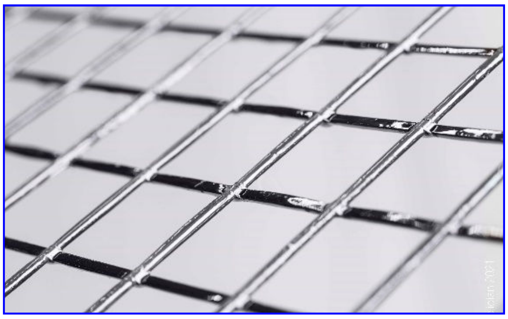
Environmental Product Declaration

Declaration code: EPD-SGR-GB-65.0



solidian

solidian GmbH

reinforcing and fastening systems

solidian GRID and solidian REBAR

Basis:

DIN EN ISO 14025
EN15804

Company EPD
Environmental
Product **D**eclaration

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Environmental Product Declaration

Declaration code: EPD-SGR-GB-65.0

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Declaration holder	solidian GmbH Sigmaringer Str. 150 72458 Albstadt, Germany www.solidian.com
Declaration code	EPD-SGR-GB-65.0
Designation of declared product	solidian GRID and solidian REBAR
Scope	Corrosion-resistant composite reinforcement grid and bars for permanent reinforcement of concrete as an alternative to conventional and stainless steel reinforcement.
Basis	This EPD was prepared on the basis of EN ISO 14025:2011 and DIN EN 15804:2012+A2:2019. In addition, the "Allgemeiner Leitfaden zur Erstellung von Typ III Umweltproduktdeklarationen" (General guideline for preparation of Type III Environmental Product Declarations) applies. The declaration is based on PCR documents "PCR Part A" PCR-A-0.3:2018 and "Reinforcing and fastening systems" PCR BS-2.3: 2018.
Validity	Publication date: 11.12.2022 — Last revision: 25.05.2023 — Next revision: 11.12.2027 This verified Company Environmental Product Declaration (company EPD) applies solely to the specified products and is valid for a period of five years from the date of publication in accordance with DIN EN 15804.
LCA Basis	The LCA was prepared in accordance with DIN EN ISO 14040 and DIN EN ISO 14044. The data collected from two production plants of the company solidian GmbH were used as a data basis, as well as generic data from the database "GaBi 10". LCA calculations were carried out for the included "cradle to gate – with options" including all upstream chains (e.g. raw material extraction, etc.).
Notes	The ift-Guidance Sheet "Conditions and Guidance for the Use of ift Test Documents" applies. The declaration holder assumes full liability for the underlying data, certificates and verifications.

Christian Kehrer Head of Certification and Surveillance Body	Dr. Torsten Mielecke Chairman of Expert Committee ift-EPD and PCR	Eric Brehm External verifier

1 General Product Information

Product definition

The EPD belongs to the product group reinforcing and fastening systems and applies to

1 kg solidian GRID Q85-CCE-21 and solidian REBAR D14-RRE made by solidian GmbH.

The functional unit is obtained by summing up:

Assessed product	Declared unit	Density
solidian GRID Q85-CCE-21	1 kg	1,280 ± 60 kg/m³
solidian REBAR D14-RRE	1 kg	2,140 ± 20 kg/m³

Table 1 Functional unit per reference product

The average unit is declared as follows:
Directly used material flows are determined by means of manufactured masses (kg) and allocated to the declared unit. All other inputs and outputs in the production were scaled to the declared unit in their entirety. The reference period is the year 2021.

The validity of the EPD is restricted to the following models:
- solidian GRID Q27-CCE-68
- solidian GRID Q43-CCE-21
- solidian GRID Q47-CCE-38
- solidian GRID Q71-CCE-51
- solidian GRID Q85-CCE-21
- solidian GRID Q95-CCE-38
- solidian REBAR D4-RRE
- solidian REBAR D6-RRE
- solidian REBAR D8-RRE
- solidian REBAR D10-RRE
- solidian REBAR D12-RRE
- solidian REBAR D14-RRE
- solidian REBAR D16-RRE
- solidian REBAR D20-RRE
- solidian REBAR D25-RRE
- solidian REBAR D28-RRE

Product description

solidian GRID Q85-CCE-21
solidian GRID Q85-CCE-21 are bidirectional reinforcement grids made of media resistant carbon fiber reinforced plastic for permanent reinforcement or connection of concrete components. Through the targeted selection of diffusion-tight and alkali-resistant epoxy resins (E) and the matching media-resistant and high-strength carbon fibers (C) in the longitudinal and transverse directions, solidian GRID (CCE) realize properties that make it possible to sustainably replace conventional or stainless reinforcing steel. The solidian GRID (CCE) covered in this EPD are manufactured and offered in types Q27, Q43, Q47, Q71, Q85 and Q95. Thanks to the broad and finely graded product portfolio, the choice of grid type can be made specifically to the requirements, thus avoiding unnecessary oversizing and minimizing material waste.

Due to their basic properties, solidian GRID (CCE) are predestined for use in bridge construction, maritime applications, in the area of concrete slabs, e.g. of industrial floors or parking decks, as well as in tunnel construction and are convincing wherever high loads occur and components are permanently exposed to aggressive environmental influences such as de-icing salts. solidian GRID (CCE) are used as reinforcement in the concrete.
The design is basically carried out in accordance with the reinforced concrete standards, with adjustments to be made for fiber-reinforced plastic reinforcements. Accordingly, the respective national standards and regulations must be taken into account in the design.
A DAfStb guideline for construction with fiber composite plastic reinforcement is expected to be published in 2023.
A national technical approval (abZ) and general design approval (aBG) of solidian GRID (CCE) with DIBt is ongoing at the time of writing this EPD and is expected to be completed in 2023 for some of the grid types covered here in the EPD.

solidian REBAR D14-RRE

Product description

solidian REBAR (RRE) are non-corroding bar-shaped reinforcements made of glass fiber reinforced plastic for permanent reinforcement or the connection of concrete components. Through the targeted selection of diffusion-tight and alkali-resistant epoxy resins (E) and the matching media-resistant and high-strength ECR glass fibers (R), as well as an efficient manufacturing process with integrated application of the bond-enhancing rib structure made of ECR glass fibers (R), solidian REBAR (RRE) realize properties that make it possible to sustainably replace conventional or stainless reinforcing steel. The solidian REBAR (RRE) covered in this EPD are manufactured and offered in diameters D4, D6, D8, D10, D12, D14, D16, D20, D25 and D28. Thanks to the broad and finely graded diameter portfolio, the choice of diameter can be made specifically to the requirements, thus avoiding unnecessary oversizing and minimizing material waste.
The design is basically carried out in accordance with the reinforced concrete standards, with adjustments to be made for fiber-reinforced plastic reinforcements. Accordingly, the respective national standards and regulations must be taken into account in the design.
The integration of fiber composite plastic reinforcement into the Eurocode is ongoing at the time of writing this EPD and will be published in the foreseeable future. A DAfStb guideline for construction with fiber composite plastic reinforcement is expected to be published in 2023.
A national technical approval (abZ) and general design approval (aBG) of solidian REBAR (RRE) with DIBt is ongoing at the time of writing this EPD and is expected to be completed in 2023/2024 for all of the diameters covered here in the EPD.
Fib Bulletin 40, "FRP Reinforcement in RC Structures," and fib Bulletin 66, Model Code 2010 - Final Draft, Vol. 2, provide another option for the design of concrete members with fiber reinforced plastic reinforcement.

Product manufacture

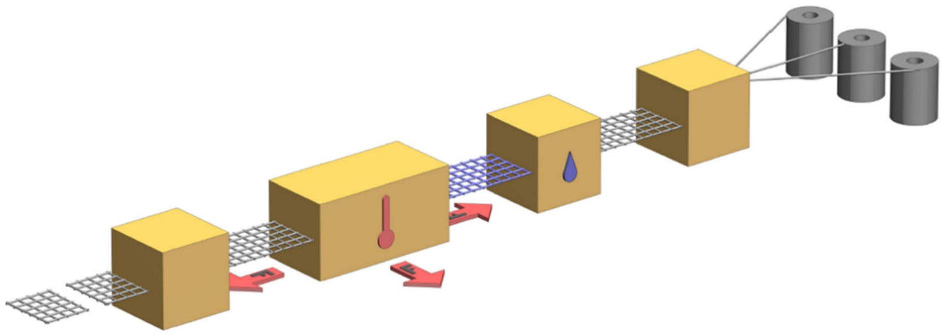


Illustration 1 Product manufacturing solidian GRID Q85-CCE-21

Sequence/description of the manufacturing steps of the graphic (Illustration 1):

1. Production of raw textile from carbon fibers
2. Impregnation raw textile
3. Curing
4. Cutting and formatting

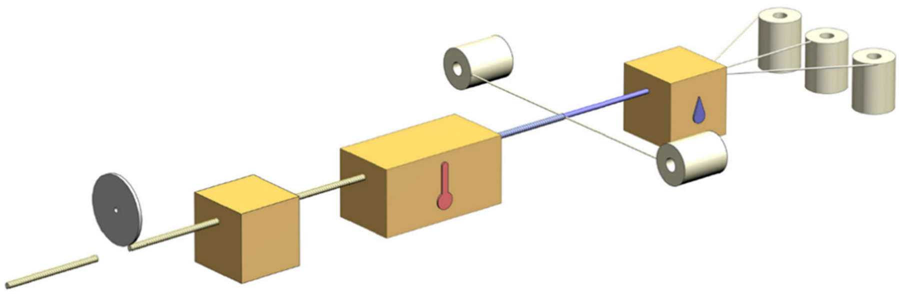


Illustration 2 Product manufacturing solidian REBAR D14-RRE

Sequence/description of the manufacturing steps of the graphic (Illustration 2):

1. Production of REBAR from glass fibres using the pultrusion process
2. Wrapping the rod with fiberglass rib
3. Curing
4. Cutting to size

Application

solidian GRID Q85-CCE-21
solidian GRID (CCE) reinforcement grids made of media-resistant carbon fiber reinforced plastic, are used indoors and outdoors for sustainable reinforcement of concrete components. Due to their basic properties, they are predestined for use in bridge construction, maritime applications, in the area of concrete slabs, e.g. of industrial floors or parking decks, as well as in tunnel construction and are convincing wherever high loads occur and components are permanently exposed to aggressive environmental influences such as de-icing salts. solidian GRID (CCE) are used as reinforcement in the concrete.

solidian REBAR D14-RRE
solidian REBAR (RRE) reinforcement bars made of media-resistant glass-fiber reinforced plastic, are used indoors and outdoors for sustainable reinforcement or the connection of concrete components. Due to their

basic properties, they are predestined for use in bridge construction, maritime applications, in the area of high-voltage or electromagnetic systems, in the area of concrete slabs, e.g. of industrial floors or parking decks, as well as in mining and tunnel construction and are convincing wherever high loads occur and components are permanently exposed to aggressive environmental influences such as de-icing salts. solidian REBAR (RRE) are used as reinforcement in concrete or as connection elements for e.g. balconies or for sandwich wall elements.

Additional information

For additional verifications of applicability or conformity refer to the CE marking and the documents accompanying the product, if applicable.

solidian GRID (CCE) do not rust and are resistant to chloride action. The short-term tensile strengths of solidian GRID (CCE) are significantly higher than those of conventional and stainless reinforcing steel.

solidian REBAR (RRE) do not rust and are resistant to chloride action. By using glass fibres, solidian REBAR (RRE) are electromagnetically neutral and have low thermal conductivity in combination with the epoxy resin. This makes solidian REBAR (RRE) both electromagnetically and thermally insulating. Mechanical processing, e.g. by tunnel drills, is easily possible due to the low abrasion known in glass fiber composites compared to steel or carbon fiber composites. The short-term tensile strengths of solidian REBAR (RRE) are significantly higher than those of conventional and stainless reinforcing steel.

Further detailed properties can be found in the technical data sheets available at www.solidian.com

2 Materials used

Primary materials

The primary materials used are listed in the LCA (see Section 7).

Declarable substances

No substances according to REACH candidate list are included (declaration of 13.07.2022 for GRID (CCE) and 04.03.2022 for REBAR (RRE)).

All relevant safety data sheets can be obtained from company solidian GmbH.

3 Construction process stage

Processing recommendations, installation

Observe the instructions for assembly/installation, operation, maintenance and disassembly, provided by the manufacturer. For this, see www.solidian.com

4 Use stage

Emissions to the environment

No emissions to indoor air, water and soil are known. There may be VOC emissions.

Reference service life (RSL)

The RSL information was provided by the manufacturer. The RSL must be established under specified reference conditions of use and relate to the declared technical and functional performance of the product within the building. It must be determined according to all specific rules given in European product standards or, if none are available, according to a c-PCR. It must also take into account ISO 15686-1, -2, -7 and -8. If there is guidance on deriving RSLs from European Product Standards or a c-PCR, then such guidance must take precedence.
If it is not possible to determine the service life as the RSL in accordance with ISO 15686, the BBSR table “Nutzungsdauer von Bauteilen zur Lebenszyklusanalyse nach BNB” (service life of building components for life cycle assessment in accordance with the sustainable construction evaluation system) can be used. For further information and explanations refer to www.nachhaltigesbauen.de.

For this EPD the following applies:
For an EPD "cradle to factory gate with options", with modules C1-C4 and module D (A1-A3 + C + D and one or more additional modules from A4 to B7), the specification of a reference service life (RSL) is only possible if the reference service life conditions are specified.
The service life of the product designation of company solidian GmbH is optionally specified with 50 years according to the manufacturer.

The service life is dependent on the characteristics of the product and in-use conditions. The conditions and characteristics described in the EPD are applicable, in particular the characteristics listed below:

- Outdoor environment: Climatic influences may have a negative impact on the service life.
- Indoor environment: No impacts known that have a negative effect on the service life

The service life solely applies to the characteristics specified in this EPD or the corresponding references.
The reference service life (RSL) does not reflect the actual life span, which is usually determined by the service life and the refurbishment of a building. It does not give any information on the useful life, warranty referring to performance characteristics or guarantees.

5 End-of-life stage

Possible end-of-life stages

solidian GRID Q85-CCE-21 and solidian REBAR D14-RRE are sent to central collection points. There the products are usually shredded and sorted into their constituents. The end-of-life stage depends on the site where the products are used and is therefore subject to the local regulations. Observe the locally applicable regulatory requirements.

In this EPD, the modules of after-use are presented according to the market situation.
Carbon, polypropylene and glass fibers as well as epoxy resin are recycled to certain parts. Residual fractions are sent to landfill.

Disposal routes

The LCA includes the average disposal routes.

All life cycle scenarios are detailed in the Annex.

6 Life Cycle Assessment (LCA)

Environmental product declarations are based on life cycle assessments (LCAs) which use material and energy flows for the calculation and subsequent representation of environmental impacts.

As a basis for this, life cycle assessments were prepared for solidian GRID Q85-CCE-21 and solidian REBAR D14-RRE. These LCAs are in conformity with the requirements set out in DIN EN 15804 and the international standards DIN EN ISO 14040, DIN EN ISO 14044, ISO 21930 and EN ISO 14025.

The LCA is representative of the products presented in the Declaration and the specified reference period.

6.1 Definition of goal and scope

Aim

The goal of the LCA is to demonstrate the environmental impacts of the products. In accordance with DIN EN 15804, the environmental impacts covered by this Environmental Product Declaration are presented for the entire product life cycle in the form of basic information. No other additional environmental impacts are specified.

Data quality, data availability and geographical and time-related system boundaries

The specific data originate exclusively from the 2021 fiscal year. They were collected on-site at the plant located in Albstadt and in Karlovac (Croatia) and originate in parts from company records and partly from values directly obtained by measurement.

The generic data originate from the “GaBi 10” professional and building materials databases. The last update of both databases was in 2022. Data from before this date originate also from these databases and are not more than 5 years old. No other generic data were used for the calculation.

Data gaps were either filled with comparable data or conservative assumptions, or the data were cut off in compliance with the 1% rule.

The life cycle was modelled using the sustainability software tool “GaBi” for the development of life cycle assessments.

Scope / system boundaries

The system boundaries refer to the procurement of raw materials and purchased parts, the production and the after-use of solidian GRID Q85-CCE-21 and solidian REBAR D14-RRE.

Additional data for the production of the raw textile for solidian GRID Q85-CCE-21 in the plant of the affiliated company Kelteks d.o.o. were taken into account.

Cut-off criteria

All company data collected, i.e. all commodities/input and raw materials used, the thermal energy and electricity consumption, were taken into consideration.

The boundaries cover only the product-relevant data. Building sections/parts of facilities that are not relevant to the manufacture of the products, were excluded.

The transport distances of the pre-products used were taken into consideration as a function of 100% of the mass of the products.
The following assumption was made for the means of transport:

- Truck, more than 32 t gross weight / 24.7 t payload, Euro 6, freight, 85 % capacity utilization

The criteria for the exclusion of inputs and outputs as set out in DIN EN 15804 are fulfilled. From the data analysis it can be assumed that the total of negligible processes per life cycle stage does not exceed 1% of the mass/primary energy. This way the total of negligible processes does not exceed 5% of the energy and mass input. The life cycle calculation also includes material and energy flows that account for less than 1%.
The following processes were neglected.

- Ancillary materials and consumables

6.2 Inventory analysis

Aim

All material and energy flows are described below. The processes covered are presented as input and output parameters and refer to the declared/functional units.

Life cycle stages

The complete life cycle of solidian GRID Q85-CCE-21 and solidian REBAR D14-RRE is shown in the annex. The product stage "A1 – A3", construction process stage"A5", end-of-life stage "C1 – C4" and the benefits and loads beyond the system boundaries "D" are considered.

Benefits

The below benefits have been defined as per DIN EN 15804:

- Benefits from recycling
- Benefits (thermal and electrical) from incineration

Allocation of co-products

No allocations occur during production.

Allocations for re-use, recycling and recovery

If the products are reused/recycled and recovered during the product stage (rejects), the elements are shredded, if necessary and then sorted into their constituents. This is done by various process plants, e.g. wind sifter.
The system boundaries were set following their disposal, reaching the end-of-waste status.

Allocations beyond life cycle boundaries

The use of recycled materials in the manufacturing process was based on the current market-specific situation. In parallel to this, a recycling potential was taken into consideration that reflects the economic value of the product after recycling (recyclate).
The system boundary set for the recycled material refers to collection.

Secondary material

The use of secondary material by solidian GmbH was not considered in Module A3. Secondary material is not used.

Inputs

The following manufacturing-related inputs were included in the LCA per 1 kg solidian GRID Q85-CCE-21 and solidian REBAR D14-RRE:

Energy
For the input material gas, "Thermal energy from natural gas Germany" was assumed. For the electricity mix, the "electricity mix EU-28 (raw textile production)" and the "electricity mix solidian GmbH" (see Table 2) were assumed.

Electricity disclosure of energy supplier	Shares in %
Renewable energies	67.6
Coal / Natural gas	6.6
Hard coal / lignite	16.0
Nuclear energy	9.0
Other fossil resources	0.8
Renewable energies	67.6

CO_2 emissions [g/kWh]	310.0
Radioactive waste disposed [g/kWh]	3,00E-4

* Biogas/mass, waste, wind power, photovoltaics, hydropower, geothermal energy

Table 2 Electricity mix "solidian GmbH"

A portion of the process heat is used for space heating. This can, however, not be quantified, hence a “worst case” figure was taken into account for the product.

Water
In the individual process steps for production, the water consumption is 3.33 l per kg solidian GRID Q85-CCE-21 and no water consumption for solidan REBAR D14-RRE.
The consumption of fresh water specified in Section 6.3 originates (among others) from the process chain of the pre-products.

Raw material / pre-products
The charts below show the share of raw materials/pre-products in percent.

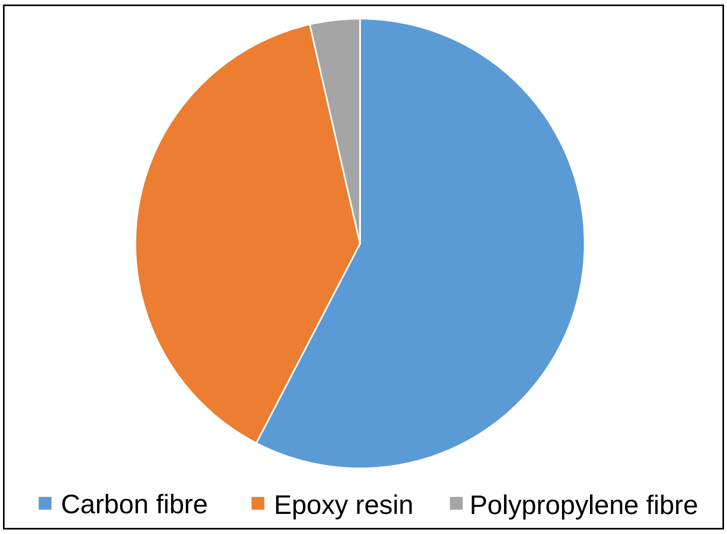


Illustration 3 Percentage of individual materials per declared unit solidian GRID Q85-CCE-21

No.	Material	Mass in %
1	Carbon fiber	57.7
2	Epoxy resin	38.8
3	Polypropylene fiber	3.6

Table 3 Percentage of individual materials per declared unit solidian GRID Q85-CCE-21

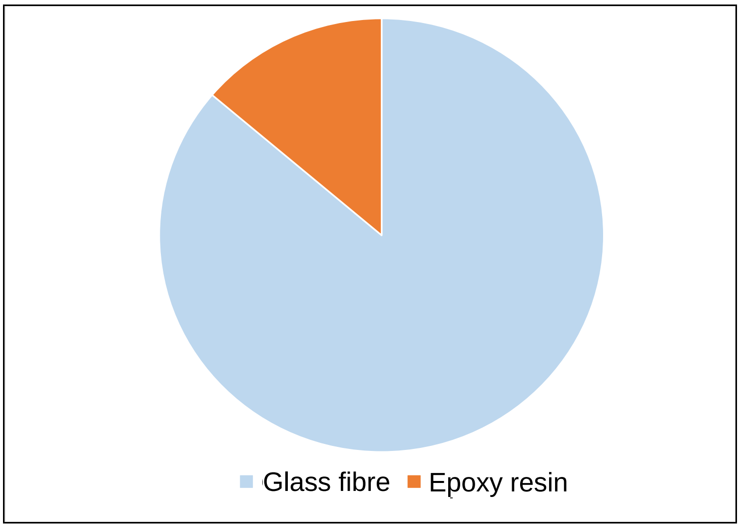


Illustration 4 Percentage of individual materials per declared unit solidian REBAR D14-RRE

No.	Material	Mass in %
1	Glass fibre	86.2
2	Epoxy resin	13.8

Table 4 Percentage of individual materials per declared unit solidian REBAR D14-RRE

Ancillary materials and consumables
Ancillary materials and consumables were treated as an excluded process in accordance with the 1% rule.

Product packaging
The amounts used for product packaging are as follows:

No.	Material	Mass in g
1	Screws	1.0
2	Cardboard	65.0
3	PE film	0.1

Table 5 Weight in kg of packaging per declared unit solidian GRID Q85-CCE-21

No.	Material	Mass in g
1	Screws	2.0
2	Cardboard	8.0

Table 6 Weight in kg of packaging per declared unit solidian REBAR D14-RRE

Biogenic carbon content
Only the biogenic carbon content of the associated packaging is reported, as the total mass of biogenic carbon-containing materials is less than 5% of the total mass of the product and associated packaging. According to EN 16449, the following amounts of biogenic carbon are generated for packaging:

No.	Part	Content in kg C
1	In the corresponding packaging solidian GRID Q85-CCE-21	0.238
2	In the corresponding packaging solidian REBAR D14-RRE	0.029

Table 7 Biogenic carbon content of the packaging at the factory gate

Outputs

The following manufacturing-related outputs were included in the LCA per 1 kg solidian GRID Q85-CCE-21 and solidian REBAR D14-RRE:

Waste
Secondary raw materials were included in the benefits.
See Section 6.3 Impact assessment.

Waste water
The production of solidian GRID Q85-CCE-21 generates 3.3 l of wastewater. No waste water is produced during the manufacture of REBAR D14-RRE.

6.3 Impact assessment

Aim

The impact assessment covers both inputs and outputs. The impact categories applied are stated below:

Impact categories

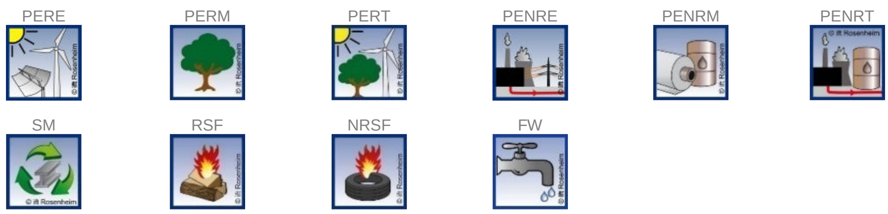
The models for impact assessment were applied as described in DIN EN 15804-A2.
The impact categories presented in the EPD are as follows:

- Depletion of abiotic resources - minerals and metals;
- Depletion of abiotic resources - fossil fuels;
- Acidification;
- Ozone depletion;
- Climate change - total;
- Climate change - fossil;
- Climate change - biogenic;
- Climate change - land use and land use change;
- Eutrophication freshwater;
- Eutrophication salt water;
- Eutrophication land;
- Photochemical ozone creation;
- Water use.

Resource management

The models for impact assessment were applied as described in DIN EN 15804-A2.
The following resource use indicators are presented in the EPD:

- Renewable primary energy as energy source;
- Renewable primary energy for material use;
- Total use of renewable primary energy;
- Non-renewable primary energy as energy source;
- Renewable primary energy for material use;
- Total use of non-renewable primary energy;
- Use of secondary materials;
- Use of renewable secondary fuels;
- Use of non-renewable secondary fuels;
- Net use of freshwater resources.

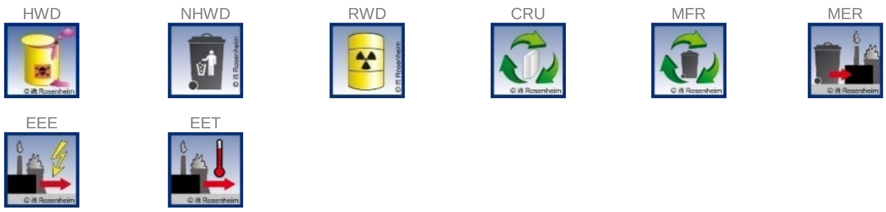


Waste

The waste generated during the production of 1 kg solidian GRID Q85-CCE-21 and solidian REBAR D14-RRE is evaluated and shown separately for the fractions trade wastes, special wastes and radioactive wastes. Since waste handling is modelled within the system boundaries, the amounts shown refer to the deposited wastes. A portion of the waste indicated is generated during the manufacture of the pre-products.

The models for impact assessment were applied as described in DIN EN 15804-A2.
The following waste categories and indicators for output closures are presented in the EPD:

- Disposed hazardous waste;
- Disposed non-hazardous waste;
- Radioactive waste disposed;
- Components for re-use;
- Materials for recycling;
- Materials for energy recovery;
- Exported electrical energy;
- Exported thermal energy.



Additional environmental impact indicators

The models for impact assessment were applied as described in DIN EN 15804-A2.
The additional impact categories presented in the EPD are as follows:

- Fine dust missions;
- Ionizing radiation, human health;
- Ecotoxicity (freshwater);
- Human toxicity, carcinogenic effects;
- Human toxicity, non-carcinogenic effects;
- Impacts associated with land use/soil quality.

Results per 1 kg solidian GRID Q85-CCE-21

	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Core indicators																
GWP-t	kg CO_2-eq.	23.30	ND	9,29E-02	ND	ND	ND	ND	ND	ND	ND	2,67E-04	3,29E-03	6,23E-02	0.00	-10.1
GWP-f	kg CO_2-eq.	23.30	ND	3,01E-03	ND	ND	ND	ND	ND	ND	ND	2,66E-04	3,27E-03	6,13E-02	0.00	-10.1
GWP-b	kg CO_2-eq.	1,90E-02	ND	8,99E-02	ND	ND	ND	ND	ND	ND	ND	4,56E-08	1,35E-06	9,83E-04	0.00	-2,71E-02
GWP-l	kg CO_2-eq.	1,28E-02	ND	2,78E-06	ND	ND	ND	ND	ND	ND	ND	1,00E-06	1,22E-05	2,49E-05	0.00	-5,66E-03
ODP	kg CFC-11-eq.	1,20E-12	ND	3,09E-17	ND	ND	ND	ND	ND	ND	ND	3,84E-17	4,67E-16	1,68E-12	0.00	-1,20E-13
AP	mol $^{H+}$-eq.	4,60E-02	ND	2,97E-05	ND	ND	ND	ND	ND	ND	ND	3,59E-06	2,91E-06	9,15E-05	0.00	-2,13E-02
EP-fw	kg P-eq.	4,47E-05	ND	4,99E-09	ND	ND	ND	ND	ND	ND	ND	5,57E-10	6,76E-09	3,34E-07	0.00	-1,36E-05
EP-m	kg N-eq.	1,54E-02	ND	1,00E-05	ND	ND	ND	ND	ND	ND	ND	1,64E-06	9,44E-07	2,97E-05	0.00	-7,10E-03
EP-t	mol N-eq.	0.16	ND	1,37E-04	ND	ND	ND	ND	ND	ND	ND	1,80E-05	1,13E-05	3,07E-04	0.00	-7,42E-02
POCP	kg NMVOC-eq.	4,40E-02	ND	2,62E-05	ND	ND	ND	ND	ND	ND	ND	4,89E-06	2,53E-06	7,16E-05	0.00	-1,99E-02
ADPF*²	MJ	430.00	ND	3,20E-02	ND	ND	ND	ND	ND	ND	ND	3,58E-03	4,35E-02	0.81	0.00	-183.00
ADPE*²	kg Sb-eq.	4,15E-06	ND	4,40E-10	ND	ND	ND	ND	ND	ND	ND	2,78E-11	3,38E-10	3,58E-08	0.00	-1,67E-06
WDP*²	m^3 world-eq. deprived	0.87	ND	1,14E-02	ND	ND	ND	ND	ND	ND	ND	1,06E-06	1,28E-05	1,58E-03	0.00	-0.43
Resource management																
PERE	MJ	67.20	ND	1.05	ND	ND	ND	ND	ND	ND	ND	2,13E-04	2,58E-03	0.80	0.00	-29.30
PERM	MJ	1.04	ND	-1.04	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
PERT	MJ	68.24	ND	7,54E-03	ND	ND	ND	ND	ND	ND	ND	2,13E-04	2,58E-03	0.80	0.00	-29.30
PENRE	MJ	406.03	ND	3,20E-02	ND	ND	ND	ND	ND	ND	ND	3,59E-03	4,35E-02	25.56	0.00	-183.00
PENRM	MJ	24.75	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	-24.75	0.00	0.00
PENRT	MJ	430.78	ND	3,20E-02	ND	ND	ND	ND	ND	ND	ND	3,59E-03	4,35E-02	0.81	0.00	-183.00
SM	kg	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
FW	m^3	9,28E-02	ND	2,68E-04	ND	ND	ND	ND	ND	ND	ND	1,85E-07	2,25E-06	2,71E-04	0.00	-4,16E-02
Categories of waste																
HWD	kg	1,35E-07	ND	7,32E-12	ND	ND	ND	ND	ND	ND	ND	1,66E-14	2,01E-13	9,87E-11	0.00	-4,98E-08
NHWD	kg	0.42	ND	1,94E-03	ND	ND	ND	ND	ND	ND	ND	5,68E-07	6,89E-06	8,91E-04	0.00	-8,15E-02
RWD	kg	1,78E-02	ND	9,24E-07	ND	ND	ND	ND	ND	ND	ND	3,61E-09	4,38E-08	8,00E-05	0.00	-8,76E-03
Output material flows																
CRU	kg	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.62	0.00	0.00
MER	kg	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
EEE	MJ	0.00	ND	1,18E-01	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
EET	MJ	0.00	ND	2,75E-01	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00

Key:

GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - feutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*²** - abiotic depletion potential – fossil resources **ADPE*²** - abiotic depletion potential – minerals&metals **WDP*²** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **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** - net use of fresh water **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 **EET** - exported thermal energy

Results per 1 kg solidian GRID Q85-CCE-21																
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	3,44E-07	ND	1,65E-10	ND	ND	ND	ND	ND	ND	ND	1,93E-10	1,78E-11	7,21E-10	0.00	-1,54E-07
IRP*1	kBq U235-eq.	2.82	ND	8,56E-05	ND	ND	ND	ND	ND	ND	ND	3,51E-07	4,26E-06	7,32E-03	0.00	-1.41
ETP-fw*2	CTUe	139.70	ND	1,26E-02	ND	ND	ND	ND	ND	ND	ND	2,84E-03	3,45E-02	0.34	0.00	-54.20
HTP-c*2	CTUh	6,56E-09	ND	7,76E-13	ND	ND	ND	ND	ND	ND	ND	5,63E-14	6,85E-13	1,54E-11	0.00	-1,63E-09
HTP-nc*2	CTUh	2,70E-07	ND	3,34E-11	ND	ND	ND	ND	ND	ND	ND	4,18E-12	3,40E-11	5,03E-10	0.00	-5,82E-08
SQP*2	dimensionless	54.91	ND	9,39E-03	ND	ND	ND	ND	ND	ND	ND	1,12E-03	1,37E-02	0.51	0.00	-21.00

Key:
PM – particulate matter emissions potential **IRP*1** – ionizing radiation potential – human health **ETP-fw*2** - Eco-toxicity potential – freshwater **HTP-c*2** - Human toxicity potential – cancer effects **HTP-nc*2** - Human toxicity potential – non-cancer effects **SQP*2** – soil quality potential

Disclaimers:

*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.

*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.

Conversion of other variants

For the declared product solidian GRID Q85-CCE-21, the respective environmental impacts per 1 kg were calculated.
For all other listed solidian GRID (CCE) products, the environmental impact values can be calculated using the percentages in the table shown on the right.

	solidian GRID Q47-CCE-38	*solidian GRID Q43-CCE-21*	*solidian GRID Q27-CCE-68*	*solidian GRID Q71-CCE-51*	*solidian GRID Q85-CCE-21*	*solidian GRID Q95-CCE-38*
	A1-A3	**A1-A3**	**A1-A3**	**A1-A3**	**A1-A3**	**A1-A3**
Global warming potential - total (GWP-total)	94.8%	94.0%	106.0%	105.2%	100.0%	101.3%
Global warming potential fossil fuels (GWP-fossil)	94.8%	94.0%	106.9%	105.2%	100.0%	100.9%
Global warming potential - biogenic(GWP-biogenic)	163.7%	242.5%	207.3%	187.6%	100.0%	101.6%
Global warming potential - land use and landuse change (GWP-luluc)	99.2%	93.0%	105.5%	107.8%	100.0%	101.6%
Ozone depletion potential (ODP)	147.5%	161.7%	242.5%	115.8%	100.0%	98.3%
Acidification potential (AP)	92.2%	88.3%	99.8%	102.4%	100.0%	101.7%
Eutrophication potential - aquatic freshwater (EP-freshwater)	107.8%	106.0%	115.6%	119.2%	100.0%	99.3%
Eutrophication potential - aquatic marine (EP-marine)	92.2%	89.0%	100.6%	102.6%	100.0%	101.9%
Eutrophication potential - terrestrial (EP-terrestrial)	92.0%	88.9%	100.6%	102.5%	100.0%	101.9%
Photochemical ozone formation potential (POCP)	93.0%	89.8%	100.9%	103.6%	100.0%	101.8%
Abiotic depletion potential – fossil resources (ADPE)	98.6%	99.3%	118.5%	105.3%	100.0%	100.0%
Abiotic depletion potential (ADPF)	94.9%	94.2%	105.8%	105.8%	100.0%	100.7%
Water (user) deprivation potential (WDP)	88.7%	86.2%	99.3%	97.7%	100.0%	102.0%
Total use of renewable primary energy resources (PERT)	97.0%	97.6%	117.6%	104.1%	100.0%	100.4%
Total use of non-renewable primary energyresources (PENRT)	94.9%	94.2%	105.8%	105.8%	100.0%	100.7%

Results per 1 kg solidian REBAR D14-RRE																
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Core indicators																
GWP-t	kg CO_2-eq.	2.71	ND	1,14E-02	ND	ND	ND	ND	ND	ND	ND	2,67E-04	3,29E-03	0.00	1,45E-02	-3,99E-03
GWP-f	kg CO_2-eq.	2.67	ND	3,21E-04	ND	ND	ND	ND	ND	ND	ND	2,66E-04	3,27E-03	0.00	1,49E-02	-3,95E-03
GWP-b	kg CO_2-eq.	3,61E-02	ND	1,11E-02	ND	ND	ND	ND	ND	ND	ND	4,56E-08	1,35E-06	0.00	-4,42E-04	-3,36E-05
GWP-l	kg CO_2-eq.	6,86E-04	ND	6,92E-08	ND	ND	ND	ND	ND	ND	ND	1,00E-06	1,22E-05	0.00	2,75E-05	-7,78E-07
ODP	kg CFC-11-eq.	2,66E-11	ND	2,28E-15	ND	ND	ND	ND	ND	ND	ND	3,84E-17	4,67E-16	0.00	3,51E-14	-4,86E-14
AP	mol H^+-eq.	1,30E-02	ND	3,63E-06	ND	ND	ND	ND	ND	ND	ND	3,59E-06	2,91E-06	0.00	1,06E-04	-3,92E-06
EP-fw	kg P-eq.	1,12E-05	ND	6,05E-10	ND	ND	ND	ND	ND	ND	ND	5,57E-10	6,76E-09	0.00	2,53E-08	-9,82E-09
EP-m	kg N-eq.	1,95E-03	ND	1,23E-06	ND	ND	ND	ND	ND	ND	ND	1,64E-06	9,44E-07	0.00	2,71E-05	-1,44E-06
EP-t	mol N-eq.	2,11E-02	ND	1,68E-05	ND	ND	ND	ND	ND	ND	ND	1,80E-05	1,13E-05	0.00	2,97E-04	-1,54E-05
POCP	kg NMVOC-eq.	6,25E-03	ND	3,19E-06	ND	ND	ND	ND	ND	ND	ND	4,89E-06	2,53E-06	0.00	8,22E-05	-3,73E-06
ADPF*²	MJ	45.30	ND	3,70E-03	ND	ND	ND	ND	ND	ND	ND	3,58E-03	4,35E-02	0.00	0.20	-5,89E-02
ADPE*²	kg Sb-eq.	1,02E-06	ND	5,55E-11	ND	ND	ND	ND	ND	ND	ND	2,78E-11	3,38E-10	0.00	1,53E-09	-1,16E-09
WDP*²	m^3 world-eq. deprived	0.23	ND	1,40E-03	ND	ND	ND	ND	ND	ND	ND	1,06E-06	1,28E-05	0.00	1,63E-03	-4,76E-05
Resource management																
PERE	MJ	11.87	ND	0.129	ND	ND	ND	ND	ND	ND	ND	2,13E-04	2,58E-03	0.00	2,93E-02	-2,32E-02
PERM	MJ	0.13	ND	-0.128	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
PERT	MJ	12.00	ND	1,07E-03	ND	ND	ND	ND	ND	ND	ND	2,13E-04	2,58E-03	0.00	2,93E-02	-2,32E-02
PENRE	MJ	41.28	ND	3,70E-03	ND	ND	ND	ND	ND	ND	ND	3,59E-03	4,35E-02	0.00	4.22	-5,89E-02
PENRM	MJ	4.02	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	-4.02	0.00
PENRT	MJ	45.30	ND	3,70E-03	ND	ND	ND	ND	ND	ND	ND	3,59E-03	4,35E-02	0.00	0.20	-5,89E-02
SM	kg	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
FW	m^3	9,00E-03	ND	3,29E-05	ND	ND	ND	ND	ND	ND	ND	1,85E-07	2,25E-06	0.00	4,96E-05	-7,99E-06
Categories of waste																
HWD	kg	9,17E-09	ND	4,08E-13	ND	ND	ND	ND	ND	ND	ND	1,66E-14	2,01E-13	0.00	1,00E-11	-1,08E-11
NHWD	kg	0.28	ND	2,39E-04	ND	ND	ND	ND	ND	ND	ND	5,68E-07	6,89E-06	0.00	1.00	-3,61E-05
RWD	kg	1,11E-03	ND	1,18E-07	ND	ND	ND	ND	ND	ND	ND	3,61E-09	4,38E-08	0.00	2,17E-06	-2,32E-06
Output material flows																
CRU	kg	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
MER	kg	0.00	ND	0.00	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
EEE	MJ	0.00	ND	1,44E-02	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00
EET	MJ	0.00	ND	3,37E-02	ND	ND	ND	ND	ND	ND	ND	0.00	0.00	0.00	0.00	0.00

Key:
GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - feutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*²** - abiotic depletion potential – fossil resources **ADPE*²** - abiotic depletion potential – minerals&metals **WDP*²** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **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** - net use of fresh water **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 **EET** - exported thermal energy

Results per 1 kg solidian REBAR D14-RRE																
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	8,56E-08	ND	2,00E-11	ND	ND	ND	ND	ND	ND	ND	1,93E-10	1,78E-11	0.00	1,30E-09	-2,84E-11
IRP*[1]	kBq U235-eq.	0.110	ND	1,17E-05	ND	ND	ND	ND	ND	ND	ND	3,51E-07	4,26E-06	0.00	2,41E-04	-2,13E-04
ETP-fw*[2]	CTUe	16.95	ND	1,49E-03	ND	ND	ND	ND	ND	ND	ND	2,84E-03	3,45E-02	0.00	0.11	-1,02E-02
HTP-c*[2]	CTUh	3,99E-09	ND	9,09E-14	ND	ND	ND	ND	ND	ND	ND	5,63E-14	6,85E-13	0.00	1,67E-11	-7,13E-13
HTP-nc*[2]	CTUh	7,52E-08	ND	3,75E-12	ND	ND	ND	ND	ND	ND	ND	4,18E-12	3,40E-11	0.00	1,85E-09	-2,88E-11
SQP*[2]	dimensionless	10.31	ND	1,15E-03	ND	ND	ND	ND	ND	ND	ND	1,12E-03	1,37E-02	0.00	4,07E-02	-1,49E-02

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Eco-toxicity potential – freshwater **HTP-c*[2]** - Human toxicity potential – cancer effects **HTP-nc*[2]** - Human toxicity potential – non-cancer effects **SQP*[2]** – soil quality potential

Disclaimers:

*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.

*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.

Conversion of other variants

For the declared product solidian REBAR D14-RRE, the respective environmental impacts per 1 kg were calculated.

For all other listed solidian REBAR D14-RRE products, the environmental impact values can be calculated using the percentages in the table shown on the right.

	solidian REBAR D4-RRE	*solidian REBAR D6-RRE*	*solidian REBAR D8-RRE*	*solidian REBAR D10-RRE*	*solidian REBAR D12-RRE*	*solidian REBAR D14-RRE*	*solidian REBAR D16-RRE*	*solidian REBAR D20-RRE*	*solidian REBAR D25-RRE*	*solidian REBAR D28-RRE*
	A1-A3	**A1-A3**	**A1-A3**	**A1-A3**	**A1-A3**	**A1-A3**	**A1-A3**	**A1-A3**	**A1-A3**	**A1-A3**
Global warming potential - total (GWP-total)	141.7%	119.6%	107.7%	108.1%	105.9%	100.0%	96.3%	94.5%	93.0%	93.0%
Global warming potential fossil fuels (GWP-fossil)	141.4%	119.4%	107.5%	107.8%	105.6%	100.0%	96.3%	94.0%	92.9%	92.5%
Global warming potential - biogenic (GWP-biogenic)	112.2%	106.9%	102.2%	109.1%	109.9%	100.0%	94.5%	93.4%	92.8%	92.8%
Global warming potential - land use and landuse change (GWP-luluc)	116.6%	109.5%	108.9%	107.1%	103.5%	100.0%	95.9%	93.0%	91.0%	90.7%
Ozone depletion potential (ODP)	108.6%	93.6%	89.9%	104.9%	113.5%	100.0%	94.4%	84.3%	79.0%	76.8%
Acidification potential (AP)	116.2%	105.4%	103.1%	103.1%	102.3%	100.0%	99.2%	98.5%	98.5%	98.5%
Eutrophication potential - aquatic freshwater (EP-freshwater)	118.8%	104.5%	113.4%	112.5%	108.0%	100.0%	93.8%	90.2%	88.0%	87.7%
Eutrophication potential - aquatic marine (EP-marine)	133.7%	109.7%	106.6%	105.6%	103.6%	100.0%	97.4%	95.9%	94.9%	94.9%
Eutrophication potential - terrestrial (EP-terrestrial)	131.3%	110.4%	106.2%	105.7%	103.3%	100.0%	97.6%	96.2%	95.3%	95.3%
Photochemical ozone formation potential (POCP)	127.9%	109.3%	105.6%	105.4%	103.7%	100.0%	97.8%	96.3%	95.5%	95.4%
Abiotic depletion potential – fossil resources (ADPE)	133.3%	140.2%	111.8%	107.8%	103.9%	100.0%	98.0%	81.9%	80.9%	80.4%
Abiotic depletion potential (ADPF)	138.6%	119.0%	107.1%	108.4%	106.6%	100.0%	95.6%	93.6%	92.3%	92.1%
Water (user) deprivation potential (WDP)	122.6%	102.7%	104.4%	104.0%	102.2%	100.0%	98.7%	97.3%	96.9%	96.5%
Total use of renewable primary energy resources (PERT)	269.7%	193.3%	152.1%	130.3%	111.8%	100.0%	95.0%	85.7%	81.6%	79.6%
Total use of non-renewable primary energyresources (PENRT)	138.9%	119.2%	107.1%	108.6%	106.6%	100.0%	95.6%	93.6%	92.3%	92.1%

6.4 Interpretation, LCA presentation and critical review

Evaluation

The environmental impacts of

- solidian GRID Q85-CCE-21
- solidian REBAR D14-RRE

differ strongly/significantly from each other. The differences lie in the different pre-products and raw materials used.

For the declared product solidian GRID Q85-CCE-21, the LCA results show that all environmental categories are primarily influenced by the carbon fibers used. A secondary role is played by the epoxy resin and the manufacturing process. Packaging, transport and the polypropylene fibers used all have a very minor impact on the environment.
The environmental impact of the declared product solidian REBAR D14-RRE in all environmental categories is almost exclusively caused by the glass fibers and the epoxy resin used. The manufacturing process, transport, and packaging materials have very little impact on the environment.
The charts below show the allocation of the main environmental impacts.

The values obtained from the LCA calculation are suitable for the certification of buildings.

Diagrams

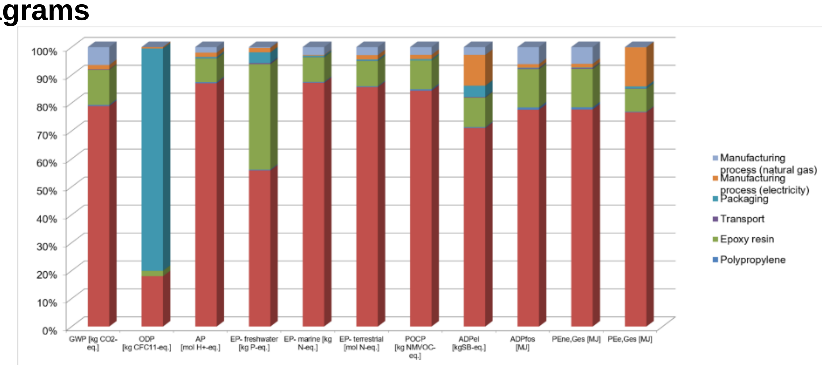


Illustration 5 Percentage shares of components, production and transport in selected environmental impact indicators solidian Q85-CCE-21

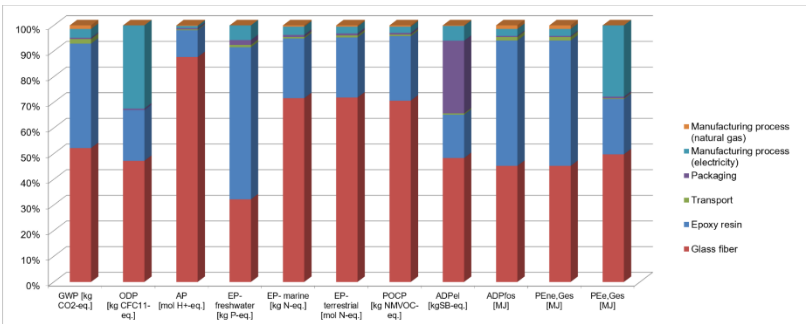


Illustration 6 Percentage shares of components, production and transport in selected environmental impact indicators solidian REBAR D14-RRE

Report

The LCA report underlying this EPD was developed according to the requirements of DIN EN ISO 14040 and DIN EN ISO 14044 as well as DIN EN 15804 and DIN EN ISO 14025. It is deposited with ift Rosenheim. The results and conclusions reported to the target group are complete, correct, without bias and transparent. The results of the study are not designed to be used for comparative statements intended for publication.

Critical review

The critical review of the LCA and of the report took place in the course of verification of the EPD and was carried out by the external auditor Prof. Dr.-Ing. Eric Brehm.

7 General information regarding the EPD

Comparability

This EPD was prepared in accordance with DIN EN 15804 and is therefore only comparable to those EPDs that also comply with the requirements set out in DIN EN 15804.
Any comparison must refer to the building context and the same boundary conditions of the various life cycle stages.
For comparing EPDs of construction products, the rules set out in DIN EN 15804, Clause 5.3, apply.

Communication

The communications format of this EPD meets the requirements of EN 15942:2012 and is therefore the basis for B2B communication. Only the nomenclature has been changed according to DIN EN 15804.

Verification

Verification of the Environmental Product Declaration is documented in accordance with the ift "Richtlinie zur Erstellung von Typ III Umweltproduktdeklarationen" (Guidance on preparing Type III Environmental Product Declarations) in accordance with the requirements set out in DIN EN ISO 14025.

This declaration is based on PCR documents "PCR Part A" PCR-A-0.3:2018 and “Reinforcing and fastening systems" PCR BS-2.3:2018.

The European standard EN 15804 serves as the core PCR [a]
Independent verification of the Declaration and statement according to EN ISO 14025:2010 ☐ internal ☒ external
Independent third party verifier: [b] Eric Brehm
[a] Product category rules [b] Optional for business-to-business communication Mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4).

Revisions of this document

No.	Date	Note	Person in charge	Testing personnel
1	07.12.2022	External verification	Pscherer	Brehm
2	05.01.2023	Formal adjustment	Pscherer	Brehm
3	02.02.2023	Formal adjustment	Pscherer	Brehm
4	25.05.2023	Content adjustment	Pscherer	Brehm

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9 Annex

Description of life cycle scenarios for solidian GRID Q85-CCE-21 and solidian REBAR D14-RRE

Product stage			Construction process stage		Use stage							End-of-life stage				Benefits and loads beyond system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Production	Transport	Construction/installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/demolition	Transport	Waste processing	Disposal	Reuse Recovery Recycling potential
✓	✓	✓	—	✓	—	—	—	—	—	—	—	✓	✓	✓	✓	✓

The scenarios were based on information provided by the manufacturer.

Note: The standard scenarios selected are presented in bold type. They were also used for calculating the indicators in the summary table.

✓ Included in the LCA

— Not included in the LCA

A5 Construction/Installation

No.	Scenario	Description
A5	Small lifting trolley / lifting platform	A small lifting trolley / lift truck is required for the installation of the units.

In case of deviating consumption during installation/assembly of the products which forms part of the site management, they are covered at the building level.

Ancillary materials, consumables, use of energy and water, other resource use, material losses, direct emissions as well as waste during construction / installation are negligible.

It is assumed that the packaging material in the Module construction / installation is sent to waste handling. Waste is only thermally recycled in line with the conservative approach: Films / casings and carton in incineration plants. Benefits from A5 are specified in module D. Benefits from waste incineration: Electricity replaces electricity mix (EU 28) for solidian GRID Q85-CCE-21, electricity mix (DE) for solidian REBAR D14-RRE. Thermal energy replaces thermal energy from natural gas (DE). Screws are recycled.

Transport to the recycling plants is not taken into account.

Since this is a single scenario, the results are shown in the relevant summary table.

C1 Deconstruction

No.	Scenario	Description
C1	Deconstruction	100% deconstruction rate of the declared products and their inputs. Deconstruction is carried out by excavators. Further deconstruction rates are possible, give adequate reasons.

No relevant inputs or outputs apply to the scenario selected.

Since this is a single scenario, the results are shown in the relevant summary table.

In case of deviating consumption the removal of the products forms part of site management and is covered at the building level.

C2 Transport

No.	Scenario	Description
C2	Transport	Transport to collection point with more than 32 t truck gross weight (Euro 6), diesel, 24 t payload, 85 % capacity used, 50 km

Since this is a single scenario, the results are shown in the relevant summary table.

C3 Waste management

No.	Scenario	Description
C3	Current market situation	**Share for recirculation of materials:** **solidian GRID Q85-CCE-21** • **Carbon fiber 100% recycled material** • **Polypropylene fiber 100% thermally recycled** • **Epoxy resin components 100 % thermally recycled** **solidian REBAR D14-RRE** • **Product 100% in landfill**

Electricity consumption of recycling plant: 0.5 MJ/kg.

As the products are placed on the European market, the disposal scenario is based on average European data sets.

The below table presents the disposal processes and their percentage by mass/weight. The calculation is based on the above mentioned shares in percent related to the declared unit of the product system.

C3 Disposal	Unit	C3 solidian GRID Q85-CCE-21	C3 solidian REBAR D14-RRE
Collection process, collected separately	kg	1.00	1.00
Collection process, collected as mixed construction waste	kg	0.00	1.00
Recovery system, for re-use	kg	0.00	0.00
Recovery system, for recycling	kg	0.62	0.00
Recovery system, for energy recovery	kg	0.00	0.00
Disposal	kg	0.38	1.00

The 100% scenarios differ from the average current recovery (C3.4). The evaluation of each scenario is described in the background report.

Since this is a single scenario, the results are shown in the summary table.

C4 Disposal

No.	Scenario	Description
C4	Disposal	**The non-recordable amounts and losses within the re-use/recycling chain (C1 and C3) are modelled as “disposed” (inert material (DE)) for solidian GRID Q85-CCE-21.** **solidian REBAR D14-RRE is modelled as 100% “disposed" (inert material (EU28)).**

The consumption in scenario C4 results from physical pre-treatment, waste recycling and management of the disposal site. The benefits obtained here from the substitution of primary material production are allocated to Module D, e.g. electricity and heat from waste incineration.

Since this is a single scenario, the results are shown in the summary table.

D Benefits and loads from beyond the system boundaries		
No.	**Scenario**	**Description**
D	**Recycling potential (current market situation)**	**solidian GRID Q85-CCE-21** **Recycled carbon fiber and recycled polypropylene fiber from C3 replace 60% carbon fiber and/or polypropylene fiber;** **remainder to landfill.** **solidian REBAR D14-RRE** **The values result exclusively from the recycling of the packaging material in module A5.**

For solidian GRID Q85-CCE-21, the values in module "D" result from recycling of the packaging material in module A5 and from deconstruction at the end of service life.

The 100% scenarios differ from the average current recovery (D4). The evaluation of each scenario is described in the background report.

Since this is a single scenario, the results are shown in the summary table.

Imprint

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