ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	CELO Befestigungssysteme GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-CLO-20240121-CBA1-EN
Issue date	03.04.2024
Valid to	13.09.2028

ResiFIX Pure Epoxy plus EPPSF

CELO Befestigungssysteme GmbH

Institut Bauen und Umwelt e.V.

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ECO PLATFORM EPD VERIFIED

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General Information

CELO Befestigungssysteme GmbH

Programme holder

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Germany

Declaration number

EPD-CLO-20240121-CBA1-EN

This declaration is based on the product category rules:

Reaction resin products, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

03.04.2024

Valid to

13.09.2028

Dipl.-Ing. Hans Peters
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ResiFIX Pure Epoxy plus EPPSF

Owner of the declaration

CELO Befestigungssysteme GmbH
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86551 Aichach
Germany

Declared product / declared unit

The declared product is the two-component reaction resin mortar "ResiFIX Pure Epoxy plus EPPSF", manufactured by CELO Befestigungssysteme GmbH. The declared unit is based on 1 kg reaction resin product in the ratio at which the two components must be mixed before use. The packaging is also included in the calculation, since the product is sold by CELO Befestigungssysteme GmbH with its packaging. The declared unit is indicated in [kg].

Scope:

This document covers the two-component reaction resin mortar "ResiFIX Pure Epoxy plus EPPSF". To prepare the life cycle assessment [*LCA*], specific data were collected from the CELO Befestigungssysteme GmbH manufacturing facility in Plant 2, Germany. The assessment is based on data from 2020 which correspond to the yearly average.
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

Angela Schindler,
(Independent verifier)

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Product

Product description/Product definition

The declared product ResiFIX Pure Epoxy plus EPPSF is a two-component reaction resin mortar based on epoxy resin that is delivered in a two-component plastic cartridge. The high-performance product is applied through a static mixer using a manual, battery-operated or pneumatic gun. It was specially developed for use in securing threaded rods, rebar or internally threaded sleeves in concrete.
Marketing of the product in the EU/EFTA (except for Switzerland) is governed by *Regulation (EU) No. 305/2011 (CPR)*. The product requires a Declaration of Performance subject to *ETA-21/0928* and *ETA-21/0929* and CE marking.

Application

The CELO Injection system ResiFIX Pure Epoxy plus is used to safely secure threaded rods, internally threaded sleeves and post-mortared rebar connections in cracked and uncracked C20/25 to C50/60 concrete for a useful life of up to 100 years, and is suitable for installation in hammer-drilled (standard SDS and hollow bit) and diamond-drilled holes at environmental temperatures between 0°C and 40°C. The CELO Injection system ResiFIX Pure Epoxy plus has ETA assessments and ICC certifications, including seismic category C1 and C2 for anchoring from M8 to M30 and for rebar connections including seismic conditions from 8mm to 40mm, and can be rated for fire conditions.

Technical Data

The following structural properties are relevant for the declared product ResiFIX Pure Epoxy plus EPPSF as delivered:

Construction Data

Name	Value	Unit
Density acc. to DIN 51757 for mixing the two components	1.4	g/cm³
Compressive strength acc. to DIN EN 196 Part 1	121.8	N/mm²
Flexural strength acc. to DIN EN 196 Part 1	66	N/mm²

Storage:
Store in a cool, dry and dark place; storage temperature: +5°C to +35°C

Shelf life:
24 months in cartridge systems

Gel and working time:
0°C 90 min.
+ 5°C 80 min.
+ 10°C 60 min.
+ 15°C 40 min.
+ 20°C 30 min.
+ 25°C 12 min.
+ 35°C 8 min.
+ 40 °C 8 min.

Curing time in dry substrate:
0°C 8640 min.
+ 5°C 2880 min.
+ 10°C 1680 min.
+ 15°C 1080 min.
+ 20°C 720 min.
+ 25°C 540 min.
+ 35°C 360 min.
+ 40°C 240 min.

For more information, please refer to the relevant technical data sheet.

Product performance values in accordance with the Declaration of Performance with regard to its principal characteristics according to *ETA-21/0928* and *ETA-21/0929*.

Base materials/Ancillary materials

The declared product ResiFIX Pure Epoxy plus EPPSF is delivered as a two-component plastic cartridge and consists of a resin component and a curing agent component in a 3:1 volume ratio. The mixing ratio between the resin component and the curing agent component is set automatically as the product is pushed out of the cartridge. Curing begins immediately after the components are mixed.

1) "This product/article/at least one partial article contains substances in the ECHA candidate list of substances of very high concern (SVHC) (17 January 2023) above a concentration of 0.1% by mass: no."

2) "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"

3) "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) Regulation on Biocidal Products No. 528/2012): no"

The product considered in this EPD contains individual components in the following ranges:

Resin component:
Epoxy resin: 40 to 75% by weight
Mineral fillers: 30 to 40% by weight
Other components: < 5% by weight

Curing agent component:
Various polyamines: 40 to 50% by weight
Mineral fillers: 30 to 50% by weight
Other components: < 5% by weight

Reference service life

The declared product ResiFIX Pure Epoxy plus EPPSF may be exposed to a wide range of environmental conditions during the use phase. Its expected reference service life depends on the specific installation situation and on the product's resulting exposure. The main factors influencing service life are weather conditions and mechanical and chemical stresses.

LCA: Calculation rules

Declared Unit

The product declared is a two-component reaction resin mortar manufactured by CELO Befestigungssysteme GmbH with the product name ResiFIX Pure Epoxy plus EPPSF. The declared unit is based on 1 kg reaction resin product in the ratio at which the two components must be mixed before use. The mass mixing ratio between the resin component and the curing agent

component is 4:1 (volume ratio 3:1). The packaging is also included in the calculation at 0.1435 kg per 1 kg of reaction resin product. The declared unit data are presented in the table below:

Declared unit data

Name	Value	Unit
Declared unit	1	kg

System boundary

Type of EPD: Cradle to factory gate with options. The following information modules are defined as system boundaries in this study:

Production stage (A1–A3):
• A1, Raw material extraction,
• A2, Transport to the manufacturer,
• A3, Manufacturing.

End of life (C1-C4):

- C1, Deconstruction/demolition,
- C2, Transport,
- C3, Waste processing,
- C4, Disposal.

Reuse, recovery and recycling potential (D)

To precisely determine the indicators and environmental impacts of the declared unit, a total of 8 information modules are considered. The information modules A1 to A3 describe the material provision, the transport to the production site, as well as the production processes of the product itself.

The precursor products are sourced from Germany. Transport is exclusively done by truck. The following process diagrams illustrate the underlying production process.

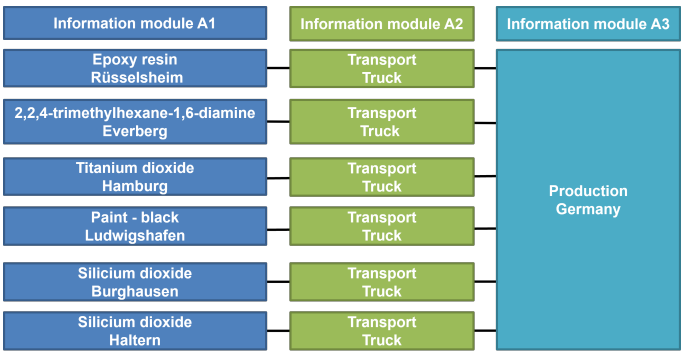

Figure 1 Information modules A1 to A3 of the product

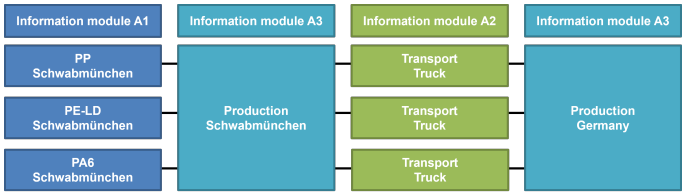

Figure 2 Information modules A1 to A3 of the packaging

Information modules C1 to C4 document deconstruction/demolition for removal from the building, transport to waste disposal, waste processing and product disposal. Reuse, recovery and recycling potential are documented in information module D.

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

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 datasets from the *LCA for Experts* and *ecoinvent 3.9.*1 databases, which this study also draws on, are documented at the following site (*Sphera*). 2023.1 *http://www.gabi-software.com/deutsch/index/ (ecoinvent 3.9.1).* http://ecoquery.ecoinvent.org/3.9.1/cutoff/search

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

No renewable raw materials are used in the product or the packaging. The biogenic carbon value is therefore reported as zero.

Packaging per declared unit

Name	Value	Unit
Packaging PP	0.1188	kg
Packaging PA6	0.0082	kg
Packaging PE-LD	0.0165	kg

End of Life (C1–C4)

The product is demolished by using an electric chisel. The electrical energy consumption for this tool is estimated at 0.05 MJ for the declared unit. The power consumption is calculated using a European energy mix. Construcion waste is transported 200 km by truck to a waste treatment facility. At the waste treatment facility, the construction waste is shredded and then disposed in a landfill.

Name	Value	Unit
Collected as mixed construction waste	1	kg
Shredding	1	kg
Disposal in landfill	1	kg

Reuse, recovery and recycling potential (D), relevant scenario specifications

The product has no reuse, recovery or recycling potential. Information module D is therefore declared and reported as zero.

Name	Value	Unit
Reuse, recovery and recycling potential	0	kg

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LCA: Results

The results in this calculation refer to the characterisation factors EN 15840+A2/EF 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	MND	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 ResiFIX Pure Epoxy plus EPPSF

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential total (GWP-total)	kg CO_2 eq	4.1E+00	4.58E-03	1.75E-02	2.58E-03	1.46E-02	0
Global Warming Potential fossil fuels (GWP-fossil)	kg CO_2 eq	3.97E+00	4.53E-03	1.73E-02	2.56E-03	1.46E-02	0
Global Warming Potential biogenic (GWP-biogenic)	kg CO_2 eq	1.26E-01	4.91E-05	0	0	0	0
Global Warming Potential luluc (GWP-luluc)	kg CO_2 eq	8.91E-04	4.87E-07	1.58E-04	1.92E-05	4.53E-05	0
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	2.19E-10	8.27E-14	1.49E-15	4.28E-15	3.71E-14	0
Acidification potential of land and water (AP)	mol H^+ eq	5.13E-03	9.57E-06	6.48E-05	1.34E-05	1.03E-04	0
Eutrophication potential aquatic freshwater (EP-freshwater)	kg P eq	2.24E-05	1.67E-08	6.21E-08	8.71E-09	2.93E-08	0
Eutrophication potential aquatic marine (EP-marine)	kg N eq	1.76E-03	2.29E-06	3.03E-05	6.13E-06	2.67E-05	0
Eutrophication potential terrestrial (EP-terrestrial)	mol N eq	1.89E-02	2.39E-05	3.39E-04	6.77E-05	2.94E-04	0
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	5.94E-03	6.11E-06	5.84E-05	1.66E-05	8.06E-05	0
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	2.08E-07	6.95E-10	1.1E-09	2.74E-09	6.72E-10	0
Abiotic depletion potential for fossil resources (ADPF)	MJ	8.8E+01	9.43E-02	2.32E-01	5.04E-02	1.94E-01	0
Water use (WDP)	m^3 world eq deprived	1.21E-01	9.98E-04	1.96E-04	4.98E-04	1.6E-03	0

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg ResiFIX Pure Epoxy plus EPPSF

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier (PERE)	MJ	8.76E+00	5.64E-02	1.64E-02	4.68E-03	3.16E-02	0
Renewable primary energy resources as material utilization (PERM)	MJ	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ	8.76E+00	5.64E-02	1.64E-02	4.68E-03	3.16E-02	0
Non renewable primary energy as energy carrier (PENRE)	MJ	6.69E+01	9.43E-02	2.32E-01	5.05E-02	1.94E-01	0
Non renewable primary energy as material utilization (PENRM)	MJ	2.11E+01	0	0	0	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	8.81E+01	9.43E-02	2.32E-01	5.05E-02	1.94E-01	0
Use of secondary material (SM)	kg	0	0	0	0	0	0
Use of renewable secondary fuels (RSF)	MJ	0	0	0	0	0	0
Use of non renewable secondary fuels (NRSF)	MJ	0	0	0	0	0	0
Use of net fresh water (FW)	m^3	1.18E-02	4.55E-05	1.81E-05	1.44E-05	4.9E-05	0

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg ResiFIX Pure Epoxy plus EPPSF

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	7.4E-09	7.38E-12	8.59E-13	1.31E-13	4.23E-12	0
Non hazardous waste disposed (NHWD)	kg	6.94E-02	6.91E-05	3.35E-05	1.33E-05	9.71E-01	0
Radioactive waste disposed (RWD)	kg	1.31E-03	1.5E-05	3E-07	6.77E-07	2.21E-06	0
Components for re-use (CRU)	kg	0	0	0	0	0	0
Materials for recycling (MFR)	kg	0	0	0	0	0	0
Materials for energy recovery (MER)	kg	0	0	0	0	0	0
Exported electrical energy (EEE)	MJ	0	0	0	0	0	0
Exported thermal energy (EET)	MJ	0	0	0	0	0	0

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg ResiFIX Pure Epoxy plus EPPSF

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Incidence of disease due to PM emissions (PM)	Disease incidence	ND	ND	ND	ND	ND	ND
Human exposure efficiency relative to U235 (IR)	kBq U235 eq	ND	ND	ND	ND	ND	ND
Comparative toxic unit for ecosystems (ETP-fw)	CTUe	ND	ND	ND	ND	ND	ND

Comparative toxic unit for humans (carcinogenic) (HTP-c)	CTUh	ND	ND	ND	ND	ND	ND
Comparative toxic unit for humans (noncarcinogenic) (HTP-nc)	CTUh	ND	ND	ND	ND	ND	ND
Soil quality index (SQP)	SQP	ND	ND	ND	ND	ND	ND

Disclaimer 2 - applies to the following indicators: 'Abiotic shortage potential - non-fossil resources', 'Abiotic shortage potential - fossil fuels', 'Water deprivation potential (users)', 'Potential comparative toxic unit for ecosystems', 'Potential comparative toxic unit for human health - carcinogenic effects', 'Potential comparative toxic unit for human health - non-carcinogenic effects', 'Potential soil quality index'. The results of this environmental impact indicator shall be used with care, as the uncertainties of the results are high and as there is limited experience with the indicator.

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DIN 51757:2011-01
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EN 196
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Methods of testing cement - Part 1: Determination of strength.

EN 15804
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environmental declarations - Principles and procedures.

ISO 14044
DIN EN ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines.

Further references

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Regulation (EU) No. 305/2011 (CPR)

Regulation (EU) No. 528/2012 (Biocidal Products Regulation)

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