Environmental Product Declaration (EPD)
According to ISO 14025 and EN 15804+A2

FIS VB

Registration number:	EPD-Kiwa-EE-000501-EN
Issue date:	22.06.2026
Valid until:	22.06.2031
Declaration owner:	fischerwerke GmbH & Co. KG
Publisher:	Kiwa-Ecobility Experts
Program operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

The fischer injection mortar FIS VB is a vinyl ester mortar with ETA approval specifically for fixings in masonry and non-cracked concrete with a variety of masonry blocks. It is suitable for fixing fire escapes, handrails, gate fixations, canopies and many more similar applications. The FIS VB is processed with the approved system components fischer threaded rod FIS A, RG M, fischer internal threaded rod FIS IG together with the fischer injection anchor sleeves indoors and outdoors.

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-000501-EN

1.3 VALIDITY

Issue date: 22.06.2026

Valid until: 22.06.2031

1.4 PROGRAM OPERATOR

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1.5 OWNER OF THE DECLARATION

Declaration owner: fischerwerke GmbH & Co. KG

Address: Klaus-Fischer-Straße 1, 72178 Waldachtal, Germany

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Website: www.fischer-international.com

Production location: fischerwerke GmbH & Co. KG in Germany

Address production location: Otto-Hahn-Strasse 15, 79211 Denzlingen, Germany

1.6 VERIFICATION OF THE DECLARATION

The independent verification is in accordance with ISO 14025:2011. The LCA is in compliance with ISO 14040:2006 and ISO 14044:2006. EN 15804:2012+A2:2019 serves as the core PCR.

☐ Internal ☒ External

Anastasiia Huk

(Third party verifier)

1.7 STATEMENTS

The owner of this EPD shall be liable for the underlying information and evidence. The program operator at Kiwa-Ecobility Experts shall not be liable with respect to manufacturer data, life cycle assessment data and evidence.

1.8 PRODUCT CATEGORY RULES

Kiwa-EE GPI R.4.0: Kiwa-Ecobility Experts, General Programme Instructions “Product Level”, Program SOP EE 1201_R.4.0 (18.12.2025)

Kiwa-EE GPI R.4.0 Annex B1: Kiwa-Ecobility Experts, General Programme Instructions "Product Level" – Annex B1 Environmental Information Programme according to EN 15804 / ISO 21930, Program SOP EE 1203_R.4.0 (18.12.2025)

General Product Category Rules: Product Category Rules for Building-Related Products and Services, from the Environmental Product Declaration of the Institute Construction and Environment e. V. (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements for the Project Report according to EN 15804+A2:2019

Specific Product Category Rules: PCR Guidance-Texts for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU), Part B: Requirements on the EPD for Reaction resin products, Institut Bauen und Umwelt e.V., 01.08.2024 v11

1.9 COMPARABILITY

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, the definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPDs programs may differ. Comparability needs to be evaluated. For further guidance, see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

1.10 CALCULATION BASIS

LCA method: EN15804+A2

LCA software: LCA software Umberto 11.18.1

Characterization method: EN 15804 +A2 Method v1.0

LCA database profiles: Ecoinvent EN15804 3.12

Version database: 3.12

1.11 PROJECT REPORT

This EPD is generated based on the following report: 2026-04-30_LCA-Report-FIS-VB-R00

2 Product

2.1 PRODUCT DESCRIPTION

This EPD is a representative declaration. The FIS VB 300 F fastening system was selected as a representative product because it has the highest share in terms of sales figures in the FIS VB group. The results and statements of this life cycle analysis cover the FIS VB in 300 ml, 360 ml, and 410 ml as all mentioned variants are produced using the same materials and processes. The injection mortars with product designation FIS VB 300 F, FIS VB 360 S, and FIS VB 410 C are available in 300 ml, 360 ml and 410 ml cartridge sizes.

The representative product, the FIS VB 300 F, consists of a mortar and a hardener. For the FIS VB cartridge, the mortar and the hardener are contained in two separate chambers of a tubular bag. The tubular bag consists of a three-layer laminated film, with the outer layers made of polyethylene and the inner layer made of polyethylene terephthalate. The tubular bag is securely sealed at both ends with aluminum wire. The tubular bag is located inside the cartridge. It is important to note that, due to the two-chamber system, the hardener in the tubular bag does not come into contact with the mortar. The entire mortar and hardener injection assembly also consists of a polypropylene piston guided within the cartridge, a polypropylene cap, and a static mixer made of polypropylene.

The products represented by the representative product are manufactured in the same production facilities and on the same production workstations in Germany.

Product specification

The composition of the product is described in the following table:

Materials mortar	Weight [m-%]
Vinyl ester resin mixture	22.05%
Others	1.38%
Inhibitor	0.92%
Dispersion agent	0.46%
Accelerator	4.59%
Cement	4.59%
Inorganic fillers	56.97%
Stabilizer	0.92%

Materials hardener	Weight [m-%]
Water	4.23%
Others	0.03%
Rheological additive	0.37%
Dibenzoyl peroxide	3.41%
Inorganic fillers	0.08%

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

The fischer injection mortar FIS VB is a vinyl ester mortar with ETA approval for fixings in masonry and non-cracked concrete in a strength range from C20/25 to C50/60, and with a wide variety of masonry blocks. It is suitable for applications such as fire escapes, handrails, gate fixations, canopies, and many other similar uses.

The FIS VB is installed using approved system components, including the fischer threaded rod FIS A, RG M, the fischer internal threaded rod FIS IG, and fischer injection anchor sleeves, for both indoor and outdoor applications.

Following the cleaning steps specified in the ETA 24/0274 and using the fischer dispenser together with the option of using fischer PRO app supports correct mortar volume control. This prevents underfilling or overfilling of the drill hole, avoids material waste, and is designed to achieve the specified load performance.

The system also allows reuse of already opened cartridges by simply replacing the static mixer, which saves time and reduces installation costs.

As part of an approved system approach, the FIS VB enables installation in accordance with system requirements with improved robustness and reduced risk of installation errors.

The product complies with ETA 24/0274 and ETA 26/0280

2.3 REFERENCE SERVICE LIFE (RSL)

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

USED RSL (YR) IN THIS CALCULATION

The use phase was not considered, which is why no information on the RSL is required.

2.4 TECHNICAL DATA

This is a representative EPD in which the representative product represents another product with the same chemical formulation in a different cartridge size: FIS VB 300 represents FIS VB 360, FIS VB 380 and FIS VB 410. The technical data refers to ETA 24/0274 and ETA 26/0280.

Description	Unit	Value
Density	[kg/m³]	1,75
Material	-	Product: Mortar and hardener (See chapter 2.1 for details on chemical formulation) Packaging: polypropylene, polyethylene, cardboard/paper, aluminum
Tensile shear strength DIN EN 14293	[N/mm²]	-
Tensile bond strength DIN EN 14293	[N/mm²]	-

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

2.5 SUBSTANCES OF VERY HIGH CONCERN

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

2.6 DESCRIPTION OF THE PRODUCTION PROCESS

The hardener and the mortar are first mixed separately. Various components of the mortar are cooked in advance for this purpose. The mixing and cooking is carried out at the production plant in Denzlingen

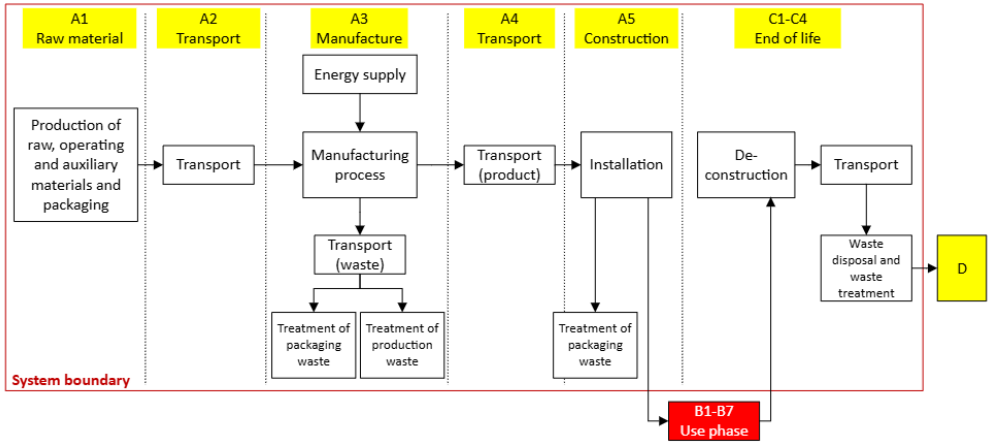
The packaging consists of polypropylene and polyethylene components as well as aluminum wires. The polypropylene components of the packaging are the cartridge, the piston, the cap, and the static mixer. These polypropylene components are manufactured on plastic injection molding machines. The cap and the piston are injection-molded at the plant in Horb. The remaining parts are injection-molded at the plant in Denzlingen.

The two chambers of the tubular bag are formed on a production machine in Denzlingen by heat-sealing the material. After the hardener and mortar are filled into the tubular bag, the aluminum wires are clamped over the ends of the tubular bag so that the ends of the tubular bag are sealed.

The mortar and hardener are filled into the two chambers of the tubular bag on the assembly line. The tubular bag is inserted into the cartridge so that one end of the bag connects to the cartridge's outlet. The bottom of the cartridge is closed with the piston. The cap is placed on the cartridge. The label is affixed to the cartridge. Finally, the cartridges are packed into a cardboard box along with the static mixer and the instructions for use. The assembly and packaging take place at the production facility in Denzlingen.

Product flow diagram

The LCA considers the product stage (A1-A3), the construction stage (A4-A5), the disposal stage (C1-C4), and benefits and loads outside the system boundary (Module D). Modules A1 (provision of raw materials), A2 (transportation) and A3 (production) are aggregated in the assessment as modules A1-A3. The modules declared in this EPD are highlighted in yellow in the figure below. The modules not declared are highlighted in red in the figure below.



Modules A1 - A3 comprise the following activities:

- Provision of energy
- Provision of raw, operating and auxiliary materials and packaging
- Transportation to the plant
- Production of mortar, hardener and cartridge
- Treatment of production waste
- Treatment of packaging waste from raw materials

Module A4 includes:

- Transportation to the construction site

Module A5 includes:

- Installation process / disposal of product packaging

Module C1 includes:

- Dismantling

Module C2 includes:

- Transportation to the waste disposal site

Modules C3 – C4 include:

- End-of-life scenarios
  - Scenario 0: Landfill of the product
  - Scenario 1: thermal treatment of the product

Module D includes:

- Benefits and loads outside the system boundary

2.7 CONSTRUCTION DESCRIPTION

The products are installed manually. Once the mortar material has been fully used, the cartridge (in module A5) is disposed of as waste.

3 Calculation rules

3.1 DECLARED UNIT

The declared unit is 1 kg of FIS VB based on the representative product. The assessed production volume is based on information provided by the manufacturer. Overall, it is assumed that the data is representative and consistent.

The product to be declared is an injection mortar. It consists of a two-chamber tubular bag, with the mortar in one chamber and the hardener in the other. The tubular bag is sealed at each end with an aluminum wire. The product also consists of a polypropylene cartridge, a static mixer, a piston, and a cap.

- Reference unit: kilogram (kg)
- Bulk density: 571 kilogram per cubic meter (kg/m³)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	Kg
Weight per reference unit	1	kg
Conversion factor to 1 kg	1,0000	kg

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

The system boundary was chosen “from the cradle to the factory gate with options”. Accordingly, the consideration includes the production stage (A1-A3), transportation to the place of use (A4), installation (A5), and the disposal stages (C1-C4) as well as benefits and loads outside the system boundary (D). The life cycle is modular in accordance with EN 15804.

The life cycle stages included are as shown below:

(X = module declared, ND = module not declared)

A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X

The modules of the EN15804+A2 contain the following:

Module A1 = Raw material supply

Module A2 = Transport

Module A3 = Manufacturing

Module A4 = Transport

Module A5 = Construction - Installation process

Module B1 = Use

Module B2 = Maintenance

Module B3 = Repair

Module B4 = Replacement

Module B5 = Refurbishment

Module B6 = Operational energy use

Module B7 = Operational water use

Module C1 = Deconstruction / Demolition

Module C2 = Transport

Module C3 = Waste Processing

Module C4 = Disposal

Module D = Benefits and loads beyond the product system boundaries

3.4 REPRESENTATIVENESS

The results of the calculations for the FIS VB 300 F ~~CL~~ of fischerwerke GmbH & Co. KG are representative for the following products:

- FIS VB 300 F (representative product)
- FIS VB 300 F CL
- FIS VB 360 S
- FIS VB 410 C

3.5 CUT-OFF CRITERIA

All relevant inputs and outputs that contribute significantly to the environmental impacts have been included in the model.

Auxiliary Materials: No workplace-specific quantities were available for some auxiliary materials. Here, the annual consumption of auxiliary materials at the production sites was scaled to one product and taken into account at each workplace.

Transport: For the transport processes the dataset "market group for transport, freight, lorry, unspecified" from the ecoinvent database was used. This dataset represents a conservative assumption with a Global Warming Potential (GWP) of 0.152 kg CO_2-eq per tonne-kilometre. This value is significantly higher than the GWP of more specific datasets, such as for trucks >32 t with EURO 3 (0.109 kg CO_2-eq) or EURO 6 (0.104 kg CO_2-eq) certification. The use of this generic dataset ensures that environmental impacts are not underestimated.

No cut-off criteria were applied, and it is ensured that the total amount of excluded mass and energy flows does not exceed 5% of the total input and output flows, in accordance with EN 15804+A2.

3.6 ALLOCATION

As there are no multi-output processes, no allocation rules had to be taken into account for the foreground processes.

3.7 DATA COLLECTION & REFERENCE TIME PERIOD

Primary data including all raw materials, packaging materials, energy consumption and ancillary materials were comprehensively collected for the reference year from 2025.01.01 to 2025.12.31.

Primary data are taken from fischer's ERP system. If production takes place at an external service provider, primary data were requested from the suppliers.

In cases where no primary data were provided by external service providers, secondary data from the ecoinvent database are used. As each component is produced specifically at one production site, it was not necessary to weigh data from different production sites.

Upstream and downstream processes, e.g. transport, and activities in module C are either based on primary data (e.g. transport distances from suppliers to production sites) or are estimated based on sales shares (e.g. distribution to installation sites).

3.8 ESTIMATES AND ASSUMPTIONS

Transport to construction site (A4)

No manufacturer-specific data is available for transportation to the construction site (Module A4). Transportation to construction sites takes place over a distance of 500 km.

Assembly (A5)

The products are installed in this phase using an electric drill. The operation of an electric vacuum cleaner is also taken into account. The power required to operate the electrical devices is 0.0132 kWh. Waste recycling of packaging waste is also taken into account in this phase. The benefits resulting from the incineration of packaging waste were considered in Module D in accordance with [IBU PCR Part A]. The thermal recovery of plastic, paper, and cardboard packaging is assessed in two scenarios.

In Scenario 0, it is assumed that 100% of the packaging materials are landfilled. No packaging materials are sent for energy recovery.

In Scenario 1, it is assumed that 100% of the packaging materials are incinerated. All packaging materials are sent for energy recovery. Both scenarios are presented in the results with the scenario specified. The thermal and electrical energy generated and exported is reported outside the system boundary in Module D as a benefit of subsequent use.

De-construction, demolition (C1)

The data used to calculate the environmental impact of dismantling was collected based on [Motzko 2016]. A demolition output of 0.000342 h/d.U. was calculated on this basis.

Transport End-Of-Life (C2)

The dismantled products are transported to a waste incineration plant for thermal recycling or disposed of in a landfill. Since the distance to the recycling center is usually not very far, the transport distance to the recycling center was assumed to be 200 km.

3.9 DATA QUALITY

Data quality is a key factor for the credibility, transparency, and comparability of environmental product declarations (EPDs). Therefore, both foreground (company-specific) and background (generic database) data were evaluated separately based on standardized criteria. Data quality is assessed in accordance with EN 15804, Annex E, and EN 15941, Chapter 7. Background data was taken exclusively from the Ecoinvent EN15804 database Version 3.12.

The foreground data was collected directly from fischerwerke GmbH & Co. KG and reflects actual production processes at the sites in Germany. Data collection covered the year 2025 and includes specific machine and process data where available. Where direct measurements were not available (e.g. auxiliary materials such as lubricants, dry ice or compressed air), data was estimated based on comparable equipment and operating conditions.

No cut-off criteria were applied, and all relevant flows contributing significantly to the results were included or estimated.

Quality requirement	Specific requirement	Data quality level	Notes
Time-related coverage	Foreground data	Very good	Reflects the actual locations of production in Germany. The product is distributed globally.
	Background data	Good	All datasets are taken from the most recent ecoinvent 3.12 version of the ecoinvent EN15804 database, which was released in 2025. All datasets are representative for current production technologies. The datasets in this version generally refer to data collected or extrapolated for the period between 2011 and 2025, depending on the process and data availability. According to ecoinvent, the indicated period reflects the original data collection period or a justified extrapolation range. Even if the end year of the period lies in the past, the datasets are still considered valid, as the underlying technologies, processes, or supply chains have not significantly changed or have been updated accordingly. This approach is consistent with the requirements of EN 15804 and EN 15941 for the temporal representativeness of background data. Some datasets used from the ecoinvent EN15804 3.12 database indicate a long period (e.g. 1945–2025 for Dataset “electricity production, hydro, run-of-river”). This reflects the stable technological nature of certain industrial processes and a broad historical data foundation. All datasets have been reviewed and validated by ecoinvent as part of version 3.12 and are in line with the temporal representativeness requirements of EN 15804 and EN 15941.
	Foreground data	Very good	Real, site-specific equipment and processes were modeled.
Geographical coverage	Background data	very good (for A1-A3) good (for EoL)	The selection of background datasets was based on geographical representativeness. If regional datasets for were not available, global averages from ecoinvent EN15804 version 3.12 were used.
Technical representativeness	Foreground data	Very good	Primary data from the year 2025 are collected for all activities taking place at fischer production sites.
	Background data	Good	All background data was sourced exclusively from Ecoinvent EN15804 3.12 database. This ensures full consistency and traceability of background data throughout the LCA model. All datasets are representative for current production technologies. Background data typically reflect industry averages, not specific technologies used on-site. Average technology is selected in ecoinvent if different technologies are available.

3.10 POWER MIX

The electricity consumption for core processes is modeled using the market-based approach in accordance with the requirements of the IBU Product Category Rules, Part A. This involves using the actual electricity sources purchased, along with the corresponding Guarantees of Origin.

The production facilities in Horb and Denzlingen use only electricity generated from renewable sources, as verified by certificates of origin. The electricity is sourced from clearly identifiable renewable energy sources. These energy sources are covered by official Guarantees of Origin, which are available upon request and serve as evidence for the renewable or low-carbon energy claims. For the LCA calculation the following renewable energy sources were used:

- 47.6% hydro, reservoir
- 29.5% hydro, run-of-river
- 10.4% biogas
- 9.5% wind power
- 3.0% Other

The consumption of one kWh of electricity from the mix of renewable energy sources shown above results in a global warming potential (GWP) of 0.0128 kg CO2e/kWh.

To ensure a consistent power supply at the Horb and Tumlingen sites, the power supply was calculated entirely with medium voltage. This approach ensures that all electricity supply across the different production sites is represented at the same voltage level (medium voltage), as required by EN 15804 and confirmed by the verification body. The use of medium-voltage representation also reflects typical industrial grid connection levels for the production sites.

4 Scenarios and additional technical information

4.1 RAW MATERIAL SUPPLY (A1)

This module covers the extraction and processing of all raw materials required for the production, including chemical components for the mortar and hardener as well as packaging materials.

4.2 TRANSPORT TO MANUFACTURER (A2)

Module A2 accounts for the transportation of all raw materials and packaging components to the manufacturing facilities. Transport distances and modes are based on supplier information and average industry data.

4.3 MANUFACTURING (A3)

The following is manufactured at the production site in Horb:

- The caps and pistons made of polypropylene
- The piston for ejecting the mortar and hardener from the cartridge

The following is manufactured at the production site in Denzlingen:

- The cartridge and the static mixer made of polypropylene
- The two-chamber bag
- The hardener and the mortar made from various substances before they are filled into the bag and sealed.

All components are assembled and packaged in Denzlingen to create the final product.

4.4 TRANSPORT TO CONSTRUCTION SITE (A4)

The transport of the FIS VB from the production site to the construction site is modeled with a standard transport distance of 500 km by truck. The transport dataset "market for transport, freight, lorry, unspecified" from the ecoinvent database is used. The transport includes the delivery of the finished product to the place of installation.

4.5 INSTALLATION ON SITE (A5)

In phase A5 the FIS VB is unpacked, the packaging material is discarded and the fixing system is installed. For the installation, a hole has to be drilled. During drilling, the dust is vacuumed and finally, the injection mortar is set. The power of the drilling and vacuum machines and the time to install one FIS VB is 0.0132 kWh. The global data set "market group for electricity, low voltage" from the ecoinvent database was used for the electrical energy required to install the product.

4.6 DECONSTRUCTION DEMOLITION (C1)

In the demolition module C1, diesel deconstruction machine operation must be considered. As it is difficult to assign the energy consumption of demolition machines specifically to the fixing system,

an average value for demolition time duration per demolition weight was calculated based on demolition examples in Motzko et al. (Motzko 2016). To account for the worst case, machine operation was calculated based on the highest demolition duration of 0,000342 h/kg to see if the impact from demolition is relevant. The data set “AM machine operation demolition in h” refers to the operation of diesel-powered demolition equipment and is calculated in hours. Therefore, this data set can be used for demolition work in phase C1.

4.7 TRANSPORT TO WASTE PROCESSING (C2)

This module accounts for the transport of demolished product components from the demolition site to waste treatment facilities. A standard transport distance of 200 km is assumed.

4.8 END OF LIFE (C3, C4)

In Phase C3 and C4, the hardener and the mortar are landfilled. In this life cycle assessment, the mortar from FIS VB is not considered for further recycling in any scenario. Different scenarios are assumed only for packaging waste.

Scenario 0: Landfill (module C3 and C4) - It is assumed that 100% of the product is disposed at the landfill. For scenario 0 the disposal of paper and cardboard waste is accounted for using the global Ecoinvent dataset titled “Treatment of residues, MSWI, waste packaging paper, residual material landfill.” The disposal of polypropylene and polyethylene waste is accounted for using the global Ecoinvent datasets titled “treatment of waste polypropylene, sanitary landfill” and “treatment of waste polyethylene, sanitary landfill”.

Scenario 1: Thermal treatment (module C3/1 and C4/1) - It is assumed that 100% of the products are disposed thermally. For this reason, incineration of the end-of-life product is considered. For scenario 1, the thermal treatment of paper and cardboard waste is accounted for using the global Ecoinvent dataset titled “treatment of waste packaging paper, municipal incineration”. The thermal treatment of polypropylene and polyethylene waste is accounted for using the global Ecoinvent datasets titled “treatment of waste polypropylene, municipal incineration” and “treatment of waste polyethylene, municipal incineration”.

4.9 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

Scenario 0: D – The benefits outside the system boundary are considered, through the recycling of the aluminum wire. The aluminum wire was used in the packaging to seal the ends of the tubular bag.

Scenario 1: D/1 – The benefits outside the system boundary are considered, through the incineration of packaging waste and cartridges in module A5 in module C3/1. In addition, the credit resulting from the recycling of the aluminum wire is taken into account. The aluminum wire was used in the packaging to seal the ends of the tubular bag.

5 Results

The results represent the calculation of the representative product. The results of the calculations for the representative product, FIS VB 300 F are representative for the products listed in section 3.4 (Representativeness). For the impact assessment, the characterization factors of the LCIA method EN 15804 +A2 Method v1.0 are used. Long-term emissions (>100 years) are not considered in the impact assessment. The results of the impact assessment are only relative statements that do not provide information on endpoints of the impact categories, exceedance of threshold values, safety margins, or risks. The following tables show the results of the indicators of the impact assessment, the use of resources as well as of waste, and other output flows. Where parameters were rated "0", there is no mass or energy flow.

5.1 ENVIRONMENTAL IMPACT INDICATORS PER KILOGRAM

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbreviation	Unit	A1-A3	A4	A5	C1	C2	C3/0	C3/1	C4/0	C4/1	D/0	D/1
AP	mol H^+ eqv.	8,13E-03	2,81E-04	7,22E-05	9,95E-06	9,49E-05	1,86E-04	2,43E-04	1,93E-04	1,33E-04	-7,23E-05	-8,84E-04
GWP-total	kg CO_2 eqv.	1,76E+00	6,71E-02	1,36E-02	1,95E-03	2,26E-02	2,48E-02	4,19E-01	5,47E-02	1,77E-02	-1,18E-02	-1,69E-01
GWP-b	kg CO_2 eqv.	-2,42E-02	1,11E-03	5,79E-05	3,13E-07	3,75E-04	5,95E-05	7,28E-02	8,72E-03	4,43E-05	-8,02E-06	-5,51E-04
GWP-f	kg CO_2 eqv.	1,77E+00	6,36E-02	1,35E-02	1,95E-03	2,15E-02	2,47E-02	3,46E-01	4,60E-02	1,76E-02	-1,18E-02	-1,68E-01
GWP-luluc	kg CO_2 eqv.	1,05E-02	2,38E-03	2,76E-05	1,95E-07	8,04E-04	4,44E-05	4,60E-05	1,06E-05	5,14E-06	-2,26E-05	-3,22E-04
EP-m	kg N eqv.	1,60E-03	1,26E-04	1,40E-05	4,55E-06	4,26E-05	6,01E-05	8,91E-05	9,06E-05	4,03E-05	-1,28E-05	-1,70E-04
EP-fw	kg P eqv.	3,46E-04	5,53E-06	6,69E-06	6,19E-08	1,86E-06	1,59E-05	1,69E-05	3,16E-05	1,46E-05	-4,39E-06	-7,71E-05
EP-T	mol N eqv.	1,44E-02	1,16E-03	1,41E-04	4,97E-05	3,93E-04	6,49E-04	9,34E-04	6,45E-04	4,35E-04	-1,32E-04	-1,72E-03
ODP	kg CFC 11 eqv.	6,61E-08	2,44E-09	9,69E-11	2,97E-11	8,23E-10	4,58E-10	5,24E-10	6,23E-10	5,12E-10	-8,41E-11	-6,25E-09
POCP	kg NMVOC eqv	6,54E-03	4,18E-04	4,10E-05	1,61E-05	1,41E-04	2,17E-04	2,87E-04	2,25E-04	1,57E-04	-3,97E-05	-5,00E-04
ADP-f	MJ	3,78E+01	9,30E-01	1,80E-01	2,51E-02	3,14E-01	4,09E-01	4,54E-01	4,50E-01	3,27E-01	-1,25E-01	-2,08E+00
ADP-mm	kg Sb-eqv.	1,35E-05	2,35E-07	8,38E-08	7,03E-10	7,94E-08	6,46E-08	7,72E-08	1,16E-07	4,69E-08	-1,45E-07	-1,20E-06
WDP	m^3 world eqv.	7,80E-01	7,17E-03	3,48E-03	6,28E-05	2,42E-03	9,87E-03	2,04E-02	1,30E-02	9,79E-03	-3,02E-03	-4,01E-02

AP=Acidification (AP) | **GWP-total**=Global warming potential (GWP-total) | **GWP-b**=Global warming potential - Biogenic (GWP-b) | **GWP-f**=Global warming potential - Fossil (GWP-f) | **GWP-luluc**=Global warming potential - Land use and land use change (GWP-luluc) | **EP-m**=Eutrophication marine (EP-m) | **EP-fw**=Eutrophication, freshwater (EP-fw) | **EP-T**=Eutrophication, terrestrial (EP-T) | **ODP**=Ozone depletion (ODP) | **POCP**=Photochemical ozone formation - human health (POCP) | **ADP-f**=Resource use, fossils (ADP-f) | **ADP-mm**=Resource use, minerals and metals (ADP-mm) | **WDP**=Water use (WDP)

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbreviation	Unit	A1-A3	A4	A5	C1	C2	C3/0	C3/1	C4/0	C4/1	D/0	D/1
ETP-fw	CTUe	3,61E+02	3,55E-01	4,01E-02	2,56E-03	1,20E-01	1,90E-01	2,78E-01	4,59E-01	1,40E-01	-6,84E-02	-5,27E-01
PM	Disease incidence	6,79E-08	7,62E-09	6,46E-10	1,94E-10	2,57E-09	1,04E-08	1,07E-08	3,07E-09	2,32E-09	-1,73E-09	-9,14E-09
HTP-c	CTUh	4,59E-10	1,75E-11	2,33E-12	1,90E-12	5,89E-12	6,32E-12	2,14E-11	2,63E-10	5,58E-12	-7,64E-12	-3,47E-11
HTP-nc	CTUh	4,32E-08	7,30E-10	1,33E-10	5,71E-12	2,46E-10	2,72E-10	9,57E-10	1,11E-08	2,98E-10	-1,18E-10	-1,70E-09
IR	kBq U-235 eqv.	9,58E-02	8,71E-04	1,80E-03	1,05E-05	2,94E-04	5,18E-04	5,69E-04	5,92E-04	4,14E-04	-4,97E-04	-1,82E-02
SQP	Pt	8,51E+00	1,22E+00	3,30E-02	1,73E-03	4,10E-01	5,82E-01	5,96E-01	7,48E-01	5,75E-01	-3,10E-02	-3,96E-01

ETP-fw=Ecotoxicity, freshwater (ETP-fw) | **PM**=Particulate Matter (PM) | **HTP-c**=Human toxicity, cancer (HTP-c) | **HTP-nc**=Human toxicity, non-cancer (HTP-nc) | **IR**=Ionising radiation, human health (IR) | **SQP**=Land use (SQP)

CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD type / level 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

Disclaimer 1 – 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.

Disclaimer 2 – 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 experience with the indicator.

5.2 INDICATORS DESCRIBING RESOURCE USE AND ENVIRONMENTAL INFORMATION BASED ON LIFE CYCLE INVENTORY (LCI) PER KILOGRAM

PARAMETERS DESCRIBING RESOURCE USE

Abbreviation	Unit	A1-A3	A4	A5	C1	C2	C3/0	C3/1	C4/0	C4/1	D/0	D/1
PERE	MJ	2,42E+00	2,09E-02	2,90E-02	1,57E-04	7,05E-03	9,63E-03	1,08E-02	1,06E-02	6,07E-03	-1,55E-02	-3,23E-01
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	0,00E+00	0,00E+00
PERT	MJ	2,42E+00	2,09E-02	2,90E-02	1,57E-04	7,05E-03	9,63E-03	1,08E-02	1,06E-02	6,07E-03	-1,55E-02	-3,23E-01
PENRE	MJ	3,78E+01	9,47E-01	1,80E-01	2,51E-02	3,19E-01	4,09E-01	4,54E-01	4,50E-01	3,27E-01	-1,25E-01	-2,08E+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	0,00E+00	0,00E+00
PENRT	MJ	3,78E+01	9,47E-01	1,80E-01	2,51E-02	3,19E-01	4,09E-01	4,54E-01	4,50E-01	3,27E-01	-1,25E-01	-2,08E+00
SM	kg	5,06E-02	4,32E-04	2,68E-05	1,04E-05	1,46E-04	1,55E-04	2,25E-04	1,54E-04	1,22E-04	-1,90E-04	-5,17E-04
RSF	MJ	4,81E-03	5,64E-06	1,98E-07	2,73E-08	1,90E-06	2,17E-06	2,67E-06	5,29E-06	1,94E-06	-4,29E-07	-2,73E-06
NRSF	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	0,00E+00	0,00E+00
FW	m^3	1,90E-02	2,32E-04	8,16E-05	1,51E-06	7,83E-05	-2,87E-03	-2,78E-03	-2,71E-03	-2,26E-03	-8,46E-05	-9,54E-04

PERE=renewable primary energy ex. raw materials | **PERM**=renewable primary energy used as raw materials | **PERT**=renewable primary energy total | **PENRE**=non-renewable primary energy ex. raw materials | **PENRM**=non-renewable primary energy used as raw materials | **PENRT**=non-renewable primary energy total | **SM**=use of secondary material | **RSF**=use of renewable secondary fuels | **NRSF**=use of non-renewable secondary fuels | **FW**=use of net fresh water

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbreviation	Unit	A1-A3	A4	A5	C1	C2	C3/0	C3/1	C4/0	C4/1	D/0	D/1
HWD	kg	3,79E-01	6,61E-03	3,41E-03	8,14E-05	2,23E-03	2,71E-03	7,68E-03	1,05E-01	1,68E-03	-3,68E-03	-4,54E-02
NHWD	kg	7,02E+00	1,20E-01	3,30E-02	4,06E-04	4,04E-02	2,10E+00	2,28E+00	3,07E+00	2,71E+00	-2,76E-02	-3,85E-01
RWD	kg	2,29E-05	2,09E-07	4,36E-07	2,46E-09	7,06E-08	1,24E-07	1,37E-07	1,42E-07	9,91E-08	-1,23E-07	-4,40E-06

HWD=hazardous waste disposed | **NHWD**=non-hazardous waste disposed | **RWD**=radioactive waste disposed

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbreviation	Unit	A1-A3	A4	A5	C1	C2	C3/0	C3/1	C4/0	C4/1	D/0	D/1
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	0,00E+00	0,00E+00
MFR	kg	6,79E-03	2,59E-05	2,56E-05	4,37E-07	8,73E-06	1,68E-05	1,86E-05	8,11E-05	7,40E-05	-6,94E-05	-3,46E-04
MER	kg	8,25E-05	6,02E-08	9,61E-09	3,38E-10	2,03E-08	2,37E-08	2,95E-08	2,54E-08	1,04E-08	-7,60E-09	-1,19E-07
EET	MJ	2,03E-02	1,14E-04	8,77E-06	5,57E-07	3,86E-05	3,66E-05	5,33E-05	2,60E-04	2,36E-04	-1,44E-05	-1,11E-04
EEE	MJ	1,71E-02	9,92E-05	2,03E-04	1,19E-06	3,35E-05	6,90E-05	7,57E-05	1,36E-04	1,16E-04	-9,53E-05	-1,96E-03

CRU=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported Energy Thermic | **EEE**=Exported Energy Electric

5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER KILOGRAM

The following information describes the biogenic carbon content in (the main parts of) the product at the factory gate per kilogram:

Biogenic carbon content	Scenario	Amount	Unit
Biogenic carbon content in the product	0	-1,77E-03	kg C
Biogenic carbon content in accompanying packaging	0	-2,86E-03	kg C
Biogenic carbon content in the product	1	-1,77E-03	kg C
Biogenic carbon content in accompanying packaging	1	1,46E-02	kg C

UPTAKE OF BIOGENIC CARBON DIOXIDE

The following amount of carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not considered in this number although they do appear in the presented results. One kilogram of biogenic carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

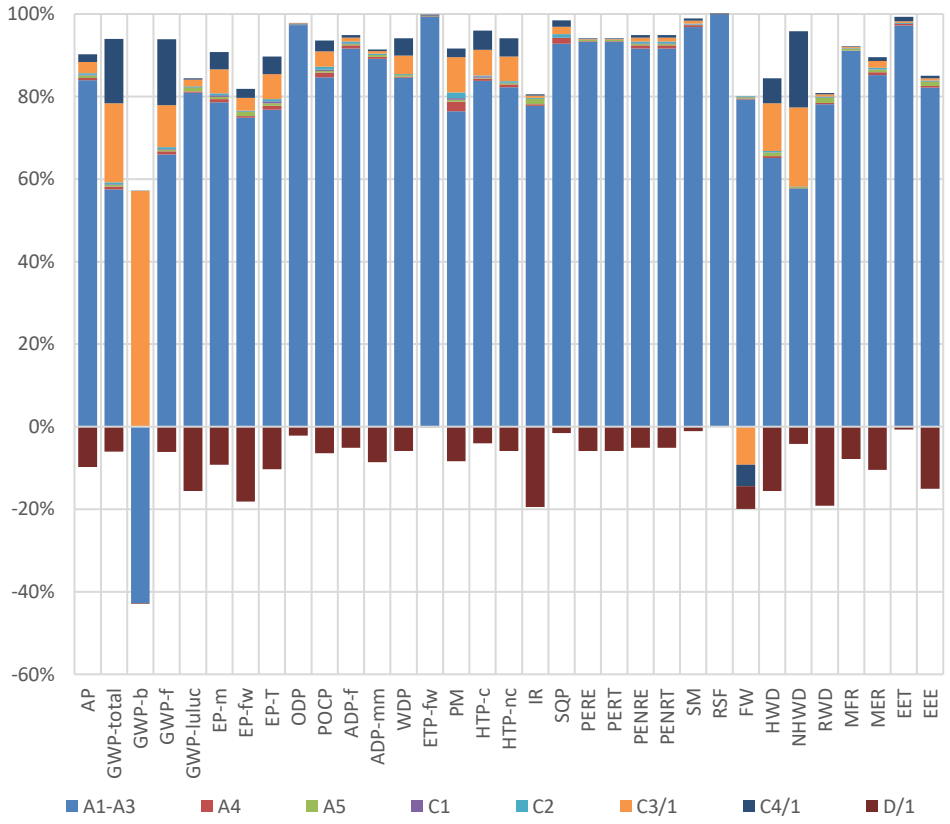
Uptake biogenic carbon dioxide	Scenario	Amount	Unit
Product	0	-6,48E-03	kg CO_2 (biogenic)
Packaging	0	-1,05E-02	kg CO_2 (biogenic)
Product	1	-6,48E-03	kg CO_2 (biogenic)
Packaging	1	5,36E-02	kg CO_2 (biogenic)

6 Interpretation of results

6.1 CONTRIBUTION ANALYSIS

Many of the indicators on environmental impact and resource use are dominated by the production phase A1-A3. In addition, waste treatment (Module C3/1) has a significant share in the indicators. Furthermore, recovery potentials result in benefits outside the system boundaries (Module D/1).

The following graph shows the relative shares of the modules in the indicator results in the declared product (based on 1 kg injection mortar with cartridge). The values are scaled in such a way that all bars are the same height. Impact categories with a value of zero show no bar. The graph shows an incineration at the end of life.



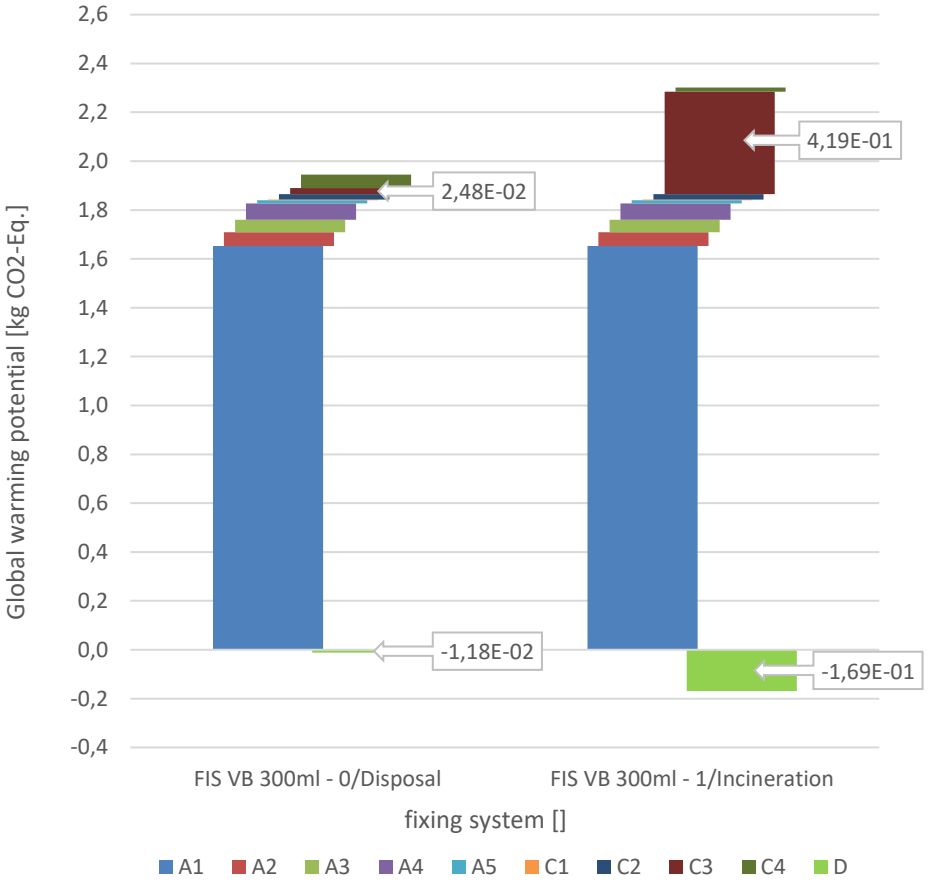
6.2 GLOBAL WARMING POTENTIAL ANALYSIS

The following figure compares the Global Warming Potential of Scenarios 0 and 1.

The comparison shows that incinerating the packaging materials in Scenario 1 results in 17 times more CO2 emissions in Phase C3 than in Scenario 0.

However, the comparison also shows that burning the packaging materials results in a credit in Phase D that is 14 times higher in Scenario 1 compared to Scenario 0.

The credit in Phase D of Scenario 1 does not offset the emissions generated by burning the packaging materials in Phase C3 of Scenario 1.



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Background database

ecoinvent version 3.11

ETA 24/0274

Bonded fastener for use in concrete

ETA 26/0280

Metal Injection anchors for use in masonry

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