ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	RHEINZINK GmbH & Co. KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-RHE-20250491-IBA1-EN
Issue date	25/03/2026
Valid to	24/03/2031

RHEINZINK GRANUM EXTRA basalte

RHEINZINK GmbH & Co. KG

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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1. General Information

RHEINZINK GmbH & Co. KG

Programme holder

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

Declaration number

EPD-RHE-20250491-IBA1-EN

This declaration is based on the product category rules:

Building metals, 01/08/2021
(PCR checked and approved by the SVR)

Issue date

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

RHEINZINK GRANUM EXTRA basalte

Owner of the declaration

RHEINZINK GmbH & Co. KG
Bahnhofstraße 90
45711 Datteln
Germany

Declared product / declared unit

1 kg of RHEINZINK GRANUM EXTRA basalte

Scope:

The Life Cycle Assessment (LCA) was **c**arried out according to DIN ISO 14044. Specific data from the company RHEINZINK in Datteln, Germany, and from the database Sphera LCA FE were used. The LCA was carried out for the manufacturing phase of the products, taking into account all background data such as raw material production and transports ('cradle to gate'). The use phase of the titanium zinc sheets is divided into several application areas: roofing applications, roof drainage and facade claddings. The treatment for the titanium zinc sheets was modelled in re-melting furnaces for the end-of-life phase. The thereby resulting credit of extracted zinc is counted as a replacement for primary zinc.
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. Marco Muhl,
(Independent verifier)

2. Product

2.1 Product description/Product definition

The basis of RHEINZINK GRANUM EXTRA basalte is electrolytic special high-grade zinc in accordance with EN 1179. Added to this are small amounts of titanium and copper based on EN 988. The RHEINZINK GRANUM EXTRA basalte surface is the result of a coating process. This coating is added for aesthetic reasons and for corrosion protection.

For the placing on the market in the EU and European Free Trade Association (EFTA) (with the exception of Switzerland) the Regulation (EU) No. 305/2011 (CPR) applies. The products need a Declaration of Performance taking into consideration EN 14782 or EN 14783, respectively and the CE-marking.

For the application and use the respective national provisions apply.

2.2 Application

• Titanium zinc sheets, strips and profiles for roofing and facade cladding according to EN 14782 -Self-supporting metal sheet for roofing, external cladding and internal lining according to EN 14783 - Fully supported metal sheet and strip for roofing, external cladding and internal lining. The products are CE-marked based on these standards.

• Roof drainage systems (roof gutters, pipes and accessories) according to EN 612 - Eaves gutters with bead stiffened fronts and rainwater pipes with seamed joints made of metal sheet.

2.3 Technical Data

The following table gives conversion data from product surface mass per unit area for the relevant product systems in roofing, facade cladding and roof drainage.

System	Area of Application	Thickness of Metal	Weight per m²
Double standing seam	Roof	0,70 mm	5,6 kg
Roll-cap system	Roof	0,70 mm	5,8 kg
Square tiles	Roof	0,70 mm	7,7 kg
Gutter	Roof drainage	0,70 mm	1,7 kg
Downpipe	Roof drainage	0,70 mm	1,6 kg
Angle standing seam	Façade cladding	0,70 mm	5,7 kg
Angle standing seam	Façade cladding	0,80 mm	6,6 kg
Flat-lock tiles	Façade cladding	0,70 mm	7,0 kg
Reveal panel	Façade cladding	1,00 mm	9,8 kg
Horizontal panel	Façade cladding	1,00 mm	9,8 kg
Shipboard panel	Façade cladding	1,00 mm	10,4 kg

Performance data of the product in accordance with the respective declaration of performance with respect to its essential characteristics according to EN 14782 and EN 14783 respectively.

Constructional data

Name	Value	Unit
Coefficient of thermal expansion	22	$10^{-6}K^{-1}$
Tensile strength /EN 10002-1/	≥150	N/mm^2
Modulus of elasticity	≥80000	N/mm^2
Melting point	420	°C
Thermal conductivity	109	W/(mK)
Electrical conductivity at 20°C	17x10^6	$\Omega^{-1}m^{-1}$
Density	7200	kg/m^3

2.4 Delivery status

The material RHEINZINK is delivered in thicknesses from 0.5 – 1.5 mm. The maximum width of strips and sheets is 1.000 mm. The standard sheets are delivered in 1x2 m and 1x3 m, coils are delivered with a maximum weight of 1 t. Finished products are delivered to customer specifications.

Application rules
EN 988, Zinc and zinc alloys - Specification for rolled flat products for building

EN 506, Roofing products from metal sheet- specification for self-supporting products of copper and zinc sheet

EN 612, Eaves gutters with bead stiffened fronts and rainwater pipes with seamed joints made of metal sheet

2.5 Base materials/Ancillary materials

-Components of RHEINZINK-alloy

- Special-High-Grade zinc 99.995% (Z1 according to DIN EN 1179)
- Copper: 0.08 - 0.17 %
- Titanium: 0.07 - 0.12 %
- Aluminium: ≤ 0.015 %

-Auxiliary substances

RHEINZINK is an alloy of zinc with small amounts of copper and titanium. No compound of the alloy >0.1 % is listed in the 'Candidate List of Substances of Very High Concern for Authorisation' (SVHC) dated 01/2025. The product does not contain any substances with carcinogenic, mutagenic, reprotoxic (CMR) properties > 0.1 %. RHEINZINK products do not have biocide properties as defined by the (EU) Ordinance on Biocide Products No. 528/2012). Coating thickness: ≤ 10 µm per side.

2.6 Manufacture

Structure of the manufacturing process:
The manufacturing process comprises seven steps:

Pre-alloy:
To improve the quality, and for energy-saving reasons, a pre-alloy is produced at 760 °C in an induction crucible (melting of SHG zinc, copper, titanium and aluminium). The pre-alloy blocks produced contain the titanium and copper portions of the subsequently rolled alloy.

Melting:
The pre-alloy blocks and SHG zinc are melted together in large melting furnaces (induction furnaces) at 500 – 550 °C and mixed by induction currents.

Casting:
The final alloy is cooled down below melting point by a closed water circuit in the casting machine, resulting in a solid cast

string.

Rolling:
There is a cooling distance between the casting machine and the roller racks. The rolling is done by 5 roller pairs, so-called roller racks. With adequate pressures the material thickness is reduced by up to 50 % at each of these roller racks. Simultaneously, the material is cooled and greased using a special emulsion.

Coiling:
Subsequently, the finished rolled RHEINZINK is wound up into coils of 20 tonnes. They are still at a temperature of 100-150 °C and are stored for further cooling.

Coating:
The surface appearance is achieved by a coating process. The material is degreased, rinsed, dried, then coated with a primer and, subsequently, with a topcoat.

Stretching and cutting:
The tensions developed inside the RHEINZINK bands during rolling are 'stretched-out' by a stretching-bending-straightening process. The trimming scrap produced during the manufacturing of the
material is sold to a recycling plant and transformed into secondary zinc.

Quality control:
Control by the manufacturer. Quality management according to ISO 9001.

2.7 Environment and health during manufacturing

Environmental management according to ISO 14001. Energy management according to ISO 50001. OHS management in place. These management systems ascertain that the legal requirements concerning worker health and environmental protection are fulfilled.

2.8 Product processing/Installation

Basic principles:

During transportation and storage, RHEINZINK material must be kept dry and ventilated. The plastic film that protects the surface must be removed immediately after installation.

The thermic stretching of the material must be taken into consideration when handling/installing the product. Due to the typical brittleness of zinc under cold conditions, the temperature of the product during installation should be 10 °C. In other cases, adequate mechanical equipment should be used, e.g. hot air blasts.

2.9 Packaging

The packaging materials in use, paper/cardboard, polyethylene (PE foils), polypropylene (PP foils) and steel, are recyclable (non-reusable wooden pallets, reusable wooden and metal pallets). If gathered separately, return in Germany is organized by INTERSEROH which collects the packaging material at given sites with exchangeable containers upon request and complies with legal regulations. The reusable wooden and steel pallets are taken back and reimbursed by RHEINZINK GmbH & Co. KG and the wholesale trade (refund system).

2.10 Condition of use

RHEINZINK GRANUM EXTRA basalte is UV-resistant and does not rot. It is non-flammable and resistant to radiating heat and against most of the chemical substances used in building construction. RHEINZINK material requires no maintenance or cleaning during its service life. In marine climates regular cleaning is recommended..

This material has a repellent effect to electro-smog (electromagnetic radiation in excess of 98 %), as certified by IGEF (https://www.rheinzink.de/nachhaltig-planen-und-bauen/zertifizierungen/)

2.11 Environment and health during use

Environmental aspects:
The transfer of zinc ions via rainwater is significantly reduced (> 90 %) due to the applied coating. The further transfer of zinc ions depends mainly on air contamination with 'acid' pollutants, particularly with SO_2. In aquatic systems, only a small part of the total zinc concentration is available for an organism - this amount is called bioavailable. It is related to the physical-chemical conditions of the receiving water body. The bioavailability is, for example, influenced by the amount of zinc which is organically or inorganically bound, linked to particles or competes with other ions.

Health aspects:
There will be no effects on health if the RHEINZINK products are used according to their designated function. Zinc, like iron, belongs to the essential metals. Zinc is not accumulated in the body.

2.12 Reference service life

Service lifetime of the base material according to BBSR (the Federal Office for Building and Regional Planning): > 50 years, theoretical lifetime according to available literature > 100 years. The standard ISO 15686 has not been considered.

2.13 Extraordinary effects

Fire
The RHEINZINK products comply with DIN 4102, Part 1 and to DIN EN 13501-1 the Requirements of Building Material Class A1 'non-combustible'.

Fire protection

Name	Value
Building material class EN 13501, DIN 4102	A1
Burning droplets EN 13501	D0
Smoke gas development EN 13501	-

Smoke production/smoke concentration:
When heated above 650 °C vaporization as zinc oxide (ZnO) occurs.
The effect of the coating can be neglected.

Toxicity of the fumes:
The ZnO smoke may cause zinc fever (diarrhoea, fever, dry throat) when inhaled over a longer period of time, this disappears completely 1 to 2 days after inhalation.

Water
Zinc metal is not classified as hazardous for the aquatic environment, WFD -European water framework directive.

Mechanical destruction
None

2.14 Re-use phase

End of life
When renovating or disassembling a building end of life, RHEINZINK products can easily be collected. The cuttings occurring at building sites, as well as, used zinc from renovation

sites are gathered and may be sent directly or via scrap-gathering organizations to secondary melting plants - several exist in Germany. The energy necessary for recycling titanium zinc sheets is only 5 % of the primary energy content of zinc. The demand for zinc scrap, resulting from zinc recycling's low energy requirement, is also mirrored by the fact that generally about 80 % of the value of the zinc content is reimbursed. According to the newest information, the total recycling rate is up to 96 % (Initiative Zink).

2.15 Disposal

A small amount of zinc might be lost during collection and erroneously disposed. All in all, this amounts to less than 4 %. The European Waste Code for zinc is 17 04 04.

2.16 Further information

Additional information: www.rheinzink.de www.rheinzink.com

3. LCA: Calculation rules

3.1 Declared Unit

Declared unit

The declared unit is 1kg RHEINZINK GRANUM EXTRA basalte.

Name	Value	Unit
Declared unit	1	kg
Gross density	7200	kg/m3

3.2 System boundary

Type of the EPD: cradle to gate - with options. In this study, the product stage information modules A1, A2, and A3 are considered. These modules include the production of raw material extraction and processing (A1), processing of secondary material input (A1), transport of the raw materials to the manufacturer (A2), manufacturing of the product (A3) and packaging materials (A3). Module A5 covers the waste treatment of packaging materials (incineration of paper, plastic and wood). The transport to module C4 is considered under module C2. An excavator is assumed to support the dismantling of the product at the construction site (C1).
Module C4 considers the non-recovered scrap due to losses and sorting efficiency as described in 2.15. There is no activity in C3.
The EoL of the product (Module D) is also included. The treatment (remelting process of zinc scrap) and credits for avoided primary production are grouped into module D.

3.3 Estimates and assumptions

No assumptions and estimations were necessary for the LCA.

3.4 Cut-off criteria

In the assessment, all available data from production process are considered, i.e. all raw materials used, utilised thermal energy, and electric power consumption using best available LCI datasets. Thus, material and energy flows contributing less than 1 % of mass or energy are considered.

3.5 Background data

The background data has been taken from the latest available Sphera LCA FE (GaBi) database CUP 2025.1. RHEINZINK-CLASSIC® walzblank, EPD-RHE-20230365-IBA2-DE has been used as pre-product for the reported product.

3.6 Data quality

The process data and the used background data are consistent.
Regarding foreground data, this study is based on high-quality primary data, collected by RHEINZINK. Data were delivered in form of Excel tables and were checked for plausibility. Therefore, the data quality can be described as good.

3.7 Period under review

Modelling is based on production data from 2025.
Background data refer to the period from 2022 to 2024.

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: Germany

3.9 Allocation

In this study, allocation was avoided wherever possible. However, the following allocations had to be done:

- Pre-consumer scrap in the Modules A1-A3 has been mass allocated, since it was assumed that the scrap generated during the production, corresponds to 80 % of the value of the new product. Therefore, the environmental burdens of the production process were allocated to the product and to the generated scrap, accordingly
- Benefits from recycling from the end of life of the product (Module D)

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. The background data have been taken from the latest available Sphera LCA FE (GaBi) database CUP 2025.1. RHEINZINK-CLASSIC® walzblank, EPD-RHE-20230365-IBA2-DE has been used as pre-product for the reported product.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The total mass of biogenic carbon-containing materials, in this case, cardboard and wooden pallets, is less than 5 % of the total mass of the product and accompanying packaging.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.01	kg C

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

Scenario Module A5

Cardboard: 0,005 kg/kg product sent to incineration
Wooden pallets: 0,027 kg/kg product sent to incineration

(exported Energy credited in Module D)
Plastic film: 0,001kg/kg product sent to incineration (exported Energy credited in Module D)
Steel wrapping band: 1,7E-4 kg/ kg product sent to recycling (material recycling credited in Module D)

Module C1:
excavator 100 kW

Module C2:
500 km transport by truck, EURO 6, 61 % average utilization (C2)

Module C3:
The material reaches the end of waste state after transport to the re-melters so there is no activity.

Module C4:
500 km transport by truck, EURO 6, 61 % average utilization (C2)

Module A4, B1, B2, B3, B4, B5, reference service life, B6, B7 and C1 are not considered and declared in this study.

The credits given in Module D result from the 100 % recyclability of each zinc-product. After the scrap collection (a collection rate of 95 % was assumed), zinc scrap is sent to a re-melting process, where the scrap is converted to secondary zinc. The credit for the zinc gained through re-melting is calculated with the dataset of the primary production.

End of life (C4)

Name	Value	Unit
Landfilling	5	%

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

Name	Value	Unit
Recycling	95	%

5. LCA: Results

For all indicators, the characterization factors from EC-JRC (http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml) mentioned in Annex C of /EN 15804+A2 / were applied. It refers to Environmental Footprint (EF) version 3.1.

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	MND	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 RHEINZINK GRANUM EXTRA Basalte

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	3.11E+00	5.2E-02	6.6E-04	6.2E-02	0	1.17E-03	-2.32E+00
GWP-fossil	kg CO_2 eq	3.13E+00	3.74E-03	6.39E-04	6.01E-02	0	1.06E-03	-2.31E+00
GWP-biogenic	kg CO_2 eq	-4.37E-02	4.83E-02	3.83E-06	2.86E-04	0	1.05E-04	-5.31E-03
GWP-luluc	kg CO_2 eq	2.94E-03	1.39E-06	1.63E-05	1.56E-03	0	3.34E-06	-3.04E-04
ODP	kg CFC11 eq	2.34E-11	1.09E-14	1.77E-16	1.69E-14	0	3.44E-15	-1.94E-11
AP	mol H^+ eq	1.54E-02	1.14E-05	3.19E-06	6.53E-05	0	6.63E-06	-1.37E-02
EP-freshwater	kg P eq	6.78E-06	1.73E-09	1.2E-09	1.15E-07	0	1.5E-09	-5.42E-06
EP-marine	kg N eq	4.1E-03	3.03E-06	1.52E-06	2.29E-05	0	1.62E-06	-3.23E-03
EP-terrestrial	mol N eq	4.37E-02	4.95E-05	1.66E-05	2.58E-04	0	1.76E-05	-3.45E-02
POCP	kg NMVOC eq	1.07E-02	8.01E-06	4.22E-06	6.2E-05	0	5.01E-06	-8.67E-03
ADPE	kg Sb eq	1.54E-03	1.05E-10	8.5E-11	8.1E-09	0	7.22E-11	-8.24E-04
ADPF	MJ	4.27E+01	1.54E-02	8.23E-03	7.84E-01	0	1.74E-02	-3.19E+01
WDP	m^3 world eq deprived	9.85E-01	5.8E-03	2.42E-06	2.31E-04	0	1.24E-04	-8.49E-01

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 RHEINZINK GRANUM EXTRA Basalte

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
PERE	MJ	1.78E+01	4.55E-01	7.1E-04	6.76E-02	0	2.83E-03	-1.77E+01
PERM	MJ	8.3E-01	-4.5E-01	0	0	0	0	0
PERT	MJ	1.86E+01	4.89E-03	7.1E-04	6.76E-02	0	2.83E-03	-1.77E+01
PENRE	MJ	4.3E+01	5.84E-02	8.23E-03	7.84E-01	0	1.74E-02	-3.19E+01
PENRM	MJ	7.42E-02	-4.3E-02	0	0	0	0	0
PENRT	MJ	4.31E+01	1.54E-02	8.23E-03	7.84E-01	0	1.74E-02	-3.19E+01
SM	kg	1.5E-01	0	0	0	0	0	7.7E-01
RSF	MJ	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0
FW	m^3	4.43E-02	1.37E-04	5.05E-07	4.81E-05	0	3.66E-06	-3.69E-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 RHEINZINK GRANUM EXTRA Basalte

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
HWD	kg	3.79E-05	1.06E-11	4.29E-13	4.09E-11	0	3.76E-12	-3.52E-05
NHWD	kg	1.48E+00	1.07E-03	1.22E-06	1.17E-04	0	5.01E-02	-1.27E+00
RWD	kg	5.14E-03	4.87E-07	1.19E-08	1.14E-06	0	2.41E-07	-4.29E-03
CRU	kg	0	0	0	0	0	0	0
MFR	kg	0	3.56E-04	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0
EEE	MJ	0	6.1E-02	0	0	0	0	0

EET	MJ	0	1.44E-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 RHEINZINK GRANUM EXTRA Basalte

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
PM	Disease incidence	ND	ND	ND	ND	0	ND	ND
IR	kBq U235 eq	ND	ND	ND	ND	0	ND	ND
ETP-fw	CTUe	ND	ND	ND	ND	0	ND	ND
HTP-c	CTUh	ND	ND	ND	ND	0	ND	ND
HTP-nc	CTUh	ND	ND	ND	ND	0	ND	ND
SQP	SQP	ND	ND	ND	ND	0	ND	ND

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.

6. LCA: Interpretation

The production of the high-grade zinc (RHEINZINK CLASSIC) is still the dominating contributor to all indicators of the impact assessment (>95 %) as the main raw material. Only for ODP, RHEINZINK CLASSIC makes up 49 %, the coatings around 27% and the wood pallets 15 %. The credits given in module D result from the 100% recyclability of the zinc products. At the EoL of the zinc products, a collection rate of 95 % was assumed. The remaining 5 % are forwarded to the waste treatment (module C4). Overall, C4 has a minimal contribution.

7. Requisite evidence

Runoff rates

In a report of TNO-MEP-R99/441, a literature study was undertaken to determine the runoff rates of zinc in Europe.

The following conclusions were taken in this report: Corrosion rates refer to the loss of metallic zinc, initially accumulating as ionic zinc in the patina layer. Run-off rates refer to the 'wash-off' of ionic zinc from the patina layer, the difference being the amount of zinc remaining in the patina layer. Run-off rates will, in general, be lower than corrosion rates or at maximum equal to the corrosion rates.

Available data for corrosion and run-off rate result from exposure of standard test panels mounted on standard test racks. Only little data are available from testing (on) real objects under a variety of typical microclimate conditions to which they are exposed. Recent experimental data with very large test racks (simulating zinc roofs) suggest that small test racks may overestimate the run- off rate. The decrease in the corrosion rates runs parallel to the decrease in the ambient concentrations of SO_2, which is generally accepted as the dominant air pollution factor determining the corrosion of zinc. Corrosion rates decrease with time due to the increasing protection of the patina layer. Therefore, long-term (20 years) average corrosion rates will be substantially lower (60 % of initial value) than those during the first years of fresh not patinated materials. After a period of about 10 years, the run-off rate will be approximately 2/3 of the corrosion rate. Run-off rates can be calculated to be 3 g/m²/a in areas with higher SO_2 concentrations and 2 g/m²/a in areas with lower concentrations.

Internal measurements of the runoff of RHEINZINK GRANUM EXTRA basalte (measurements of zinc ions in rain water from samples) showed a decrease of the runoff rate after 6 months of more than 90 %, as compared to uncoated zinc.

8. References

EN 506:2009
EN 506:2009, Roofing products of metal sheet - Specification for self-supporting products of copper or zincsheet

EN 612:2005
EN 612:2005, Eaves gutters with bead stiffened fronts and rainwater pipes with seamed joints made of metal sheet

EN 988:1996
EN 988:1996, Zinc and zinc alloys

EN 1179:2003
EN 1179:2003, Zinc and zinc alloys- Primary zinc

DIN 4102:1998
DIN 4102:1998, Fire behaviour of building materials and

building components

ISO 9001:2015
ISO 9001:2015, Quality management systems – Requirements

EN 10002:2001
EN 10002:2001, Metallic materials - Tensile testing

DIN EN 13501:2019
DIN EN 13501:2019, Fire classification of construction products and building elements

ISO 14001:2015
ISO 14001:2015, Environmental management systems - Requirements with guidance for use

DIN EN ISO 14040:2021
DIN EN ISO 14040:2021, Environmental management - Life cycle assessment

DIN ISO 14044:2018
DIN ISO 14044:2018, Environmental management - Life cycle assessment – Requirements and guidelines

EN 14782:2006
EN 14782:2006, Self-supporting metal sheet for roofing, external cladding and internal lining

EN 14783:2013
EN 14783:2013, Fully supported metal sheet and strip for roofing, external cladding and internal lining. The products are CE-marked based on these standards

ISO 15686:2011
ISO 15686:2011, Buildings and constructed assets - Service life planning

ISO 50001:2018
ISO 50001:2018, Energy Management System - Requirements with guidance for use
IGEF certificate for RHEINZINK
https://www.rheinzink.de/nachhaltig-planen-und-bauen/zertifizierungen/

Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR): *'Nutzungsdauer von Bauteilen für Lebenszyklusanalysen nach BNB' (BNB: Bewertungssystem Nachhaltiges Bauen) (2011)*

(EU) 305/2011
REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 9 March 2011, laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

(EU) 528/2012
REGULATION (EU) No 528/2012 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 22 May 2012, concerning the making available on the market and use of biocidal products

European waste catalogue
Commission decision 2000/532/EC2 for zinc is 17 04 04

Sphera LCA FE
Sphera LCA For Experts (formerly GaBi Software System) with the associated databases Managed LCA Content MLC (formerly GaBi databases), Sphera Solutions GmbH. CUP Version: 2025.1. University of Stuttgart, Leinfelden Echterdingen, MLC data documentation at https://lcadatabase.sphera.com/ (June 2025).

Hullmann, Heinz (Ed.):
Natürlich oxidierende Metalloberflächen; Umweltauswirkungen beim Einsatz von Kupfer und Zink in Gebäudehüllen (Naturally oxidising metal surfaces; environmental effects when using copper and zinc for buildings) ; 2003, Stuttgart, Fraunhofer ISB-Verlag, ISBN: 3-8167-6218-2.

Initiative Zink 2025
https://www.zink.de/zink/materialkreislauf/recyclingrate/

EPD Rheinzink-Classic
RHEINZINK-CLASSIC® walzblank, EPD-RHE-20230365-IBA2-DE, 02.01.2024

PCR 2024, Part A (version 1.4)
Institut Bauen und Umwelt e.V., Berlin: Product Category Rules for Building-Related Products and Services from the range of Environmental Product Declarations of *Institut Bauen und Umwelt* (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. 2024 www.ibu-epd.de

PCR 2023, Part B
Institut Bauen und Umwelt e.V., Berlin: Product Category Rules for Construction Products from the range of Environmental Product Declarations of *Institut Bauen und Umwelt* (IBU), Part B: Requirements on the EPD for Building metals. October 2023
www.ibu-epd.de

TNO-MEP-R99/441
TNO-MEP-R99/441, Diffusive emissions of zinc due to atmospheric corrosion of zinc and zinc coated (galvanized) materials, 11-1999

Directive 2000/60/EG (Water Framework Directive, WFD)
DIRECTIVE 2000/60/EG OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 23 October 2000, establishing a framework for Community action in the field of water policy

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