	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	2.72E+01	1.6E-01	1.57E+00	7.88E-02	-2.14E+01
Use of secondary material (SM)	kg	7.88E-01	0	0	0	0
Use of renewable secondary fuels (RSF)	MJ	0	0	0	0	0
Use of non renewable secondary fuels (NRSF)	MJ	0	0	0	0	0
Use of net fresh water (FW)	m ³	2.29E-03	0	0	0	0

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg aluminium billets

Parameter	Unit	A1-A3	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	3.17E-05	4.28E-07	5.94E-03	1.15E-07	2.41E-04
Non hazardous waste disposed (NHWD)	kg	7.48E-01	6.79E-03	1.38E-01	2.06E-01	-4.71E-01
Radioactive waste disposed (RWD)	kg	1.66E-04	1.07E-06	6.49E-06	3.72E-07	-8.64E-05
Components for re-use (CRU)	kg	0	0	0	0	0
Materials for recycling (MFR)	kg	1.22E-03	0	0	0	0
Materials for energy recovery (MER)	kg	0	0	0	0	0
Exported electrical energy (EEE)	MJ	0	0	0	0	0
Exported thermal energy (EET)	MJ	0	0	0	0	0

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg aluminium billets

Parameter	Unit	A1-A3	C2	C3	C4	D
Incidence of disease due to PM emissions (PM)	Disease incidence	2.87E-07	7.29E-10	1.47E-08	5.86E-10	-1.39E-07
Human exposure efficiency relative to U235 (IR)	kBq U235 eq	4.33E-01	8.49E-04	1.61E-02	4.5E-04	-2.35E-01
Comparative toxic unit for ecosystems (ETP-fw)	CTUe	5.83E+01	4.61E-02	5.68E-01	1.58E-01	-2.1E+01
Comparative toxic unit for humans (carcinogenic) (HTP-c)	CTUh	9.35E-09	2.18E-12	5.04E-11	2.82E-12	-4.48E-09
Comparative toxic unit for humans (noncarcinogenic) (HTP-nc)	CTUh	8.61E-08	1.26E-10	6.93E-09	1.14E-10	-6.3E-08

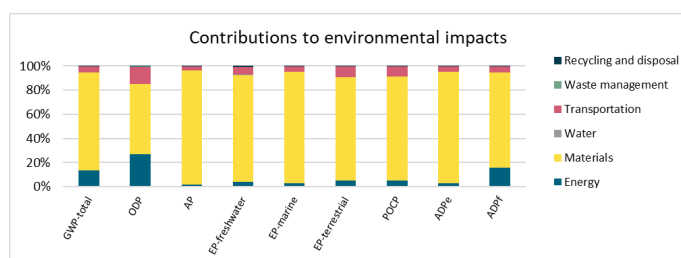
Soil quality index (SQP)	SQP	1.15E+01	9.45E-02	1.49E+00	9.88E-02	-1.26E+00
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Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low-dose ionizing radiation 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 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. 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 experienced with the indicator.

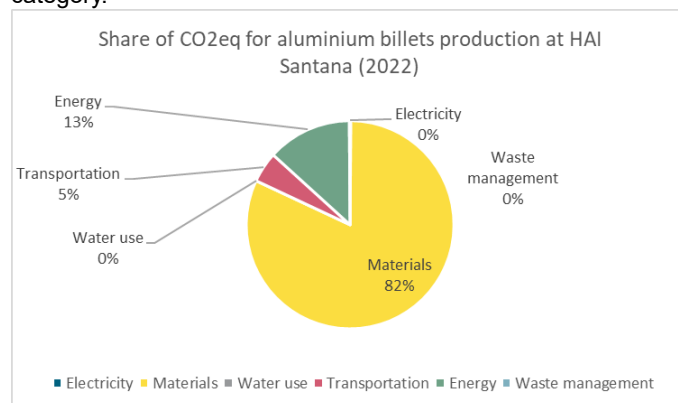
6. LCA: Interpretation

The LCA results are presented for 1 kg of aluminium billets. The charts below provide information on the impacts per main processes of the upstream and manufacturing life cycle stages. There are no known limitations to the results in the context of the set goal and scope of the study.



Based on the results it can be concluded that the dominant material category appears to be materials responsible for 81.58% for climate change category. The second biggest contributor to the overall impact is energy with 13.26 % for climate change category followed by the footprint of the transportation with a share of 4.74 % for climate change category.

In the figure below it can be seen that by excluding the final disposal materials still represent the dominant category and are responsible for 82 % of the total climate change impact category.



7. Requisite evidence

The product is not a finished product (end product) and it is used as raw material for other industries. The processing and the design of the end product will vary, depending on the

application of the final product.

8. References

Standards

DIN EN 573-3:2019-10

Aluminium and aluminium alloys - Chemical composition and form of wrought products - Part 3: Chemical composition and form of products

DIN 4102-4

Fire behaviour of building materials and building components - Part 4: Synopsis and application of classified building materials, components and special components

IATF 16949

IATF 16949:2016 Quality management system for organizations in the automotive industry

ISO 14001

ISO 14001:2015 Environmental management systems

ISO 14025

EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

ISO 14040

ISO 14040:2006, Environmental management — Life cycle assessment — Principles and framework

ISO 14044

ISO 14044:2006, Environmental management — Life cycle assessment — Requirements and guidelines

EN 15804

EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

ISO 45001

ISO 45001:2018 Occupational health and safety management systems

ISO 50001

ISO 50001:2018 Energy management systems

Further References

BPR Regulation

Biocidal Products Regulation EU 528/2012

European Aluminium Association

A strategy for achieving aluminium's full potential for circular economy by 2030

<https://european-aluminium.eu/wp-content/uploads/2022/08/european-aluminium-circular-aluminium-action-plan.pdf>

ECHA list

List of substances of very high concern (SVHC) for authorisation (ECHA Candidate List), 14.01.2020, published under Article 59(10) of REACH. Helsinki: European Chemicals Agency. <http://echa.europa.eu/>

European Waste Catalogue (EWC)

Ordinance on the European Waste List (Waste List Ordinance AVV)

IBU

Institut Bauen und Umwelt e.V.: General Instructions for the

EPD programme of Institut Bauen und Umwelt e.V., Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021, www.ibu-epd.com

PCR Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, v. 1.3

PCR Part B: Requirements on the EPD for Products of aluminium and aluminium alloys, v. 1.6

Software and database**SimaPro**

LCA and reporting software apps.simapro.com

ecoinvent Version 3

Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, [online] 21(9), pp.1218–1230.

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