

Owner: Bayo.S Skruefundamenter ApS  
No.: MD-23199-EN  
Issued: 22-02-2024  
Valid to: 22-02-2029

3<sup>rd</sup> PARTY VERIFIED

**EPD**

VERIFIED ENVIRONMENTAL PRODUCT DECLARATION | ISO 14025 & EN 15804



**Owner of declaration**  
 Bayo.S Skruefundamenter ApS  
 Ankervej 1  
 4800 Nykøbing F, Denmark  
 CVR: 39002299



**Issued:**  
22-02-2024

**Valid to:**  
22-02-2029

**Programme**  
 EPD Danmark  
[www.epddanmark.dk](http://www.epddanmark.dk)



- Industry EPD
- Product EPD

**Basis of calculation**  
 This EPD is developed in accordance with the European standard EN 15804+A2.

**Comparability**  
 EPDs of construction products may not be comparable if they do not comply with the requirements in EN 15804. EPD data may not be comparable if the datasets used are not developed in accordance with EN 15804 and if the background systems are not based on the same database.

**Validity**  
 This EPD has been verified in accordance with ISO 14025 and is valid for 5 years from the date of issue.

**Use**  
 The intended use of an EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings.

- EPD type**
- Cradle-to-gate with modules C1-C4 and D
  - Cradle-to-gate with options, modules C1-C4 and D
  - Cradle-to-grave and module D
  - Cradle-to-gate
  - Cradle-to-gate with options

**Declared product(s)**  
 1 kg of ground screws

Number of declared datasets/product variations: 1

**Production site**  
 Ankervej 1  
 4800 Nykøbing F, Denmark


No green certificate has been applied in module A3

**Product(s) use**  
 Foundational ground screws

**Declared/ functional unit**  
 1 kg of ground screw

**Year of production site data (A3)**  
 2022

**EPD version**  
 Version 1

CEN standard EN 15804 serves as the core PCR
Independent verification of the declaration and data, according to EN ISO 14025
<input type="checkbox"/> internal <input checked="" type="checkbox"/> external
Third party verifier:  <hr/> Guangli Du

  
 Martha Katrine Sørensen  
 EPD Danmark

**Life cycle stages and modules (MND = module not declared)**

Product			Construction process		Use								End of life				Beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport	Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Re-use, recovery and 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	MND	MND	MND	MND	MND	X	X	X	X	X	

# Product information

## Product description

The product assessed in this study is foundational ground screws in steel, ready to be installed with the instructions of Bayo.S Skruefundamenter ApS.

The main product components are shown in the table below.

Material	Weight-% of declared product
Steel	96.45
Zinc	3.55

## Product packaging:

The composition of the sales- and transport packaging of the product is shown in the table below. Materials account for 100% of the mass of the declared product packaging.

Material	Weight-% of packaging
Steel	100

## Representativity

This declaration, including data collection and the modeled foreground system including results, represents the production of Bayo.S Skruefundamenter ApS production site in the Czech Republic, and its warehouse and administration sites in Denmark. The geographical area covered is Europe. Product specific data are based on average values collected at the production site for the year 2022. Background data is based on Ecoinvent 3.9.1 (published 01-2023) and complies with EN 15804:2012 + A2:2019, section 6.3.8.2, by being less than 10 years old. Almost all datasets are locally and/or regionally representative (e.g., Denmark, Czech Republic, or Europe), and electricity is country-specific, reflecting practices for A3. Generally, the datasets utilized are of good quality, with a reference year of 2022 in line with the publication of the Ecoinvent database.

## Hazardous substances

The foundational ground screws does not contain substances listed on the "Candidate List of Substances of Very High Concern for authorisation"

(<http://echa.europa.eu/candidate-list-table>)

## Essential characteristics

Bayo.S ground screws are produced in the EU and have a CE marking. The screws are zinc galvanized cf. EN ISO 1461:2022, quality assured cf. SBI 271, and DS1140, and can document carrying capacity cf. Eurocode 7.

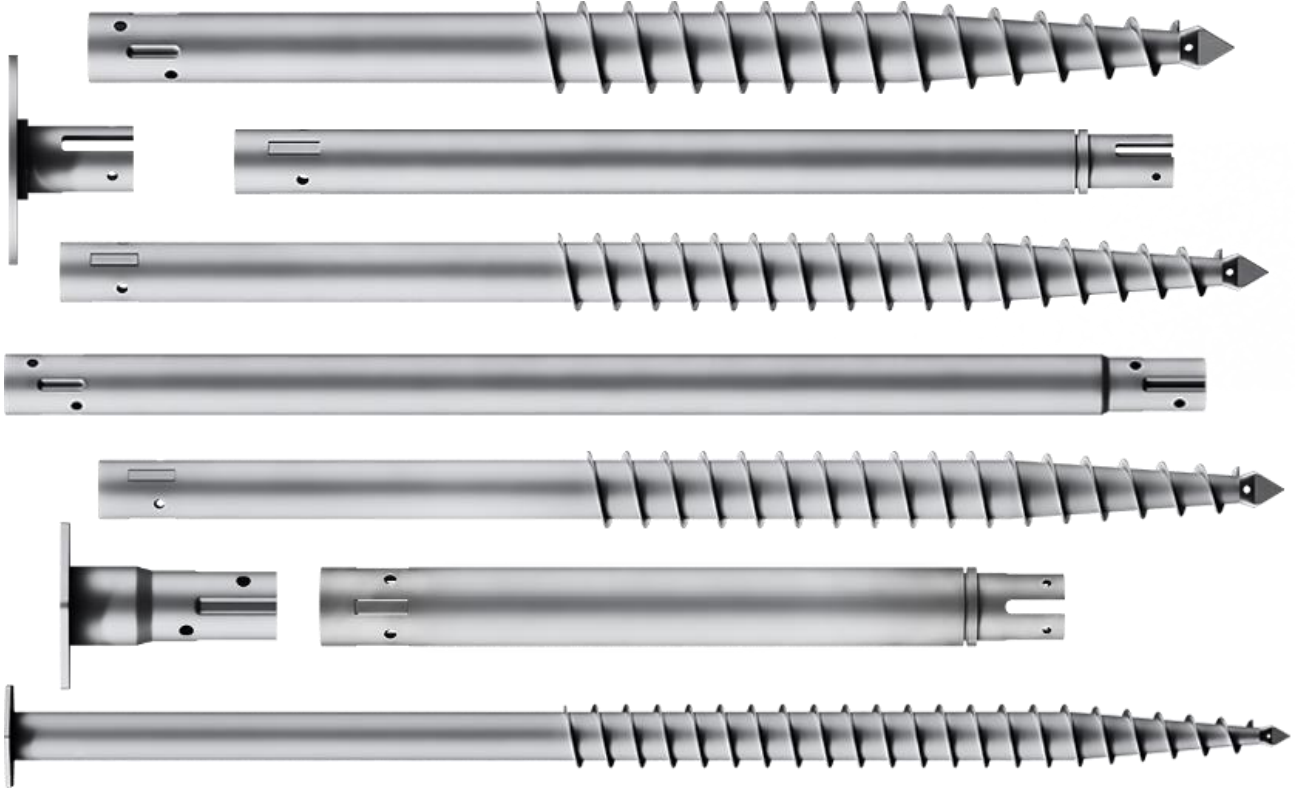
Further technical information can be obtained by contacting the manufacturer or on the manufacturer's website:

<https://www.bayosystem.com/>

## Reference Service Life (RSL)

No reference service life (RSL) has been declared since the scope of this EPD is cradle-to-gate with modules C1-C4 and D. As a result, the use stage (B1-B7) of the declared product is not included.

Picture of product(s)



## LCA background

**Declared unit**

The LCI and LCIA results in this EPD relates to 1 kg of galvanized foundational ground screw, ready for installation. The declared unit embodies 83 ground screw products, which differs in length, screw tip, and top mount, depending on intended use.

Name	Value	Unit
Foundational ground screw	1	kg

**PCR**

This EPD is developed according to the core rules for the product category of construction products in EN 15804+A2, and use no supporting cPCR.

**Guarantee of Origin – certificates**

No GO certificates are being used in Bayo.S Skruefundamenter ApS production, and electricity is modelled by utilizing residual electricity mixes.

**Foreground system:**

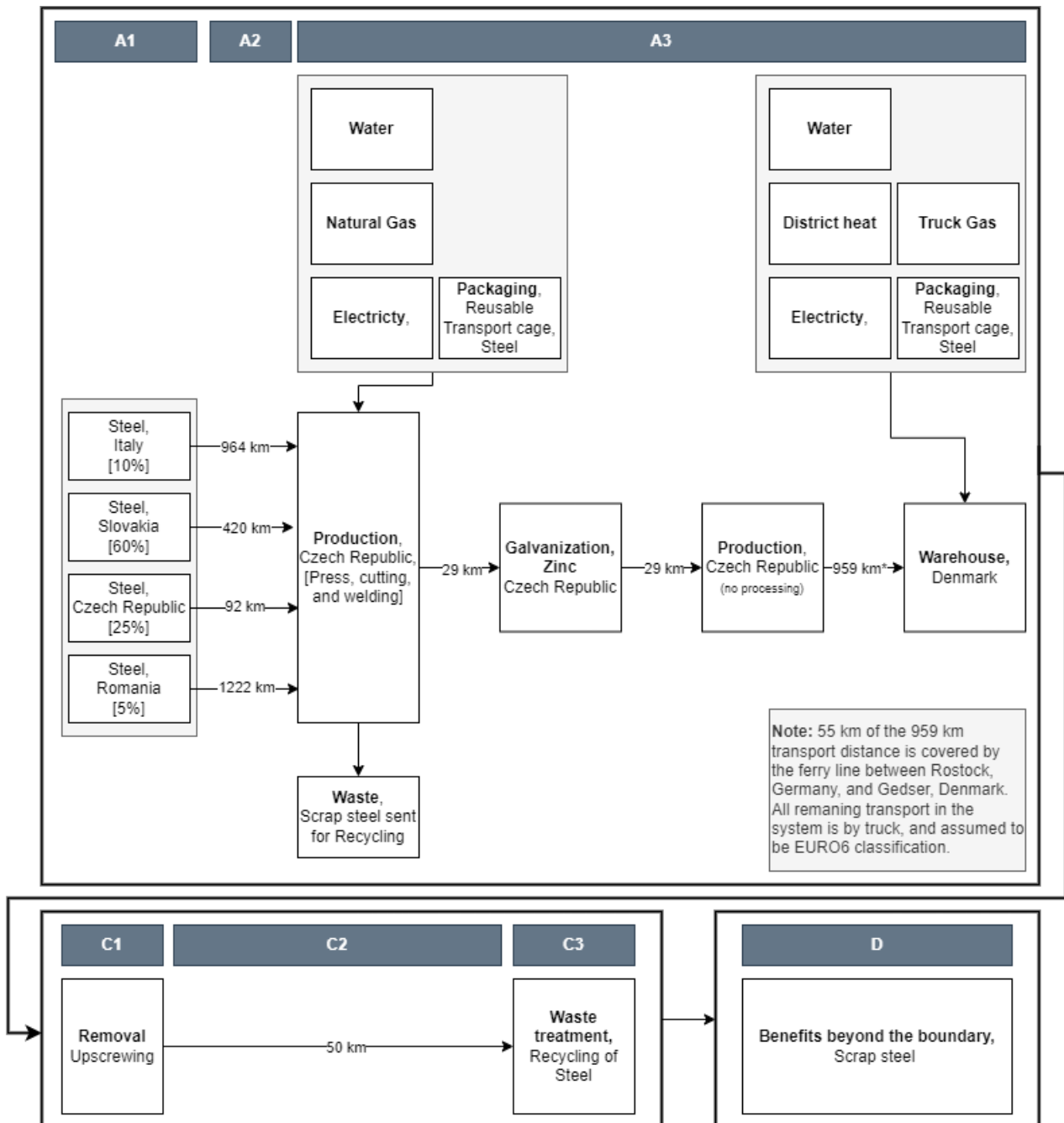
The production at Bayo.S Skruefundamenter ApS (A3) is modelled based on site-specific data for the year 2022. The electricity consumption is modeled with residual electricity mixes for Denmark and the Czech

Republic. The remaining activities are modelled with average supply mixes representing the individual countries (e.g. DK or CZ) or regions (e.g. EU) pertaining to the specific processes in the value chain.

**Background system:**

The database, Ecoinvent 3.9.1 (published 01-2023) is utilized for the background system. As the results both upstream- and downstream activities are based on average supply mixes for the specific country or region depending on the given dataset.

**Flowdiagram**



### System boundary

This EPD is based on a cradle-to-gate with modules C1-C4 and D, in which 100 weight-% has been accounted for. The general rules for exclusion of inputs and outputs follow the requirements in EN 15804, 6.3.5, where the total of neglected input flows per module shall be a maximum of 5 % of energy usage and mass and 1 % of energy usage and mass for unit processes.

### Product stage (A1-A3) includes:

The product stage comprises the acquisition of all raw materials, products, and energy, transport to the production site, packaging and waste processing up to the end-of-waste state, or final disposal. The LCA results are declared in aggregated form for the product stage, which means modules A1, A2, and A3 are declared as one module A1-A3. A European supply mix is applied for A1, based on Bayo.S Skruefundamenter ApS largest suppliers of steel. The steel is transported to production in the Czech Republic, with an applied weighted average distance based on the supply mix. The steel is primarily procured in pipes and press-formed/drawn into the screw shape during A3. Some pieces of the ground screws, e.g., the top parts, are procured in sheets and pressed, and stamped to their desired form. The screw thread is welded on by electric arc welding, while the small coupling points at the top of the screw is cut using a laser. 3% of steel waste is generated during production (primarily during the screw tip cut/laser cut). The 3% leftover scrap waste generated in production is sent for recycling. The shaped ground screws are subsequently zinc galvanized cf. EN ISO 1461:2022 by a galvanizing service provider located near the production site.

After galvanization, the finished products are shipped to Denmark by truck (959 km in total), with water crossing by ferry between Rostock (DE) and Gedser (DK), before arriving in Toreby L (DK) where the warehouse is located. Admin

offices located in Nykøbing F are also included in A3.

For packaging, both for intermediate shipping between the production site and galvanization and for storage and transport to customer, a custom made steel cage is used. This is retrieved back and reused once it has in circulation.

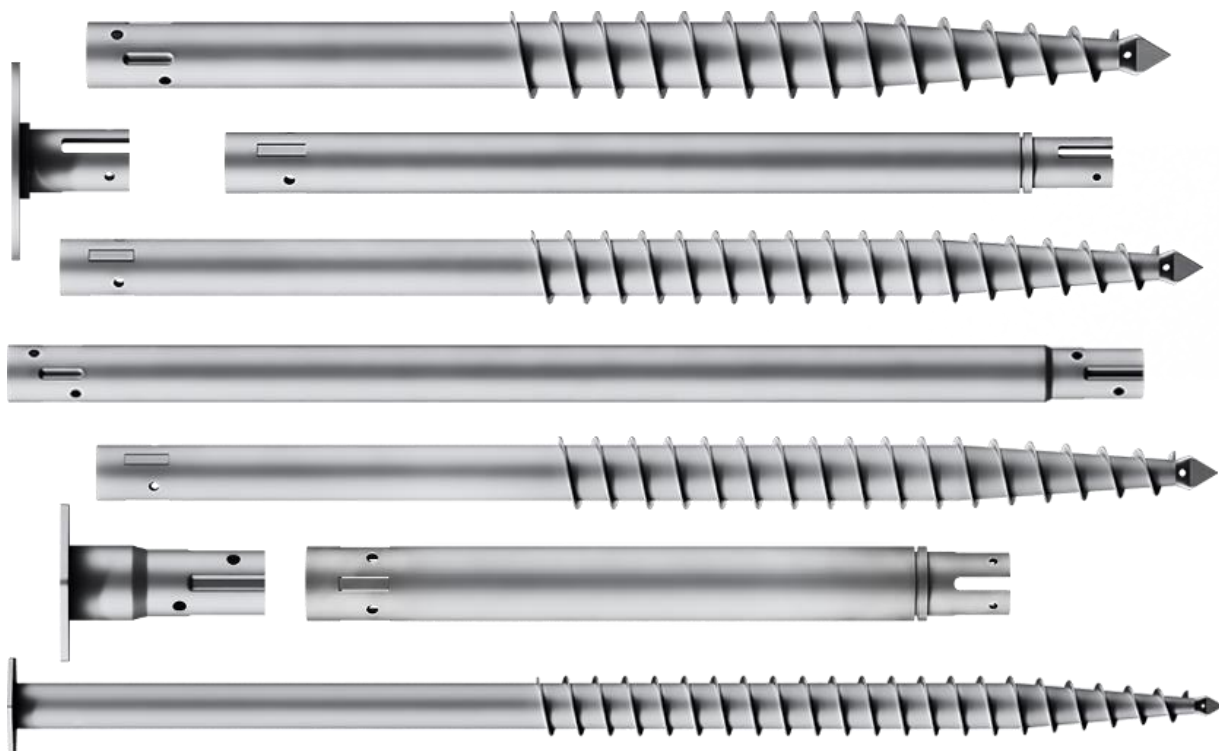
### End of Life (C1-C4) includes:

The deconstruction of the products covered by this study is assumed to be done by means of manually removing it from the ground, or with assistance from a machine specially purposed to install and uninstall the ground screws which utilize 1.2 liters of diesel/hour when uninstalling screws (40% less fuel consumption compared to installation).

The uninstalled ground screws are then transported 50 km by truck to a waste treatment facility where they are to be recycled by being scrapped, pressed, and made ready to be remelted at a metallurgical plant. No processes related to C4 are included in this study, as separation of zinc and steel is made before remelting, as this occurs at remelting and is considered out of the system boundary.

### Re-use, recovery and recycling potential (D) includes:

Emissions related to module D – Benefits beyond the boundary are calculated cf. the equation stated in EN 15804+A2 D.3.4 for secondary materials, utilizing EF 3.1. The iron scrap content (M, MR<sub>in</sub>) is 18.40 % in the steel Bayo.S produces, leaving 82.60% (M, MR<sub>out</sub> – M, MR<sub>in</sub>) of the material to be accounted for in the system. 82.60% of secondary materials substitute the production of unalloyed steel in Europe. Recovery of zinc is not applied in module D due to reasons stated in EoL C1-C4.



# LCA results

ENVIRONMENTAL IMPACTS PER 1 kg of ground screw							
Parameter	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	[kg CO <sub>2</sub> eq.]	2.32E+00	3.57E-01	9.25E-03	6.08E-03	0.00E+00	-1.84E+00
GWP-fossil	[kg CO <sub>2</sub> eq.]	2.31E+00	3.57E-01	9.24E-03	6.08E-03	0.00E+00	-1.83E+00
GWP-biogenic	[kg CO <sub>2</sub> eq.]	4.00E-03	8.20E-05	8.46E-06	3.48E-06	0.00E+00	-4.87E-03
GWP-luluc	[kg CO <sub>2</sub> eq.]	1.15E-03	4.02E-05	4.56E-06	3.67E-06	0.00E+00	-8.64E-04
ODP	[kg CFC 11 eq.]	5.23E-08	5.68E-09	2.01E-10	1.76E-10	0.00E+00	-3.39E-08
AP	[mol H <sup>+</sup> eq.]	8.95E-03	3.31E-03	2.02E-05	4.58E-05	0.00E+00	-7.91E-03
EP-freshwater	[kg P eq.]	1.10E-03	1.10E-05	6.57E-07	5.06E-07	0.00E+00	-9.11E-04
EP-marine	[kg N eq.]	2.16E-03	1.53E-03	5.09E-06	1.76E-05	0.00E+00	-1.73E-03
EP-terrestrial	[mol N eq.]	2.30E-02	1.67E-02	5.18E-05	1.88E-04	0.00E+00	-1.85E-02
POCP	[kg NMVOC eq.]	1.09E-02	4.94E-03	3.13E-05	6.56E-05	0.00E+00	-8.60E-03
ADPm <sup>1</sup>	[kg Sb eq.]	5.64E-05	1.25E-07	3.02E-08	8.44E-09	0.00E+00	-1.77E-05
ADPf <sup>1</sup>	[MJ]	2.71E+01	4.68E+00	1.31E-01	1.51E-01	0.00E+00	-1.91E+01
WDP <sup>1</sup>	[m <sup>3</sup> world eq. deprived]	5.53E-01	1.01E-02	5.41E-04	6.69E-03	0.00E+00	-3.70E-01
Caption	GWP-total = Globale Warming Potential - total; GWP-fossil = Global Warming Potential - fossil fuels; GWP-biogenic = Global Warming Potential - biogenic; GWP-luluc = Global Warming Potential - land use and land use change; ODP = Ozone Depletion; AP = Acidification; EP-freshwater = Eutrophication – aquatic freshwater; EP-marine = Eutrophication – aquatic marine; EP-terrestrial = Eutrophication – terrestrial; POCP = Photochemical zone formation; ADPm = Abiotic Depletion Potential – minerals and metals; ADPf = Abiotic Depletion Potential – fossil fuels; WDP = water depletion potential						
	The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 <sup>2</sup> or 195, while 1,12E-11 is the same as 1,12*10 <sup>-11</sup> or 0,0000000000112.						
Disclaimer	<sup>1</sup> The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.						

ADDITIONAL ENVIRONMENTAL IMPACTS PER 1 kg of ground screw							
Parameter	Unit	A1-A3	C1	C2	C3	C4	D
PM	[Disease incidence]	1.66E-07	9.23E-08	6.88E-10	1.00E-09	0.00E+00	-1.41E-07
IRP <sup>2</sup>	[kBq U235 eq.]	1.68E-01	2.22E-03	1.78E-04	9.59E-05	0.00E+00	-7.24E-02
ETP-fw <sup>1</sup>	[CTUe]	4.56E+01	4.47E+00	1.30E-01	1.42E-01	0.00E+00	-1.35E+01
HTP-c <sup>1</sup>	[CTUh]	2.38E-08	2.19E-10	8.42E-12	5.17E-12	0.00E+00	-2.37E-08
HTP-nc <sup>1</sup>	[CTUh]	6.25E-08	1.52E-09	1.86E-10	6.47E-11	0.00E+00	-4.43E-08
SQP <sup>1</sup>	-	7.76E+00	3.15E-01	7.93E-02	3.01E-01	0.00E+00	-6.41E+00
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Soil Quality (dimensionless)						
	The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 <sup>2</sup> or 195, while 1,12E-11 is the same as 1,12*10 <sup>-11</sup> or 0,0000000000112.						
Disclaimers	<sup>1</sup> The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.						
	<sup>2</sup> 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.						

## RESOURCE USE PER 1 kg of ground screw



Parameter	Unit	A1-A3	C1	C2	C3	C4	D
PERE	[MJ]	1.16E+00	2.66E-02	2.06E-03	1.28E-03	0.00E+00	-2.16E+00
PERM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	[MJ]	1.16E+00	2.66E-02	2.06E-03	1.28E-03	0.00E+00	-2.16E+00
PENRE	[MJ]	2.89E+00	3.30E-02	2.91E-03	1.61E-03	0.00E+00	-1.20E+00
PENRM	[MJ]	2.42E+01	4.65E+00	1.28E-01	1.50E-01	0.00E+00	-1.79E+01
PENRT	[MJ]	2.71E+01	4.68E+00	1.31E-01	1.51E-01	0.00E+00	-1.91E+01
SM	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	[m³]	5.37E-01	1.01E-02	5.39E-04	6.69E-03	0.00E+00	-4.19E-01
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials; PENRM = Use of non renewable primary energy resources used as raw materials; PENRT = Total use of non renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non renewable secondary fuels; FW = Net use of fresh water The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 <sup>2</sup> or 195, while 1,12E-11 is the same as 1,12*10 <sup>-11</sup> or 0,0000000000112.						

WASTE CATEGORIES AND OUTPUT FLOWS PER 1 kg of ground screw							
Parameter	Unit	A1-A3	C1	C2	C3	C4	D
HWD	[kg]	1.57E-03	9.32E-06	2.45E-06	1.06E-06	0.00E+00	-3.09E-04
NHWD	[kg]	5.42E-01	6.69E-03	6.52E-03	1.00E+00	0.00E+00	-8.89E-01
RWD	[kg]	4.15E-05	5.13E-07	4.31E-08	2.24E-08	0.00E+00	-1.83E-05

CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	[kg]	2.89E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	[kg]	1.82E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Caption	HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 <sup>2</sup> or 195, while 1,12E-11 is the same as 1,12*10 <sup>-11</sup> or 0,0000000000112.						

BIOGENIC CARBON CONTENT PER 1 kg of ground screw		
Parameter	Unit	At the factory gate
Biogenic carbon content in product	[kg C]	0.00
Biogenic carbon content in accompanying packaging	[kg C]	0.00
Note	1 kg biogenic carbon is equivalent to 44/12 kg of CO <sub>2</sub>	

# Additional information

## LCA interpretation

The production of upstream processes such as pig iron, is the largest contributor in the system in terms of GWP. The zinc galvanization proves to be a significant factor for the environmental impacts, despite its relatively low material contribution. Lastly, transport does influence the system, but is not detrimental to the vast majority of environmental impact categories.

## Technical information on scenarios

### End of life (C1-C4)

Scenario information	Value	Unit
Collected separately	0.00	kg
Collected with mixed waste	0.00	kg
For reuse	0.00	kg
For recycling	1.00	kg
For energy recovery	0.00	kg
For final disposal	0.00	kg

### Re-use, recovery and recycling potential (D)

Scenario information/Materiel	Value	Unit
Displaced material	0.82	kg


#### **Indoor air**

*The EPD does not give information on release of dangerous substances to indoor air because the horizontal standards on the relevant measurements are not available. Read more in EN15804+A1 chapter 7.4.1.*

#### **Soil and water**

*The EPD does not give information on release of dangerous substances to soil and water because the horizontal standards on the relevant measurements are not available. Read more in EN15804+A1 chapter 7.4.2.*

# References

<p><b>Publisher</b></p>	 <a href="http://www.epddanmark.dk">www.epddanmark.dk</a> <small>Template version 2023.1</small>
<p><b>Programme operator</b></p>	<p>Danish Technological Institute  Buildings &amp; Environment  Gregersensvej  DK-2630 Taastrup  <a href="http://www.teknologisk.dk">www.teknologisk.dk</a></p>
<p><b>LCA-practitioner</b></p>	 <a href="http://www.EnergySolution.dk">www.EnergySolution.dk</a> True Møllevej 1, 8381 Tilst Project Lead: Jesper Kokborg Lassen Project Support: Philip Mckay Boyle
<p><b>LCA software / background data</b></p>	<p><i>SimaPro 9.5</i>  ecoinvent 3.9.1 allocation, cut-off by classification  EN 15804 reference package 3.1</p>
<p><b>3<sup>rd</sup> party verifier</b></p>	<p><i>Guangli Du</i>  Department of the Built Environment, Aalborg University, Denmark</p>

**General programme instructions**

General Programme Instructions, version 2.0, spring 2020  
[www.epddanmark.dk](http://www.epddanmark.dk)

**EN 15804**

DS/EN 15804 + A2:2019 - "Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products"

**EN 15942**

DS/EN 15942:2011 – " Sustainability of construction works – Environmental product declarations – Communication format business-to-business"

**ISO 14025**

DS/EN ISO 14025:2010 – " Environmental labels and declarations – Type III environmental declarations – Principles and procedures"

**ISO 14040**

DS/EN ISO 14040:2008 – " Environmental management – Life cycle assessment – Principles and framework"

**ISO 14044**

DS/EN ISO 14044:2008 – “ Environmental management – Life cycle assessment – Requirements and guidelines”