# ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A1*

| | |
|---|---|
| Owner of the Declaration | JORDAHL GmbH |
| Programme holder | Institut Bauen und Umwelt e.V. (IBU) |
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| Valid to | 16/03/2026 |

## Brickwork Support Brackets JVAeco+

## JORDAHL GmbH

Institut Bauen und Umwelt e.V.

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ECO PLATFORM EPD EN 15804 VERIFIED


JORDAHL® anchored in quality

# 1. General Information

JORDAHL GmbH

**Programme holder**
IBU – Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

**Declaration number**
EPD-JDL-20200259-IBA1-EN

**This declaration is based on the product category rules:**
Structural steels, 11.2017
(PCR checked and approved by the SVR)

**Issue date**
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16/03/2026

Dipl. Ing. Hans Peters
(chairman of Institut Bauen und Umwelt e.V.)

Dr. Alexander Röder
(Managing Director Institut Bauen und Umwelt e.V.))

Brickwork Support Brackets JVAeco+

**Owner of the declaration**
JORDAHL GmbH
Nobelstraße 51
12057 Berlin
Germany

**Declared product / declared unit**
1 kg Facade Connection Systems JVAeco+ from JORDAHL GmbH.

**Scope:**
This document refers to the Brickwork Support Bracket Systems JVAeco+, manufactured in Trebbin, Germany. The declared unit refers to 1 kg Brickwork Support Bracket System as specific product. The data collection for the production was collected on a plant-specific basis with current annual data from 2019. The declaration holder is responsible for the underlying data and its verification.

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+A1*. In the following, the standard will be simplified as *EN 15804*.

**Verification**

| |
|---|
| The standard *EN 15804* serves as the core PCR |
| Independent verification of the declaration and data according to *ISO 14025:2010* |
| ☐ internally ☒ externally |

Christina Bocher
(Independent verifier)

# 2. Product

## 2.1 Information about the enterprise

Since its foundation in 1907, JORDAHL has been manufacturing products for fastening, reinforcement, connection and assembly technology as well as façade fastening, which are used worldwide in demanding construction projects. Owned by the Pohl family of shareholders since 1977, JORDAHL stands over more than 100 years for fastening and connection technology. In-house developments such as the “Kahneisen” and the cast-in anchor channel have become milestones in construction technology and have changed architecture worldwide in a lasting way.

## 2.2 Product description/Product definition

The JORDAHL brickwork support brackets are part of a system for brickwork with which facades are permanently fixed. Different designs allow their use both in new buildings and in renovations. They take up the dead weight of the facing brickwork and transfer it via anchor channels or wall plugs into the load-bearing inner wall of reinforced concrete. The anchor channels or dowel fastenings are not part of the declared product. Together with the supporting structure, a double skinned construction is formed. The triangular recess in the bracket body (JVAeco+) reduces the material expenditure to the essential static tasks and additionally minimizes the heat flow in the area of the brickwork support bracket.
The brackets are designed as standard to support masonry with a width of 90 mm to 115 mm and air layers between 60 and 300 mm.

The declared product is a system made of Lean Duplex stainless steel, consisting of bracket head and bracket body of different types, sizes and load levels.

The bracket head, consisting of two serrated plates, is welded to a web plate (bracket body). Depending on the design, a support plate or an angle is welded to the console body to support the facing brickwork. A pressure plate on the brickwork support bracket, which is supported by the load-bearing anchoring base (see

figure 1), is used to transfer the compressive forces generated. In the case of special design variants, it may be necessary to fix several bracket backs with welded bracket heads to one support structure (with angles).
The bracket head reaches over serrated plates into a bend of an inclined hole plate and is braced with the anchoring base by means of an approved fastening means (clamping disc and special screw or wall plugs) and thus held horizontally and vertically.

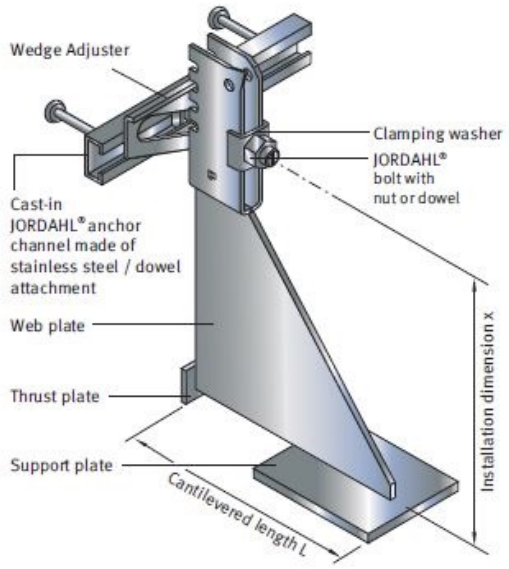


Figure 1: Brickwork support bracket with cast-in anchor channel

**Bracket body (Fig.1)**
For placing the products on the market in the EU/EFTA (except Switzerland) the regulation (EU) No. 305/2011 (CPR) applies.
The products require a declaration of performance in accordance with the harmonized standards *DIN EN 1090-1:2009+A1:2011* and the CE marking. For the use of the products the test report *TP-12-0009* and the respective national regulations apply.

**Bracket head** (Fig.1)
The use of the product is subject to the respective national regulations at the place of use, in Germany for example the building regulations of the federal states, and the technical regulations based on these regulations. General technical approval *Z-21.8-1868* dated April 15, 2020 according to *DIBt.*

For the application and use the respective national provision apply.

### 2.3 Application
JVAeco+ N, NA, NU intercept closed wall surfaces.

JVAeco+ P, PAR are preferably used in normal wall areas and edge areas (e.g. inside corners or vertical joints).
JVAeco+ E, EA are used in the end area of facing masonry panels (inner corners or vertical joints).

JVAeco+ F, FAR are combined support brackets with continuous support angle and two or more bracket backs, for visible or invisible building openings.

JVAeco+ NFT, NAFT are mainly used for openings that are supported by prefabricated columns and do not have a lateral support.
The respective types have a further variant which serves to overcome a certain height by means of a step, downwards.
Examples of this are: JVAeco+

- NA-
- PAR-
- EA-
- FAR-
- NAFT- (with lowered bracket support)
- NU- (with raised bracket support)

### 2.4 Technical Data
The following technical data apply to facing brickwork made of stainless steel. The test standard is *DIN EN 845-1*.

**Constructional data structural steel**

| Name | Value | Unit |
|---|---|---|
| Coefficient of thermal expansion | 13 | $10^{-6}K^{-1}$ |
| Tensile strength | 650 | $N/mm^2$ |
| Modulus of elasticity | 20000 | $N/mm^2$ |
| Melting point | 1470 | °C |
| Thermal conductivity | 15 | W/(mK) |
| Electrical conductivity at 20°C | 0.7 | $\Omega^{-1}m^{-1}$ |
| Density | 7800 | $kg/m^3$ |

**Bracket body**
Performance values of the product according to the declaration of performance in relation to its essential characteristics in accordance with *EN 1090-1:2009+A2:2011, Execution of steel structures and aluminium structures - Part 1: Requirements for conformity assessment of structural components.*

**Bracket head**
Performance values of the product in relation to its characteristics according to the relevant technical regulation (no CE marking).

### 2.5 Delivery status
The dimensions on delivery standard sizes are:

- X dimension: 200 mm
- Angular length/support length: 290 mm
- Thickness: 4 mm

### 2.6 Base materials/Ancillary materials
The most important components of JORDAHL brickwork support brackets JVAeco+ are:

- Stainless steel: 100 M.-%

This product or at least one partial article contains substances listed in the *candidate list* (27.06.2018)exceeding 0.1 percentage by mass: no.

This product or at least one partial article contains other *CMR substances* in categories 1A or 1B which

are not on the ECHA candidate list, exceeding 0.1 percentage by mass: no.

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.

### 2.7 Manufacture

After the stainless steel sheets have been delivered, a laser is used to cut the bracket backs, which are available in various sizes, from the metal plates.
The accumulated metal waste and filter dust is stored in containers, collected by a scrap dealer and recycled in accordance with regulations.

*Shaping & Processing*
The bracket heads and the bracket back are formed by a press brake. The pre-formed individual parts of the brickwork support bracket are passed on for further processing. The bracket head is welded together by a welding robot.
Afterwards, the individual parts of the brickwork support bracket (welded bracket head, bracket back, support plate/angle, pressure plate) are joined to form a product by manual welding.

*Shot peening*
The manufactured brickwork support brackets are shot-blasted to prevent corrosion.

### 2.8 Environment and health during manufacturing

During the entire manufacturing process, no health protection measures beyond the usual industrial safety measures for commercial enterprises are required.

The following certifications exist:

- *ISO 9001* (Quality Management)
- *ISO 50001* (Energy Management)

### 2.9 Product processing/Installation

Installation must be carried out by trained personnel in accordance with assembly instructions specified by the manufacturer. The manufacturer's instructions must be observed.

### 2.10 Packaging

The brickwork support brackets are packed in cartons and loaded onto EU-pallets.
Cardboard and plastic pads are used as packaging for the JVAeco+ brickwork support brackets as scratch protection. PE and PVC strapping is used for transport protection. The packaging material is easily separable and can be reused if used properly.
The remaining part can be collected according to type and sent to the regional recycling provider. Residual materials must be disposed of in accordance with the respective national regulations.

### 2.11 Condition of use

JORDAHL brickwork support brackets JVAeco+ are durable building materials. The material composition does not change during the service life.

### 2.12 Environment and health during use

No environmental pollution is caused by processing/installation of the products mentioned. No special measures to protect the environment are to be taken.
No risks can arise to water, air and soil if the products are used as designated.

### 2.13 Reference service life

The reference service life could not be determined in compliance with *ISO 15686*. According to the service lives of components for life cycle analyses according to the Sustainable Building Assessment System (*BBSR*), the reference service life of stainless steel components such as brickwork support brackets is at least 50 years.
The product is made of stainless steel and is protected against external influences after installation. It therefore shows no weathering per year.

### 2.14 Extraordinary effects

**Fire**
The JVAeco+ stainless steel brickwork support brackets declared here correspond to building material class A1 according to *EN 13501.*

**Fire protection**

| Name | Value |
|---|---|
| Building material class | A1 |
| Building material class | - |
| Burning droplets | - |

**Water**
No water-endangering ingredients are washed out.

**Mechanical destruction**
In the event of mechanical destruction, all substances remain in bound state. There are no relevant environmental impacts associated with mechanical destruction.

### 2.15 Re-use phase

The brickwork support brackets can be recycled. Reuse is not possible.

### 2.16 Disposal

The waste codes are according to the Waste Catalogue Ordinance
(Abfall Verzeichnis Verordnung *AVV*) and European Waste Catalogue *(EWC*):

- 17 04 05 – Iron and Steel

### 2.17 Further information

JORDAHL products are sold centrally in Germany through PohlCon Vertriebs GmbH. Further information and downloads are available on www.pohlcon.com.

# 3. LCA: Calculation rules

## 3.1 Declared Unit

The declaration refers to the production of 1 kg brickwork support brackets JVAeco+ made of stainless steel.

**Declared unit**

| Name | Value | Unit |
|---|---|---|
| Declared unit | 1 | kg |
| Conversion factor to 1 kg | - | - |
| Density | 7800 | kg/m$^3$ |

The product group of brickwork support brackets JVAeco+ vary in size, weight and slightly in composition.

## 3.2 System boundary

The Life Cycle Assessment considers the system boundaries "cradle to gate - with options" and follows the modular construction system described by *EN 15804*. The LCA takes into account the following modules:

- A1: Raw material supply: extraction of raw material, production of precursors, processing of secondary material
- A2: Transport: transport of raw materials to manufacturing plant
- A3: Manufacturing: Production of brickwork support brackets
- C2: Transportation towards disposal: transport of discarded product as part of waste processing
- C3: Waste processing: Waste management for reuse, recovery and/or recycling
- C4: Disposal
- D: Reuse, recovery or recycling potential as net flows and credits (benefits) for stainless steel

## 3.3 Estimates and assumptions

Plant-specific and data regarding the production process was provided by JORDAHL GmbH. Missing data was supplemented by estimates based on comparable substitutes or data used from the secondary literature, which have no significant relevance for the results. Missing data set in the database were modeled by the life cycle assessor.

## 3.4 Cut-off criteria

All relevant data, i.e. all applied materials according to the recipe and the energy used originate from the production data acquisition and have been considered within the inventory analysis.
The actual transport distances were used for the inputs and outputs taken into account.
Material- and energyflows with a proportion of less than 1 % were collected. It can be assumed, that the sum of the neglected processes does not exceed 5 % of the impact categories.
Provision of the infrastructure (machines, buildings, etc.) of the entire foreground system were not taken into account.

## 3.5 Background data

All background data required for the Life Cycle Assessment originates form the database *ecoinvent 3:6*.

## 3.6 Data quality

For modelling the Life Cycle of JVAeco+ brickwork support brackets, data from the production year 2019 was collected by JORDAHL GmbH at the Trebbin production plant, according to *ISO 14044*. All other relevant background has been taken from the database of *ecoinvent 3:6* and is not older than 5 years. For the Life Cycle Inventory all input and output flows have been respected.
The selection of the background data was made in accordance to technological, geographical and time-related representativeness of the data basis. Absent of specific data was supplemented with generic data sets or a representative average data.
The representativeness and data quality is therefore classified as good.

## 3.7 Period under review

The amount of raw materials, input energy and the volume of waste relate to the year 2019. It corresponds to the best currently available technology and thus is representative for the considered time period. The reference area is Germany.

## 3.8 Allocation

Co-product allocation does not exist in the manufacturing process.
All product-related data refer to the declared product. More detailed information on the allocation in the background data can be found in the documentation for the ecoinvent 3.6 database.

After the use phase, the product can be subjected to material recycling. When modeling the end-of-life (EoL), a collection rate of 95% after the use phase was assumed ("cut-off" approach).

## 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 LCA background database *ecoinvent 3:6* was used.

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## 4. LCA: Scenarios and additional technical information

The following technical information models the basis for the declared modules or can be used for developing specific scenarios within the context of a building assessment.

The reference life span according to *ISO 15686* could not be determined. The information on service life is taken from Table *BBSR* 2017, Service life of components for - Life cycle analyses according to the Sustainable Building Assessment System (Bewertungssystem Nachhaltiges Bauen BNB).

**Reference service life**

| Name | Value | Unit |
|---|---|---|
| Life Span (according to BBSR) | ≥ 50 | a |

**End of life (C1 - C4)**

| Name | Value | Unit |
|---|---|---|
| Collected separately waste type | 1 | kg |
| Recycling | 0.95 | kg |
| Landfilling (recycling loss) | 0.05 | kg |

The net amount of steel scrap is 0.46 kg and results from a steel scrap input of 0.494 kg and a steel scrap amount at the end of its life of 0.95 kg, taking into account a recycling loss of 5%.
Cuttings within production were recorded. The collection rate is set at 100%, the recycling loss at 5%.

**Reuse, recovery and/or recycling potentials (D), relevant scenario information**

| Name | Value | Unit |
|---|---|---|
| Steel scrap End of Life volume | 0.95 | kg |
| Net steel scrap volume | 0.445 | kg |

## 5. LCA: Results

The table displayed below summarizes the results of the Life Cycle Assessment (LCA). The results of the impact assessment do not provide any information on endpoints of the impact categories, exceedances of thresholds,safety margins or risks. The results refer to the declared unit of 1 m cast-in anchor channels. The Impact Assessment is based on *CML IA baseline*.

**DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE 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 | MND | MND | MND | MND | MNR | MNR | MNR | MND | MND | MND | X | X | X | X |

**RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 m brickwork support bracket JVAeco+**

| Parameter | Unit | A1-A3 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|
| Global warming potential | [kg $CO_2$-Eq.] | 4.43E+0 | 8.59E-3 | 0.00E+0 | 2.42E-4 | -2.72E+0 |
| Depletion potential of the stratospheric ozone layer | [kg CFC11-Eq.] | 2.41E-7 | 1.56E-9 | 0.00E+0 | 4.23E-11 | -1.12E-7 |
| Acidification potential of land and water | [kg $SO_2$-Eq.] | 2.22E-2 | 2.23E-5 | 0.00E+0 | 1.46E-6 | -1.59E-2 |
| Eutrophication potential | [kg $(PO_4)^{3-}$-Eq.] | 2.37E-3 | 3.80E-6 | 0.00E+0 | 3.05E-7 | -1.42E-3 |
| Formation potential of tropospheric ozone photochemical oxidants | [kg ethene-Eq.] | 1.07E-3 | 8.18E-7 | 0.00E+0 | 5.09E-8 | -6.52E-4 |
| Abiotic depletion potential for non-fossil resources | [kg Sb-Eq.] | 1.42E-4 | 5.03E-10 | 0.00E+0 | 6.64E-11 | -1.20E-4 |
| Abiotic depletion potential for fossil resources | [MJ] | 4.68E+1 | 1.20E-1 | 0.00E+0 | 3.34E-3 | -2.72E+1 |

**RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A1: 1 m brickwork support bracket JVAeco+**

| Parameter | Unit | A1-A3 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|
| Renewable primary energy as energy carrier | [MJ] | 1.90E+0 | -6.24E-2 | 0.00E+0 | 4.74E-5 | 9.08E-6 |
| Renewable primary energy resources as material utilization | [MJ] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| Total use of renewable primary energy resources | [MJ] | 1.90E+0 | -6.24E-2 | 0.00E+0 | 4.74E-5 | 9.08E-6 |
| Non-renewable primary energy as energy carrier | [MJ] | 5.21E+1 | -1.54E+0 | 0.00E+0 | 1.28E-1 | 3.55E-3 |
| Non-renewable primary energy as material utilization | [MJ] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| Total use of non-renewable primary energy resources | [MJ] | 5.21E+1 | -1.54E+0 | 0.00E+0 | 1.28E-1 | 3.55E-3 |
| Use of secondary material | [kg] | 4.94E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 4.56E-1 |
| Use of renewable secondary fuels | [MJ] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| Use of non-renewable secondary fuels | [MJ] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| Use of net fresh water | [$m^3$] | 1.13E+0 | -1.51E-2 | 0.00E+0 | -2.66E-5 | -4.36E-6 |

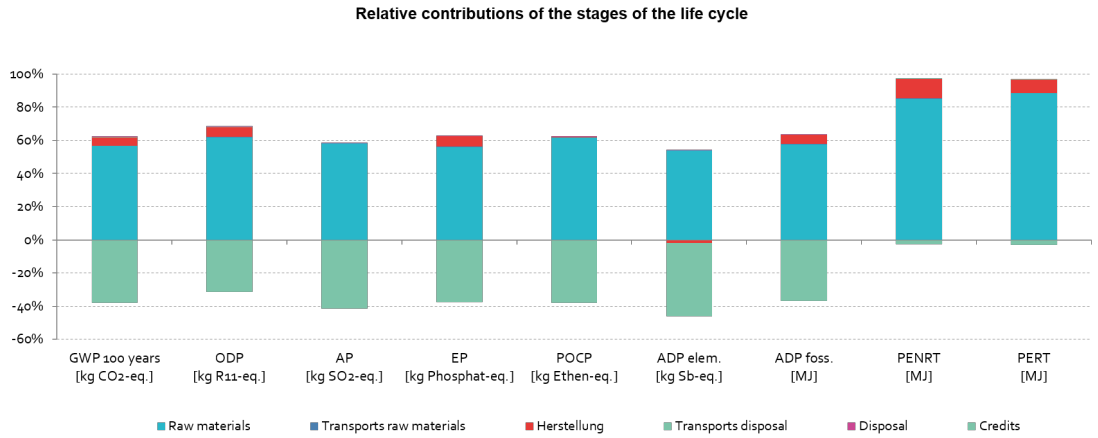
**RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A1: 1 m brickwork support bracket JVAeco+**

| Parameter | Unit | A1-A3 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|
| Hazardous waste disposed | [kg] | 3.67E-5 | -5.73E-7 | 0.00E+0 | 3.20E-7 | 8.50E-9 |
| Non-hazardous waste disposed | [kg] | 5.39E+0 | -2.23E-1 | 0.00E+0 | 5.01E-6 | 4.96E-2 |
| Radioactive waste disposed | [kg] | 1.69E-4 | -3.22E-6 | 0.00E+0 | 8.75E-7 | 2.42E-8 |
| Components for re-use | [kg] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| Materials for recycling | [kg] | 0.00E+0 | 0.00E+0 | 9.50E-1 | 0.00E+0 | 0.00E+0 |
| Materials for energy recovery | [kg] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| Exported electrical energy | [MJ] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| Exported thermal energy | [MJ] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |

## 6. LCA: Interpretation

The following figure shows the relative contributions of different Life Cycle processes and the primary energy demand in the form of a dominance analysis.

The present impact assessment relates to a specific product with a weight of 1 kg. The final products can differ in their dimensions. The results of the impact assessment can be scaled linearly over the weight.




**Indicators of the impact assessment**
The impact categories of brickwork support brackets are determined along the life cycle mainly by the supply of raw materials. The main driver is the use of steel and stainless steel, which contributes approx. 91% of the global warming potential (GWP) within production (A1-A3). Compared to the raw material supply, the contributions to the environmental impacts from the transport (A2) of the primary products and the energy input for production (A3) within the production stage are less pronounced.
For the product, the end-of-life (EoL) results in credits (-2,76 kgCO2eqv.) and charges resulting from the net flow statement for the secondary materials used over the entire life cycle. Credits can be issued for the primary raw materials contained in the product, while debits are incurred for losses of secondary materials used.

**Global warming potential (GWP)**
The GWP factor is determined in particular by the raw material supply with approx. 88 % within the production (A1-A3), followed by the required energy source electricity (10 %) and natural gas (approx. 1 %). The minor scrap losses in the recycling scenario must be compensated within the life cycle consideration by the production of primary steel at the end of its life (D).

**Depletion potential of the stratospheric ozone layer (ODP)**
The ozone depletion potential is mainly determined by the provision of the precursors (approx. 91 %). The use of electricity causes about 8,6 % of the ODP factor within the production module (A3).

**Acidification potential of land and water (AP)**
The acidification potential within the production is determined by the use of precursors at 97 %. The use of energy sources in A3 contributes 4 % to AP.

**Eutrophication potential (EP)**
The eutrophication potential is determined to 86 % by the intermediate products, followed by the use of the energy sources electricity with 13 % in A3.

**Potential of tropospheric ozone photochemical oxidants (POCP)**
The POCP value is dominated to approx. 97 % by the use of steel and stainless steel.

**Abiotic depletion potential for non-fossil resources (ADP elem.)**
The ADP elem. value is almost exclusively determined by the extraction of stainless steel (> 99 %).

**Abiotic depletion potential for fossil resources (ADP foss.)**
The ADP fossil value within production (A1-A3) results mainly from the provision of stainless steel (approx. 88%) and the use of electricity (approx. 10%).

The **total primary energy demand** within the production (A1-A3) is divided into about 96 % from non-renewable energy sources and about 4 % from renewable energies.

## 7. Requisite evidence

Not relevant.

## 8. References

**BBSR**
Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR): Service lifes of construction components. Service lifes of construction components for Life Cycle Assessments according to the assessment system for sustainable construction (BNB), in: Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (ed.), 2017.

**Regulation 528/2012**
Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products, in: Official Journal of the European Union L 161/I, 2012.

**Candidate List**
European Chemical Agency (ECHA): Candidate List of substances of very high concern for Authorisation, in: https://echa.europa.eu/candidate-list-table, 2020.

**CMR Substances**
European Chemical Agency (ECHA): CMR substances from Annex VI of the CLP regulation registered under REACH and/ or notified under CLP.

**Construction Product Regulation**
Construction Product Regulation (CPR): Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC (Text with EEA relevance), in: Official Journal of the European Union, 2011.

**CML 2001**
Centrum voor Milieukunde der Universität Leiden, Institute of Environmental Sciences, Leiden University, The Netherlands: "Life Cycle Assessment. An operational guide to the ISO standards, Volume 1, 2 and 3", 2001.

**European Waste Catalogue**
Waste Classification Ordinance (AVV)/ European Waste Catalogue (EWC): Waste Classification.

**ecoinvent 3.6**
ecoinvent V. 3.6: Databank Version 3.6, Switzerland, Dübendorf, [Access on 09.04.2019].

**EN 845-1**
DIN EN 845-1:2016-12 Specification for ancillary components for masonry - Part 1: Ties, tension straps, hangers and brackets

**EN 1090**
DIN EN 1090-1:2012-02 , Execution of steel and aluminium structures - Part 1: Proof of conformity procedures for structural components.

**General EPD program instructions of the IBU e.V.**
Institut Bauen und Umwelt e.V. (Ed.): The creation of environmental product declarations (EPD), Version 1.1., 2016.

**PCR A**
Product category rules for building-related products and service. Part A: Calculation rules for Life Cycle Assessment and requirements on the project report, version 1.7, 2018. Institut Bauen und Umwelt e.V.

**PCR: Structural steels**
PCR instruction texts for building-related products and services. Part B: EPD requirements for structural steels, version 1.6. Berlin: Institut Bauen und Umwelt e.V. (Ed.), 2017.

**EN 1350**
EN13501-1: 2019, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

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

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

**TP-12-2009**
German Institute for Building Technology: Test report, test report number: TP-12-0009, bracket body of JORDAHL brickwork support brackets JVA+ and JVAeco+, 2018.

**Z-21.8-1868**
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**ISO 9001**
DIN EN ISO 9001:2015-11: Quality management systems - Requirements.

**ISO 50001**
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**ISO 15686**
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