# 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-20230457-IBA1-EN |
| Issue date | 19.03.2024 |
| Valid to | 18.03.2029 |

## Drawn wire

## voestalpine Wire Germany GmbH

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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# 1. General Information

## voestalpine Wire Germany GmbH

**Programme holder**

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

**Declaration number**

EPD-VOE-20230457-IBA1-EN

**This declaration is based on the product category rules:**

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

**Issue date**

19.03.2024

**Valid to**

18.03.2029

## Drawn wire

**Owner of the declaration**

voestalpine AG
voestalpine-Straße 3
4020 Linz
Austria

**Declared product / declared unit**

1 ton of drawn wire

**Scope:**

This EPD is based on a declared unit of 1 metric ton of an average drawn wire produced at the production site in Finsterwalde (Germany).

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 |

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

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

Matthias Schulz,
(Independent verifier)

# 2. Product

## 2.1 Product description/Product definition

Cold heading wires (CHQ) are used to produce parts of complex shapes by means of cold forming operations, using different production techniques, such as cutting, heading, upsetting, extrusion or rolling. This kind of forming process can also be complemented by different machining operations, such as turning, grinding, polishing and others.

Bearing steel wires are part of the voestalpine Wire Germany GmbH product range. The properties of these wires are optimized to produce ball, roller, cylindrical and needle bearings. Generally, bearing steels are characterized by good hardenability and high surface hardness, which results in little material abrasion during use.
Low-Carbon wires are unalloyed carbon steels with a carbon content of less than 0.25 %. Iron wire is drawn from a non-heat-treated wire rod or is heat treated before, between or after drawing.

Free-cutting steel wires are also a part of the voestalpine Wire Germany GmbH product range and are optimized for processing on automated machine tools.

Welding wires are used for a variety of products. Depending on the cold working and heat treatment, wire is used to make e.g. wire ropes, barbed wire, wire mesh, nails, but also springs, welded steel mesh and reinforcing wire used.

In order to fulfil certain requirements concerning mechanical properties and deformability, specific chemical compositions, as well as optimized production processes are used to produce cold heading, bearing and steel wires.

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

Cold heading wire products from voestalpine Wire Germany GmbH are used to produce a variety of components ranging from safety parts, fasteners, fixations, chains, bolts and rivets to ball studs and gear wheels.

Special products include cold heading wire for high-strength screws and highly loaded shafts for automotive lightweight construction.

Bearing steel wire products from voestalpine Wire Germany GmbH are used in a wide variety of bearing concepts, such as ball, roller, cylindrical or needle bearings.
Spring steel wire products from voestalpine Wire Germany GmbH are characterized by a high yield strength to tensile strength ratio and are therefore well suited to produce a wide variety of spring elements.

Low-Carbon wires are used to produce a variety of components ranging from shop or display construction, in the white industry (refrigerators, washing machines, etc.), for shopping carts, for folder mechanisms, in the construction industry, in the manufacture of bent wire parts.

Free-cutting steel wires are used to produce a variety of components ranging from fasteners, white industry, construction industry, automotive industry.

Welding wires are used in the welding industry.

## 2.3 Technical Data

This EPD applies to all cold heading, bearing, low-carbon, free-cutting and welding wires from voestalpine Wire Germany GmbH, which is why a general statement about mechanical parameters is not possible.
Various steel grades are processed at the drawing facility of voestalpine Wire Germany GmbH:

**Cold heading wire steel grades:**

| | *EN 10027-2* |
|---|---|
| | 1.1015 |
| | 1.1014 |
| C4C | 1.0303 |
| C8C | 1.0213 |
| C10C | 1.0214 |
| C15C | 1.0234 |
| C15E2C | 1.1132 |
| C20E2C | 1.1152 |
| C35EC | 1.1172 |
| C45EC | 1.1192 |
| 17B2 | 1.5502 |
| 18B2 | 1.5503 |
| 20MnB4 | 1.5525 |
| 23B2 | 1.5508 |
| 28B2 | 1.5510 |
| 33B2 | 1.5514 |
| 35B2 | 1.5511 |
| 38B2 | 1.5515 |
| 45B2 | 1.5513 |
| 32MnB4 | 1.5535 |
| 30 MnVS6 | 1.1302 |
| 17Cr3 | 1.7016 |
| 34Cr4 | 1.7033 |
| 41Cr4 | 1.7035 |
| 25CrMo4 | 1.7218 |
| 34CrMo4 | 1.7220 |
| 42CrMo4 | 1.7225 |
| 40CrMoV4-6 | 1.7711 |
| 20NiCrMo2-2 | 1.6523 |
| 34CrNiMo6 | 1.6582 |
| 30MnB4 | 1.5526 |
| 32CrB4 | 1.7076 |
| 36CrB4 | 1.7077 |
| 51CrV4 | 1.8159 |
| C62D | 1.0611 |

Further steel grades can be processed on request.

**Bearing wire steel grades:**

| *ISO 683-17* | *EN 10027-2* |
|---|---|
| 100Cr6 | 1.3505 |

Customer-specific changes to the alloy composition can occur on request.

**Low carbon wire grades:**

| *EN 16120* | *EN 10027-2* |
|---|---|
| C4D | 1.0300 |
| C7D | 1.0313 |
| C9D | 1.0304 |
| C10D | 1.0310 |
| C15D | 1.0413 |

**Free-cutting steel wire grades:**

| *EN 10277* | *EN 10027-2* |
|---|---|
| 11SMn30 | 1.0715 |
| 11SMn37 | 1.0736 |
| 11SMnPb30 | 1.0718 |
| 11SMnPb37 | 1.0737 |
| C15Pb | 1.0403 |
| C45Pb | 1.0504 |
| C60Pb | 1.0602 |

**Welding wire grades:**

| *EN 14171* |
|---|
| S1 |
| S2 |
| S2 MO |
| SG2 |

Customer-specific changes to the alloy composition can occur on request.

Other constructional data as described in PCR B are not relevant for the product declared in this EPD.

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

### 2.4 Delivery status

By applying the *EN 10278* standard, tightest diameter tolerances are guaranteed (h8, h9, h10, h11) for all types of wire products.
Cold heading wires produced have a standard diameter range between 1.50 mm and 35.00 mm. Bearing wires produced have a standard diameter range between 2.00 and 26.00 mm.
Low carbon wires produced have a standard diameter range between 2.00 mm and 15.00 mm.
Free-cutting steel wires produced have a standard diameter range between 2.00 and 15.00 mm.
Welding wires produced have a standard diameter range between 2.00 and 5.50 mm.

In terms of surface finish, a distinction is made between:

- phosphate-free
- end phosphate coated, with a soap or lime coating
- bright drawn

All produced wires are supplied in coils with different coil types:

- catchweight coils
- on carriers
- coreless coils (with/without longitudinal winding, with/without conical winding)

The outer diameter and weight of the coils vary between 600 to 1500 mm and 300 to 2500 kg, depending on the wire diameter.

### 2.5 Base materials/Ancillary materials

The starting product for drawn wire is hot-rolled wire, which is produced at the voestalpine Wire Rod Austria site. The basic material for this is in turn crude steel, which consists of about 85 % pig iron and about 15 % scrap and alloying elements.

This product/article/at least one partial article contains substances listed in the candidate list (date: 27.05.2022) 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 starting material to produce drawn wires is low alloyed steel, which is mainly produced at voestalpine Stahl Donawitz GmbH via the primary route (blast furnace, LD steel mill, ladle furnace). The steel is cast into blooms using a continuous casting process.
In a further step, the blooms are rolled to the desired dimension in the wire rod rolling mill of voestalpine Wire Rod Austria GmbH. The diameters of the rolled wire rod vary between 5 and 36 mm. After the rolling process, the wires are delivered by train or truck to voestalpine Wire Germany GmbH in Finsterwalde.
In a first step, the wire rods are pickled in hydrochloric acid. At the drawing facility of voestalpine Wire Germany GmbH the wires are further processed according to *EN 10263* specifications.

| Type (EN 10263) | |
|---|---|
| +U +C | cold drawn |
| +U +C +AC | cold drawn + annealed on spheroidised carbide |
| +AC +C | annealed on spheroidised carbide + cold drawn |
| +U +C +AC +LC | cold drawn + annealed on spheroidised carbide + light cold second drawing |
| +AC +C +AC | annealed on spheroidised carbide + cold drawn + annealed on spheroidised carbide |
| +AC +C +AC +LC | annealed on spheroidised carbide + cold drawn + annealed on spheroidised carbide + light cold second drawing |

The annealing of the coils takes place in a bell-type annealing furnace at temperatures and times of around 700 °C and 12 hours.

### 2.7 Environment and health during manufacturing

The voestalpine Wire Germany site is certified according to *ISO 9001*, *ISO 50001* and *ISO 14001*. At the Finsterwalde 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 statutory emission limits are complied with.
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

Drawn wire products from voestalpine Wire Germany GmbH are processed by a broad range of different customers in the respective factories. Depending on the desired wire specification, the wire is further processed in different ways, e.g. cold heading, turning or spring coiling.

### 2.9 Packaging

The declared product is delivered on wooden pallets. Pallets treated according to the ISPM 15 standard are drawn wires which vary according to customer requirements, therefore various packaging materials are used to protect the wires from environmental influences, e.g.:

- Cardboard
- Steel
- Wood
- PE (polyethylene) stretch foil

### 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 steel wire 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 Germany GmbH does not specify a reference service life for their wire products. Corrosive atmospheres must be avoided to guarantee a full lifetime of functionality.

### 2.13 Extraordinary effects

**Fire**
Steel wires are 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 Germany GmbH consist of almost 100 % steel and can therefore be reused or recycled in the steel industry as a secondary raw material.

### 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).

### 2.16 Further information

Further information on the product is available on the website at https://www.voestalpine.com/wiretechnology/en/drawnwire

## 3. LCA: Calculation rules

### 3.1 Declared Unit

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

**Declared unit**

| Name | Value | Unit |
|---|---|---|
| Declared unit | 1 | t |

For the calculation of the declared average all produced qualities are considered as a yearly average. Input and production quantities for the entire fiscal year 2019/2020 were taken into account.

The calculated results can thus be considered representative for the total product portfolio of voestalpine Wire Germany GmbH.

All products consist of the same main precursor material, i.e. low-allowed steel wire. The main production steps are comparable for the majority of products. As the main production volumes are characterized by a high degree of vertical integration, the calculations given here represent a conservative approach. Only for double annealed products a slight underestimation of the product-related environmental impact is to be expected.

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

### 3.2 System boundary

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

**Module A1–A3 | Production stage**
The production stage includes the burdens of the production of drawn wires of voestalpine Wire Germany GmbH at the production site in Finsterwalde. Most of the used wire rod is provided by voestalpine Wire Rod Austria GmbH. Thus, the upstream environmental impact of the wire rods supplied is represented by primary data of the respective production site.

Within the factory gates, the following production steps are considered: Pickling, wire drawing and annealing. Electricity at Finsterwalde is provided by the regional grid. Thermal energy provision is based on natural gas. Modules A1–A3 also include 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. The actual energy demand for deconstruction highly depends on the specific use of the drawn wire.

**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 | Disposal**
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.

### 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 does 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 2022.2 and is modelled in *GaBi*-software version 10.

### 3.6 Data quality

The foreground data collected at voestalpine Wire Germany 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 fiscal year 2019/2020, 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: Germany

### 3.9 Allocation

The primary data for the upstream production of the wire rods 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 (G*aBi* 10; 2022.2).

## 4. LCA: Scenarios and additional technical information

**Characteristic product properties of biogenic carbon**
The declared product does not contain any biogenic carbon.

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of $CO_2$.

**Information on describing the biogenic carbon content at factory gate**

| Name | Value | Unit |
|---|---|---|
| Biogenic carbon content in accompanying packaging | 2.07 | kg C |

The carbon stored in the packaging was taken into account as "$CO_2$-neutral". Thus the storage effect of the carbon bound in the packaging is not included in the calculation but is considered as emitted immediately.

**Installation into the building (A5)**
The end-of-life of the packaging materials is not declared in Module A5.

| Name | Value | Unit |
|---|---|---|
| Packaging (cardboard) | 0.029 | kg |
| Packaging (wood) | 4.58 | kg |
| Packaging (binding wire) | 1.7 | kg |
| Packaging (plastic) | 0.077 | 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 waste type (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 | 814 | 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 drawn wire.

**DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = 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 t drawn wire**

| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| Global Warming Potential total (GWP-total) | kg $CO_2$ eq | 2.83E+03 | 0 | 3.03E+00 | 0 | 2.39E+00 | -1.41E+03 |
| Global Warming Potential fossil fuels (GWP-fossil) | kg $CO_2$ eq | 2.82E+03 | 0 | 3.01E+00 | 0 | 2.39E+00 | -1.41E+03 |
| Global Warming Potential biogenic (GWP-biogenic) | kg $CO_2$ eq | 1.41E+01 | 0 | 0 | 0 | 0 | 7.2E-01 |
| Global Warming Potential luluc (GWP-luluc) | kg $CO_2$ eq | 8.61E-01 | 0 | 2.02E-02 | 0 | 1.45E-03 | -2.91E-02 |
| Depletion potential of the stratospheric ozone layer (ODP) | kg CFC11 eq | 1.76E-09 | 0 | 2.95E-13 | 0 | 3.18E-12 | -3.08E-12 |
| Acidification potential of land and water (AP) | mol $H^+$ eq | 8.65E+00 | 0 | 1E-02 | 0 | 7.62E-03 | -3.03E+00 |
| Eutrophication potential aquatic freshwater (EP-freshwater) | kg P eq | 9.42E-03 | 0 | 1.07E-05 | 0 | 1.85E-06 | -2.56E-04 |
| Eutrophication potential aquatic marine (EP-marine) | kg N eq | 1.93E+00 | 0 | 4.59E-03 | 0 | 1.86E-03 | -5.33E-01 |
| Eutrophication potential terrestrial (EP-terrestrial) | mol N eq | 2.06E+01 | 0 | 5.14E-02 | 0 | 2.04E-02 | -4.67E+00 |
| Formation potential of tropospheric ozone photochemical oxidants (POCP) | kg NMVOC eq | 6.65E+00 | 0 | 9E-03 | 0 | 5.88E-03 | -2.16E+00 |
| Abiotic depletion potential for non fossil resources (ADPE) | kg Sb eq | 3.77E-03 | 0 | 3.03E-07 | 0 | 1.68E-07 | -3.51E-03 |
| Abiotic depletion potential for fossil resources (ADPF) | MJ | 2.67E+04 | 0 | 3.94E+01 | 0 | 3.43E+01 | -1.29E+04 |
| Water use (WDP) | $m^3$ world eq deprived | 2.44E+02 | 0 | 3.36E-02 | 0 | -2.28E-02 | -2.62E+02 |

**RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 t drawn wire**

| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| Renewable primary energy as energy carrier (PERE) | MJ | 2.07E+03 | 0 | 2.73E+00 | 0 | 2.8E+00 | 8.16E+02 |
| Renewable primary energy resources as material utilization (PERM) | MJ | 7.61E+01 | 0 | 0 | 0 | 0 | 0 |
| Total use of renewable primary energy resources (PERT) | MJ | 2.14E+03 | 0 | 2.73E+00 | 0 | 2.8E+00 | 8.16E+02 |
| Non renewable primary energy as energy carrier (PENRE) | MJ | 2.68E+04 | 0 | 3.96E+01 | 0 | 3.43E+01 | -1.3E+04 |
| Non renewable primary energy as material utilization (PENRM) | MJ | 3.55E+00 | 0 | 0 | 0 | 0 | 0 |
| Total use of non renewable primary energy resources (PENRT) | MJ | 2.68E+04 | 0 | 3.96E+01 | 0 | 3.43E+01 | -1.3E+04 |
| Use of secondary material (SM) | kg | 1.46E+02 | 0 | 0 | 0 | 0 | 8.14E+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) | $m^3$ | 1.12E+01 | 0 | 3.15E-03 | 0 | 4.81E-04 | -5.92E+00 |

**RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 t drawn wire**

| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| Hazardous waste disposed (HWD) | kg | 3.8E-06 | 0 | 2.09E-10 | 0 | 5.17E-09 | -1E-07 |
| Non hazardous waste disposed (NHWD) | kg | 6.64E+01 | 0 | 6.45E-03 | 0 | 5.01E+01 | 1.96E+02 |
| Radioactive waste disposed (RWD) | kg | 1.91E-01 | 0 | 7.34E-05 | 0 | 4.13E-04 | 1.61E-03 |
| Components for re-use (CRU) | kg | 0 | 0 | 0 | 0 | 0 | 0 |
| Materials for recycling (MFR) | kg | 4.91E+01 | 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 t drawn wire**

| 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 |

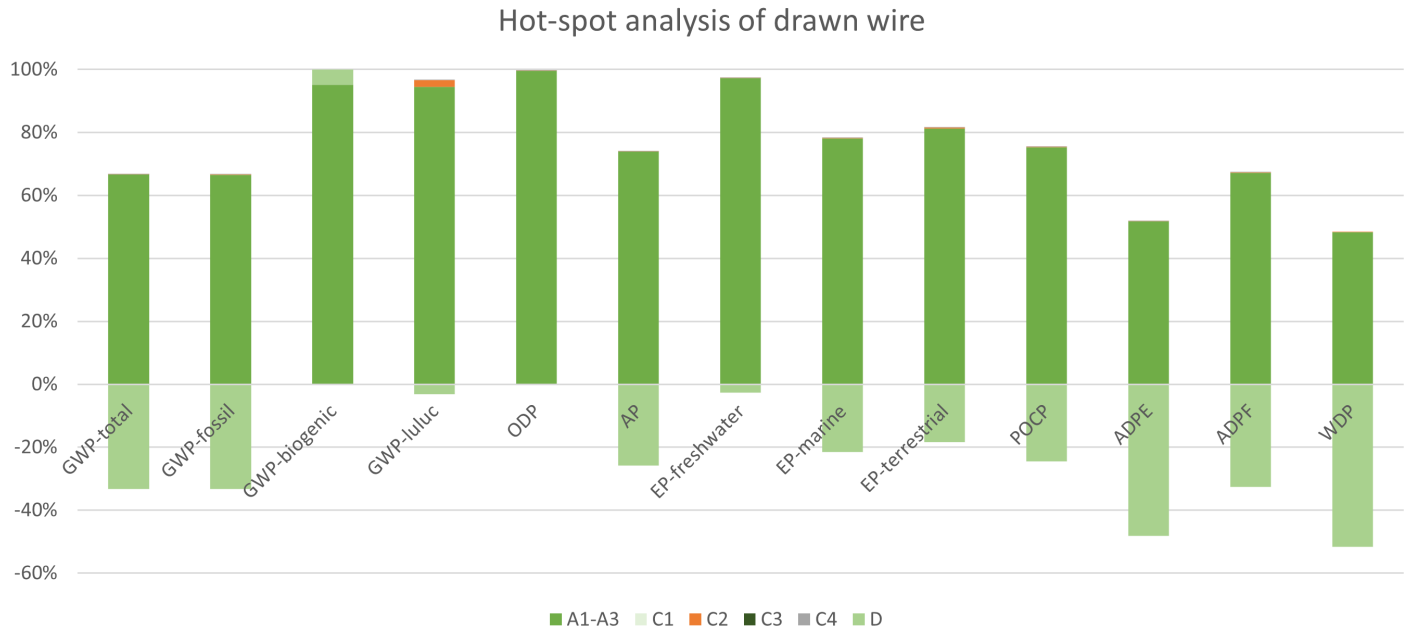
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Comparative toxic unit for ecosystems (ETP-fw) | CTUe | ND | ND | ND | ND | ND | ND |
| Comparative toxic unit for humans (carcinogenic) (HTP-c) | CTUh | ND | ND | ND | ND | ND | ND |
| Comparative toxic unit for humans (noncarcinogenic) (HTP-nc) | 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 – for the indicators 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption', 'potential comparative toxic unit for ecosystems', '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 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 drawn wire.




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 upstream supply chain of the purchased raw materials.

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.

All of the potential environmental impacts except for the depletion potential of the stratospheric ozone layer (ODP) of the production phase (module A1–A3) of the drawn wire can be traced back to the upstream supply chain of the wire rods produced in St. Peter Freinstein and from external suppliers. The majority of purchased wire rods are supplied by voestalpine Wire Rod Austria GmbH. All other raw materials are purchased from German suppliers. The production of drawn wires at the production site at Finsterwalde contributes app. 8 % to global warming potential.

Due to the homogeneous structure of the products, their environmental impact correlates directly with their mass. The calculated results can be considered representative for the full product portfolio of voestalpine Wire Germany. As the main production volumes are characterized by a high degree of vertical integration, the calculations given here tend to represent a conservative approach. The potential range of the LCA results of the average product is to be expected as low.

## 7. Requisite evidence

Not relevant for this EPD.

# 8. References

**Standards**

**EN 10027-2**
DIN EN 100272:2015-07, Designation systems for steels Part 2: Numerical system.

**EN 10089**
DIN EN 100892:2003-04, Hot rolled steels for quenched and tempered springs Technical delivery conditions.

**EN 10263**
DIN EN 102631:2018-02, Steel rod, bars and wire for cold heading and cold extrusion Part 1: General technical delivery conditions.

**EN 10278**
DIN EN 10278:1999-12, Dimensions and tolerances of bright steel products.

**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**
ISO 9001:2015, Quality management systems –Requirements.

**ISO 10270-1**
DIN EN ISO 102701:2011, Steel wire for mechanical springs Part 1: Patented cold drawn unalloyed spring steel wire.

**ISO 14001**
ISO 14001:2015, 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**
ISO 50001:2018, Energy Management Systems.

**Further references**

**Candidate list**
Candidate List of Substances of Very High Concern (ECHA Candidate List) of 27.05.2022, published in accordance with Article 59 (10) of the REACH Regulation Helsinki: European Chemicals Agency.

**European Waste Catalogue**
European Waste Catalogue (EWC) Ordinance of December 10th, 2001 (Federal Law Gazette I p. 3379), last amended by Article 1 of the Ordinance of June 30th, 2020 (Federal Law Gazette I p. 1533).

**GaBi**
GaBi 10, Software-System and Database for Life Cycle Engineering. DB 2022.2. Sphera, 1992-2022.
Available in: http://documentation.gabisoftware.com.

**IBU 2021**
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.ibuepd.com

**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.

**PCR Part A**
Product category rules for building-related products and services. Part A: Calculation rules for life cycle assessment and project report requirements according to EN 15804+A2:2019. version 1.3. Berlin: Institut Bauen und Umwelt e.V.. (ed.), 2022.

**PCR: Structural steels**
Product category rules for building-related products and services. Part B: Requirements for the EPD for structural steels. Version v2. Berlin: Institut Bauen und Umwelt e.V., 31.05.2023.

**worldsteel 2014**
World Steel Association, February 14, 2014: A methodology to determine the LCI of steel industry coproducts.

**Publisher**

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