ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	voestalpine AG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-VOE-20230104-IBC2-EN
Issue date	09.05.2023
Valid to	08.05.2028

Annealed wire rod

voestalpine Wire Rod Austria GmbH

Institut Bauen und Umwelt e.V.

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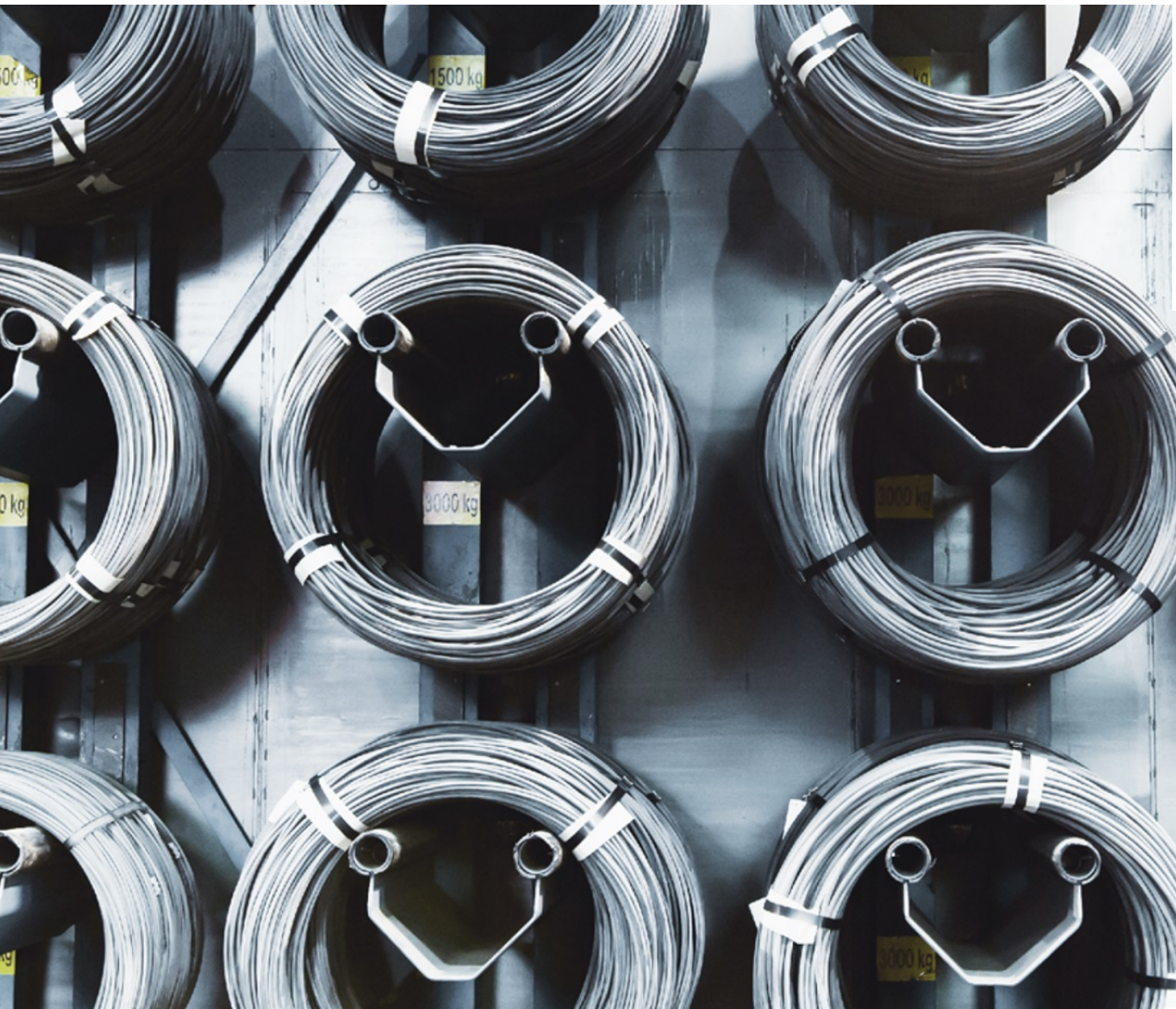


1. General Information

voestalpine Wire Rod Austria GmbH

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-VOE-20230104-IBC2-EN

This declaration is based on the product category rules:

Structural steels, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

09.05.2023

Valid to

08.05.2028

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

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Annealed wire rod

Owner of the declaration

voestalpine AG
voestalpine-Straße 3
4020 Linz
Austria

Declared product / declared unit

1 tonne of annealed wire rod

Scope:

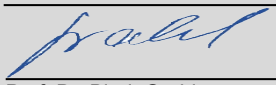
This EPD is based on a declared unit of 1 metric tonne of average voestalpine annealed wire rod produced at the production site in St. Peter Freienstein (Austria).

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally



Prof. Dr. Birgit Grahl,
(Independent verifier)

2. Product

2.1 Product description/Product definition

Wire rod made by voestalpine in St. Peter Freienstein is the base product for lots of applications, that require un- or low alloyed steel in round shape. Wire rod is hot rolled in dimensions from 5 to 52 mm.

A large part of the produced wire rod is delivered to voestalpines' own drawing facilities Wire Austria, Wire Germany, Wire Italy and Special Wire for further processing. Many customers use wire rod directly to manufacture finished- or semi-finished products.

After the rolling process, wire rod can be heat treated in annealing furnaces to achieve better deformation- and mechanical properties. The heat treatment is considered in this EPD.

For the use and application of the product the respective national provisions at the place of use apply, in Germany for example the building codes of the federal states and the corresponding national specifications.

2.2 Application

Wire rod from voestalpine Wire Rod Austria GmbH is used for a variety of applications.
The main amount is used for cold heading products.
Typical examples are fasteners, bolts and rivets, ball studs, high-strength screws and highly loaded shafts for automotive lightweight construction. Further important products made out of wire rod are springs, bearings,chains, as well as welding wire.

Un- and low-alloyed steel grades categories:

- Cold forging steel
- Spring steel
- Chain steel
- Bearing steel
- Soft drawing steel
- Saw wire
- Prestressing wire
- Machining steel
- Welding wire
- Cold-work steel

Market Segments:

- Automotive
- Construction
- Mechanical Engineering
- Energy
- White goods
- others

2.3 Technical Data

This EPD applies to all wire rod in the condition 'annealed' from voestalpine Wire Rod Austria GmbH, which is why a general statement about mechanical properties is not possible. The technical data given for the products are generic literature data for steel as described e.g. in *Key to Steel*. No product-specific test rules are applicable to the data given:

Constructional data

Name	Value	Unit
Density	7850	kg/m3
Young's modulus	210000	N/mm2
Thermal expansion coefficient	12*10-6	K-1
Thermal conductivity	48	W/(mK)
Melting temperature pure iron	1536	°C

The standard product range of voestalpine Wire Rod Austria contains around 500 different steel grades and a total number of 3500 grades can be produced on customers' demands.

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

2.4 Delivery status

The produced wire rod has a standard diameter range between 5 and 52 mm. By applying the *EN 10108* standard, tight tolerances are guaranteed. Due to our state-of-the-art rolling technologies, even stricter tolerances are achieved.

Delivery Condition acc. to *EN 10027*:

- +U +AC (annealed on spheroidised carbide)

2.5 Base materials/Ancillary materials

100 % of the pre-material for the wire rod rolling process is made by voestalpine Stahl Donawitz GmbH, which is located right next to the wire rod rolling mill. The maximum alloyment content is around 5 %.

The steel is produced by one of the two blast furnaces using the Linz-Donawitz-process (oxygen converter), which was developed by voestalpine in 1949.

The steel works from voestalpine in Donawitz uses approximately 20 % - 30 % of scrap (internal and external) for its steel production.

Depending on the steel grade and application the liquid steel is poured into one of the two continuous casting lines of voestalpine Stahl Donawitz and rolled over to a square billet format of 150 mm x 150 mm.

Each billet has a length up to approximately 18 m, a weight up to 3 tonnes and is transported to the wire rod mill by train.

This product/article/at least one partial article contains substances listed in the *candidate list* (date: 16.1.2020) exceeding 0.1 percentage by mass: **no**.

This product/article/at least one partial article contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the *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**.

2.6 Manufacture

The billets from voestalpine Stahl Donawitz GmbH are heated up in the walking beam furnace to reach the required rolling temperature.

For dimensions up to 23 mm the loop-laying head and cooling conveyor line is used. The bar in coil line is used to produce dimensions from 24 mm to 52 mm.

A total number of 36 rolling stands, deform the wire rod to its final dimension. Waterboxes along the rolling lines ensure that the required rolling temperatures are achieved.

After the rolling process, the wire rod is pickled in hydrochloric acid to remove scale.
The following heat treatment (annealing) takes place in a bell-type annealing furnace with a capacity of 48 t, temperatures around 700 °C and times up to ~24 hours.

Depending on customer requirements, voestalpine Wire Rod Austria can apply 43 different annealing programs on the wire rod depending on the diameter and steel grade. The goal is to achieve a spherodized carbide structure on the wire rod to optimize its deformation capability.

2.7 Environment and health during manufacturing

voestalpine Wire Rod Austria GmbH in St. Peter Freienstein is certified according to *EMAS III, ISO 9001, ISO 50001, ISO 45001 and ISO 14001*. As part of the environmental declarations required by EMAS, voestalpine Wire Rod Austria GmbH continuously publishes environmentally relevant data and facts about the site.

At the St. Peter Freienstein site, investments are constantly being made in the expansion of environmental protection measures in order to be able to reduce emissions to air and water to a minimum.

All operating facilities that have been approved in accordance with the environmental impact assessment procedure are also periodically inspected by the authorities as part of environmental inspections.

2.8 Product processing/Installation

Wire Rod products from voestalpine Wire Rod Austria GmbH are processed by a broad range of different customers in the respective factories. Depending on the desired application, the wire rod is further processed in different ways, e.g. drawing, cold heading, turning, bending or spring coiling.

2.9 Packaging

Wire rod is mostly delivered by truck or train. For selected customers voestalpine Wire Rod Austria is also able to supply by ship.

The products are delivered in coil shape either as a single bundle (3 t coil) or double bundle (2 x 1,5 t coils). These bundles are strapped together using metal straps to ensure a stable position on the trucks/train.

In case the coils are loaded on a ship a seaproof packaging is applied on the wire rod by wrapping it in plastic foil.

For surface treated material it is possible to use wooden frames on the truck to ensure a secure transport.

This EPD considers steel bands as packaging. The majority of products is delivered without additional packaging.

Coil dimensions:

- Inner diameter ~ 850 mm
- Outer diameter ~ 1250 mm
- Length ~ 2 x 1200 mm or 1 x 2400 mm
- Weight: ~ 2 x 1,5 t or 1 x 3 t

2.10 Condition of use

There is no change in material composition over the service life of the product. If used as intended, no effects on the environment are to be expected.

2.11 Environment and health during use

During the use of wire rod products, no effects on human and animal health and no harmful emissions to air, soil and water are expected.

2.12 Reference service life

Due to the variety of applications and their stresses, voestalpine Wire Rod Austria GmbH does not specify a reference service life for wire rod products. Corrosive atmospheres must be avoided to guarantee a full lifetime of functionality.

2.13 Extraordinary effects

Fire
Steel wire rod is not flammable, therefore no flammable gases or vapours escape.

Water
No negative consequences for the environment are to be expected under the influence of water.

Mechanical destruction
Unpredictable mechanical impact on the declared products has no negative consequences on the environment due to the plastic deformability of steel.

2.14 Re-use phase

The declared products from voestalpine Wire Rod Austria GmbH consist of almost 100 % steel and can therefore be reused or recycled in the steel industry as a secondary raw material for an unlimited number of circles.

2.15 Disposal

The declared product can be fully used as a recycling raw material. The waste code according to the *European Waste Catalogue* is: 17 04 05 (iron and steel). The waste type is equivalent to the key number 35103 according to the nationally applicable Waste Catalogue by-law.

2.16 Further information

Further information on the product is available on the website at https://www.voestalpine.com/wiretechnology/en/contact/production-ites/voestalpine-wire-rod-austria/

3. LCA: Calculation rules

3.1 Declared Unit

This environmental product declaration refers to a declared unit of 1 tonne of average annealed wire rod.

Declared unit

Name	Value	Unit
Declared unit	1	t
Density	7850	kg/m^3

For the calculation of the declared average, input and production quantities for the entire calendar year 2018 were

taken into account and broken down to the declared product group. The calculated results can thus be considered representative for the declared product portfolio of annealed wire rod of voestalpine Wire Rod Austria GmbH.

A linear correlation of the environmental impacts with the product weight is to be expected. Therefore, the conversion from the declared unit to a specific product is possible using a mass-specific scaling factor.

3.2 System boundary

The life cycle assessment of average annealed wire rod refers to a cradle-to-gate analysis with modules (A1–A3 + C +D). Subsequent life cycle phases are part of the analysis:

Module A1–A3 | Production stage
The production stage includes the burdens of the production of annealed wire rod of voestalpine Wire Rod Austria GmbH at the production site in St. Peter Freienstein. The used steel billets are provided by the integrated steel mill at the production site in Donawitz. Thus, the upstream environmental impact of the steel supplied is represented by primary data of the respective production site. Material and energy flows for the rolling line, pickling and annealing are considered. Electricity at St. Peter Freienstein is provided from the network of the integrated steel mill at the production site in Donawitz. The power plant is represented based on the site-specific conditions. Data for the representation of the power plant refers to the year 2017. Since 2020, Donawitz purchases 100 % green electricity, which is also considered in this EPD. Thermal energy provision is based on natural gas. Module A1–A3 also includes the production of the packaging.

Module C1 | Deconstruction and demolition
It is assumed that the product is not connected with other materials and can therefore be dismantled. Associated efforts are negligible, no environmental impacts from the deconstruction of the products are declared.

Module C2 | Transport
The transport to the disposal of the material is estimated declaring a 50 km radius to the waste processing.
Module C3 | Waste processing
Product flows that reach Module D for recycling leave the product system in C3. Environmental impacts resulting from the grinding and sorting of steel scrap are not included due to the negligible expected environmental impact.

Module C4 | Landfilling
Module C4 declares the environmental impacts incurred by landfilling (5 % of the product).

Module D | Benefits and loads beyond the system boundary
The potential for substituting primary steel with a recycling scenario (95 % of the product) is outlined in Module D.

3.3 Estimates and assumptions

All assumptions are verified through detailed documentation and correspond to the best possible representation of reality based on the available data. Regional applicability of the used background data refers to average data under European or German conditions taken from the *GaBi*-database. German data were used for the Austrian market whenever European or Austrian average data were not available.

3.4 Cut-off criteria

All inputs and outputs for which data are available are included in the LCA model. Data gaps are filled with conservative assumptions from average data (when available) or with generic data and are documented accordingly. Only data with a contribution of less than 1 % were cut off. Ignoring such data is justified based on the irrelevance of the expected effect. Processes, materials, or emissions known to make a significant contribution to the environmental effects of the products under examination have not been neglected. All relevant data were collected comprehensively. It is assumed that the data have been completely recorded and the overall total of ignored input flows do not amount to more than 5 % of total energy and mass flows.
Environmental impacts of machines, plant and infrastructure were not included.

3.5 Background data

This study uses generic background data for the evaluation of upstream environmental impacts from *GaBi*-database 2021.1 and is modelled in *GaBi*-software version 10.

3.6 Data quality

The foreground data collected at voestalpine Wire Rod Austria GmbH are based on the quantities used and volumes produced annually. Process data were collected by voestalpine in the course of reporting to official agencies. Data on material and energy use originate from material-specific throughput measurements of various processes as well as from controlling. The technological, geographical and time-related representativeness of the data base was kept in mind when selecting background data. Whenever specific data were missing, either generic datasets or representative average data were used instead. The implemented *GaBi* background datasets are not more than ten years old.

3.7 Period under review

Foreground data were collected in the 2018 production year, and the data are based on the volumes produced on an annual basis.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Austria

3.9 Allocation

The primary data for the upstream production of the steel billets were allocated using the partitioning approach developed by *worldsteel 2014* for calculating life cycle inventories of co-products in steel production, which is in line with the provisions of *EN 15804*. The so-called partitioning approach provides for the allocation of environmental effects on the steelmaking process and the emerging byproducts based on physical relations. Material-inherent flow properties are, thus, taken into account.

Economic allocation is not considered as referring byproducts and co-products are not directly tradable goods. Furthermore, long-term contracts for the sale of the byproducts exist, and the negotiated prices are, therefore, not subject to market dynamics.

3.10 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 *GaBi* background database was used to calculate the LCA (*GaBi* 10; 2021.1).

4. LCA: Scenarios and additional technical information

Characteristic product properties biogenic carbon

The declared product does not contain any biogenic carbon. The considered packaging does not contain any biogenic carbon either.

Installation into the building (A5)

The end-of-life of the packaging materials is not declared in Module A5.

Name	Value	Unit
Packaging (steel coil)	5.42	kg

The end-of-life scenario used in this LCA study is based on the following assumptions and thus complies with the specifications published in *ökobaudat 2022*:

End of life (C1–C4)

Name	Value	Unit
Collected separately (steel)	1000	kg
Recycling 95 %	950	kg
Landfilling 5 %	50	kg

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

Name	Value	Unit
Net flow of steel scrap	908	kg

This scenario contains a recycling rate of 95 %. Since voestalpine externally purchases scrap for steel production, this is offset against the steel scrap for recycling (net flow).

5. LCA: Results

The following table contains the LCA results for a declared unit of 1 tonne of annealed wire rod.

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	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 tonne annealed wire rod

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential total (GWP-total)	kg CO_2 eq	2.95E+03	0	3.02E+00	0	2.42E+00	-1.54E+03
Global Warming Potential fossil fuels (GWP-fossil)	kg CO_2 eq	2.93E+03	0	3E+00	0	2.44E+00	-1.54E+03
Global Warming Potential biogenic (GWP-biogenic)	kg CO_2 eq	1.66E+01	0	-3.56E-03	0	-2.5E-02	-9.97E-01
Global Warming Potential luluc (GWP-luluc)	kg CO_2 eq	9.95E-01	0	2.44E-02	0	2.44E-03	2.23E-01
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	8.21E-12	0	5.9E-16	0	5.77E-15	-2.57E-12
Acidification potential of land and water (AP)	mol H^+ eq	9.16E+00	0	9.92E-03	0	7.78E-03	-2.76E+00
Eutrophication potential aquatic freshwater (EP-freshwater)	kg P eq	1.07E-02	0	8.88E-06	0	1.86E-06	-3.15E-04
Eutrophication potential aquatic marine (EP-marine)	kg N eq	2.21E+00	0	4.55E-03	0	1.93E-03	-4.12E-01
Eutrophication potential terrestrial (EP-terrestrial)	mol N eq	2.38E+01	0	5.08E-02	0	2.12E-02	-4.01E+00
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	7.5E+00	0	8.94E-03	0	6.08E-03	-2.11E+00
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	5.2E-03	0	2.65E-07	0	1.68E-07	-3.35E-03
Abiotic depletion potential for fossil resources (ADPF)	MJ	2.66E+04	0	3.98E+01	0	3.56E+01	-1.34E+04
Water use (WDP)	m^3 world eq deprived	2.82E+02	0	2.77E-02	0	-2.89E-02	-3.02E+02

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 tonne annealed wire rod

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier (PERE)	MJ	1.98E+03	0	2.29E+00	0	2.57E+00	1.23E+03
Renewable primary energy resources as material utilization (PERM)	MJ	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ	1.98E+03	0	2.29E+00	0	2.57E+00	1.23E+03
Non renewable primary energy as energy carrier (PENRE)	MJ	2.67E+04	0	4E+01	0	3.56E+01	-1.34E+04
Non renewable primary energy as material utilization (PENRM)	MJ	0	0	0	0	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	2.67E+04	0	4E+01	0	3.56E+01	-1.34E+04
Use of secondary material (SM)	kg	9.16E+01	0	0	0	0	9.08E+02
Use of renewable secondary fuels (RSF)	MJ	0	0	0	0	0	0
Use of non renewable secondary fuels (NRSF)	MJ	0	0	0	0	0	0
Use of net fresh water (FW)	m^3	1.53E+01	0	2.62E-03	0	3.67E-04	-6.78E+00

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 tonne annealed wire rod

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	5.59E-06	0	2.11E-09	0	6.3E-09	3.74E-06
Non hazardous waste disposed (NHWD)	kg	3.92E+01	0	6.27E-03	0	5.01E+01	1.61E+02
Radioactive waste disposed (RWD)	kg	2.4E-01	0	7.25E-05	0	4.05E-04	4.85E-04
Components for re-use (CRU)	kg	0	0	0	0	0	0
Materials for recycling (MFR)	kg	0	0	0	9.5E+02	0	0
Materials for energy recovery (MER)	kg	0	0	0	0	0	0
Exported electrical energy (EEE)	MJ	0	0	0	0	0	0
Exported thermal energy (EET)	MJ	0	0	0	0	0	0

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 tonne annealed wire rod

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Incidence of disease due to PM emissions (PM)	Disease incidence	ND	ND	ND	ND	ND	ND
Human exposure efficiency relative to U235 (IR)	kBq U235 eq	ND	ND	ND	ND	ND	ND
Comparative toxic unit for ecosystems (ETP-fw)	CTUe	ND	ND	ND	ND	ND	ND

Comparative toxic unit for humans (carcinogenic) (HTP-c)	CTUh	ND	ND	ND	ND	ND	ND
Comparative toxic unit for humans (noncarcinogenic) (HTP-nc)	CTUh	ND	ND	ND	ND	ND	ND
Soil quality index (SQP)	SQP	ND	ND	ND	ND	ND	ND

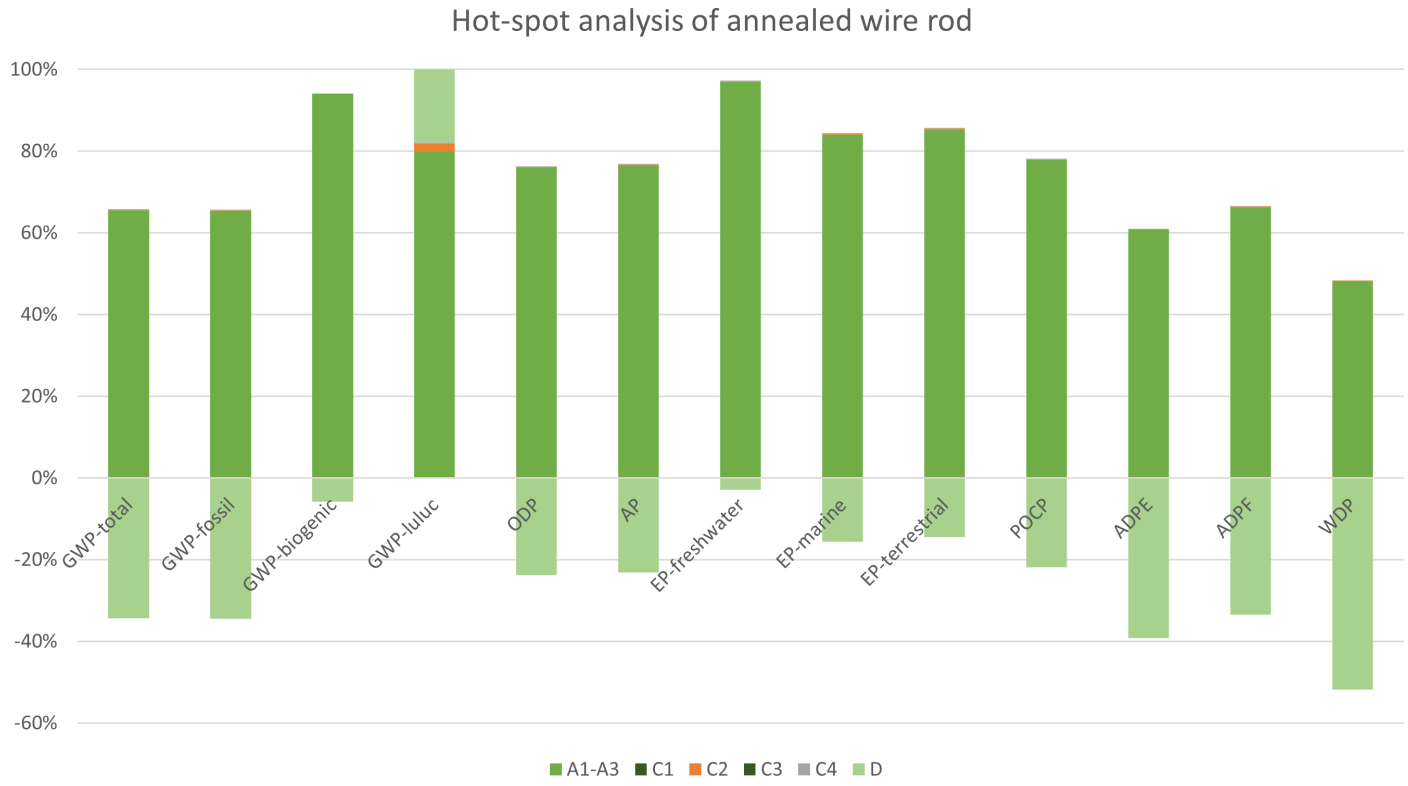
The additional and optional impact categories according to *EN 15804*+A2 are not declared, as the uncertainty of these indicators is to be classified as high.

Disclaimer 1 – for the indicator potential human exposure efficiency relative to U235:
This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators abiotic depletion potential for non-fossil resources,abiotic depletion potential for fossil resources, water (user) deprivation potential, deprivation weighted water consumption, eutrophication fraction of nutrients reaching freshwater end compartment, potential comparative toxic unit for humans cancerogenic, potential comparative toxic unit for humans not cancerogenic, potential soil quality index:
The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

6. LCA: Interpretation

The following interpretation contains a summary of the LCA results referenced to a declared unit of 1 tonne of annealed wire rod.



A comparison of the individual lifecycle phases results in a clear dominance of the production phase (modules A1–A3). The environmental effects in the production phase are mainly dominated by the direct process emissions of billet production.

As a result of product recyclability, the material removed at the end of life can substitute primary steel. According to the set method, the first step is to saturate the secondary material used in module A with material from module C. The excess amount from module C ('net flow') can substitute primary steel and leads to corresponding substitution potentials in module D.

The environmental impact of the transport of the products to recycling (C2) as well as landfilling of the losses at the end of life (C4) represents a minor contribution to the overall environmental impact of the product.

Most of the potential environmental impacts of the production phase (module A1–A3) of the annealed wire rod can be traced back to the billet production in Donawitz. The production of annealed wire rod at the production site at St. Peter Freienstein contributes app. 10 % to global warming potential.

A linear correlation of the environmental impacts with the product weight is to be expected. Therefore, the conversion from the declared unit to a specific product is possible using a mass-specific scaling factor.

All primary data were specifically broken down to the declared product group. As a result, the representativity of the results for the declared product group is to be expected as high.

7. Requisite evidence

Not relevant for this EPD.

8. References

Standards

EN 10027-1
DIN EN 10027-1:2016, Designation systems for steels - Part 1: Steel names.

EN 10108
DIN EN 10108:2004, Round steel rod for cold heading and cold extrusion Dimensions and tolerances.

EN 15804
DIN EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

ISO 9001
DIN EN ISO 9001:2015-11, Quality management systems - Requirements.

ISO 14001
DIN EN ISO 14001:2015-11, Environmental management systems - requirements with guidance for use.

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

ISO 14044
DIN EN ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidance.

ISO 45001
DIN EN ISO 45001:2018-03, Occupational health and safety management systems - Requirements with guidance for use.

ISO 50001
DIN EN ISO 50001:2018-12, Energy management systems - Requirements with guidance for use.

Further references

Candidate list
Candidate List of Substances of Very High Concern (ECHA Candidate List) of 16.01.2020, published in accordance with Article 59 (10) of the REACH Regulation Helsinki: European Chemicals Agency.

EMAS III
Regulation (EC) No 1221/2009 of the European parliament and of the council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC.

European Waste Catalogue
Guidance on classification of waste according to EWC Stat categories. Supplement to the Manual for the Implementation of the Regulation (EC) No 2150/2002 on Waste Statistics. Commission of the European Communities, EUROSTAT.

GaBi
GaBi 10, Software System and Database for Life Cycle Engineering. DB 2021.1. Sphera, 1992-2021. Available in: http://documentation.gabisoftware.com

IBU 2021
Institut Bauen und Umwelt e.V.: General guidance for the EPD program of the Institut Bauen und Umwelt e.V.. (IBU). Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021. www.ibu-epd.com

Key to Steel
Key to Steel (Stahlschlüssel) 2019, 25. edition, 2023, Verlag Stahlschlüssel Wegst GmbH, Germany.

ökobaudat 2022
ökobaudat 2022. EN 15804 and BNB compliant data for over 700 building products.

Ordinance on Biocide Products
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.

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