ENVIRONMENTAL PRODUCT DECLARATION

THE INTERNATIONAL EPD® SYSTEM

Institut Bauen und Umwelt e.V.

According to ISO 14025 and EN 15804

Registered under the scope of mutual recognition between
The International EPD® System and Institut Bauen und Umwelt e.V (IBU)

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Valid to: 2019-11-30

Injection Mortar FIS Green 300 T
fischerwerke GmbH & Co. KG

1. General Information

fischerwerke GmbH & Co. KG

Programme holder

IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number

EPD-FIS-20130269-IBG1-EN

This Declaration is based on the Product Category Rules:

Reaction resin products, 07.2014
(PCR tested and approved by the independent expert committee)

Issue date

01.12.2014

Valid to

30.11.2019

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr. Burkhart Lehmann
(Managing Director IBU)

Injection Mortar FIS Green 300 T

Owner of the Declaration

fischerwerke GmbH & Co. KG
Otto-Hahn-Str. 15
79211 Denzlingen
Germany

Declared product / Declared unit

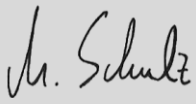
1kg/1kg; density: 1400 to 1700 kg/m³

Scope:

This validated declaration entitles the holder to bear the symbol of the Institut Bauen und Umwelt e.V. It exclusively applies for plants in Germany and the product groups referred to for a period of five years from the date of issue. The Declaration holder is liable for the details and documentation upon which the evaluation is based. This involves an EPD for which the product of a group was selected which displays the highest environmental burdens in this group in order to calculate the Life Cycle Assessment. 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.

Verification

The CEN Norm EN 15804 serves as the core PCR
Independent verification of the declaration according to ISO 14025
☐ internally ☒ externally



Matthias Schulz
(Independent tester appointed by SVA)

2. Product

2.1 Product description

The Chemical Injection System FIS Green 300 T is a 2-component system based on a methacrylate resin with renewable raw materials.

These two-component reactive systems are manufactured using methacrylate formulations and hardening agents.

They fulfil manifold and specific, tasks in the construction, furnishing, repair and waterproofing of buildings. The application of resins based on methacrylate decisively improves the performance capability of structures and extends their service lives. The product with the highest environmental impact was applied as a representative product for calculating the results of the Life Cycle Assessment.

2.2 Application

FIS Green 300 T is an injection system based on methacrylate resins, which is applied for fixing. It is suitable for the following applications: mounting of kitchen and sanitary elements, anchoring of wooden elements, covering of blocking installation, for usage of door, gate and window assembling, repair and renovation operations.

The composition of the Injection Mortar FIS Green 300 T in this EPD is similar to the compositions of high filled flow coatings. Therefore the sample EPD for high filled flow coatings of Deutsche Bauchemie was taken as a basis for this EPD.

2.3 Technical Data

FIS Green 300 T displays the following characteristics.

Name	Value	Unit
Density	1400 - 1700	kg/m^3
Tensile shear strength nach DIN EN 14293	not relevant	N/mm^2
Tensile bond strength nach DIN EN 14293	not relevant	N/mm^2

Further performance features can be found in the technical documentation at www.fischer.de.

2.4 Placing on the market / Application rules

The two different components of the fischer Injection Mortar FIS Green 300 T are stored in two separate chambers and are not mixed and activated until extrusion through the static mixer. The mortar is injected bubble-free from the drill hole base. The mortar bonds the entire surface of the anchor rod with the drill hole wall and seals off the drill hole. The anchor rod is inserted manually to the ground of the drill hole with slightly rotation. During push-through installation the annular gap between anchor rod and accessory ist filled with injection mortar.

2.5 Delivery status

Pasty, in plastic-cartridges, appropriately packed in the application-friendly mixing ratio
Package size: 300 ml

2.6 Base materials / Ancillary materials

The Injection System FIS Green 300 T comprises a resin and a hardening agent component. The resin component contains as reactive main constituent co-monomers from the group of methacrylates. Hardening takes place after installation on site and using the hardening component. This involves the use of radicalforming initiators which are added as hardeners.

The components can contain dissolved polymers and other auxiliaries such as accelerators, wetting agents, foam regulators and viscosity regulators for fine-tuning the required product features. The mixing ratio is automatically ensured during the squeezing process. Product hardening commences after the components are mixed.

On average, the products covered by this EPD contain the following ranges of base materials and auxiliaries referred to:

Fillers: 60 - 70%
Methacrylates: < 35%
Others: < 10%

At the time of preparation of this EPD FIS Green 300 T does not contain any substances, which are on the candidate list for substances of very high concern for entry into annex XIV of REACH. More detailed information about hazardous substances can be found in the safety data sheet.

2.7 Manufacture

The formulated product components are produced in batch mode and packed in the delivery containers in compliance with DIN ISO 9001 and with conditions of relevant regulations such as the Ordinance on Industrial Safety and Health or the Pollution Control Act.

2.8 Environment and health during manufacturing

As a general rule, no additional environmental protection measures are required beyond those which are specified by law.

2.9 Product processing/Installation

The fixing system is applied by injection via the static mixer.

Health and safety measures (hand and eye protection, ventilation) must be performed and consistently observed in line with the instructions in the safety data sheet and conditions on site.

Methacrylate resin products react after mixing resin and hardening agent under heat development (exothermicity). The mixed components must therefore be squeezed within the specified pot time and the anchor rod has to be set before curing.

2.10 Packaging

Empty containers and clean foil can be recycled. Reusable wooden pallets are returned to the building materials trade (reusable pallets against deposits) from where they are returned to the building product manufacturers and redirected into the production process.

2.11 Condition of use

During the use phase the Injecton System FIS Green 300 T is fully cured and essentially comprises an inert, three-dimensional network.

FIS Green 300 T is a durable product which protects our buildings and makes a significant contribution towards retaining their function and long-term value.

2.12 Environment and health during use

Option 1 – Products for applications outside confined spaces

After curing, the Injection System FIS Green 300 T is not reactive anymore and acts inertly.

No risks are known for water, air and soil if the products are used as designated.

Option 2 – Products for applications inside confined spaces

FIS Green 300 T complies with emission class A+ accoding to the French Decree „Décret n° 2011-321“.

Other influences on the environment and health caused by escaping materials are not known.

2.13 Reference service life

The Injection System FIS Green 300 T fulfills various, often specific tasks associated with the construction or refurbishment of building structures. Its use decisively improves the usability of building structures and significantly extends their Reference Service Life.
The anticipated Reference Service Life depends on the specific installation situation and associated product exposure. It can be influenced by weather factors as well as by mechanical or chemical exposure.

2.14 Extraordinary effects

Fire

Even without any special fire safety features the Injection System FIS Green 300 T complies with at least the requirements of the DIN EN 13501-1 standard for fire classes E and Efl. As cross-linked methacrylate resins do not melt or drip, the resins do not contribute towards spreading fire. Apart from the common combustion products carbon monoxide and carbon dioxide, fire gases can contain traces of methyl methacrylate, esters, alcohols and hydrocarbons. Due to the quantities used, they only have a subordinate

influence on the fire characteristics of a building structure in which they have been installed.

Water
The cured Injecton System FIS Green 300 T is chemically inert and insoluble in water.

Mechanical destruction
The mechanical destruction of FIS Green 300 T does not lead to any decomposition products which are harmful for the environment or health.

2.15 Re-use phase
According to present knowledge, no environmentally-hazardous effects are reasonably expected during the dismantling and recycling (including landfilling) of building components to which hardened products based on methacrylate resins adhere.
If methacrylate systems can be removed from the components at no great effort, thermal recovery is a practical recycling option on account of its energy content.
The low quantities of the products are generally negligible and do not impair disposal or recycling of the remaining components/substances.

2.16 Disposal
Individual components which can no longer be recycled must be combined at a specified ratio and hardened.
Hardened product residue is not special waste.
Nonhardened product residue is special waste.
Empty, dried containers (free of drops and scraped clean) are directed to the recycling process. Residue must be directed to proper waste disposal taking consideration of local guidelines.

The following EWC/AVV waste codes can apply:
Non-hardened product residue:
200127 - paint, inks, adhesives and resins containing dangerous substances
080409 - waste adhesives and sealants containing organic solvents or other dangerous substances

2.17 Further information
More information is available in the product or safety data sheets and is available on www.fischer.de or on request.
Valuable technical information is also available on associations' websites. For example more infomation is available at www.deutschebauchemie.de.

3. LCA: Calculation rules

3.1 Declared Unit
The EPD refers to the declared unit of 1 kg Injection System FIS Green 300 T in the mixing ratio required for processing both components. Consumption per unit area of the products to be applied extensively can range between only a few hundred grams and more than 1 kg per square meter. In the case of products which are injected, the application volume depends on the component to be injected.

The product with the highest environmental impact in the product groups was declared.

The density is between 1400 - 1700 kg/m³.

Declared unit

Name	Value	Unit
Declared unit	1	kg
Conversion factor to 1 kg	1	-

3.2 System boundary
Modules A1/A2/A3, A4, A5 and D are taken into consideration in the LCA:
- A1 Manufacture of preliminary products
- A2 Transport to plant
- A3 Production incl. provision of energy, manufacture of packaging, auxiliaries and consumables, waste treatment)
- A4 Transport to site
- A5 Installation (disposal of packaging and emissions during installation)
- D Credits from incineration of packaging materials and recycling the metal container

The Declaration is therefore from the "cradle to plant gate".

3.3 Estimates and assumptions
Where no specific GaBi processes were available, the individual recipe ingredients of formulae were estimated on the basis of information provided by the manufacturer or literary sources.

3.4 Cut-off criteria
No cut-off criteria were applied for calculating the LCA. All raw materials submitted by the associations for the formulae were taken into consideration. The manufacture of machinery, plants and other infrastructure required for production of the products under review was not taken into consideration in the LCA.

3.5 Background data
Data from the GaBi 6 data base was used as background data. Where no background data was available, it was supplemented by manufacturer information and literary research.

3.6 Data quality
Representative products were applied for this sample EPD and the product in a group displaying the highest environmental impact was applied for calculating the LCA results. The data sets are no more than 5 years old.

3.7 Period under review
The production data is based on primary data collation for the year 2011.

3.8 Allocation
No allocations were used for production. Production waste was however directed to a refuse incineration plant. After incineration, credits were calculated for electricity and thermal energy. A multi-input allocation with a credit for electricity and thermal energy was used for incineration of packaging in accordance with the simple credit method. The credits achieved through packaging disposal are offset in Module D.

3.9 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. In this case, 1 kg FIS Green 300 T was selected as the declared unit. Depending on the application, a corresponding conversion factor such as the specific unit area must be taken into consideration.

4. LCA: Scenarios and additional technical information

The following technical information forms the basis for the declared modules or can be used for developing specific scenarios in the context of a building evaluation if modules are not declared (MND).

Transport to site (A4)

Name	Value	Unit
Litres of fuel	0.0016	l/100km
Transport distance	500	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	1400 - 1700	kg/m^3
Capacity utilisation volume factor	100	-

Construction installation process (A5)

Name	Value	Unit
Material loss	0.01	kg
VOC in the air	0.002 - 0.0045	kg

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
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	MND	MND	MND	MND	MND	MND	MND	MND	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 kg FIS Green 300 T

Parameter	Unit	A1-A3	A4	A5	D
Global warming potential	[kg CO_2-Eq.]	1.92E+0	2.74E-2	1.75E-1	-2.67E-1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	3.03E-10	5.72E-13	2.47E-12	-3.09E-11
Acidification potential of land and water	[kg SO_2-Eq.]	6.84E-3	1.80E-4	2.42E-5	-8.01E-4
Eutrophication potential	[kg $(PO_4)^{3-}$- Eq.]	4.68E-4	4.48E-5	4.59E-6	-7.10E-5
Formation potential of tropospheric ozone photochemical oxidants	[kg Ethen Eq.]	1.38E-3	-7.56E-5	1.65E-3	-1.06E-4
Abiotic depletion potential for non fossil resources	[kg Sb Eq.]	1.95E-5	1.26E-9	2.83E-9	-1.65E-5
Abiotic depletion potential for fossil resources	[MJ]	4.30E+1	3.74E-1	5.77E-2	-3.16E+0

RESULTS OF THE LCA - RESOURCE USE: 1 kg FIS Green 300 T

Parameter	Unit	A1-A3	A4	A5	D
Renewable primary energy as energy carrier	[MJ]	2.19E+0	-	-	-
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	-	-	-
Total use of renewable primary energy resources	[MJ]	2.19E+0	2.22E-2	9.42E-3	-2.04E-1
Non renewable primary energy as energy carrier	[MJ]	3.58E+1	-	-	-
Non renewable primary energy as material utilization	[MJ]	9.25E+0	-	-	-
Total use of non renewable primary energy resources	[MJ]	4.50E+1	3.76E-1	7.14E-2	-3.40E+0
Use of secondary material	[kg]	-	-	-	-
Use of renewable secondary fuels	[MJ]	7.56E-4	2.79E-6	1.19E-6	0.00E+0
Use of non renewable secondary fuels	[MJ]	7.78E-3	2.92E-5	1.24E-5	0.00E+0
Use of net fresh water	[m^3]	9.59E-3	2.14E-5	4.39E-4	-1.08E-3

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 kg FIS Green 300 T

Parameter	Unit	A1-A3	A4	A5	D
Hazardous waste disposed	[kg]	2.61E-3	0.00E+0	8.55E-4	-9.26E-5
Non hazardous waste disposed	[kg]	6.82E-2	7.43E-5	3.80E-5	-2.94E-3
Radioactive waste disposed	[kg]	8.41E-4	5.39E-7	5.65E-6	-9.44E-5
Components for re-use	[kg]	-	-	-	-
Materials for recycling	[kg]	-	-	-	-
Materials for energy recovery	[kg]	-	-	-	-
Exported electrical energy	[MJ]	-	-	2.12E-1	-
Exported thermal energy	[MJ]	-	-	5.15E-1	-

6. LCA: Interpretation

Non-renewable primary energy requirements are dominated by manufacture of the preliminary products (> 95%). This is explained by the fact that they partly involve preliminary products from fossil raw materials which are usually energy-intensive during production. The primary energy carriers used are therefore natural gas and crude oil. Owing to the high impact by preliminary products, they are given subject to closer scrutiny: Fillers are the main components of the formulations. But as they are less energy-intensive during manufacturing, they make a low contribution to primary energy requirements in relation to their mass percentage. The resin components play a greater role as a result.
At approx. 5%, the share of total primary energy required by **renewable primary energy** is relatively low. Among preliminary products, this is particularly attributable to the renewable percentage of the power mix, whereby the use of pallets has the greatest effect in production. Wood growth requires solar energy for photosynthesis which therefore appears here as a renewable source of primary energy.
At approx. 70%, the **Global Warming Potential (GWP)** is dominated by production of preliminary products, whereby the three resin components play the greatest role. During production, which accounts for < 10% of the GWP, manufacturing of the steel containers has a particular impact. In A5, GWP is dominated by incineration of wooden pallets (7%). The credits from thermal utilisation of waste reduce the GWP by approx. 11%. As the primary ingredient of the recipe is quartz sand which only displays minor environmental impact, the other modules play a greater role, especially

Production, A5 and D. Nevertheless, the GWP is also dominated by carbon dioxide emissions here (> 95%). In the case of the **Ozone Depletion Potential (ODP)**, it is apparent that the influences are largely necessitated by the preliminary products (> 80%) and production (< 10%) which in turn are primarily accounted for by halogenated organic emissions from the power mix used. The credits from waste incineration reduce the ODP by approx. 10%.
Approx. 60% of the **Acidification Potential (AP)** is attributable to sulphur dioxide which is emitted during manufacture of the resin components in particular. Preliminary products have a total impact of approx. 75%. Production accounts for approx. 10% of the AP, whereby the greatest impact is attributable to the steel containers. The nitric oxide emissions incurred during the transport processes are practically negligible. The credits from waste incineration reduce the AP by approx. 10%.
Approx. 80% of the **Eutrophication Potential (EP)** is attributable to emissions into the air and approx. 20% by emissions into water (incl. ammonium & nitrates). Nitric oxide emissions are responsible for approx. 55% of emissions into air followed by nitrous oxide and nitrogen monoxide emissions (each accounting for 10%). Approx. 65% of the EP is caused by manufacture of preliminary products, whereby the resin components make the greatest contribution to the EP. Production accounts for approx. 15% of the EP which is attributable to the manufacture of steel containers.
Only the **Photochemical Ozone Creation Potential (POCP)** is not dominated by production of preliminary products: preliminary products only account for approx. 30% of the POCP. The greatest share (approx. 50%) is incurred during installation of the MMA product in the form of emissions of non-polymerised MMA. As a characterisation factor for CML was not available for methyl methacrylate, the NMVOC characterisation factor was applied. At approx. 10%, manufacturing the product indicates a significant influence.

7. Requisite evidence

7.1 VOC
Special tests and evidence have not been carried out or provided within the framework of drawing up this Environmental Product Declaration.
From products with similar formulations it was conclude that FIS Green 300 T has a TVOC content („Total Volatile Organic Compounds“) < 0,2 µg/m³ after 28 days. This complies with emission class A+ according to the French Decree „Décret n° 2011-321“.

8. References

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin (pub.):

PCR 2013 Part A: Calculation rules for the Life Cycle Assessment and requirements on the background report, 2013-04

PCR 2013, Part B: Product Category Rules for Building Products, Part B: Requirements on the EPD for reactive resin products, 2013-04

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

DIN EN ISO 14040
DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006); German and English version EN ISO 14040:2006

DIN EN ISO 14044
DIN EN ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044:2006); German and English version EN ISO 14044:2006

EN 15804
EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

GaBi 5 software & documentation, Data base for Life Cycle Engineering LBP, University of Stuttgart and PE International, Documentation of GaBi 5 data records, 2012
http://documentation.gabi-software.com/

DIN EN ISO 9001
Quality management systems - Requirements (ISO 9001:2008); Trilingual version
EN ISO 9001:2008

ISO 16000 ff
Indoor Air

Décret n° 2011-321 du 23 mars 2011
relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils

DIN EN 13501-1: 2010-01
Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests; German version EN 13501-1:2007+A1:2009

GISBAU
Gefahrstoff-Informationssystem der Berufsgenossenschaft der Bauwirtschaft.
www.gisbau.de

REACH
Directive (EG) No. 1907/2006 of the European Parliament and of the Council dated 18 December 2006 n the registration, evaluation, approval and restriction of chemical substances (REACH), for establishing a European Agency for chemical substances, for amending Directive 1999/45/EC and for annulment of Directive (EEC) No. 793/93 of

the Council, Directive (EC) No. 1488/94 of the Commission, Guideline 76/769/EEC of the Council and Guidelines 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC of the Commission.

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