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-20230106-IBC2-EN
Issue date	09.05.2023
Valid to	08.05.2028

Drawn Wire – Cold Heading Wire

voestalpine Wire Austria GmbH

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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1. General Information

voestalpine Wire Austria GmbH

Programme holder

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

Declaration number

EPD-VOE-20230106-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.)

Drawn Wire – Cold Heading Wire

Owner of the declaration

voestalpine AG
voestalpine-Straße 3
4020 Linz
Austria

Declared product / declared unit

1 tonne of CHQ steel-, bearing steel-, spring steel wire

Scope:

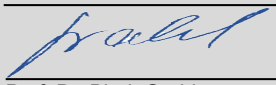
This EPD is based on a declared unit of 1 metric tonne of average voestalpine cold heading (CHQ)-, bearing-, spring steel wire produced at the production site in Bruck a.d. Mur (Austria).

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

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 processes can also be complemented by different machining operations, such as turning, grinding, polishing and others.

Bearing steel wires are part of the voestalpine Wire Austria 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.

Spring steel wires are also a part of the voestalpine Wire Austria GmbH product range and are used to produce steel springs. Thanks to optimized alloying concepts and processing parameters, spring steel is characterized by its high yield strength to tensile strength ratio, compared to other types of steel. Therefore, spring steels can be subjected to high loads without plastic deformation.

In order to fulfill certain requirements concerning mechanical properties and deformability, specific chemical compositions, as well as optimized production processes are used to produce cold heading-, bearing steel- and spring steel wires.
To ensure high-quality standards, all products are manufactured under optimized process conditions, such as:

- High degree of purity
- Low core segregation
- Optimized annealing conditions
- Continuous quality inspections and several special testing options
- End-to-end traceability of all production and test parameters
- Greatest possible flexibility as the result of an integrated production chain
- Strict adherence to schedules, and partnerships with our customers
- Technical and sales service

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 Austria 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 Austria 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 Austria 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.

2.3 Technical Data

This EPD applies to all cold heading-, bearing and spring steel wires from voestalpine Wire Austria GmbH, which is why a general statement about mechanical parameters 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

Various steel grades are processed at the drawing facility of voestalpine Wire Austria 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
-	1.5513
38B2	1.5515
23MnB4	1.5535
30MnVS6	1.1302
17Cr3	1.7016
34Cr4	1.7033
41Cr4	1.7035
16MnCr5	1.7131
34CrMo4	1.7220
42CrMo4	1.7225
40CrMoV4-6	1.7711
20NiCrMo2-2	1.6523
34CrNiMo6	1.6582
30MnB4	1.5526
C60S	1.1221
C67S	1.1231
32CrB4	1.7076
36CrB4	1.7077
51CrV4	1.8159

Further steel grades can be processed on request.

Bearing wire steel grades:

ISO 683-17	EN 10027-2
100Cr6	1.3505
100CrMnSi6-4	1.3520

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

Spring wire steel grades:
Steels according to *EN 10270-1* and *EN 10089* are used to produce drawn spring steel wire. The following alloys are suitable to produce quenched and tempered springs and are a selection from the voestalpine Wire Austria GmbH product range.

EN 10089	EN 10027-2
51CrV4	1.8159
52SiCrNi5	1.7117
54SiCr6	1.7102
67SiCr5	1.7103

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

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 0.8 and 30 mm. Spring wires according to *EN 10270-1* are produced in a dimension range between 14 and 20 mm. Spring wires according to *EN 10089* are produced in a dimension range between 1 and 29 mm. Bearing wires produced have a standard diameter range between 1.05 and 26 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:

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

The outer diameter and weight of the coils vary between 450 to 1500 mm and 350 to 1500 kg, depending on the wire diameter.

2.5 Base materials/Ancillary materials

The starting product for cold heading 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: 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 starting material to produce cold heading-, bearing steel- and spring steel 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 31 mm. After the rolling process, the wires are delivered by train to voestalpine Wire Austria GmbH in Bruck an der Mur.

In a first step, the wire rods are pickled in hydrochloric acid. At the drawing facility of voestalpine Wire Austria 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 Austria site is certified according to *EMAS III, ISO 9001, ISO 50001* and *ISO 14001*. As part of the environmental declarations required by EMAS, voestalpine continuously publishes environmentally relevant data and facts about the site.

At the Bruck/Mur 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

Drawn wire products from voestalpine Wire Austria 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 used on customer request. The packaging of the drawn wires varies according to customer requirements, therefore various packaging materials are used to protect the wires from environmental influences, e.g.:

- PE (polyethylene) stretch foil
- LDPE (low-density polyethylene) foil
- VCI (volatile chemical inhibitors) foil
- crepe paper
- cardboard boxes
- wooden boxes

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 Austria 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 Austria 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). 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/drawn-wire

3. LCA: Calculation rules

3.1 Declared Unit

This environmental product declaration refers to a declared unit of 1 tonne of average CHQ-, bearing-, spring steel – automotive wire.

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 CHQ-, bearing-, spring steel – automotive wire of voestalpine Wire 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 CHQ-, bearing-, spring steel – automotive wire 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 CHQ-, bearing-, spring steel – automotive wire of voestalpine Wire Austria GmbH at the production site in Bruck a.d. Mur. Most of the used steel wire is provided by the voestalpine Wire Rod Austria from St. Peter Freienstein. 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 pickling, drawing, cold rolling and annealing are considered. Electricity at Bruck a. d. Mur is provided from 100 % renewable energy (emission factor GWP-total: 14 g CO_2-equivalents/kWh). 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 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.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in accompanying packaging	3.75	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 (binding wire, packaging strips)	1.2	kg
Packaging (plastic)	0.1	kg
Packaging (cardboard)	0.08	kg
Packaging (wood)	8.3	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	856	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 CHQ-, bearing-, spring steel – automotive wire.

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 CHQ-, bearing-, spring steel – automotive wire

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential total (GWP-total)	kg CO_2 eq	2.93E+03	0	3.02E+00	0	2.42E+00	-1.45E+03
Global Warming Potential fossil fuels (GWP-fossil)	kg CO_2 eq	2.9E+03	0	3E+00	0	2.44E+00	-1.45E+03
Global Warming Potential biogenic (GWP-biogenic)	kg CO_2 eq	2.09E+01	0	-3.56E-03	0	-2.5E-02	-9.41E-01
Global Warming Potential luluc (GWP-luluc)	kg CO_2 eq	1E+00	0	2.44E-02	0	2.44E-03	2.1E-01
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	8.57E-12	0	5.9E-16	0	5.77E-15	-2.42E-12
Acidification potential of land and water (AP)	mol H^+ eq	8.99E+00	0	9.92E-03	0	7.78E-03	-2.61E+00
Eutrophication potential aquatic freshwater (EP-freshwater)	kg P eq	1.62E-02	0	8.88E-06	0	1.86E-06	-2.97E-04
Eutrophication potential aquatic marine (EP-marine)	kg N eq	2.17E+00	0	4.55E-03	0	1.93E-03	-3.88E-01
Eutrophication potential terrestrial (EP-terrestrial)	mol N eq	2.31E+01	0	5.08E-02	0	2.12E-02	-3.79E+00
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	7.24E+00	0	8.94E-03	0	6.08E-03	-1.99E+00
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	4.5E-03	0	2.65E-07	0	1.68E-07	-3.16E-03
Abiotic depletion potential for fossil resources (ADPF)	MJ	2.68E+04	0	3.98E+01	0	3.56E+01	-1.26E+04
Water use (WDP)	m^3 world eq deprived	5.01E+02	0	2.77E-02	0	-2.89E-02	-2.85E+02

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 tonne CHQ-, bearing-, spring steel – automotive wire

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier (PERE)	MJ	2.15E+03	0	2.29E+00	0	2.57E+00	1.16E+03
Renewable primary energy resources as material utilization (PERM)	MJ	1.39E+02	0	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ	2.29E+03	0	2.29E+00	0	2.57E+00	1.16E+03
Non renewable primary energy as energy carrier (PENRE)	MJ	2.68E+04	0	4E+01	0	3.56E+01	-1.26E+04
Non renewable primary energy as material utilization (PENRM)	MJ	5.68E+00	0	0	0	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	2.69E+04	0	4E+01	0	3.56E+01	-1.26E+04
Use of secondary material (SM)	kg	1.16E+02	0	0	0	0	8.56E+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	1.5E+01	0	2.62E-03	0	3.67E-04	-6.4E+00

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 tonne CHQ-, bearing-, spring steel – automotive wire

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	7.92E-06	0	2.11E-09	0	6.3E-09	3.53E-06
Non hazardous waste disposed (NHWD)	kg	7.07E+01	0	6.27E-03	0	5.01E+01	1.52E+02
Radioactive waste disposed (RWD)	kg	1.35E-01	0	7.25E-05	0	4.05E-04	4.58E-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 CHQ-, bearing-, spring steel – automotive 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

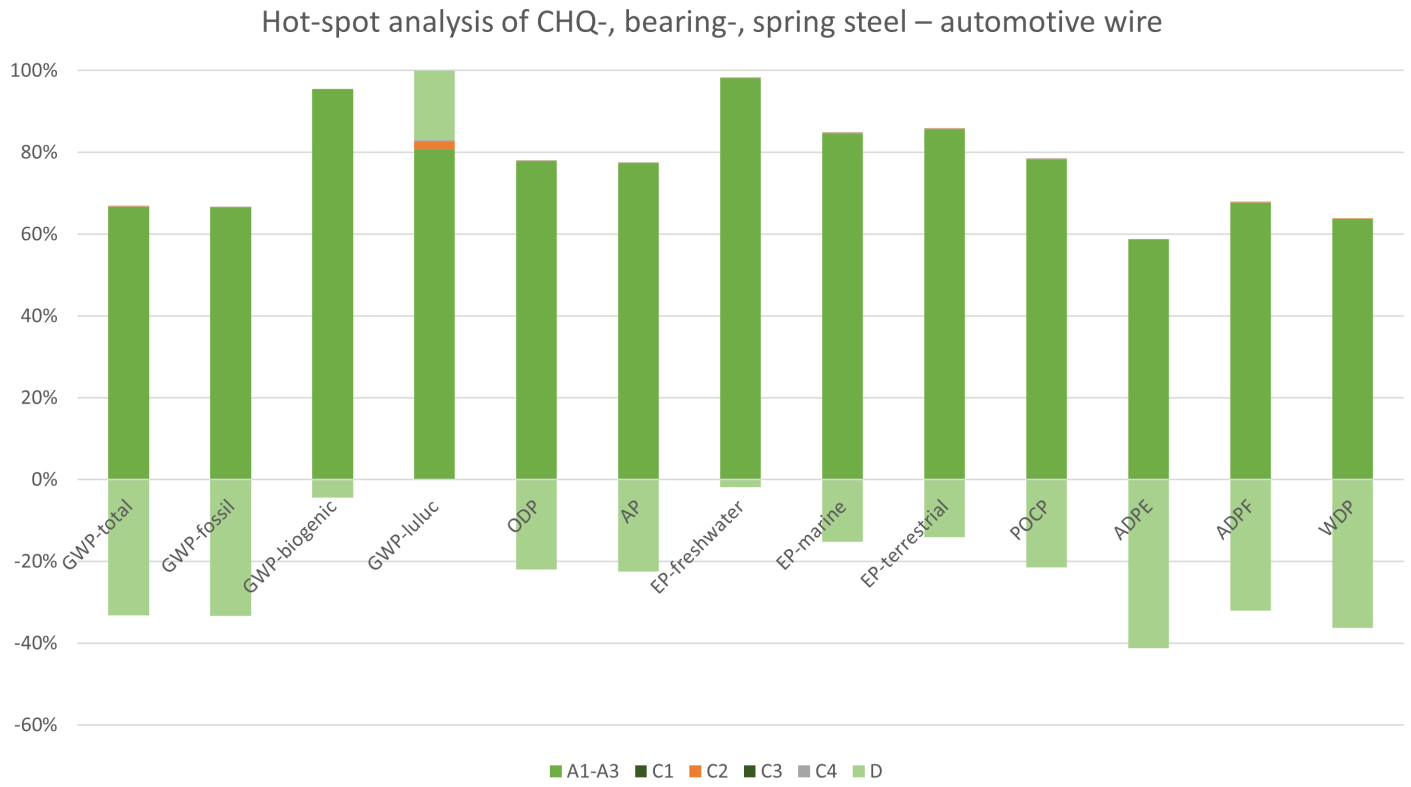
The additional and optional impact categories according to *EN 15804*+A2 are not declared, as the uncertainty of these indicators is to be classified as high.

Disclaimer 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 CHQ-, bearing-, spring steel – automotive 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 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 CHQ-, bearing-, spring steel – automotive wire can be traced back to the upstream supply of the wire rod. The production of automotive wire at the production site at Bruck contributes app. 5 % 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 10027-2
DIN EN 10027-2:2015-07, Designation systems for steels - Part 2: Numerical system.

EN 10089
DIN EN 10089-2:2003-04, Hot rolled steels for quenched and tempered springs - Technical delivery conditions.

EN 10263
DIN EN 10263-1:2018-02, 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 683-17
DIN EN ISO 683-17:2015-02, Heat-treated steels, alloy steels and free-cutting steels - Part 17: Ball and roller bearing steels.

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

ISO 10270-1
DIN EN ISO 10270-1:2011, 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 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.

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 v0. Berlin: Institut Bauen und Umwelt e.V., 08.03.2023.

worldsteel 2014
World Steel Association, February 14, 2014: A methodology to determine the LCI of steel industry co-products.

worldsteel 2019
World Steel Association, 2019: Life cycle inventory methodology report.

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Programme holder

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Author of the Life Cycle Assessment

Daxner & Merl GmbH
Schleifmühlgasse 13/24
1040 Wien
Austria

+43 676 849477826
office@daxner-merl.com
www.daxner-merl.com

Owner of the Declaration

voestalpine AG
voestalpine-Straße 3
4020 Linz
Austria

+43/50304/15-0
info@voestalpine.com
www.voestalpine.com