

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	fischerwerke GmbH & Co. KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-FIW-20230530-CBA1-EN
Issue date	18.04.2024
Valid to	17.04.2029

FIS EM Plus fischerwerke GmbH & Co. KG

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General Information

fischerwerke GmbH & Co. KG

Programme holder

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

Declaration number

EPD-FIW-20230530-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

18.04.2024

Valid to

17.04.2029



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



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

FIS EM Plus

Owner of the declaration

fischerwerke GmbH & Co. KG
 Klaus-Fischer-Straße 1
 72178 Waldachtal
 Germany

Declared product / declared unit

fischerwerke GmbH & Co. KG
 A COMPANY OF THE FISCHER GROUP OF COMPANIES
 Otto-Hahn-Strasse 15
 79211 Denzlingen GERMANY

Scope:

The declared unit is 1 kg injection mortar. The declared product is 2-component injection mortar in plastic cartridges which consists of a component A and a component B. The product designation is FIS EM Plus in 390 ml, 585 ml and 1500 ml sizes.
 FIS EM Plus and all plastic parts are produced by fischerwerke GmbH & Co. KG in company-owned factories. Data from the production sites in Denzlingen and Horb was used for the lifecycle analysis.
 Denzlingen factory: Otto-Hahn-Strasse 15, 79211 Denzlingen Horb factory: Hindenburgstrasse 81, 72160 Horb am Neckar
 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	
<input type="checkbox"/>	internally
<input checked="" type="checkbox"/>	externally



Matthias Klingler,
 (Independent verifier)

Product

Product description/Product definition

The declared product is 2-component injection mortar in plastic cartridges which consists of a component A and a hardener component B. Component A consists of an epoxy resin mixture. Polyamines are generally used as hardeners. In addition, the product may contain fillers, ancillary materials and solvents.

The injection mortar with product designation FIS EM Plus is a product average in 390 ml, 585 ml and 1500 ml cartridge sizes. EU regulation no. 305/2011/ (CPR) applies for placing the product on the market in the EU/EFTA (with the exception of Switzerland). The product requires a declaration of performance taking into account the following standards:

- ETA-17/0979 (Bonded anchors for anchoring in concrete),
- ETA-17/1056 (Injection system for post-installed rebar connections),
- ETA-22/0001 (post-installed rebar connections with improved bond-splitting behavior),
- CE mark.
- The respective national regulations apply to its use.

Application

FIS EM Plus is for example recommended for anchorings with the highest load-bearing capacity in cracked and noncracked concrete and for applications of seismic performance categories C1 and C2. It is also suitable for top concrete connectors, high-rise racks and heavy indoor or outdoor steel constructions. The injection mortar is processed with approved system components and also with reinforcing steel bars. The epoxy mortar is ideally suited for rebar connections that are installed with a large drill hole diameter and a great anchorage depth. It can also be used for diamond-drilled and water-filled drill holes. In addition, FIS EM Plus is qualified for anchoring in accordance with the German Water Resources Act (WHG) with a general construction technique permit (aBG) for liquid-proof concrete and coated concrete.

Technical Data

The following table shows the technical data of the product examined for this lifecycle assessment.

Bautechnische Daten

Name	Value	Unit
Density	1.54	kg/m ³
Tensile shear strength nach DIN EN 14293	-	N/mm ²
Tensile bond strength nach DIN EN 14293	-	N/mm ²

Shear strength and adhesive tensile strength in accordance with DIN EN 14293 are not relevant for this product.

 	17; 17; 22	DoP: 0218; 0236; 0308
	2873	www.fischer.de/sdb
fischerwerke GmbH & Co. KG Klaus-Fischer-Straße 1 72178 Waldachtal		

EAD-330499-01-0601; EAD-330087-01-0601; EAD-332402-00-0601

Performance parameters depending on the base material, adhesive, embedded metal part, environmental conditions and installation.

Bonded fastener for use in cracked or uncracked concrete (Option 1 under static or quasi-static actions and under seismic actions C1 and C2) acc. to

ETA-17/0979: $N_{Rk,s}=13-1011[kN]$; $T_{Rk,ucr}=7-18[N/mm^2]$;
 $T_{Rk,ucr,100}=4,6-14,4[N/mm^2]$; $T_{Rk,cr}=5-9[N/mm^2]$;
 $T_{Rk,cr,100}=3,3-7,2[N/mm^2]$; $c_{cr,N}=1,5xh_{ef}[mm]$; $k_{cr,N}=7,7$; $k_{ucr,N}=11$; $\gamma_{inst}=1-1,4$;
 $c_{cr,sp}=1xh_{ef}-2,26xh_{ef}[mm]$; $c_{min}=40-175[mm]$; $s_{min}=40-160[mm]$;
 $h_{min}=100-910[mm]$; $max. T_{inst}=10-300[Nm]$; $V_{Rk,s}=8-505[kN]$;
 $M_{Rk,s}^0=13-6065[Nm]$; $k_7=1$; $k_8=2$; $d_{nom}=8-40[mm]$; $l_f=4-8x d_{nom}[mm]$;
 $\delta_{ucr,NO}=0,07-0,15[mm/(N/mm^2)]xT$; $\delta_{ucr,N\infty}=0,11-0,22[mm/(N/mm^2)]xT$;
 $\delta_{cr,NO}=0,07-0,15[mm/(N/mm^2)]xT$; $\delta_{cr,N\infty}=0,11-0,22[mm/(N/mm^2)]xT$;
 $\delta_{V0}=0,04-0,18[mm/kN]xV$; $\delta_{V\infty}=0,05-0,27[mm/kN]xV$; $N_{Rk,s,C1}=27-449[kN]$;
 $N_{Rk,s,C2}=39-282[kN]$; $T_{Rk,C1}=4,8-7,5[N/mm^2]$; $T_{Rk,C2}=2,9-5,8[N/mm^2]$;
 $V_{Rk,s,C1}=11-225[kN]$; $V_{Rk,s,C2}=14-99[kN]$; $\alpha_{gap}=0,5-1$; $A_5 > 8\%$ option 1 and seismic
 action C1; $A_5 > 12\%$ under seismic action C2; $\delta_{N,C2}=0,09-0,18[mm/(N/mm^2)]xT$
 C2; $\delta_{V,C2}=0,06-0,25[mm/kN]xV_{C2}$; Durability: (gvz/hdg) dry internal conditions /
 (R) CRC III acc. to EN 1993-1-4, (HCR) CRC V acc. to EN 1993-1-4

System for post-installed rebar connection with mortar for use in concrete (structures subject to static or quasi-static actions, exposure to fire, structures subject to seismic actions) acc. to ETA-17/1056:

$f_{bd,PIR}=1,5-4,2[N/mm^2]$; $f_{bd,PIR,100y}=1,5-4,2[N/mm^2]$; $k_b=0,76-1$;
 $k_{b,100y}=0,76-1$; $\alpha_{lb}=1-1,5$; $\alpha_{lb,100y}=1-1,5$; $N_{Rk,s}=63-270[kN]$;
 $f_{bd,PIR,seis}=1,5-4,2[N/mm^2]$; $f_{bd,PIR,seis,100y}=1,5-4,2[N/mm^2]$; $k_{b,seis}=0,98-1$;
 $k_{b,seis,100y}=0,98-1$; $c_{min,seis}=30-220[mm]$; class(A1); $f_{bd,fl(\theta)}=1,5-4,2[N/mm^2]$;
 $k_{fl(\theta)}=0-1$; $\theta_{max}=284[^\circ C]$; $f_{bd,fl,100y(\theta)}=1,5-4,2[N/mm^2]$; $N_{Rk,s,\theta}=0,9-7,4[kN]$

System for post-installed rebar connection with improved bond-splitting behaviour with mortar for use in concrete (structures subject to static or quasi-static actions) acc. to ETA-22/0001: $T_{Rk,ucr,50}=8-16[N/mm^2]$;

$T_{Rk,ucr,100}=6,5-12[N/mm^2]$; $c_{cr,N}=1,5x l_b[mm]$; $k_{cr,N}=7,7$; $k_{ucr,N}=11$; $\gamma_{inst}=1-1,4$;
 $A_k=4,4$; $sp1=0,33$; $sp2=0,34$; $sp3=0,62$; $sp4=0,33$; $lb1=0,68$; $\Omega_{cr}=0,91-0,93$

Technical data as of August 2023. Subject to modification.

The product's performance data corresponding to the declaration of performance in relation to its main characteristics in accordance with:

- ETA-17/0979 (bonded anchors for anchoring in concrete),
- ETA-17/1056 (Injection system for post-installed rebar connections),
- ETA-22/0001 (post-installed rebar connections with improved bond-splitting behavior).

Base materials/Ancillary materials

The lifecycle assessment is based on the product system of 1 kg mass of injection mortar. The injection mortar to be declared is a product average in different cartridge sizes.

The main components of the product are:

- Cartridge
- Static mixer
- Mortar mass
- Hardener mass

The following compositions for components A and B were included for the lifecycle assessment:

Component A

- 5-40% epoxy resin mixture
- 30-40% cement
- < 3 % miscellaneous

Component B

- 30-40% binder
- 30-40% cement
- 15-25% hardener
- 5-15% accelerant
- < 3 % miscellaneous

The product contains no substances on the Candidate List of substances of very high concern for Authorisation (Substances of Very High Concern – SVHC) at a concentration of above 0.1 % mass.

Does the product contain further Category 1A or 1B CMR

(carcinogenic, mutagenic or toxic to reproduction) substances which are not on the ECHA candidate list above 0.1 % of mass: yes. This is trimethylolpropane triglycidyl ether (10-15%, CAS 30499-70-0, classified as Repr. 1B, H360F)

No biocide products have been added to this construction product or it has not been treated with biocides (treated goods in terms of EU biocide product ordinance no. 528/2012).

Reference service life

No modules from the use phase have been declared. No reference service life is stated for this reason.

LCA: Calculation rules

Declared Unit

In accordance with *PCR Part B* the declared unit is 1 kg of injection mortar. The plastic cartridge filled with two-component injection mortar consists of a component A and a hardener component B. Component A takes up a share of 84 % whilst component B takes up 16 % of the whole finished product. Raw materials which are used in both the mortar and the hardener were attributed to the mortar in the course of the inventory analysis as apportionment was not possible. For this reason the share of the individual components in the overall product can only be estimated.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	kg
Gross density	1.54	kg/m ³
Mass reference 390 ml (without packaging)	0,5995	kg/Stk.
Mass reference 585 ml (without packaging)	0,856	kg/Stk.
Mass reference 1500 ml (without packaging)	2,235	kg/Stk.

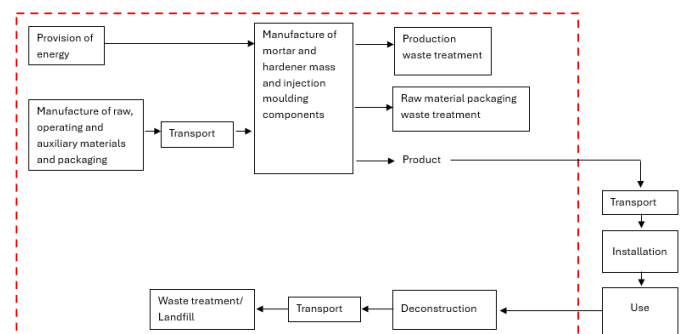
Other declared units are allowed if the conversion is shown transparently.

The balanced production volume is based on manufacturer information for the reference year and has been converted to the declared unit. Overall, it is assumed that the data is representative and robust.

System boundary

The 'cradle to factory gate - with options' system boundary was selected. The lifecycle is modular in design in accordance with EN 15804 . The lifecycle assessment on which this EPD is based includes the production stage (A1-A3), the disposal

stage (C1-C4) and benefits and impacts outside of the system boundary (Module D). The modules A1 (Raw material provision), A2 (Transport) and A3 (Manufacturing) are shown aggregated in the assessment as Module A1–A3.



Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's lifespan: EU-27 Member States

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 was taken from the Managed LCA Content database (formerly GaBi Professional) which is implemented in the LCA for Experts software (*Sphera*, 2023).

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The biogenic carbon content quantifies the quantity of biogenic carbon in a construction product when it passed through the factory gate. No biogenic carbon is bound up in the construction product itself. Only the wooden or cardboard raw material and product packaging used indicate approximately 47.7% biogenic carbon for wood and approximately 43 % for cardboard. Since Module A5 is not part of the system boundary, the binding of this carbon was not included in the Global Warming Potential (GWP-biogenic) indicator in Module A1-A3. The following table shows the proportion of biogenic carbon in the packaging related to the declared unit.

Information to describe the biogenic carbon content at the factory gate

Name	Value	Unit
Biogenic carbon content in accompanying packaging	0.071	kg C

Installation in the building (A5)

Both the manufacture of the injection mortar mass and the plastic cartridges, static mixers and plastic lid (injection moulding parts) were included in the course of lifecycle assessment as these are produced by fischerwerke GmbH & Co KG. Disposal of the injection moulding parts takes place in Module A5 after the product has been used. This module is, however, not included in this study. The information available on disposal of the primary product packaging is purely informative in nature.

Name	Value	Unit
Injection moulding part for disposal	0,1391	kg

End of life (C1-C4)

No manufacturer-specific data is known of for transferral to material and thermal recycling or disposal in landfill. The injection mortar remains in the wall or in the building until it is demolished. For this reason the conventional assumption of 100% disposal of inert material is made.

Name	Value	Unit
Landfilling	1	kg
Electricity consumption	0,0033	kWh
Material loss	0,01	kg

Source: EPD-DBC-FIW-20220088-IBE2-DE

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

Energy recovered from thermal and material recycling of waste (thermal energy and electricity) and the recycling material produced are principally credited in Module D. Since injection mortar is a disposed inert material, no landfill gas is produced in Module C4 which could be available for energy recovery. For this reason, no credits and impacts outside of the system boundary occur for this construction product.

Name	Value	Unit
Exported electric energy	0	kWh
Exported thermal energy	0	MJ

LCA: Results

The results of the inventory analysis and impact assessment for the injection mortar examined are listed in detail in this chapter. The calculations and background data used were performed exclusively by the GaBi software or taken from the associated database (Sphera, 2023).

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 Injektionsmörtel

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential total (GWP-total)	kg CO ₂ eq	4.59E+00	1.07E-03	4.41E-03	0	1.49E-02	0
Global Warming Potential fossil fuels (GWP-fossil)	kg CO ₂ eq	4.54E+00	1.06E-03	4.37E-03	0	1.48E-02	0
Global Warming Potential biogenic (GWP-biogenic)	kg CO ₂ eq	5.68E-02	9.25E-06	0	0	0	0
Global Warming Potential luluc (GWP-luluc)	kg CO ₂ eq	1.35E-03	1.16E-07	3.96E-05	0	4.67E-05	0
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	1.9E-11	1.96E-14	5.56E-16	0	3.82E-14	0
Acidification potential of land and water (AP)	mol H ⁺ eq	6.93E-03	2.27E-06	7.28E-06	0	1.07E-04	0
Eutrophication potential aquatic freshwater (EP-freshwater)	kg P eq	2.93E-05	3.97E-09	1.56E-08	0	3.03E-08	0
Eutrophication potential aquatic marine (EP-marine)	kg N eq	2.02E-03	5.44E-07	2.87E-06	0	2.75E-05	0
Eutrophication potential terrestrial (EP-terrestrial)	mol N eq	2.15E-02	5.68E-06	3.29E-05	0	3.03E-04	0
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	6.58E-03	1.45E-06	6.5E-06	0	8.31E-05	0
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	2.47E-07	1.65E-10	2.83E-10	0	6.94E-10	0
Abiotic depletion potential for fossil resources (ADPF)	MJ	9.3E+01	2.24E-02	5.82E-02	0	2E-01	0
Water use (WDP)	m ³ world eq deprived	1.28E+00	2.37E-04	5.17E-05	0	1.65E-03	0

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

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier (PERE)	MJ	1.84E+01	1.34E-02	4.24E-03	0	3.26E-02	0
Renewable primary energy resources as material utilization (PERM)	MJ	2.16E+00	0	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ	2.05E+01	1.34E-02	4.24E-03	0	3.26E-02	0
Non renewable primary energy as energy carrier (PENRE)	MJ	9.97E+01	2.24E-02	5.85E-02	0	2E-01	0
Non renewable primary energy as material utilization (PENRM)	MJ	2.37E+01	0	0	0	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	1.23E+02	2.24E-02	5.85E-02	0	2E-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	4.01E-02	1.08E-05	4.64E-06	0	5.05E-05	0

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

1 kg Injektionsmörtel

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	3.1E-07	-1.75E-12	1.81E-13	0	4.36E-12	0
Non hazardous waste disposed (NHWD)	kg	6.68E-02	1.64E-05	8.91E-06	0	1E+00	0
Radioactive waste disposed (RWD)	kg	1.04E-03	3.56E-06	1.09E-07	0	2.28E-06	0
Components for re-use (CRU)	kg	0	0	0	0	0	0
Materials for recycling (MFR)	kg	1.79E-04	0	0	0	0	0
Materials for energy recovery (MER)	kg	0	0	0	0	0	0
Exported electrical energy (EEE)	MJ	1.13E+00	0	0	0	0	0
Exported thermal energy (EET)	MJ	2.02E+00	0	0	0	0	0

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

1 kg Injektionsmörtel

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Incidence of disease due to PM emissions (PM)	Disease incidence	6.46E-08	1.91E-11	4.84E-11	0	1.31E-09	0
Human exposure efficiency relative to U235 (IR)	kBq U235 eq	1.21E-01	5.93E-04	1.63E-05	0	2.64E-04	0

Comparative toxic unit for ecosystems (ETP-fw)	CTUe	3.9E+01	6.23E-03	4.17E-02	0	1.08E-01	0
Comparative toxic unit for humans (carcinogenic) (HTP-c)	CTUh	2.07E-09	3.3E-13	8.47E-13	0	1.68E-11	0
Comparative toxic unit for humans (noncarcinogenic) (HTP-nc)	CTUh	1.38E-07	5.25E-12	3.77E-11	0	1.77E-09	0
Soil quality index (SQP)	SQP	3.15E+01	8.79E-03	2.43E-02	0	4.86E-02	0

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

ECHA list

Candidate List of substances of very high concern for authorisation, <https://www.echa.europa.eu/candidate-list-table>

EN 15804

DIN EN 15804:2022-03: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

EPD-DBC-FIW-20220088-IBE2-DE

Environmental product declaration for methacrylate-based fischer injection mortar (FIS V Plus, FIS VW Plus, FIS VS, FIS HB, FIS SB); EPD-DBC-FIW-20220088-IBE2-DE; IBU 2022.

ETA-17/0979

European technical assessment: Bonded anchors for anchoring in concrete, Deutsches Institut für Bautechnik, 2020

ETA-17/1056

European technical assessment: injection system for post-installed rebar connections, 2020

ETA-22/0001

European technical assessment: Post-installed rebar connections with improved bond-splitting behavior, 2023

ISO 14025

DIN EN ISO 14025:2011-10, Environmental labels and declarations - Type III environmental declarations - Principles and procedures

ISO 14040 DIN EN ISO 14040:2021-02, Environmental management - Life cycle assessment - Principles and framework

ISO 14044

DIN EN ISO 14044:2021-02, Environmental management - Life cycle assessment - Requirements and guidelines

PCR Part A

Institut Bauen und Umwelt e.V.: Product categories for building-related Products and services. Part A: Calculation rules for the lifecycle assessment and requirements of the project report in accordance with DIN EN 15804:2022-03, Version 1.3, 2022

PCR Part B

Institut Bauen und Umwelt e.V.: Product categories for building-related Products and services. Part B: Requirements of the EPD for reaction resin products, 01/08/2021

Programme guidance

Institut Bauen und Umwelt e.V.: Institut Bauen und Umwelt e.V. (IBU) general EPD programme guidance. Version 2.0, 2021

PCR Teil A

Institut Bauen und Umwelt e.V.: Produktkategorieregeln für gebäudebezogene Produkte und Dienstleistungen. Teil A: Rechenregeln für die Ökobilanz und Anforderungen an den Projektbericht nach EN 15804+A2:2019, Version 1.3, 2022

PCR Teil B

Institut Bauen und Umwelt e.V.: Produktkategorieregeln für gebäudebezogene Produkte und Dienstleistungen. Teil B: Anforderungen an die EPD für Reaktionsharzprodukte, 01.08.2021

Programmanleitung

Institut Bauen und Umwelt e.V.: Allgemeine EPD-Programmanleitung des Institut Bauen und Umwelt e.V. (IBU). Version 2.0, 2021

Sphera, 2023

LCA for Experts, Version 10.7, 2023. Leinfelden-Echterdingen: Sphera Solutions GmbH



Publisher

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com



Programme holder

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com



Author of the Life Cycle Assessment

SKZ - Das Kunststoff-Zentrum
Friedrich-Bergius-Ring 22
97076 Würzburg
Germany

+49 931 4104-433
kfe@skz.de
www.skz.de



Owner of the Declaration

fischerwerke GmbH & Co. KG
Klaus-Fischer-Straße 1
72178 Waldachtal
Germany

+49 (0)7443 12-0
info@fischer.de
www.fischer.de