epd-norge
Global program operatør

Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

ZEBRA ANODE

PROTECTOR

Conductive Paint for Cathodic Protection of reinforced concrete

carboline
Coatings - Linings - Fireproofing

The Norwegian EPD Foundation

Owner of the declaration:
Carboline Norge AS

Product:
ZEBRA ANODE

Declared unit:
1 kg

This declaration is based on Product Category Rules:
CEN Standard EN 15804:2012+A2:2019 serves as core PCR
IBU PCR Part B for coatings with organic binders

Program operator:
The Norwegian EPD Foundation

Declaration number:

NEPD-6965-6349-EN

Registration number:

NEPD-6965-6349-EN

Issue date: 24.06.2024

Valid to: 24.06.2029

EPD software:
LCAno EPD generator ID: 412672

General information

Product

ZEBRA ANODE

Owner of the declaration:

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Program operator:

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Manufacturer:

Protector AS
Ringveien 6
3409 Tranby, Norway

Declaration number:

NEPD-6965-6349-EN

Place of production:

Carboline Norge AS
Husebysletta 7
3414 Lierstranda, Norway

This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR
IBU PCR Part B for coatings with organic binders

Management system:

ISO 9001:2015 and ISO 14001:2015

Statement of liability:

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Organisation no:

980 488 683

Declared unit:

1 kg ZEBRA ANODE

Issue date:

24.06.2024

Declared unit with option:

A1,A2,A3,A4,C1,C2,C3,C4,D

Valid to:

24.06.2029

Year of study:

2022

Functional unit:

Comparability:

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

General information on verification of EPD from EPD tools:

Independent verification of data, other environmental information and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4. Verification of each EPD is made according to EPD-Norway's guidelines for verification and approval requiring that tools are i) integrated into the company's environmental management system, ii) the procedures for use of the EPD tool are approved by EPD-Norway, and iii) the process is reviewed annually by an independent third party verifier. See Appendix G of EPD-Norway's General Programme Instructions for further information on EPD tools

Development and verification of EPD:

The declaration is created using EPD tool lca.tools ver EPD2022.03, developed by LCA.no. The EPD tool is integrated in the company's management system, and has been approved by EPD Norway.

Developer of EPD: Anders Øverby

Reviewer of company-specific input data and EPD: Inger Venge

Verification of EPD tool:

Independent third party verification of the EPD tool, background data and test-EPD in accordance with EPDNorway's procedures and guidelines for verification and approval of EPD tools.

Third party verifier:

Elisabet Amat, GREENIZE projects

(no signature required)

Approved:

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:

ZEBRA Anode is a 2-component, mineralic conductive paint designed for use as a long-lasting anode in the ZEBRA system for Cathodic Protection (CP) of steel in concrete.

The ZEBRA Anode, sealed with AHEAD TopCoat M or AHEAD Multiprimer Floor, is designed for use on car-parks, top of decks, slabs, columns, balconies, beams and soffits. Different areas of application require different pre- and post-treatments in order to serve as a long lasting cathodic protection system.

The ZEBRA Anode material is based on silicate technology combined with additives to ensure stable and long time functionality as a CP anode. When overlaid with alkaline AHEAD products, the alkalinity contributes to reduced acidification over time.

Adhesion and resistivity of the Zebra Anode should be checked before it's overcoated.

The colour of the anode is dark grey.

Product specification

Materials	Value	Unit
Binders	10-25	%
Pigments	10-25	%
Fillers	2.5-10	%
Sovents	2.5-10	%
Additives	<1	%
Packaging	<1	%

Technical data:

Component A:_____Special silicate with additives
Component B:_____Alkaline Mg-carbonate
Pigment:_____Graphite
Density:_____approx: 1.33 kg/dm^3
No. of layers:_____1
Solid content:_____41 % by weight
Material per m^2: _____0.35 kg/m^2 of concrete surface (structure dependent)
Dry layer thickness:_____approx. 150 microns
VOC:_____128 g/l
Touch dry at 25 °C:_____after approx. 30 min
Drying time (overpaint): ___2 ... 7 days
Min. temp:_____10°C on concrete surface
Max. temp:_____30°C on concrete surface

Apply with a roller or airless spray in ONE coat. The optimal consumption is 0.30 to 0.35 kg/pr. m^2. Full strength is achieved after 14 days, dependent on temperature and relative humidity.

Technical parameter	Parameter data
Adhesion strength	> 1 N/mm^2, after full curing on good concrete
Electrical resistivity	< 1 Ohm cm (after 4 days)
Approx. pin-pin resistivity	< 100 Ohm
Sheet resistance	< 50 Ohm square
Water-vapour diffusion / Equivalent air layer thickness	sd < 0.03 m (Class V1)
Max. voltage	2.5 V or less normally sufficient, limited by acidification of concrete sub base
Max. current density	20 mA/m^2

Market:

Europe

Reference service life, product

The reference service life of the product is highly dependent on the condition of use.

Reference service life, building or construction works

The coated object is not declared in this EPD.

LCA: Calculation rules

Declared unit:

1 kg ZEBRA ANODE

Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

Data quality:

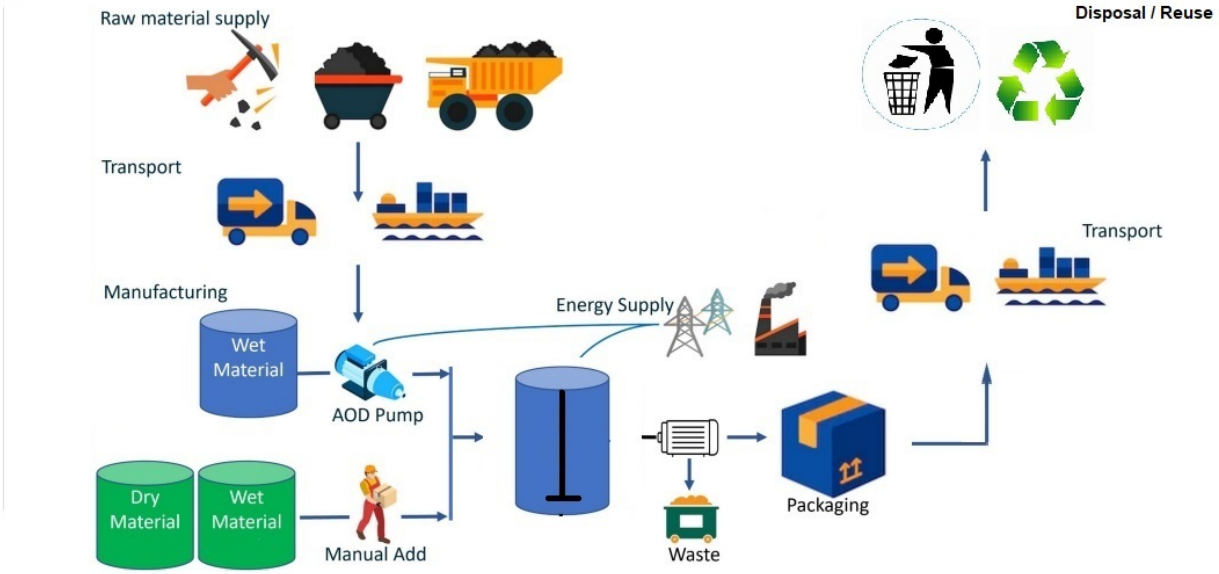
Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on EPDs according to EN 15804 and different LCA databases. The data quality of the raw materials in A1 is presented in the table below.

Materials	Source	Data quality	Year
Chemical	ecoinvent 3.6	Database	2019
Chemical	Ecoinvent 3.6 + CEPE Database	Database	2019
Cleaning agent	ecoinvent 3.6	Database	2019
Packaging - Pallet	Modified ecoinvent 3.6	Database	2019
Packaging - Plastic	ecoinvent 3.6	Database	2019
Plasticizer	Ecoinvent 3.6	Database	2019
Unverified data	CEPE RM Database v3.0	Database	2016
Water	ecoinvent 3.6	Database	2019

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	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	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

System boundary:



Additional technical information:

For more information please refer to Product Data Sheet and Safety Data Sheet.

LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

This EPD is prepared for declaring the production process (A1-A3) of 1 kg of packed 'ready-to-use' product. Transport to the client (A4) and end life stage (C modules) and potential environmental benefits (D module) are also included.

Module A4 describes an average distance from the manufacturing site to where the product is being sold to the client.

This declaration covers end-of-life stage (C module) of a coated construction where dried/cured paint is not removed from the surface during demolition.

Module C1 is declared as zero due to the negligible consumption of energy and natural resources for disassembling, since paint is a part of another product that ends its life.

Module C2 is estimated for delivery of paint residues to the closest waste treatment facility and is assumed as 50 km.

Module C3 has a zero impact since dried paint is not recycled or reused.

Module C4 is declared for dried paint, after solvents' evaporation.

Module D is declared for zero since drier or cured paint is non-recyclable nor reusable.

Transport from production place to user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Truck, 7.5-16 tonnes, EURO 6 (kgkm)	35,4 %	300	0,056	l/tkm	16,80

De-construction demolition (C1)	Unit	Value			
Energy use during decommissioning	kWh/DU	0,00			

Transport to waste processing (C2)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Truck, 16-32 tonnes, EURO 5 (kgkm)	36,7 %	50	0,044	l/tkm	2,20

Waste processing (C3)	Unit	Value			
Waste treatment per kg Paint, municipal incineration (kg)	kg/DU	0,00			

Disposal (C4)	Unit	Value			
Waste, paint, to landfill (kg)	kg/DU	0,42			

Benefits and loads beyond the system boundaries (D)	Unit	Value			
Substitution of raw materials (kg)	kg/DU	0,00			

LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

Environmental impact											
	Indicator	**Unit**	A1	A2	A3	A4	C1	C2	C3	C4	D
	GWP-total	kg CO_2 -eq	6,31E-01	1,51E-01	8,87E-02	7,63E-02	0,00E+00	9,90E-03	0,00E+00	4,91E-02	0,00E+00
	GWP-fossil	kg CO_2 -eq	6,26E-01	1,51E-01	8,69E-02	7,63E-02	0,00E+00	9,89E-03	0,00E+00	4,91E-02	0,00E+00
	GWP-biogenic	kg CO_2 -eq	4,18E-03	6,02E-05	1,65E-03	3,53E-05	0,00E+00	4,03E-06	0,00E+00	4,10E-06	0,00E+00
	GWP-luluc	kg CO_2 -eq	5,68E-04	5,96E-05	1,05E-04	3,30E-05	0,00E+00	3,46E-06	0,00E+00	8,59E-07	0,00E+00
	ODP	kg CFC11 -eq	5,10E-08	3,39E-08	1,18E-08	1,67E-08	0,00E+00	2,26E-09	0,00E+00	1,31E-09	0,00E+00
	AP	mol H+ -eq	4,43E-03	1,03E-03	5,47E-04	2,19E-04	0,00E+00	4,04E-05	0,00E+00	3,07E-05	0,00E+00
	EP-FreshWater	kg P -eq	1,18E-04	1,14E-06	1,86E-06	6,99E-07	0,00E+00	7,77E-08	0,00E+00	3,96E-08	0,00E+00
	EP-Marine	kg N -eq	5,34E-04	2,87E-04	1,95E-04	4,15E-05	0,00E+00	1,20E-05	0,00E+00	1,14E-05	0,00E+00
	EP-Terrestial	mol N -eq	8,97E-03	3,18E-03	2,15E-03	4,66E-04	0,00E+00	1,33E-04	0,00E+00	1,26E-04	0,00E+00
	POCP	kg NMVOC -eq	1,88E-03	9,09E-04	6,01E-04	1,78E-04	0,00E+00	4,06E-05	0,00E+00	4,66E-05	0,00E+00
	ADP-minerals&metals[1]	kg Sb-eq	1,11E-05	3,76E-06	1,17E-06	2,75E-06	0,00E+00	2,68E-07	0,00E+00	3,11E-08	0,00E+00
	ADP-fossil[1]	MJ	1,21E+01	2,24E+00	8,53E-01	1,14E+00	0,00E+00	1,49E-01	0,00E+00	9,50E-02	0,00E+00
	WDP[1]	m^3	4,47E+01	2,02E+00	3,12E+01	1,36E+00	0,00E+00	1,42E-01	0,00E+00	6,16E-01	0,00E+00

GWP-total = Global Warming Potential total; GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment: EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. 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

Remarks to environmental impacts

Additional environmental impact indicators

Indicator		Unit	A1	A2	A3	A4	C1	C2	C3	C4	D
	PM	Disease incidence	5,11E-08	1,01E-08	1,18E-08	4,27E-09	0,00E+00	7,12E-10	0,00E+00	6,54E-10	0,00E+00
	IRP[2]	kgBq U235 -eq	3,00E+01	9,78E-03	5,98E-03	4,98E-03	0,00E+00	6,52E-04	0,00E+00	4,37E-04	0,00E+00
	ETP-fw[1]	CTUe	2,03E+01	1,62E+00	1,71E+00	8,88E-01	0,00E+00	1,10E-01	0,00E+00	5,91E-02	0,00E+00
	HTP-c[1]	CTUh	6,03E-10	0,00E+00	9,60E-11	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,00E-12	0,00E+00
	HTP-nc[1]	CTUh	6,19E-08	1,75E-09	1,57E-09	1,07E-09	0,00E+00	1,19E-10	0,00E+00	5,40E-11	0,00E+00
	SQP[1]	dimensionless	9,16E+00	1,44E+00	3,51E-01	6,77E-01	0,00E+00	1,03E-01	0,00E+00	3,65E-01	0,00E+00

PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Potential Soil Quality Index (dimensionless)

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. 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
2. 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.

Resource use											
Indicator		Unit	A1	A2	A3	A4	C1	C2	C3	C4	D
	PERE	MJ	1,96E+00	3,05E-02	2,30E+00	1,94E-02	0,00E+00	2,11E-03	0,00E+00	3,54E-03	0,00E+00
	PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	PERT	MJ	1,96E+00	3,05E-02	2,30E+00	1,94E-02	0,00E+00	2,11E-03	0,00E+00	3,54E-03	0,00E+00
	PENRE	MJ	1,07E+01	2,24E+00	8,53E-01	1,14E+00	0,00E+00	1,49E-01	0,00E+00	9,50E-02	0,00E+00
	PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	PENRT	MJ	1,07E+01	2,24E+00	8,53E-01	1,14E+00	0,00E+00	1,49E-01	0,00E+00	9,50E-02	0,00E+00
	SM	kg	7,40E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	RSF	MJ	4,33E-02	1,10E-03	2,39E-03	7,00E-04	0,00E+00	7,54E-05	0,00E+00	7,35E-05	0,00E+00
	NRSF	MJ	1,23E-02	3,76E-03	9,84E-03	2,54E-03	0,00E+00	2,69E-04	0,00E+00	1,52E-04	0,00E+00
	FW	m^3	1,16E-02	2,28E-04	1,91E-02	1,36E-04	0,00E+00	1,57E-05	0,00E+00	1,17E-04	0,00E+00

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 materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

End of life - Waste

Indicator		Unit	A1	A2	A3	A4	C1	C2	C3	C4	D
	HWD	kg	3,73E-03	1,13E-04	2,51E-02	6,30E-05	0,00E+00	7,61E-06	0,00E+00	0,00E+00	0,00E+00
	NHWD	kg	1,64E-01	9,77E-02	4,25E-02	4,49E-02	0,00E+00	7,13E-03	0,00E+00	4,20E-01	0,00E+00
	RWD	kg	3,72E-05	1,53E-05	5,82E-06	7,68E-06	0,00E+00	1,02E-06	0,00E+00	0,00E+00	0,00E+00

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

End of life - Output flow

Indicator		Unit	A1	A2	A3	A4	C1	C2	C3	C4	D
	CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	MFR	kg	0,00E+00	0,00E+00	4,01E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	MER	kg	0,00E+00	0,00E+00	2,77E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	EEE	MJ	0,00E+00	0,00E+00	1,30E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	EET	MJ	0,00E+00	0,00E+00	1,96E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

Biogenic Carbon Content

Indicator	Unit	At the factory gate
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	0,00E+00

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO2

Additional requirements

Greenhouse gas emissions from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

Electricity mix	Source	Amount	Unit
Electricity, Norway (kWh)	ecoinvent 3.6	24,33	g CO2-eq/kWh

Dangerous substances

The product contains no substances given by the REACH Candidate list.

Indoor environment

Not relevant.

Additional Environmental Information

Additional environmental impact indicators required in NPCR Part A for construction products										
Indicator	**Unit**	A1	A2	A3	A4	C1	C2	C3	C4	D
GWPIOBC	kg CO_2 -eq	6,30E-01	1,51E-01	8,36E-02	7,63E-02	0,00E+00	9,90E-03	0,00E+00	4,91E-02	0,00E+00

GWP-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

Bibliography

ISO 14025:2010 Environmental labels and declarations - Type III environmental declarations - Principles and procedures.
ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines.
EN 15804:2012+A2:2019 Environmental product declaration - Core rules for the product category of construction products.
ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products.
ecoinvent v3, Allocation, cut-off by classification, Swiss Centre of Life Cycle Inventories.
Iversen et al., (2021) eEPD v2021.09 Background information for EPD generator tool system verification, LCA.no Report number: 07.21
Ruud and Iversen (2023) EPD generator for PCR IBU Part B: Requirements on the EPD for Coatings with organic binders, LCA.no report number: 13.23
NPCR Part A: Construction products and services. Ver. 2.0. April 2021, EPD-Norge.
IBU PCR Part B: Requirements on the EPD for Coatings with organic binders, version 4, 2023, IBU - Institut Bauen und Umwelt e.V.

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