ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-HIL-20220125-IBA1-EN
Issue date	21.06.2022
Valid to	20.06.2027

Hilti HIT-RE 500 V4

HILTI AG

Institut Bauen und Umwelt e.V.

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1. General Information

HILTI AG	HIT-RE 500 V4
Programme holder IBU – Institut Bauen und Umwelt e.V. Hegelplatz 1 10117 Berlin Germany	**Owner of the declaration** Hilti AG Feldkircher Str. 100 FL-9494 Schaan Liechtenstein
Declaration number EPD-HIL-20220125-IBA1-EN	**Declared product / declared unit** The declared product is a HILTI injectable mortar HIT-RE 500 V4. The declared unit is one kilogram of reaction resin product in the mixing ratio of the two components necessary for processing. The packaging is also included in the calculation. The declared unit is stated in [kg].
This declaration is based on the product category rules: Reaction resin products, 11.2017 (PCR checked and approved by the SVR)	**Scope:** This document refers to the injectable mortar HIT-RE 500 V4 with its packaging. For the compilation of the life cycle assessment, specific data were collected from the factory in Kaufering, Germany, of the HILTI AG. Data from the year 2020 are used, which correspond to the annual average.
Issue date 21.06.2022	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*.
Valid to 20.06.2027	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*.
 Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	**Verification** The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data according to *ISO 14025:2011* ☐ internally ☒ externally
 Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	 Matthias Klingler (Independent verifier)

2. Product

2.1 Product description/Product definition

The declared product of HIT-RE 500 V4 is a two-component system.
The resin component (component A) comprises a resin based on epoxides as well as mineral fillers. The curing agent component (component B) comprises of amine hardener, mineral and cement-like fillers.
Mixing the two components A and B in the static mixer initiates the curing (hardening) reaction of both binder systems. During the curing phase, a very strong bond is formed between the organic and inorganic binder matrix. The system formed during curing results in a cross-linked duromer with desired design properties (high bond strengths within defined curing time) and particular long-term stability.
Composite foils are used for the two-component foil pack of HIT-RE 500 V4. This kind of packaging serves the following purposes: waste volume reduction, easy storage and transport, less packaging material.
Through legislation and increased public awareness users have increasingly become discerned towards the

use of highly volatile components with their resulting unpleasant odour and low flash point (flammability). The reaction resins used in all Hilti adhesives are practically odourless and have a considerably higher flash point, i.e. higher than 100 °C in comparison to 34 °C for styrene-based products. HIT-RE 500 V4 is the high-performance injectable hybrid mortar with approvals for rebar connections and heavy duty anchoring.
For the placing of the product on the market in the European Union European Free Trade Association EU/EFTA) (with the exception of Switzerland) the Regulation (EU) No. 305/2011 (CPR) applies. The product needs a declaration of performance taking into consideration the following European Technical Approvals
ETA 20/0793
ETA 20/0539
ETA 20/0834
ETA 20/0540
ETA-20/0541
and the CE-marking. For the application and use the respective national provisions apply.

2.2 Application

Hilti HIT-RE 500 V4 serves for safely securing of threaded rods and post-installed rebar connections in cracked and uncracked concrete C20/25 to C50/60. HIT-RE 500 V4 is ETA and ICC approved for seismic C1 and C2 category for anchoring and C1 category for rebar.

Hilti HIT-RE-500 V4 is a component of the Hilti SAFEset concept. Hilti SAFEset is an approved system which makes anchor installation an easier, safer and faster process. It significantly improves the robustness of fastening and dramatically reduces the possibilities of error during installation. As part of SAFEset HIT-RE 500 V4 can be installed with approved Hilti Hollow Drill bits and vacuum cleaners that drill and clean the hole in one step for virtually dust-free installation. The use of Hilti HDE-22 dispenser with Volume Calculator app leads to no under or over fill, reducing underfilling related risks and minimizing mortar wastage.

2.3 Technical Data

Constructional data

Name	Value	Unit
Density EN ISO 1183-1	1420	kg/m^3
Compressive strength (Tcure=120h) EN ISO 604	105	N/mm^2
Elastic modulus (pressure) EN ISO 604	4800	N/mm^2
Tensile shear strength acc. to DIN EN 14293	not relevant	N/mm^2
Tensile bond strength acc. to DIN EN 14293	not relevant	N/mm^2

Hilti HIT-RE 500 V4 displays the following characteristics:

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to
ETA 20/0793
ETA 20/0539
ETA 20/0834
ETA 20/0540
ETA-20/0541

Shelf life of 12 months:
Substrate temperature during installation -5 to +40 °C (internal method).

Working time:

-5 to 0 °C	120 min
> 0 to +4 °C	120 min
> 4 to +9 °C	120 min
> 9 to +14 °C	90 min
> 14 to +19 °C	60 min
> 19 to +24 °C	30 min
> 24 to +29 °C	20 min
> 29 to +34 °C	15 min
> 34 to +39 °C	12 min
40°C	10 min

Curing time:

-5 to 0 °C	168 h
> 0 to +4 °C	48 h
> 4 to +9 °C	24 h
> 9 to +14 °C	16 h
> 14 to +19 °C	12 h
> 19 to +24 °C	7 h
> 24 to +29 °C	6 h
> 29 to +34 °C	5 h
> 34 to +39 °C	4,5 h
40°C	4 h

2.4 Delivery status

The product Hilti HIT-RE 500 V4 is available in foil-packages with a total of 330 ml, 500 ml and 1400 ml injectable mortar in the corresponding mixing ratio.

2.5 Base materials/Ancillary materials

Hilti HIT-RE 500 V4 is supplied in the form of a dual component film-wrapped pack comprising a resin component and a curing agent component at a volume ratio of 3:1. The mixing ratio of resin and curing agent components is automatically set during the injection process. Product curing commences directly after the components are mixed.

The product reviewed in this EPD contains the following component volumes:

Resin component:
Epoxide resin mixture: 60 to 70% by weight
Mineral fillers: 30 to 40% by weight
Other: < 5% by weight

Curing agent component:
Amine hardener mixture: 60-70% by weight
Mineral fillers: 15 to 25% by weight
Cement: 10 to 20% by weight
Other: <5% by weight

This product article contains substances listed in the candidate list (date: 25.04.2022) exceeding 0.1 percentage by mass: no.

This product contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: yes,
1,3 Propanediol, 2 ethyl-2-(hydroxymethyl)-, polymer with 2-(chloromethyl)oxirane (Reach-no 01-2119494060- 45), classified as Repr. 1B, H360F and Muta. 2, H341, below 10 % by weight.

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) Ordinance on Biocide Products No. 528/2012): no.

2.6 Manufacture

All raw materials are sourced from Europe. The transport is exclusively by truck. Chemical mortars are usually two-component systems consisting of a binder and a hardener.

The production of chemical mortars consists of a mixing process and a filling process of the respective single components (binder and hardener) and their subsequent union to a two-component system (container). Here as well process control technology is used to weigh and mix solid and liquid compounds according to specification. In the next step both well-mixed components run through an automized filling line in which each of the processed masses is filled into a tubular foil bag. Finally the single components are united in one container. The two-pack foil bags are packed into cardboard boxes and then finally shipped. The manufacturing plant of HIT-RE 500 V4, Hilti GmbH Industriegesellschaft für Befestigungstechnik, Hiltistr. 6, 86916 Kaufering, Germany, is certified according to ISO 9001. The guideline defines international standards for quality and process management.
The following flowcharts illustrate the underlying production process

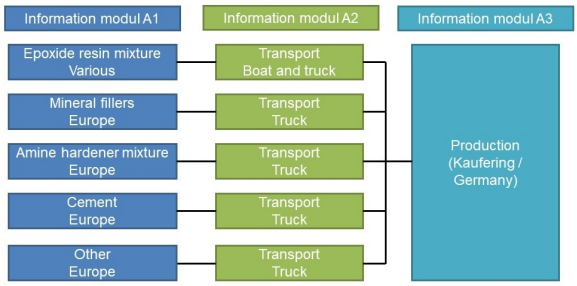

Illustration: Production process of the reaction resin mixture

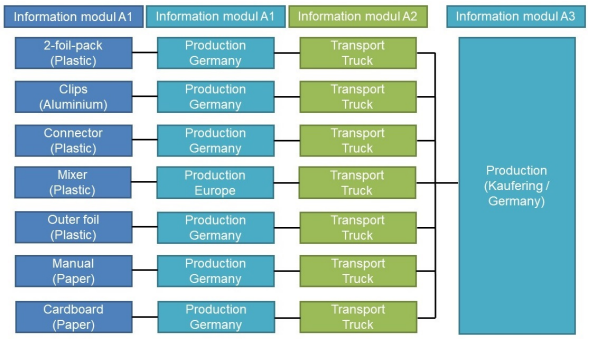

Illustration: Production process of the packaging

2.7 Environment and health during manufacturing

The manufacturing plant of HIT-RE 500 V4,Hilti GmbH Industriegesellschaft für Befestigungstechnik, Hiltistr. 6, 86916 Kaufering, Germany, is certified according to ISO 14001 which defines international standards for sustainable environmental management. The production site is also certified in accordance with DIN EN ISO 50001 Energy Management Systems.

2.8 Product processing/Installation

The product is delivered with Instructions for Use explaining the basic steps for installation:

1) For safe handling the precautionary measures described in the SDS (e.g. hand and eye protection) must be adhered to
2) Insert the cartridge into the black cassette
3) Screw on the mixing nozzle
4) Put the cassette into the dispenser system
5) Discard the first trigger pulls
6) Fill 2/3 of the borehole with mortar
7) Set the fixing element

After mixing the components and squeezing the mortar into the borehole the fixing element has to be set within the working time mentioned in Instructions for Use. After the curing time, described as well in Instructions for Use, the mortar is ready to take up loads.

2.9 Packaging

Hilti HIT-RE 500 V4 is supplied in the form of a 2-foil-pack system and thus leads to very little waste remaining after use on the construction site. After curing, the product can be disposed of with household waste. Full or only partially emptied cartridges must be disposed of as special waste in accordance with official regulations.
The outer packaging consisting of plastic foil and cardboard boxes designed according to the product size can be recycled. Packaging contaminated by the product must be disposed in a safe manner in accordance with local/national regulations.
For this EPD, the declared packaging is a weighted meanvalue of all available packaging sizes. This results in a 151 g packaging composed of 64 g of plastic, 84g of paper and cardboard, 3 g of aluminium.

2.10 Condition of use

During the installation the temperature of the base material must be between -5°C and +40°C . The temperature of the product should be between +5 and +25 °C during storage and +5 and 40°C during usage. Hilti literature and official approvals must always be considered. The two components of HIT-RE 500 V4 are only for use in combination with the defined volume ratio and under these conditions mentioned above to build up a cross-linked filled duromer.

2.11 Environment and health during use

Refer to the Safety Data Sheet (SDS) for detailed information on handling, storage as well as first aid, firefighting and accidental release measures and disposal considerations. Following the given instructions helps to minimize the risk for health and environment.

2.12 Reference service life

Hilti HIT-RE 500 V4 is exposed to a wide variety of environmental factors during the use phase. The anticipated Reference Service Life depends on the specific installation situation and the product exposure scenario. The main factors influencing the period of use involve weathering as well as mechanical loads and chemical exposure.

2.13 Extraordinary effects

Fire

Even without any special fire safety features the Injection Systems comply with at least the requirements of the DIN EN 13501-1 standard for fire classes E and Efl. As cross-linked epoxy-amine resins do not melt or drip, the resins do not contribute towards spreading fire. Apart from the common combustion produces carbon monoxide and carbon dioxide, fire gases can contain traces of various phenolic compounds. 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.

Fire protection

Name	Value
Building material class	E/Efl
Burning droplets	No performance assessed
Smoke gas development	No performance assessed

Water
The cured product is chemically inert and insoluble in water. HIT-RE 500 V4 is certified for use as an anchoring adhesive in concrete for water treatment applications according to National Sanitation Foundation (US) /NSF/.

Mechanical destruction
It is recommended to use dust protection during demolition of the cured chemical anchor.

2.14 Re-use phase
The product cannot be re-used. After usage the product can be removed by demolition.

2.15 Disposal
Uncured Hilti HIT-RE 500 V4 can be disposed of according to the European waste code 08 04 09* or 20 01 27*. The built-in cured anchor can be disposed as construction waste for which the European waste code 17 01 01 applies.

2.16 Further information

Further information is available on request under anchor.hse@hilti.com and on the Hilti website: www.hilti.group

3. LCA: Calculation rules

3.1 Declared Unit

The declared product is a HILTI injection mortar HIT-RE 500 V4. The declared unit refers to one kilogram of reaction resin product in the required mixing ratio of the two components. The packaging of 0,151 kg/kg of product is also included in the calculation. The following table shows the data of the declared unit.

Declared unit

Name	Value	Unit
Declared unit	1	kg

3.2 System boundary

The type of the EPD is cradle to grave. The following information modules are defined as system boundaries in this study:

A1 – Raw material supply:
Production and packaging of the raw materials to be supplied to the manufacturer. All processes are included from cradle to gate.
A2 – Transport (to manufacturing site):
Transportation of all the raw materials and their packaging between their production site and the manufacturing site, for all transport modes (sea, road).
A3 – Manufacturing:
Production, supply and use of energy sources at the manufacturing sites (electricity, biomass and natural gas). Green electricity from wind turbines is considered for the whole manufacturing process.
Production and transport of production losses, final product packaging and other inputs.
End-of-life of production waste (hazardous, non-hazardous and recyclable), production losses and raw material packaging, including waste and losses transportation, processing and disposal.
A4 – Transport (to construction site)
Transportation of packaged products from the manufacturing site to the construction site, including potential in-betweens (retailer, workshop, etc.).
A5 – Installation-Construction
Electricity consumption for drilling and injecting (in case of injection with electrical dispenser).
Production of the construction losses.
Provision and end-of-life of tools and accessories for injectable mortars (manual or electrical dispenser with or without battery and with cartridge holder).
End-of-life of hazardous construction losses and packaging (uncured mortar and soiled packaging) and non-hazardous construction losses (cured mortar and unsoiled packaging): including waste transportation, processing and disposal.
C1 – Deconstruction/demolition
Diesel for building demolition.
C2 – Transport (to waste processing)
Transportation to waste processing facility.
C4– Waste disposal
Treatment and disposal of plastic to sanitary landfill.

For the environmental impact, the use of green electricity (stage A3) was calculated taking into account the residual electricity mix for the remaining electricity. The proportion of the electricity demand covered by green electricity in the total electricity demand is 100%.

3.3 Estimates and assumptions

In general, background data and elecricity mixes are chosen and calculated country-specifically for the production processes. In some cases, assumptions were made because of a lack of primary or secondary data, in particular for the following aspects:

- The synthesis way of raw materials which were not available on the Ecoinvent database were used to reconstructed these material's impact
- Some raw material's packaging composition and transportation distances were estimated
- The energy consumption for production of the current product (HIT-RE 500 V4) was assimilated to the energy consumption measured on the production line of another Hilti product, which has a very similar manufacturing process
- Estimations were made to calculate the energy consumption during installation
- The transportation scenario to building site is based on french transportation companies statistics.

3.4 Cut-off criteria

All information modules considered were included in the calculation in such detail that all requirements of /EN 15804/ are met. The consumption of additional inputs such as lubricants, oils or solvents used for manufacture is less than 5% by weight and therefore falls below the cut-off criterion of the total calculation.

3.5 Background data

The source for background data for the LCA calculations is the ecoinvent 3.8 database.

3.6 Data quality

For the compilation of the life cycle assessment, specific data were collected from the factory Kaufering, in Germany, of the HILTI AG from the year 2020. The background data from the ecoinvent 3.8 database used was updated in the year 2021 and thus of highly up-to-date. The mass of the different components of the reactive resin mixture come from the information in the recipe. The data quality is classified as appropriate.

3.7 Period under review

Data from the year 2020 are used, which correspond to the annual average.

3.8 Allocation

The energy for manufacturing (A3) is supposed to be the same as for another HITLI product, which

consumptions were measured on production line. No allocation was used for this stage.
The used operating tools (stage A5), which are Hilti's manual or electrical dispenser can be used to inject the HIT-RE 500 V4 as well as other Hilti products. The part of the dispenser's impact allocated to the current product is based on the estimated total mass of injected product each dispenser can be used for. This can be considered as a mass allocation.

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.

The used background database is given by ecoinvent 3.8 database, to which this study refers.

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic Carbon
The declared product contains 84 g of paper and cardboard (outer packaging and user manual). Moreover, during production of one of the raw materials, biogenic carbon is captured. Since only the packaging and one raw material contain biogenic carbon, in addition to a neglectable part contained in the raw materials' packaging, all the biogenic carbon capture and release were cancelled to simplify the model.
The cancelled emission corresponds to 0,025 kg of biogenic carbon (0,093 kg of CO2) for a cancelled capture of 0,151 kg of biogenic carbon (0,553 kg of CO2).

The following scenarios were considered for the LCA calculations:

Transport to the building site (A4)

Name	Value	Unit
Transport distance	900	km
Vehicle type	lorry 16-32 metric ton	-
Effective load	21	t
Maximum capacity	24	t
Consumption when unloaded	0,25	L/km
Consumption at fill capacity	0,38	L/km
Empty return rate	14	%
Effective consumption	0,019	L/tkm

Installation into the building (A5)

Name	Value	Unit
Electricity consumption	0.00036	kWh
Uncured mortar loss	0,04	kg
Cured mortar loss	0,03	kg
Material loss	0.07	kg
Hazardous waste (soiled packaging)	0,067	kg
Non-hazardous waste (unsoiled packaging)	0,084	kg

End of life (C1-C4)

Name	Value	Unit
Fuel for building demolition	0,0437	MJ
Distance to sanitary landfill	50	km
Landfilling	1	kg

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = 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	X	X	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg HIT-RE 500 V4

Core Indicator	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO_2-Eq.]	3.25E+0	4.95E-2	4.75E-1	7.17E-2	5.72E-1	4.02E-3	4.84E-3	0.00E+0	1.14E-1	0.00E+0
GWP-fossil	[kg CO_2-Eq.]	3.10E+0	4.93E-2	4.43E-1	7.14E-2	5.58E-1	4.02E-3	4.82E-3	0.00E+0	1.14E-1	0.00E+0
GWP-biogenic	[kg CO_2-Eq.]	4.04E-2	1.71E-4	3.03E-2	2.48E-4	6.18E-3	3.65E-6	1.67E-5	0.00E+0	2.85E-4	0.00E+0
GWP-luluc	[kg CO_2-Eq.]	1.06E-1	1.97E-5	9.51E-4	2.85E-5	7.62E-3	4.00E-7	1.93E-6	0.00E+0	2.15E-6	0.00E+0
ODP	[kg CFC11-Eq.]	4.13E-7	1.14E-8	5.66E-8	1.65E-8	6.98E-8	8.59E-10	1.12E-9	0.00E+0	3.10E-9	0.00E+0
AP	[mol H^+-Eq.]	1.67E-2	1.40E-4	2.04E-3	2.03E-4	2.34E-3	4.17E-5	1.37E-5	0.00E+0	7.63E-5	0.00E+0
EP-freshwater	[kg P-Eq.]	9.91E-4	3.37E-6	1.36E-4	4.88E-6	1.71E-4	1.27E-7	3.30E-7	0.00E+0	8.58E-7	0.00E+0
EP-marine	[kg N-Eq.]	6.30E-3	2.86E-5	5.80E-4	4.14E-5	6.24E-4	1.85E-5	2.79E-6	0.00E+0	2.14E-3	0.00E+0
EP-terrestrial	[mol N-Eq.]	3.92E-2	3.10E-4	4.36E-3	4.49E-4	6.25E-3	2.03E-4	3.03E-5	0.00E+0	3.07E-4	0.00E+0
POCP	[kg NMVOC-Eq.]	1.45E-2	1.19E-4	1.34E-3	1.73E-4	1.48E-3	5.57E-5	1.17E-5	0.00E+0	1.12E-4	0.00E+0
ADPE	[kg Sb-Eq.]	4.46E-5	1.78E-7	1.75E-6	2.58E-7	7.85E-6	2.04E-9	1.74E-8	0.00E+0	3.11E-8	0.00E+0
ADPF	[MJ]	5.80E+1	7.33E-1	8.32E+0	1.06E+0	6.46E+0	5.41E-2	7.17E-2	0.00E+0	2.22E-1	0.00E+0
WDP	[m^3 world-Eq deprived]	5.47E+0	3.43E-3	2.32E-1	4.97E-3	4.56E-1	1.45E-4	3.36E-4	0.00E+0	2.30E-3	0.00E+0

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg HIT-RE 500 V4

Indicator	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	1.36E+1	1.07E-2	4.56E-1	1.55E-2	1.07E+0	3.09E-4	1.04E-3	0.00E+0	1.17E-2	0.00E+0
PERM	[MJ]	0.00E+0	0.00E+0	6.81E-1	0.00E+0	4.77E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	1.36E+1	1.07E-2	1.14E+0	1.55E-2	1.11E+0	3.09E-4	1.04E-3	0.00E+0	1.17E-2	0.00E+0
PENRE	[MJ]	3.77E+1	7.33E-1	5.64E+0	1.06E+0	4.82E+0	5.41E-2	7.17E-2	0.00E+0	2.22E-1	0.00E+0
PENRM	[MJ]	2.07E+1	0.00E+0	2.68E+0	0.00E+0	1.68E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	5.84E+1	7.33E-1	8.32E+0	1.06E+0	6.49E+0	5.41E-2	7.17E-2	0.00E+0	2.22E-1	0.00E+0
SM	[kg]	1.74E-2	2.50E-4	8.31E-2	3.62E-4	8.70E-3	2.12E-5	2.44E-5	0.00E+0	8.41E-5	0.00E+0
RSF	[MJ]	3.29E-4	2.75E-6	6.72E-3	3.98E-6	5.20E-4	6.91E-8	2.69E-7	0.00E+0	3.83E-6	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m^3]	1.30E-1	9.35E-5	5.66E-3	1.35E-4	1.09E-2	3.28E-6	9.14E-6	0.00E+0	2.92E-4	0.00E+0

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg HIT-RE 500 V4

Indicator	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	2.93E-1	8.34E-4	4.17E-2	1.21E-3	1.85E-1	7.23E-5	8.16E-5	0.00E+0	3.46E-4	0.00E+0
NHWD	[kg]	4.17E+0	1.48E-2	5.02E-1	2.15E-2	4.87E-1	5.08E-4	1.45E-3	0.00E+0	1.00E+0	0.00E+0
RWD	[kg]	9.57E-5	5.05E-6	1.41E-5	7.31E-6	1.77E-5	3.81E-7	4.93E-7	0.00E+0	1.47E-6	0.00E+0
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	5.89E-3	2.30E-6	5.10E-2	3.33E-6	9.35E-2	7.20E-8	2.25E-7	0.00E+0	1.21E-6	0.00E+0
MER	[kg]	1.52E-2	1.85E-8	1.11E-5	2.68E-8	1.07E-3	1.15E-9	1.81E-9	0.00E+0	5.85E-9	0.00E+0
EEE	[MJ]	3.30E-2	1.60E-4	7.35E-3	2.31E-4	3.82E-3	2.12E-5	1.56E-5	0.00E+0	4.53E-4	0.00E+0
EET	[MJ]	1.32E-1	6.64E-4	2.13E-2	9.62E-4	1.42E-2	2.15E-4	6.49E-5	0.00E+0	1.22E-3	0.00E+0

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg HIT-RE 500 V4

Indicator	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	1.59E-7	3.97E-9	2.34E-8	5.75E-9	2.35E-8	1.12E-9	3.88E-10	0.00E+0	1.62E-9	0.00E+0
IRP	[kBq U235-Eq.]	2.50E-1	3.85E-3	3.51E-2	5.58E-3	3.22E-2	2.48E-4	3.76E-4	0.00E+0	1.48E-3	0.00E+0
ETP-fw	[CTUe]	1.60E+2	6.12E-1	6.49E+0	8.87E-1	2.02E+1	3.25E-2	5.98E-2	0.00E+0	4.83E-1	0.00E+0
HTP-c	[CTUh]	6.09E-9	1.88E-11	2.30E-10	2.73E-11	6.71E-10	1.25E-12	1.84E-12	0.00E+0	7.12E-12	0.00E+0
HTP-nc	[CTUh]	8.99E-6	5.99E-10	1.09E-8	8.68E-10	6.33E-7	2.35E-11	5.86E-11	0.00E+0	1.81E-10	0.00E+0
SQP	[-]	4.48E+1	5.21E-1	4.43E+0	7.55E-1	3.98E+0	7.03E-3	5.09E-2	0.00E+0	5.83E-1	0.00E+0

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

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 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 – 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 or as there is limited experienced with the indicator.

6. LCA: Interpretation

The dominance analysis shows that the main causes of environmental impacts and indicators can be found in the information module A1. This shows the global warming potential for the provision of material with about 70%, based on all information modules. Modules A3 and A5 also represent an import part of the final impact.

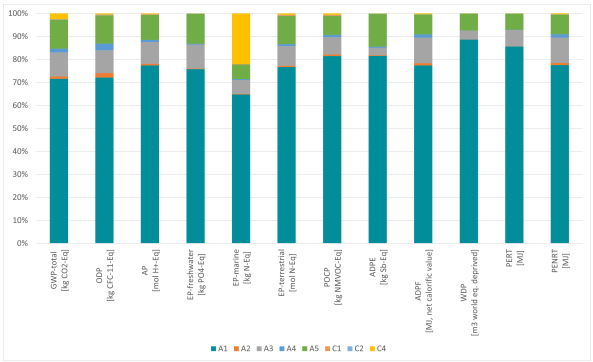

Illustration: Dominance analysis A1- C4

Module A1 is detailed below. Module A3’s global warming impact is mostly constituted by the final product packaging (9% of the total impact). Most of the global warming impact from module A5 is caused by the product losses (6% of the final impact) the end-of-life of the soiled product packaging, treated as hazardous waste (4% of the final impact).

In the information module A1, the material supply of the resin mixture causes more than 70% of the global warming potential.

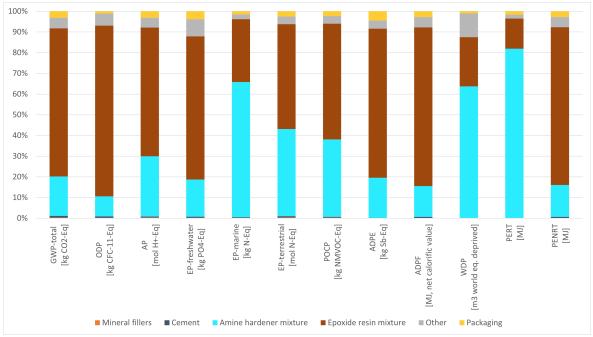

Illustration: Dominance analysis A1

The mass of the resin mixture come from the recipe information provided by the manufacturer. According to the manufacturer, this information can be assumed to be highly accurate.

The relevant datasets used to calculate the material availability of the product are topical with corresponding data in the latest Ecoinvent database (2021). The locations were also respected.
Since these datasets strongly influence the results, as shown by the dominance analysis, so does the overall computation.

7. Requisite evidence

Hilti HIT-RE 500 V4 complies with the requirements of

- *DIBt (2010)* in combination with the NIK values from *AgBB (2018)* for applications in interior areas,
- emission class A+ outlined in the *French VOC Directives (2020)* in accordance with the *Eurofins attestation,*
- *CDPH/EHLB* Standard Method V 1.2 *(2017)*

in accordance with *Eurofins test report, No. 392-2020-00453802_A_EN, Eurofins test report, No. 392-2020-00453802_A_EN and Eurofins test report, No. 392-2020-00453802_H_EN* respectively.

AgBB overview of results (28 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	<1000	µg/m³
Sum SVOC (C16 - C22)	<100	µg/m³
R (dimensionless)	<1	-
VOC without NIK	<100	µg/m³
Carcinogenic Substances	<1	µg/m³

AgBB overview of results (3 days [µg/m³])

Name	Value	Unit
VOC without NIK	<10000	µg/m³
Carcinogenic Substances	<10	µg/m³

8. References

Standards

DIN EN 13501-1
Klassifizierung von Bauprodukten und Bauarten zu ihrem Brandverhalten

DIN EN 14293
Klebstoffe - Klebstoffe für das Kleben von Parkett auf einen Untergrund - Prüfverfahren und Mindestanforderungen

DIN EN ISO 50001
DIN EN ISO 50001: 2018 Energy management systems - Requirements with guidance for use

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

EN 15804
EN 15804:2012+A2:2019, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

EN ISO 604
DIN EN ISO 604:2003-12: Determination of compressive properties

EN ISO 1183-1
DIN 51757:2011-01 Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pyknometer method and titration method

ISO 9001
ISO 9001:2015 Quality management systems - Requirements

ISO 14001
ISO 14001:2015 Environmental management systems - Requirements with guidance for use

ISO 14025
EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

PCR Part A
Institut Bauen und Umwelt e.V, Berlin (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations for Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, 2021-04

PCR Part B
Institut Bauen und Umwelt e.V, Berlin (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations for Institut Bauen und Umwelt (IBU), Part B: Requirements on the EPD for Reaction resin products, 2019-01

Further References

AFNOR, «FD P01-015» 2006
Qualité environnementale des produits de construction - Fascicule de données énergie et transport

AgBB (2018)
Vorgehensweise bei der gesundheitlichen Bewertung der Emissionen von flüchtigen organischen Verbindungen (VVOC, VOC und SVOC) aus Bauprodukten (2018)

Candidate List of substances of very high concern for Authorisation
European Cheminals Agency (ECHA), in accordance with Article 50(10) of the REACH regulation

CDPH/EHLB/Standard Method V1.2
California CDPH Standard Method is a US standard for evaluating and restricting VOC emissions to indoor air. Developed in California as "Section 01350" Specification, several systems in the US refer to CDPH Standard Method

Comité National Routier (CNR)
Enquête longue distance, PARIS, 2019

DIBt (2010)
Grundsätze zur gesundheitlichen Bewertung von Bauprodukten in Innenräumen (Oktober 2010)
Eurofins test report, No. 392-2019-00435401_D_EN
VOC test report for verification of compliance with DIBt(2010)/AgBB(2018)

Eurofins test report, No. 392-2020-00453802_A_EN
VOC test report for verification of compliance with DIBt(2010)/AgBB(2018)

Eurofins test report, No. 392-2020-00453802_A_EN
VOC test report for verification of compliance with the French VOC directive from 2020

Eurofins test report, No. 392-2020-00453802_H_EN
VOC test report for verification of compliance with CDPH/EHLB/Standard Method V1.2 from 2017

European Waste code
in accordance with the European Waste Catalogue (EWC) (EWC 2014/955/EU) Commission Decision amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council

ETA 20/0793
European Technical Approval Hilti HIT-RE 500 V4

ETA 20/0539
European Technical Approval Hilti HIT-RE 500 V4

ETA 20/0834
European Technical Approval Hilti HIT-RE 500 V4

ETA 20/0540
European Technical Approval Hilti HIT-RE 500 V4

ETA-20/0541
European Technical Approval Hilti HIT-RE 500 V4

French VOC Directives
Décret no 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
Arrêté du 19 avril 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

NSF
NSF/ANSI/CAN 61 Drinking Water System Components - Health Effects

Umwelt Bundesamt 2021
Umwelt Bundesamt: Herkunftsnachweisregister (HKNR) — Entwertungsnachweis durch GETECH ENERGIE GMBH für HILTI

Database

Ecoinvent 3.8
ecoinvent Version 3
Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, [online] 21(9), pp.1218–1230. Available at: <http://link.springer.com/10.1007/s11367-016-1087-8> [Accessed in 2021/2022].

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