ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Schüco International KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-SCH-20230392-CBA1-EN
Issue date	23.10.2023
Valid to	22.10.2028

Schüco Ultra Low Carbon Aluminium Profile

Schüco International KG

Institut Bauen und Umwelt e.V.

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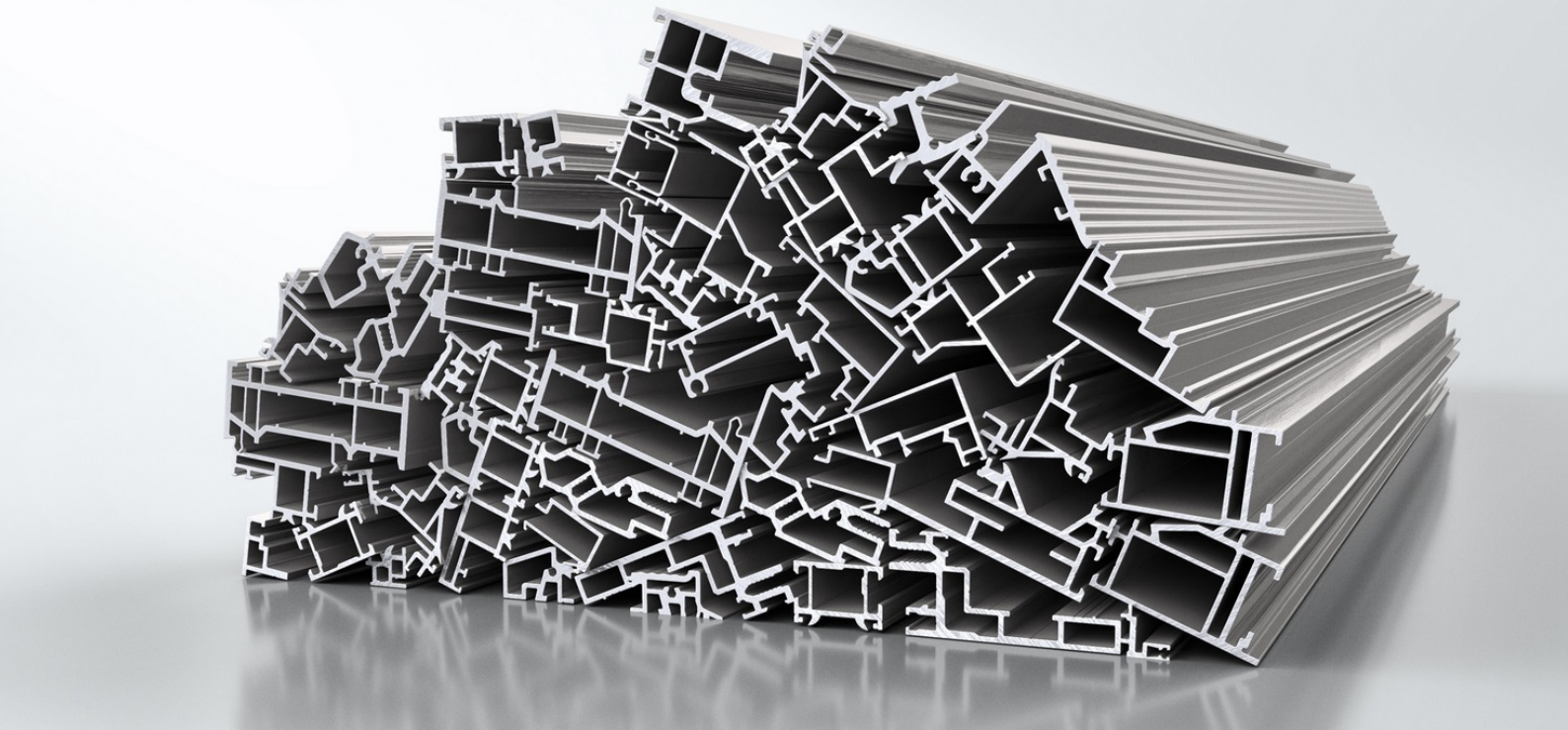
SCHÜCO

Ultra Low Carbon Aluminium

SCHÜCO CARBON CONTROL ∞

ECO PLATFORM EPD VERIFIED



General Information

Schüco International KG

Programme holder

IBU – Institut Bauen und Umwelt e.V.
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Germany

Declaration number

EPD-SCH-20230392-CBA1-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

23.10.2023

Valid to

22.10.2028

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Schüco Ultra Low Carbon Aluminium Profile

Owner of the declaration

Schüco International KG
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33609 Bielefeld
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Declared product / declared unit

1 kg plate finish, Schüco Ultra Low Carbon aluminium profile

Scope:

The present environmental product declaration concerns the 1 kg plate finished Schüco Ultra Low Carbon aluminium profile.

This EPD is based on data from aluminium pressing plants which produce aluminium profiles with comparable environmental attributes. The creation of these aluminium profiles requires technically similar production processes.

In this EPD, upstream aluminium production refers to a mixture of primary and secondary aluminium, the proportions have been determined using a conservative approach.

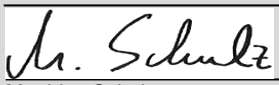
The data collected for this EPD refers to 2022.

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



Matthias Schulz,
(Independent verifier)

Product

Product description/Product definition
The Ultra Low Carbon aluminium profiles are a semi-finished product for use in Schüco windows, doors and façade systems.

Ultra Low Carbon Aluminium Profiles are made from aluminium billets that have a specific environmental quality. According to Schüco's definition, this quality includes aluminium billets that do not surpass a defined global warming potential and contains a minimum post-consumer scrap content of 75%.
Compliance with the required quality (GWP & 75% post-consumer scrap) is verified by the billet suppliers in the form of an EPD.

The Schüco Ultra Low Carbon aluminium profiles are made out of aluminium alloys consisting of light metal aluminium (Al) and various alloying elements (such as silicon, copper, manganese, magnesium etc.).

The raw aluminium profiles can be anodised, wet or powder-coated (as required by the customer).

Relevant standards
Whether aluminium profiles are subject to harmonisation regulations or not depends on whether these carry a load in the final application (e.g. window frames or support beams). However, since the aluminium profiles are intermediate products, it is not possible to make a clear statement about their final application. For this reason, both standards ("Profiles and constructions in accordance with CPR" and "Profiles that are not subject to the EU harmonisation regulations") are listed below in order to cover the scope of the possible end uses of the aluminium profiles.

Profiles and constructions in accordance with CPR (hEN): The regulation (EU) *No. 305/2011 (CPR)* applies to bringing the product into circulation in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland). The product requires a Declaration of Performance taking into account the following standards:

- *EN 15088, Aluminium and aluminium alloys – Structural products for construction works –Technical conditions for inspection and delivery*
- *EN 1090-3, Execution of steel structures and aluminium structures - Part 3: Technical requirements for aluminium structures*

With regard to use, the respective national regulations apply.

Profiles that are not subject to any EU harmonisation legislation:
With regard to using the product, the respective national regulations apply for the location of application

- *EN 755-1, Aluminium and aluminium alloys – Extruded rod/bar, tube and profiles –Part 1: Technical conditions for inspection and delivery*
- *EN 12020-1, Aluminium and aluminium alloys - Extruded precision profiles in alloys EN AW-6060 and EN AW-6063 - Part 1: Technical conditions for inspection and delivery*

Application
Schüco Ultra Low Carbon aluminium profiles are used in Schüco windows, doors and façade systems.

Technical Data
Physical properties of aluminium (e.g. EN AW-6060/6063; EN AW-6005):

Constructional data

Name	Value	Unit
Gross density	2700	kg/m^3
Melting point	660	°C
Thermal conductivity	200	W/(mK)
Modulus of elasticity	70000	N/mm^2
Shear modulus	27000	N/mm^2
Specific heat capacity	0.9	kJ/kgK
Hardness	65	HB
Yield strength Rp 0,2 min.	160	N/mm^2
Tensile strength Rm min.	200	N/mm^2
Tensile stress at break	8	%

Construction data (as in PCR B: Requirements on the EPD for Products of aluminum and aluminum alloys listed, e.g. electrical conductivity, coefficient of thermal expansion and the chemical composition) are not relevant for this product.

Profiles and constructions in accordance with CPR (hEN): Performance values of the products corresponding to the Declaration of Performance in relation to its essential features as per:

- *EN 15088, Aluminium and aluminium alloys – Structural products for construction works –Technical conditions for inspection and delivery*
- *EN 1090-3, Execution of steel structures and aluminium structures - Part 3: Technical requirements for aluminium structures*

Profiles that are not subject to any EU harmonisation legislation: Performance values of the product in regard to its features in accordance with the controlled technical regulations (no CE marking).

Delivery condition
Materials delivered in accordance with *EN 755-1* or *EN 12020-1*. The alloys comply with *EN 573-3* regarding their chemical composition. The aluminium profiles are packaged in accordance with customer requirements.

Base materials/Ancillary materials
The chemical composition of aluminum alloys of the 6000 series - AlMgSi (specifically EN AW-6060/6063; EN AW-6005) can be found in standard *EN 573-3* (limit values for alloying elements). The aluminum content is > 90%. The other alloy components are magnesium, silicon, iron, copper, manganese, chromium, zinc, titanium.

Material note: Aluminium is a light metal. The melting point of pure aluminium is 660 °C. The natural colour is silvery-white.

Aluminium is very corrosion-resistant and has a long service life. A naturally thin oxide layer protects the material from degradation due to air, water or certain chemicals.

The properties make it possible to manufacture profiles with complex shapes.

This product/article/at least one partial article contains substances listed in the candidate list (date: 28.09.2023)

exceeding 0.1 percentage by mass: no.

This product/article/at least one partial article contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: no.

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): no.

Manufacture
Cutting – The aluminium billets are cut to size.

Heating – The aluminium billets are heated in an oven to between 460 °C and 530 °C so that it is easier to reach the plastic state of the metal during shaping.

Extrusion – With typical compression of 6000–8000 MN/mm² on a cross-sectional area of the billet, the hot aluminium billet is pressed through a pre-heated die. This is how the profile gets its geometric shape.

Chilling – The profiles are cooled directly after the extrusion (there are various processes that use air, water or spray). Cooling is necessary for the final adhesive strength.

Elongation – After extrusion the profiles are elongated in order to straighten them out. Cutting to length – Cutting the profiles according to customer requirements (default 6000 mm).

Tempering – Hardening of the profiles at a temperature between 145 °C and 210 °C (5–12 hours).

Packaging – This is followed by packing the profiles in accordance with customer requirements.

Environment and health & safety during manufacture
Throughout the entire manufacturing process, all legal obligations regarding occupational health and safety and the environment are fulfilled.

Production fabrication/installation
Throughout the entire manufacturing process, all legal obligations regarding occupational health and safety and the environment are fulfilled.

Packaging
All profiles are individually packaged in accordance with customer requirements. The packing materials used range from reusable containers, untreated wooden crates and pallets to cardboard packaging etc.

In order to protect the profiles, they are packaged separately with cardboard intermediate layers, polyethylene (PE) foil and paper, for example. The PE foil, paper and cardboard used can be fed into the recycling process by the customer.

Condition during use
The profiles are made of an alloy which consists of aluminium and the named alloying components. The constituents correspond to the raw materials named in *EN 573-3* with the specified mass percentage shares.

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

Environment and health & safety during use
The intended use of the aluminium profiles does not pose any risks to water, air/the atmosphere or soil.

The specifications regarding use and maintenance do not comply with the semi-finished product created but instead are specific to the design and intended application of the end product.

Reference service life
An expected life cycle is not declared for aluminium profiles as these are semi-finished products. The service life is dependent on the product application. As aluminium is protected by an oxide layer on the surface itself, the service life is, in theory, unlimited.

Exceptional fire effects
In accordance with *DIN 4102-4*, uncoated aluminium profiles fulfil the requirements of building material class A, "non-flammable". The melting point of the aluminium material is 660 °C.

- Smoke gas development: No smoke gas develops with the profiles.
- Burning drops of liquid: Not applicable
- Toxicity of combustion gases: Not applicable

Water
The exposure of the profiles to water does not lead to any changes in the product nor to any negative consequences for the environment.

Mechanical destruction
Mechanical destruction is not relevant for aluminium profiles.

Period of post use
Aluminium profiles are fully recyclable. The material does not suffer any loss in quality from this process. Scrap from demolitions, conversions or renovations can be easily separated and (via the recycling industry) fed into the recycling process.

All of the process scrap that occurs during the manufacture and further processing of the profile in the factory is collected and processed into new primary material (billets, bars, ...) in a recycling process in the remelting plant. These billets are then used in the plant as a new starting material.

Disposal
In accordance with the *European Waste Catalogue (EWC)* the end product complies with the disposal code (170402 Aluminium).

Due to its high value as a raw material, aluminium scrap is not disposed of. Instead, it is fed into an established circle of reuse or recycling.

LCA: Calculation rules

Declared Unit

The declared unit refers to 1 kg of extruded aluminium profile.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	kg

Geographically, the study represents the production of aluminium extrusion profiles in Central Europe. Upstream aluminium production refers to European production and a mixture of primary and secondary aluminium. The proportions of primary and secondary aluminium have been determined using a conservative approach.

System boundary

Cradle to gate with options: modules A1–A3, C, D and additional modules A4 and A5

Modules A1 to A3 include the supply of all materials, auxiliaries, energy and packaging materials up to the factory gate, as well as waste processing up to the end-of-waste state or disposal of final residues. Aluminium billets, produced from remelted production scrap, stay within the product system and are reused within A3.

Module A4 includes transport of the aluminium profile to the place of installation or further processing.

Module A5 includes the disposal of packaging material.

Module C1 includes the energy demand for dismantling and separation of materials.

Module C2 includes transportation of post-consumer waste to waste processing.

Module C3 does not include environmental impacts, as aluminium waste reaches its end-of-waste status after dismantling.

Module C4 does not include environmental impacts, as all 100 % of the waste is expected to be recycled.

Module D includes potential benefits from all net flows given in modules A5 and C3 that leave the system boundary of the product system after having past end-of-waste state in the form of recovery and/or recycling potentials.

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

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. *LCAfE software* and *MLC databases* (f.k.a. GaBi) by *Sphera Solutions GmbH* were used for all background databases and LCA calculations.

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The product itself does not contain any biogenic Carbon. Packaging material contain biogenic carbon from the use of wood and cardboard/ paper.

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

Information on biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.021	kg C

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel (A4)	0.0029	l/100km
Transport distance (A4)	100	km
Capacity utilisation (including empty runs)	61	%

Installation into the building (A5)

Name	Value	Unit
Output substances following waste treatment on site packaging waste	0.056	kg

End of Life (C1-C4)

For dismantling and separation of built-in aluminium profiles at the end of life, the use of diesel-powered construction machinery is assumed in module C1.

Name	Value	Unit
Diesel used in construction machines (C1)	0.0056	kg

Transport distance in module C2 is considered with the listed scenario settings.

Name	Value	Unit
Litres of fuel (C2)	0.0029	l/100km
Transport distance (C2)	50	km
Capacity utilisation (including empty runs)	61	%

Collection rate of aluminium scrap at the end of life is set to 100 %.

Name	Value	Unit
Collected separately waste type (aluminium)	1	kg

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

Recycling potentials are calculated for the amount of the net flow aluminium scrap.

Name	Value	Unit
Net flow aluminium scrap	0.23	kg

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = 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	X	X	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg Schüco Ultra Low Carbon Aluminium Profile

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	2.27E+00	8.69E-03	9.78E-02	1.99E-02	4.34E-03	0	0	-1.48E+00
GWP-fossil	kg CO_2 eq	2.33E+00	8.58E-03	2.22E-02	1.96E-02	4.29E-03	0	0	-1.47E+00
GWP-biogenic	kg CO_2 eq	-6.04E-02	2.54E-05	7.57E-02	7.73E-05	1.27E-05	0	0	-4.8E-03
GWP-luluc	kg CO_2 eq	8.8E-04	7.96E-05	3.61E-07	1.81E-04	3.98E-05	0	0	-2.88E-04
ODP	kg CFC11 eq	1.75E-11	1.12E-15	9.19E-15	2.55E-15	5.59E-16	0	0	-1.22E-11
AP	mol H^+ eq	8.4E-03	1.28E-05	1.74E-05	1.15E-04	6.4E-06	0	0	-5.73E-03
EP-freshwater	kg P eq	2.91E-06	3.14E-08	2.64E-09	7.16E-08	1.57E-08	0	0	-7.75E-07
EP-marine	kg N eq	1.62E-03	4.67E-06	5.36E-06	5.6E-05	2.34E-06	0	0	-8.16E-04
EP-terrestrial	mol N eq	1.76E-02	5.52E-05	7.6E-05	6.2E-04	2.76E-05	0	0	-8.87E-03
POCP	kg NMVOC eq	4.78E-03	1.12E-05	1.46E-05	1.49E-04	5.62E-06	0	0	-2.52E-03
ADPE	kg Sb eq	9.79E-07	5.66E-10	8.54E-11	1.29E-09	2.83E-10	0	0	-4.06E-07
ADPF	MJ	3.47E+01	1.17E-01	2.34E-02	2.67E-01	5.85E-02	0	0	-2.13E+01
WDP	m^3 world eq deprived	1.64E-01	1.04E-04	1.07E-02	2.37E-04	5.19E-05	0	0	-6.54E-02

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg Schüco Ultra Low Carbon Aluminium Profile

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	1.48E+01	8.52E-03	7.88E-01	1.94E-02	4.26E-03	0	0	-1.03E+01
PERM	MJ	7.82E-01	0	-7.82E-01	0	0	0	0	0
PERT	MJ	1.55E+01	8.52E-03	5.79E-03	1.94E-02	4.26E-03	0	0	-1.03E+01
PENRE	MJ	3.44E+01	1.17E-01	3.27E-01	2.68E-01	5.87E-02	0	0	-2.14E+01
PENRM	MJ	3.04E-01	0	-3.04E-01	0	0	0	0	0
PENRT	MJ	3.47E+01	1.17E-01	2.34E-02	2.68E-01	5.87E-02	0	0	-2.14E+01
SM	kg	9.54E-01	0	0	0	0	0	0	2.31E-01
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0
FW	m^3	2.24E-02	9.33E-06	2.52E-04	2.13E-05	4.66E-06	0	0	-1.77E-02

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg Schüco Ultra Low Carbon Aluminium Profile

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	1.86E-08	3.64E-13	5.97E-13	8.29E-13	1.82E-13	0	0	-1.33E-08
NHWD	kg	5.3E-01	1.79E-05	1.89E-03	4.08E-05	8.95E-06	0	0	-4.35E-01
RWD	kg	3.07E-03	2.2E-07	1.31E-06	5.01E-07	1.1E-07	0	0	-2.42E-03
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	0	0	1E-04	0	0	1E+00	0	0
MER	kg	0	0	0	0	0	0	0	0
EEE	MJ	0	0	1.18E-01	0	0	0	0	0
EET	MJ	0	0	2.11E-01	0	0	0	0	0

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 OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg Schüco Ultra Low Carbon Aluminium Profile

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	1.34E-07	1.06E-10	1.07E-10	2.29E-09	5.3E-11	0	0	-9.17E-08
IR	kBq U235 eq	5.97E-01	3.28E-05	2.09E-04	7.47E-05	1.64E-05	0	0	-4.88E-01
ETP-fw	CTUe	1.15E+01	8.31E-02	1.1E-02	1.89E-01	4.16E-02	0	0	-8.05E+00
HTP-c	CTUh	8.91E-10	1.7E-12	8.97E-13	3.87E-12	8.51E-13	0	0	-3.95E-10
HTP-nc	CTUh	4.94E-08	9.07E-11	4.96E-11	2.55E-10	4.54E-11	0	0	-1.05E-08
SQP	SQP	1.24E+01	4.89E-02	7.04E-03	1.11E-01	2.45E-02	0	0	-6.91E-01

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, 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 as there is limited experience with the indicator.

References

Standards

DIN 4102-4
DIN 4102-4:2016-05, Fire behaviour of building materials and building components - Part 4: Synopsis and application of classified building materials, components and special components.

EN 573-3
EN 573-3:2019-10, Aluminium and aluminium alloys - Chemical composition and form of wrought products - Part 3: Chemical composition and form of products.

EN 755-1
EN 755-1:2016-10, Aluminium and aluminium alloys – Extruded rod/bar, tube and profiles –Part 1: Technical conditions for inspection and delivery.

EN 1090-3
EN1090-3:2019, Execution of steel structures and aluminium structures - Part 3: Technical requirements for aluminium structures.

EN 12020-1
EN 12020-1:2022, Aluminium and aluminium alloys - Extruded precision profiles in alloys EN AW-6060 and EN AW-6063 - Part 1: Technical conditions for inspection and delivery.

EN 15088
EN 15088:2006-03, Aluminium and aluminium alloys – Structural products for construction works –Technical conditions for inspection and delivery.

EN 15804
EN15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

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European Waste Catalogue (EWC), COMMISSION DECISION of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council.

ISO 14025
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LCAfE software and MLC databases
LCAfE and MLC databases (f.k.a. GaBi) by Sphera. Version CUP 2023.1. Sphera Solutions GmbH, https://sphera.com/product-sustainability-gabi-data-search/, 2023.

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