# ENVIRONMENTAL PRODUCT DECLARATION

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

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|---|---|
| Owner of the Declaration | Schöck Bauteile GmbH |
| Programme holder | Institut Bauen und Umwelt e.V. (IBU) |
| Publisher | Institut Bauen und Umwelt e.V. (IBU) |
| Declaration number | EPD-SBG-20200240-IBA1-EN |
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| Valid to | 15.07.2026 |

## Schöck Combar®

Schöck Bauteile GmbH

Institut Bauen und Umwelt e.V.

www.ibu-epd.com | https://epd-online.com

ECO PLATFORM EPD EN 15804 VERIFIED

# 1. General Information

| Schöck Bauteile GmbH | Schöck Combar® |
|---|---|
| **Programme holder**<br>IBU – Institut Bauen und Umwelt e.V.<br>Panoramastr. 1<br>10178 Berlin<br>Germany | **Owner of the declaration**<br>Schöck Bauteile GmbH<br>Vimbucher Straße 2<br>D-76534 Baden-Baden |
| **Declaration number**<br>EPD-SBG-20200240-IBA1-EN | **Declared product / declared unit**<br>1 kg Schöck Combar® |
| **This declaration is based on the product category rules:**<br>Reinforcing and securing systems made from glass fibre composite materials, 04.2018<br>(PCR checked and approved by the SVR) | **Scope:**<br>This EPD relates to a specific load bearing product from Schöck Bauteile GmbH - Schöck Combar®.<br>The glass fibre composite material which is an essential core element of the Schöck Combar® product is manufactured in collaboration with Fiberline Composites A/ S and is produced in Middelfart, Denmark. Final assembly of all the necessary components takes place at the Schöck plant in Landsberg (near Halle, Germany).<br><br>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.<br>The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard will be simplified as *EN 15804*. |
| **Issue date**<br>16.07.2021 | **Verification**<br>The standard *EN 15804* serves as the core PCR<br>Independent verification of the declaration and data according to *ISO 14025:2010*<br>☐ internally ☒ externally |
| **Valid to**<br>15.07.2026 | |
| Dipl. Ing. Hans Peters<br>(chairman of Institut Bauen und Umwelt e.V.) | |
| Dr. Alexander Röder<br>(Managing Director Institut Bauen und Umwelt e.V.)) | Angela Schindler<br>(Independent verifier) |

# 2. Product

### 2.1 Product description/Product definition

The Schöck Combar® product offers an alternative to conventional reinforcing steel to reinforce concrete components. As with reinforcing steel, Combar® is available in diameters of 8, 12, 16, 20, 25 and 32 mm. The glass fibre composite material achieves its specific properties in terms of resistance to alkali, ease of machining, corrosion resistance, electro-magnetic neutrality, and its extremely low thermal conductivity through the combination of two basic materials.
The properties of the individual components are strengthened through the specific combination of their individual characteristics. The typically amorphous structure of the glass fibres provides high-strength properties. The fibres are impregnated with high-quality vinyl ester resin during the production process. The extremely high packing density of the fibres means the tensile strength achieved is many times greater than that of the basic materials. The typical linearly elastic elongation behaviour of glass fibre composite materials is also evident in Schöck Combar®.

The use of the product is subject to the respective national regulations at the place of use, for example, in Germany, the building regulations of the federal states and the technical provisions based on these regulations.
The product-specific parameters are available in the general construction authority certification for Schöck Combar *Z-1.6-238*.

### 2.2 Application

Schöck Combar® offers an alternative means of connecting and reinforcing compared to conventional reinforcing steel or stainless steel. Design and machining are to be completed in accordance with the current standards for reinforced concrete *DIN EN 1992-1-1/NA* with appropriate adjustments for glass fibre composite materials.

### 2.3 Technical Data

Product performance values in relation to its characteristics in accordance with the relevant technical provision. The technical data for the products

which are within the scope of the EPD are based on the relevant building authority approvals (*Z-1.6-238*) and are therefore subject to continuous internal and external monitoring which ensures permanent compliance with the values.

**Technical Data**

| Name | Value | Unit |
|---|---|---|
| Characteristic tensile strength (Z-1.6-238) | >1000 | N/mm² |
| Tensile strength (Bemessungswert) (Z-1.6-238) | 445 | N/mm² |
| Modulus of elasticity Ef (Z-1.6-238) | 60.000 | N/mm² |
| Compressive strength (charakteristische) fpk (Z-21.8-2082) | 264 | N/mm² |
| Electrical resistance R (Z-1.6-238) | >10^10 | Ωm |
| specific weight ϱ (Z-1.6-238) | 2.2 | g/cm³ |
| Thermal conductance λ(Z-1.6-238) | 0.7 | W/(m²K) |

Product performance values in relation to its characteristics in accordance with the relevant technical provision (*Z-1.6-238* and *Z-21.8-2082*)

### 2.4 Delivery status

Delivery is specific to each contract, i.e. Combar® reinforcing material is configured specifically to each project taking the required parameters such as length, diameter, quantity etc. into consideration.

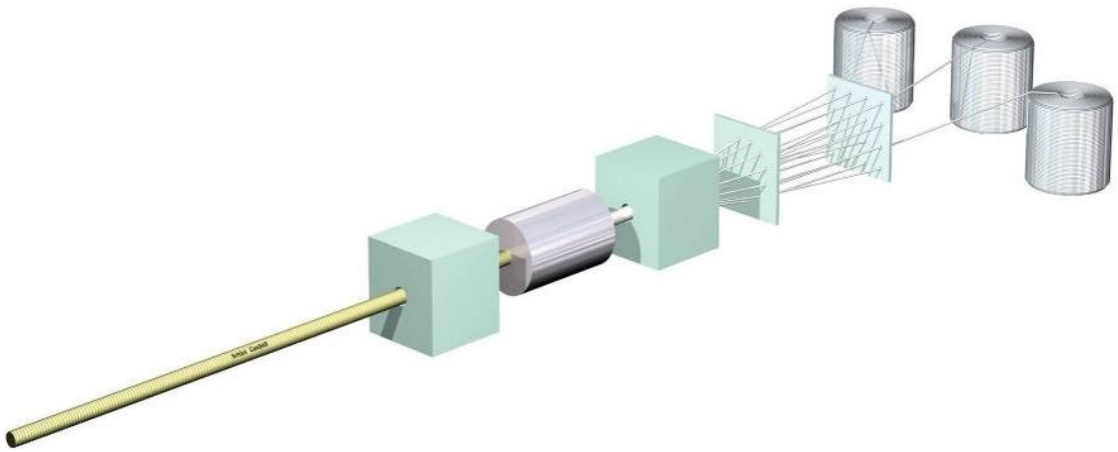
### 2.5 Base materials/Ancillary materials

Combar is a 100 % single-source product when used as a reinforcement material. The material comprises vinyl ester resin: 13%
Glass fibre: E-CR:
(E-glass Corrosion Resistant): 87%

1) The product/commodity/at least one sub-product contains substances on the ECHA list of Substances of Very High Concern (SVHC) (as of December 2020) at more than 0.1% by mass which require approval: **No**.
2) The product/commodity/at least one sub-product contains other CMR substances in Category 1A or 1B, which are not on the candidate list, at more than 0.1% by mass in at least one sub-product: **No**
3) Biocide products have been added to the building product in question or it has been treated with biocide products (it is thus a treated product as defined in the Biocidal Products Regulation (EU) No. 528/2012): **No**

### 2.6 Manufacture

The product is manufactured in a “pultrusion” process. E-CR rovings are bundled together and impregnated with a vinyl ester resin. The glass fibres are shaped by a pultrusion process in which they are drawn through a die. The bars are then profiled.



The glass fibre reinforced polymer bars (Combar) are manufactured by the company Fiberline in Denmark and transported from there to the Landsberg plant (Halle) where they are cut to length and prefabricated to customer’s specific requirements.

**Quality management - production:**
Certified quality management in accordance with *DIN EN ISO 9001* since 2006.

### 2.7 Environment and health during manufacturing

The criteria for environmental and energy management and the requirements relating to health and safety in the workplace are maintained in accordance with the following certifications:

**Occupational health and safety – production:**
Occupational health and safety management in accordance with *BS OHSAS 18001:2007*.

**Environmental protection – production:**
Certified environmental management in accordance with *DIN EN ISO 14001* since 2013.

Energy management in accordance with *DIN EN ISO 50001* and to *BS OHSAS 18001* certified by DEKRA Certification GmbH.
Any waste such as stainless steel, glass fibres, plastics, wood, (wooden pallets and wooden fittings) and packaging film which occur while manufacturing the product or which are left over as excess material are separated, stored and recycled as far as is possible.

### 2.8 Product processing/Installation
Schöck Combar® is processed on site in the same way as reinforcing steel. The relevant specific engineering provisions as well as occupational and environmental protections are to be observed. The requirements and provisions can vary due to the breadth of use.

### 2.9 Packaging
Packaging is on current EU pallets and wooden frames (dependent on delivery).
Stretch film is also used as a packaging material.

### 2.10 Condition of use
Once installed, all materials used are protected against external exposure for their service life and are designed for the service life of the construction. If the products are used as intended, there is no danger to water, air or soil.

### 2.11 Environment and health during use
Schöck Combar® does not interact with its environment.
There are no detrimental effects on the environment or health during the use phase due to the integration of the product during the building phase.

### 2.12 Reference service life
Service life is at least 50 years which corresponds to average building use and building design. However, the actual service life can be considerably longer. The service life complies with fatigue tests which simulate a service life of 50 years using load spectra (temperature, deformation, environmental influences) and are part of the approval by building authorities. A further precondition for the service life is that the necessary conditions for packaging, transport, storage, installation and use are met.
The test scenario for meeting a general construction authority certification from the German Institute for Construction Technology includes corresponding fatigue tests which simulate the ageing process for Schöck Combar®. These tests have not revealed any appearance of ageing in the material over the nominal service life.
A Reference Service Life (RSL) to *ISO 15686* has not been declared.

Description of the influences on the ageing of the product when applied in accordance with the rules of technology.

### 2.13 Extraordinary effects

**Fire**
The Schöck Combar® composite material has been grouped in the materials class B – 'very low flammability' in accordance with the criteria for fire resistance of materials to *EN 13501-1*.

**Fire protection**

| Name | Value |
|---|---|
| Building material class | B |
| Burning droplets | S1 |
| Smoke gas development | d0 |

**Water**
Due to the use of glass-fibre reinforced plastics and the appropriate embedded length into the construction to which it is to be connected, there is no danger of corrosion. The materials used in the Schöck Isolink® types do not exhibit any chemical reaction with water, are not soluble in water, and do not release any substances which may pollute water.

**Mechanical destruction**
Schöck Combar is intended to be mechanically destroyed within specific construction schedules. As no structural components of the material are released, mechanical destruction can be classified as harmless.

### 2.14 Re-use phase

### 2.15 Disposal
Non-recyclable components of the Schöck Combar® types can be disposed of at any waste disposal site using the relevant waste code (in accordance with *European Waste Catalogue Waste Codes)*.
Section 170904: mixed building and demolition wastes with the exception of those listed under 170901, 170902 and 170903.

### 2.16 Further information
Other information on the product is available at www.schoeck.de.

## 3. LCA: Calculation rules

### 3.1 Declared Unit
This declaration relates to 1kg of the Combar® reinforcing bar with a diameter of 25 mm.
It is produced in Denmark (unprocessed product) and Germany (finishing and prefabrication).
Annual production figures for 2018 are used as the source data.

**Declared unit**

| Name | Value | Unit |
|---|---|---|
| Declared unit | 1 | kg |
| Gross density | 2200 | $kg/m^3$ |

### 3.2 System boundary
Type of EPD: From the scales to the factory gate using modules A5, C2–C4 and module D (A1–A3, A5, C and D). This environmental product declaration relates to the manufacturing stage (A1-A3), installation (A5), disposal stage (C2-C4) and module D.

The following specific processes were included in the manufacturing stage A1-A3 in the production of the reinforcing rod:
- Preparation processes for preproducts and energy
- Transport of resources and preproducts (glass fibres, hybrid resin) to production site
- Manufacturing process in the plant including energy expenditure
- Production of pro rata packaging

The EPD takes into consideration the CO2 stored in the packaging material (wooden pallet) through photosynthesis within A1–A3 and as re-emitted biogenic CO2 emissions in A5. This ensures the

neutrality of the renewable raw materials' CO2 within the system threshold.

The following processes are considered in the disposal stage:
· Transport from the construction site to the inert material disposal site (module C2)
· Energy consumption for crushing (module C3)
· Disposal of inert materials (module C4)

### 3.3 Estimates and assumptions
Country-specific data sets for power generation were used to produce the life cycle assessment model. The preproducts were mainly generated using European data sets.
Assumptions were made with respect to the following raw materials/preproducts: The vinyl ester hybrid resin (13 M-%) in the Combar material was specifically modelled using conservative estimates.

### 3.4 Cut-off criteria
All data taken from the operating data i.e. all basic materials in the recipe and the electricity consumption were taken into consideration in the balancing.
Machines, plant and infrastructure required for production were ignored. Assumptions were made for all relevant inputs and outputs for transport applications if no primary data were available.
Transport applications for the packaging material used were not taken into consideration.
Any sawing waste from production (sawdust) was ignored.
Consumptions for removing the product from the building at the end of its life were ignored.

### 3.5 Background data
The software system for integrated balancing, /GaBi9/ service pack 40, as developed by Sphera Solutions GmbH, was used to model the reinforcing rods. The GaBi 2020 database was used as the background database. The consistent data sets contained in the GaBi database are documented online in the /GaBi 2020 documentation/. The base data for the GaBi database were used for preproducts, energy and transport.

### 3.6 Data quality
All the relevant background data sets used for production were taken from the GaBi 2020 database from the *GaBi 9* software. Foreground data was provided by Schöck Bauteile GmbH.
The latest revision of the background data used goes back less than 1 year. All the production data are current industrial data from Schöck Bauteile GmbH.
Overall, the quality of the data and the robustness of the results can be classified as good.

### 3.7 Period under review
The fundamental data for the life cycle assessment presented here is based on data acquired for the production of the reinforcing rods during 2018.

### 3.8 Allocation
Sphera Solutions GmbH does not have to complete an allocation as all the production data provided apply exclusively to the production of the reinforcing rods.

### 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.

## 4. LCA: Scenarios and additional technical information

**Characteristic product properties**
**Information on biogenic Carbon**

**Information to describe the biogenic carbon content at the factory gate**

| Name | Value | Unit |
|---|---|---|
| Biogenic Carbon Content in product | - | kg C |
| Biogenic Carbon Content in accompanying packaging | - | kg C |

**Transport from the manufacturer to the place of use**

| Name | Value | Unit |
|---|---|---|
| Litres of fuel | - | l/100km |
| Transport distance | - | km |
| Capacity utilisation (including empty runs) | - | % |
| Gross density of products transported | - | kg/m³ |
| Capacity utilisation volume factor | - | - |

**Installation in the building (A5)**
The pro rata quantity of wooden pallets for each declared unit contains approx. 0.003 kg of biogenic carbon.. This is taken into account in the relevant combustion scenario with 0.012 kg CO2 .

| Name | Value | Unit |
|---|---|---|
| Wooden pallet | 0,008 | kg |
| PE-Folie | 0,005 | kg |

**Use (B1) see section 2.12 "Use"**

| Name | Value | Unit |
|---|---|---|

**Maintenance (B2)**

| Name | Value | Unit |
|---|---|---|
| Information on maintenance | - | - |
| Maintenance cycle | - | Number/RSL |
| Water consumption | - | m³ |
| Auxiliary | - | kg |
| Other resources | - | kg |
| Electricity consumption | - | kWh |
| Other energy carriers | - | MJ |
| Material loss | - | kg |

**Repair (B3)**

| Name | Value | Unit |
|---|---|---|
| Information on the repair process | - | - |
| Information on the inspection process | - | - |
| Repair cycle | - | Number/RSL |
| Water consumption | - | $m^3$ |
| Auxiliary | - | kg |
| Other resources | - | kg |
| Electricity consumption | - | kWh |
| Other energy carriers | - | MJ |
| Material loss | - | kg |

**Replacement (B4)/Conversion/Renovation (B5)**

| Name | Value | Unit |
|---|---|---|
| Replacement cycle | - | Number/RSL |
| Electricity consumption | - | kWh |
| Litres of fuel | - | l/100km |
| Replacement of worn parts | - | kg |

**Reference service life**

| Name | Value | Unit |
|---|---|---|
| Reference service life (nach ISO 15686-1, -2, -7 und -8) | - | a |
| Life Span (nach BBSR) | - | a |
| Life Span (nach BBSR) | - | a |
| Declared product properties (at the gate) and finishes | - | - |
| Design application parameters (if instructed by the manufacturer), including the references to the appropriate practices and application codes | - | - |
| An assumed quality of work, when installed in accordance with the manufacturer's instructions | - | - |
| Outdoor environment, (for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature | - | - |
| Indoor environment (for indoor applications), e.g. temperature, moisture, chemical exposure | - | - |
| Usage conditions, e.g. frequency of use, mechanical exposure | - | - |
| Maintenance e.g. required frequency, type and quality and replacement of components | - | - |

**Operational energy and water consumption (B7)**

| Name | Value | Unit |
|---|---|---|
| Water consumption | - | $m^3$ |
| Electricity consumption | - | kWh |
| Other energy carriers | - | MJ |
| Equipment output | - | kW |

**End of life cycle (C2-C4)**

Once the usage phase has run its course, this is followed by manual disassembly (module C1 not declared), transport (30 km) and disposal at an inert materials disposal site

| Name | Value | Unit |
|---|---|---|
| Collected as mixed construction waste | 1 | kg |
| Landfilling | 1 | kg |

**Reuse, recovery and recycling potential (D), relevant scenario data**

| Name | Value | Unit |
|---|---|---|

## 5. LCA: Results

Below is a representation of the environmental impact of 1 kg of the Combar® reinforcing bar with a diameter of 25 mm as produced by Schöck Bauteile GmbH in Denmark and Germany. The modules in accordance with *EN 15804* marked with an 'X' are dealt with here. The modules marked 'ND' (Not Declared) are not part of this process.
The following tables show the results of the indicators from the impact assessment, the consumption of resources, including to waste, and other output flows relevant to the declared unit.

Disclaimer:
EP-freshwater: This indicator has been calculated as "kg P eq" as required in the characterization model (EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml).

**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 | ND | X | ND | ND | MNR | MNR | MNR | ND | ND | ND | X | X | X | X |

**RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg Combar® mit 25 mm Durchmesser**

| Core Indicator | Unit | A1-A3 | A5 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| Global warming potential - total | [kg $CO_2$-Eq.] | 2.22E+0 | 2.57E-2 | 1.89E-3 | 4.04E-2 | 1.53E-2 | -1.20E-2 |
| Global warming potential - fossil fuels | [kg $CO_2$-Eq.] | 2.20E+0 | 1.37E-2 | 1.81E-3 | 4.03E-2 | 1.52E-2 | -1.20E-2 |
| Global warming potential - biogenic | [kg $CO_2$-Eq.] | 1.74E-2 | 1.20E-2 | 8.25E-5 | 1.34E-4 | 5.58E-5 | -2.81E-5 |
| GWP from land use and land use change | [kg $CO_2$-Eq.] | 1.40E-3 | 6.12E-7 | 1.08E-7 | 5.83E-5 | 4.37E-5 | -8.39E-6 |
| Depletion potential of the stratospheric ozone layer | [kg CFC11-Eq.] | 1.68E-14 | 5.69E-18 | 3.03E-19 | 8.86E-16 | 5.68E-17 | -1.25E-16 |
| Acidification potential, accumulated exceedance | [mol $H^+$-Eq.] | 1.33E-2 | 3.87E-6 | 1.84E-6 | 8.89E-5 | 1.09E-4 | -1.68E-5 |
| Eutrophication, fraction of nutrients reaching freshwater end compartment | [kg P-Eq.] | 5.94E-6 | 9.23E-10 | 4.20E-10 | 1.08E-7 | 2.61E-8 | -1.55E-8 |
| Eutrophication, fraction of nutrients reaching marine end compartment | [kg N-Eq.] | 1.81E-3 | 1.16E-6 | 5.73E-7 | 1.97E-5 | 2.80E-5 | -4.33E-6 |
| Eutrophication, accumulated exceedance | [mol N-Eq.] | 1.96E-2 | 1.78E-5 | 6.35E-6 | 2.07E-4 | 3.08E-4 | -4.64E-5 |
| Formation potential of tropospheric ozone photochemical oxidants | [kg NMVOC-Eq.] | 5.86E-3 | 3.23E-6 | 1.65E-6 | 5.41E-5 | 8.48E-5 | -1.25E-5 |
| Abiotic depletion potential for non-fossil resources | [kg Sb-Eq.] | 4.77E-7 | 8.59E-11 | 7.18E-11 | 1.17E-8 | 1.37E-9 | -1.97E-9 |
| Abiotic depletion potential for fossil resources | [MJ] | 3.91E+1 | 8.36E-3 | 2.55E-2 | 7.08E-1 | 1.99E-1 | -2.03E-1 |
| Water (user) deprivation potential, deprivation-weighted water consumption (WDP) | [$m^3$ world-Eq deprived] | 2.15E-1 | 2.90E-3 | 5.05E-6 | 8.77E-3 | 1.58E-3 | -1.24E-3 |

**RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg Combar® mit 25 mm Durchmesser**

| Indicator | Unit | A1-A3 | A5 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| Renewable primary energy as energy carrier | [MJ] | 5.73E+0 | 1.46E-1 | 1.28E-4 | 3.14E-1 | 2.61E-2 | -4.44E-2 |
| Renewable primary energy resources as material utilization | [MJ] | 1.44E-1 | -1.44E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| Total use of renewable primary energy resources | [MJ] | 5.87E+0 | 1.65E-3 | 1.28E-4 | 3.14E-1 | 2.61E-2 | -4.44E-2 |
| Non-renewable primary energy as energy carrier | [MJ] | 3.53E+1 | 2.45E-1 | 2.56E-2 | 7.08E-1 | 3.70E+0 | -2.03E-1 |
| Non-renewable primary energy as material utilization | [MJ] | 3.74E+0 | -2.37E-1 | 0.00E+0 | 0.00E+0 | -3.50E+0 | 0.00E+0 |
| Total use of non-renewable primary energy resources | [MJ] | 3.91E+1 | 8.36E-3 | 2.56E-2 | 7.08E-1 | 1.99E-1 | -2.03E-1 |
| Use of secondary material | [kg] | 0.00 | 0.00 | 0.00 | ND | 0.00 | ND |
| Use of renewable secondary fuels | [MJ] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Use of non-renewable secondary fuels | [MJ] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Use of net fresh water | [$m^3$] | 9.52E-3 | 6.86E-5 | 2.10E-7 | 3.63E-4 | 5.01E-5 | -5.14E-5 |

**RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg Combar® mit 25 mm Durchmesser**

| Indicator | Unit | A1-A3 | A5 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| Hazardous waste disposed | [kg] | 1.97E-1 | 1.99E-11 | 6.73E-12 | 2.93E-10 | 3.03E-9 | -8.09E-11 |
| Non-hazardous waste disposed | [kg] | 2.44E-8 | 1.40E-3 | 2.77E-6 | 5.02E-4 | 1.00E+0 | -9.39E-5 |
| Radioactive waste disposed | [kg] | 1.96E-1 | 3.94E-7 | 4.21E-8 | 1.07E-4 | 2.23E-6 | -1.52E-5 |
| Components for re-use | [kg] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Materials for recycling | [kg] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Materials for energy recovery | [kg] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Exported electrical energy | [MJ] | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Exported thermal energy | [MJ] | 0.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 |

**RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:**
**1 kg Combar® mit 25 mm Durchmesser**

| Indicator | Unit | A1-A3 | A5 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| Potential incidence of disease due to PM emissions | [Disease Incidence] | ND | ND | ND | ND | ND | ND |
| Potential Human exposure efficiency relative to U235 | [kBq U235-Eq.] | ND | ND | ND | ND | ND | ND |
| Potential comparative toxic unit for ecosystems | [CTUe] | ND | ND | ND | ND | ND | ND |
| Potential comparative toxic unit for humans - cancerogenic | [CTUh] | ND | ND | ND | ND | ND | ND |
| Potential comparative toxic unit for humans - not cancerogenic | [CTUh] | ND | ND | ND | ND | ND | ND |
| Potential soil quality index | [-] | ND | ND | ND | ND | ND | ND |

Constraint note 2 – applies for indicators ADPE, ADPF, WDP
The results of this environmental impact indicator must be used with care as the uncertainties in these results are high or because experience with this indicator is limited.

## 6. LCA: Interpretation

In all impact categories, the main contribution to the total impact potential is in the production phase (modules A1-A3). The loading in this phase is primarily produced by the upstream chain of the raw materials. The production energy, transport and packaging have little to negligible impact.

**Conversion of other variants**
The following tables allow environmental categories to be calculated for other product selections. To calculate the results, the values in section 5 must be calculated using the percentages in the following table.

| | Combar 8 mm | Combar 12 mm | Combar 16 mm | Combar 20 mm | Combar 25 mm | Combar 32 mm |
|---|---|---|---|---|---|---|
| | A1-A3 | A1-A3 | A1-A3 | A1-A3 | A1-A3 | A1-A3 |
| Globales Erwärmungspotenzial total (GWP-total) | 102,1% | 99,6% | 99,3% | 98,7% | 100,0% | 99,1% |
| Globales Erwärmungspotenzial fossil (GWP-fossil) | 102,2% | 99,6% | 99,3% | 98,6% | 100,0% | 99,1% |
| Globales Erwärmungspotenzial biogen (GWP-biogenic) | 97,2% | 101,1% | 101,1% | 101,6% | 100,0% | 100,7% |
| Globales Erwärmungspotenzial luluc (GWP-luluc) | 106,6% | 98,3% | 97,8% | 96,0% | 100,0% | 97,7% |
| Abbau Potential der stratosphärischen Ozonschicht (ODP) | 107,0% | 98,2% | 97,6% | 95,7% | 100,0% | 97,5% |
| Versauerungspotenzial von Boden und Wasser (AP) | 100,5% | 99,9% | 99,8% | 99,7% | 100,0% | 99,8% |
| Eutrophierungspotenzial Süßwasser (EP-freshwater) | 103,4% | 99,1% | 98,8% | 97,9% | 100,0% | 98,8% |
| Eutrophierungspotenzial Salzwasser (EP-marine) | 101,2% | 99,7% | 99,6% | 99,2% | 100,0% | 99,5% |
| Eutrophierungspotenzial Land (EP-terrestrial) | 101,2% | 99,8% | 99,6% | 99,3% | 100,0% | 99,6% |
| Bildungspotential für troposphärisches Ozon (POCP) | 101,0% | 99,8% | 99,7% | 99,4% | 100,0% | 99,6% |
| Potenzial für den abiotischen Abbau nicht fossiler Ressourcen (ADPE) | 104,0% | 99,0% | 98,6% | 97,5% | 100,0% | 98,5% |
| Potenzial für den abiotischen Abbau fossiler Brennstoffe (ADPF) | 101,5% | 100,0% | 99,7% | 99,0% | 100,0% | 99,2% |
| Wassernutzung (WDP) | 101,4% | 99,6% | 99,5% | 99,2% | 100,0% | 99,6% |

| | Combar 8 mm | Combar 12 mm | Combar 16 mm | Combar 20 mm | Combar 25 mm | Combar 32 mm |
|---|---|---|---|---|---|---|
| | A5 | A5 | A5 | A5 | A5 | A5 |
| Globales Erwärmungspotenzial total (GWP-total) | 107,9% | 118,8% | 107,9% | 88,7% | 100,0% | 81,9% |
| Globales Erwärmungspotenzial fossil (GWP-fossil) | 116,1% | 138,5% | 116,1% | 77,0% | 100,0% | 63,0% |
| Globales Erwärmungspotenzial biogen (GWP-biogenic) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Globales Erwärmungspotenzial luluc (GWP-luluc) | 112,6% | 130,2% | 112,6% | 81,9% | 100,0% | 71,0% |
| Abbau Potential der stratosphärischen Ozonschicht (ODP) | 111,3% | 126,9% | 111,3% | 83,9% | 100,0% | 74,1% |
| Versauerungspotenzial von Boden und Wasser (AP) | 107,5% | 118,0% | 107,5% | 89,2% | 100,0% | 82,6% |
| Eutrophierungspotenzial Süßwasser (EP-freshwater) | 111,7% | 127,9% | 111,7% | 83,3% | 100,0% | 73,1% |
| Eutrophierungspotenzial Salzwasser (EP-marine) | 106,8% | 116,3% | 106,8% | 90,2% | 100,0% | 84,3% |
| Eutrophierungspotenzial Land (EP-terrestrial) | 107,3% | 117,5% | 107,3% | 89,5% | 100,0% | 83,1% |
| Bildungspotential für troposphärisches Ozon (POCP) | 107,0% | 116,8% | 107,0% | 89,9% | 100,0% | 83,8% |
| Potenzial für den abiotischen Abbau nicht fossiler Ressourcen (ADPE) | 111,0% | 126,3% | 111,0% | 84,3% | 100,0% | 74,7% |
| Potenzial für den abiotischen Abbau fossiler Brennstoffe (ADPF) | 110,2% | 124,5% | 110,2% | 85,3% | 100,0% | 76,4% |
| Wassernutzung (WDP) | 107,9% | 118,9% | 107,9% | 88,7% | 100,0% | 81,8% |

| | Combar 8 mm | Combar 12 mm | Combar 16 mm | Combar 20 mm | Combar 25 mm | Combar 32 mm |
|---|---|---|---|---|---|---|
| | C1/C2/C3 /C4 | C1/C2/C3 /C4 | C1/C2/C3 /C4 | C1/C2/C3 /C4 | C1/C2/C3 /C4 | C1/C2/C3 /C4 |
| Globales Erwärmungspotenzial total (GWP-total) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Globales Erwärmungspotenzial fossil (GWP-fossil) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Globales Erwärmungspotenzial biogen (GWP-biogenic) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Globales Erwärmungspotenzial luluc (GWP-luluc) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Abbau Potential der stratosphärischen Ozonschicht (ODP) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Versauerungspotenzial von Boden und Wasser (AP) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Eutrophierungspotenzial Süßwasser (EP-freshwater) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Eutrophierungspotenzial Salzwasser (EP-marine) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Eutrophierungspotenzial Land (EP-terrestrial) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Bildungspotential für troposphärisches Ozon (POCP) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Potenzial für den abiotischen Abbau nicht fossiler Ressourcen (ADPE) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Potenzial für den abiotischen Abbau fossiler Brennstoffe (ADPF) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |
| Wassernutzung (WDP) | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |

| | Combar 8 mm | Combar 12 mm | Combar 16 mm | Combar 20 mm | Combar 25 mm | Combar 32 mm |
|---|---|---|---|---|---|---|
| | D | D | D | D | D | D |
| Globales Erwärmungspotenzial total (GWP-total) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Globales Erwärmungspotenzial fossil (GWP-fossil) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Globales Erwärmungspotenzial biogen (GWP-biogenic) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Globales Erwärmungspotenzial luluc (GWP-luluc) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Abbau Potential der stratosphärischen Ozonschicht (ODP) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Versauerungspotenzial von Boden und Wasser (AP) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Eutrophierungspotenzial Süßwasser (EP-freshwater) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Eutrophierungspotenzial Salzwasser (EP-marine) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Eutrophierungspotenzial Land (EP-terrestrial) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Bildungspotential für troposphärisches Ozon (POCP) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Potenzial für den abiotischen Abbau nicht fossiler Ressourcen (ADPE) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Potenzial für den abiotischen Abbau fossiler Brennstoffe (ADPF) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |
| Wassernutzung (WDP) | 109,6% | 123,0% | 109,6% | 86,2% | 100,0% | 77,9% |

## 7. Requisite evidence

No negative effects on the environment or health are to be anticipated with correct use. The product is cast into concrete and has no contact with the internal spaces or external shell of the building. No verifications are required by law for the product

Not relevant

## 8. References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