Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

[FATZER *Prefabricated steel and stainless steel wire ropes with end connectors*]

from

[*Fatzer AG*]

This EPD is an average EPD based on the specific individual products of Fatzer such as full locked coil ropes (FLC) and spiral strand ropes (OSS) with HYEND end connections.

Programme:	The International EPD® System, www.environdec.com
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): *PCR 2019:14 Construction products (EN 15804+A2) (1.3.4)*
PCR review was conducted by: *technical committee of the International EPD® System*
Life Cycle Assessment (LCA)
LCA accountability: *myclimate Deutschland gGmbH - www.myclimate.org*
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: *Susanne Jorre, TÜV Rheinland Energy & Environment GmbH* Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No [Procedure for follow-up the validity of the EPD is at minimum required once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period. The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both approaches, the EPD owner is responsible for the procedure being carried out. If a change that requires an update is identified, the EPD shall be re-verified by a verifier]

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation

factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD:
Fatzer AG
Hofstrasse 44
CH- 8590 Romanshorn

Contact:
Martin Bechtold
Martin.Bechtold@fatzer.com
www.fatzer.com/de

Description of the organisation:
FATZER has been specializing in the production of top-quality ropes for around 190 years. Today, the focus is on the development, manufacture, and sale of technically sophisticated ropes for ropeways, structures, and more. Assembly and customer service play a special role in this.
People all over the world rely on FATZER steel wire ropes. In addition to the development and sale of steel wire ropes, we offer a comprehensive range of services. We support you from the planning of your project to the installation, inspection, and maintenance of the installed ropes.
FATZER is part of the international BRUGG Group. In addition to rope technology, the Group also specializes in geotechnical products, electrical cable and piping systems, and process control technology. Together, we deliver the highest quality and unparalleled customer service.

Product-related or management system-related certifications: ISO 9001
Name and location of production site(s): Fatzer AG, Hofstrasse 44, 8590 Romanshorn

Product information

Product name: FATZER Prefabricated steel and stainless steel wire ropes with end connectors
Product identification:
Spiral Strand Rope Assemblies
Full Locked Coil Rope Assemblies
Products as described inEN 12385 and EN 1993-1-11
European Technical Assessment ETA-15/0917 of 2 December 2019
The ropes are made from individual wires that are arranged in helical order.
One long length of rope is cut into individual lengths according to the intended use in a specific structure.
End connections are fitted to the rope ends either by spelter socketing or by swaging.
Fatzer rope construction ropes consist of round and profile wire and are manufactured from high-strength wire made of unalloyed steel in accordance with DIN EN 10264-2 and DIN EN 10264-3. The composition of the steel wire complies with the relevant standards. The secondary material content is a standard 21%. The cast steel end connections contain up to 70% secondary material.
Product description:
Fatzer ropes are used for the following applications:
Ropes as load bearing tensile structural members in structures such as Vehicular Bridges, Pedestrian Bridges, Roof Structures, Membrane Structures, Facades and Stayed Masts:
- Suspension Ropes, Stays or Hangers of Bridges
- Ring Cables, Radial Cables or Stay Cables in Roof Structures

- Stabilizing Cables in Facades
- Stay Cables in Stayed Masts

UN CPC code: there is no UN CPC code for Fatzer's products
Geographical scope: A1-A3: Europe, Switzerland. C1-C4: Switzerland

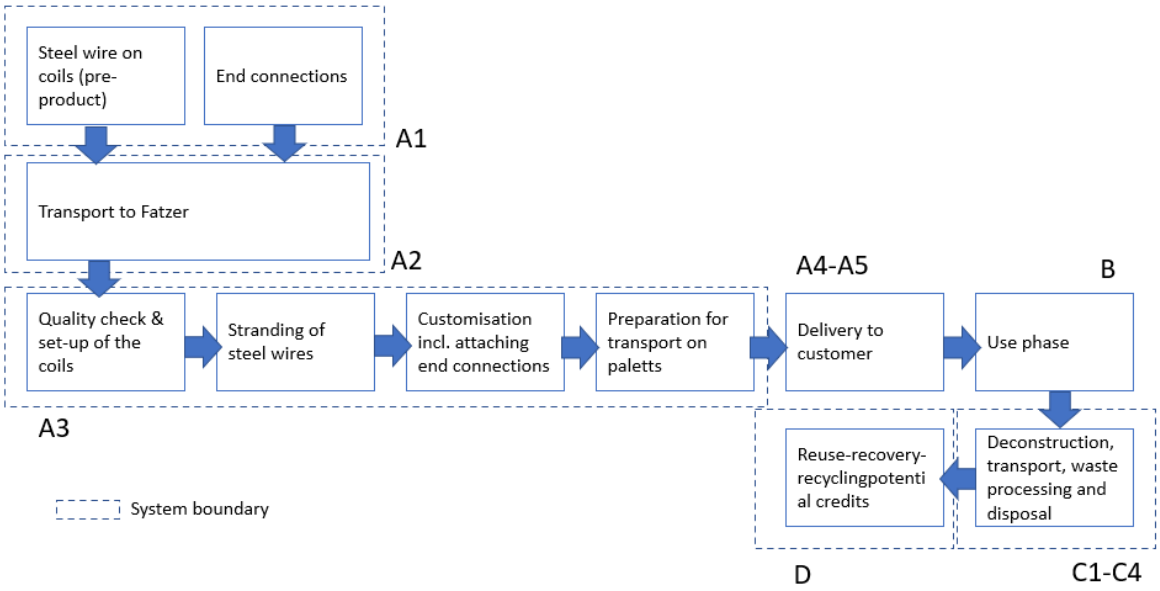
LCA information

Functional unit / declared unit: 1 ton FATZER steel and stainless steel wire ropes with end connectors
Reference service life: > 50 years. If properly handled and installed, Fatzer ropes have a reference service life equal to the lifetime of the whole rope installation, and thus 50 years according to BBSR 2017. The reference service life could not be determined in accordance with ISO 15686.
Time representativeness: The data for the study was collected at the production site in Romanshorn (Switzerland), representing Fatzer's entire production in 2022. This data includes raw material, energy consumption, packaging and quantity of ropes produced.
Database(s) and LCA software used: Generic background data has been extracted from ecoinvent 3.9. The energy required to dismantle the ropes in module C1 was not known and was accounted via the LCA database oekobaudat (EN 15804+A2) (Version 2021-II). Software used: SimaPro 9.4.0.1.
Description of system boundaries:
Cradle to gate with modules C1–C4 and module D (A1–A3 + C + D)
Installation (A4-A5) and Use Stage (B) are not declared in this EPD because both are not carried out by Fatzer itself and there is no representative data. The inaccuracy of the LCA results would increase and is also outside Fatzer's scope of work.

System diagram:

PRODUCTION	A1	Raw material extraction: the raw materials and preliminary products such as steel wire and end connections are produced. -> steel wire on coils (pre-product) and end connections (pre-product)
	A2	Transport: this stage covers the transport of the raw material and the other raw materials (steel wire, ...) from their corresponding production site to the Fatzer production site in Romanshorn (CH).
	A3	Manufacturing: in this phase, the pre-products delivered to the Fatzer production site are processed into the ropes, which are assembled and configured individually on request. The end connections are attached depending on the dimensions of the rope. Preparation for pallets or reels to the construction site is prepared, quality control is carried out.
END OF LIFE	C1	De-construction: removal of the ropes from the place of use with estimated machine and energy consumption. Fatzer has no data on this. It can be assumed that the de-construction process contributes little to the already low share of module C overall.
	C2	Transport: representative default values are assumed for the transport distance for waste disposal (recycling: 70 km; landfill: 60 km).
	C3	Waste processing: this includes the material (steel wire) that can be recycled and reused, less a recycling loss of 5% (source: oekobaudat 2022).
	C4	Disposal: in the end, all material that cannot be reused or recycled is disposed of as residual material in mixed steel scrap (5%).
BENEFITS AND IMPACTS RELATED TO THE REUSE; RECOVERY; RECYCLING OF MATERIALS	D	Reuse- Recovery- Recyclingpotential: for the use of steel scrap, a credit is awarded here for the primary materials saved in this way. Potential benefits and impacts related to recovery-reuse-recycling of materials and energy throughout the life cycle. In this module, the benefits and/or impacts related to, for example, the potential recycling of materials at the end of their life of the products under study are evaluated.

System Boundary Diagram:



More information:

- The core product category rules are provided by standards EN 15804, EN 16485, and the PCR 2019:14 from The International EPD® System.
- Following the cut-off approach, secondary materials are treated as burden-free in the model, and credits are only given for the recycling potential of virgin materials such as alloys. The packaging waste from intermediate products generated in production is reusable or is delivered without packaging in bulk. Minor packaging waste was neglected in the model.
- Needed machines, production sites and further infrastructure for the production at Fatzer are not considered in the calculation.
- All known and available primary data of the production processes were considered. Therefore, no cut-off rules were applied.
- No allocations are applied in the product stage because there is no co-products. All benefits of energy recovery from waste incineration are allocated to module D. At end of life phase benefits of material recycling are also considered (avoided burden approach).

- main product components: steel and stainless steel wire ropes, cast iron end connectors, size and end connection combination according to individual order, delivery on reels
- transport to the construction site, assembly and use phase not part of the EPD (modules A4, A5, B)
- the EPDs of construction products may not be comparable if they do not comply with this standard (EN 15804:2012+A2:2019 + AC:2021)
- this is an average EPD. Within the Fatzer rope construction product range, there are open and fully locked coil ropes. Both are available in different diameters and lengths depending on what is ordered. The manufacturing method and material components are identical regardless of the rope type. The energy consumption is proportional to the material processed and production time. A minimum and maximum scaling factor was determined for the fluctuation ranges using the average stranding time per rope produced. It is 0.12 and 1.88 respectively.
- All ropes are manufactured at Fatzer's production site in Romanshorn (CH).
- There are no substances of very high concern on the Candidate List of Substances of Very High Concern for Authorisation at the European Chemicals Agency.

- In the interests of climate protection, Fatzer is currently testing CO2-reduced steel, which they are including in their production on a trial basis and using to manufacture a small rope diameter. This alternative procurement route is currently being analyzed and, if successful, will be included in an update of the current EPD.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography	GLO	RER	CH	-	-	-	-	-	-	-	-	-	CH	CH	CH	CH	RER
Specific data used	Data from production site in Romanshorn (CH).			-	-	-	-	-	-	-	-	-	-	-		-	
Variation – products	Average product in reference year 2022. GWP-GHG results for modules A1-A3 (cradle-to-gate) include a variation of 0,12 to 1,88.			-	-	-	-	-	-	-	-	-	-	-		-	
Variation - sites	One production site in Romanshorn (CH).			-	-	-	-	-	-	-	-	-	-	-		-	

X = Module included in the LCA analysis and declared in the report. MND = Module not declared because outside of the LCA scope. GLO = Global. RER = Reference Energy Region

Content information

Product components	Weight, per t of net product	Post-consumer material, weight, per t of net product
Steel wire	0.997	0.827
End connections	0.145	0.124

Socketing material	0.002	0
Zinc alloy	0.008	0
TOTAL	1.152	1.000

The packaging material used to send the steel wires to Fatzer consists of wooden or steel reels or wooden pallets, which are reused and are insignificant (less than 1% of the total weight, less than 5% of the total emissions). The same applies to the export of rope products to the construction site.

Dangerous substances from the candidate list of SVHC for Authorisation	EC No.	CAS No.	Weight-% per functional or declared unit
-	-	-	-

No dangerous substances or materials from the candidate list of SVHC are used.

Results of the environmental performance indicators

Contributors to the environmental impact:
Global warming potential: indicates the contribution to climate change of the DU during its lifetime and includes the effect of the calculated emissions in the atmosphere of climate-relevant gases (such as methane and carbon dioxide - CO2).
Ozone depletion potential: indicates the potential of the DU to contribute to the depletion of the stratospheric ozone layer. However, since the use of specific ozone-depleting substances (such as halon 1211, halon 1301 and CFC114) has been prohibited by the Montreal Protocol, this indicator is considered highly uncertain because based on outdated background data.
Eutrophication potential: describes the enrichment of nutrients (such as nitrogen and potassium) in both aquatic and terrestrial environments. Eutrophication can cause an increase in biomass production (such as algae, cyanobacteria and zooplankton) resulting in the degradation of water quality and altered species composition of the ecosystem.
Acidification potential: indicates the conversion of air pollutants into acids which can affect soil productivity and fertility, the weathering of mineral building materials, and the quality of aquatic ecosystems.
Photochemical Oxidant Formation Potential: it is calculated from emissions (such as CO and VOC emissions – mostly toluene, formaldehyde and pentane) that can contribute to the formation of ozone in summer.
Abiotic Resource Consumption: reflects the consumption of non-renewable fossils (such as crude oil and natural gas) and minerals (such as ores and raw minerals).
Water deprivation potential: indicates the potential deprivation caused by water consumption. When combined with the local water scarcity factor, the water deprivation potential addresses the water scarcity footprint linked to a certain area.

Parts of the data leading to the GWP-GHG results for modules A1-A3 (cradle-to-gate) include a variation of 0,12 to 1,88. This variation refers to the minimum and maximum stranding time and the corresponding energy input in the manufacturing process of each rope manufactured at Fatzer. It is for information only and does not need to be applied to the values in the following table.

The energy resource behind electricity used in the manufacturing process in A3 is Electricity, medium voltage (CH) residual mix and its climate impact is 0,0124 kg CO2e/kWh. This mix contains about 59 % water power and 31 % nuclear power; the remaining percentages are distributed in small proportions among other energy sources.

It is not recommended to use the results of modules A1-A3 without taking into account the results of module C.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Mandatory impact category indicators according to EN 15804

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	3.01E+03	1.93E+01	7.42E+00	0.00E+00	2.96E+00	-4.58E+02
GWP-fossil	kg CO_2 eq.	2.99E+03	1.93E+01	7.41E+00	0.00E+00	2.96E+00	-4.58E+02
GWP-biogenic	kg CO_2 eq.	1.17E+01	2.97E-03	2.66E-03	0.00E+00	2.40E-03	-4.69E-01
GWP-luluc	kg CO_2 eq.	1.01E+01	2.12E-03	3.42E-03	0.00E+00	9.57E-04	-2.99E-01
ODP	kg CFC 11 eq.	6.08E-05	2.98E-07	1.58E-07	0.00E+00	7.98E-08	-7.79E-06
AP	mol H^+ eq.	1.12E+01	9.77E-02	2.43E-02	0.00E+00	1.63E-02	-1.97E+00
EP-freshwater	kg P eq.	1.27E+00	5.76E-04	5.14E-04	0.00E+00	8.11E-04	-2.08E-01
EP-marine	kg N eq.	2.76E+00	4.35E-02	8.41E-03	0.00E+00	6.85E-03	-4.54E-01
EP-terrestrial	mol N eq.	2.81E+01	4.70E-01	8.89E-02	0.00E+00	7.32E-02	-4.63E+00
POCP	kg NMVOC eq.	1.33E+01	1.47E-01	3.78E-02	0.00E+00	2.75E-02	-2.11E+00
ADP-minerals&metals*	kg Sb eq.	7.37E-03	6.55E-06	1.95E-05	0.00E+00	5.73E-06	-2.85E-03
ADP-fossil*	MJ	3.29E+04	2.46E+02	1.06E+02	0.00E+00	5.63E+01	-4.69E+03
WDP*	m^3	9.84E+02	5.42E-01	5.11E-01	0.00E+00	2.60E-01	1.21E+01
Acronyms							

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Resource use indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	2.01E+03	1.40E+00	1.54E+00	6.34E-04	0.00E+00	-3.98E+02
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	2.01E+03	1.40E+00	1.54E+00	6.34E-04	0.00E+00	-3.98E+02
PENRE	MJ	3.29E+04	2.46E+02	1.06E+02	5.85E-02	0.00E+00	-4.69E+03
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	3.29E+04	2.46E+02	1.06E+02	5.85E-02	0.00E+00	-4.69E+03
SM	kg	3.12E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.88E+02
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	2.81E+01	1.93E-02	1.66E-02	4.67E-05	0.00E+00	-7.43E-01
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

Waste indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2.41E-01	1.65E-03	6.56E-04	9.76E-08	0.00E+00	-3.28E-02
Non-hazardous waste disposed	kg	8.46E+02	3.52E-01	9.26E+00	0.00E+00	2.59E+02	-1.83E+02
Radioactive waste disposed	kg	6.07E-02	2.69E-05	3.22E-05	3.59E-07	0.00E+00	-3.58E-03

Output flow indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D

Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	9.50E+02	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Other environmental performance indicators

Additional environmental information

Fatzer issues project- and application specific manuals for installation, storage, maintenance and repair. Following those instructions can extend the live time of the ropes.
The ropes can be recycled as part of the established steel recycling processes.

Additional social and economic information

Information related to Sector EPD

This EPD is not a sector EPD.

Differences versus previous versions

This EPD is a new creation and is not based on the existing EPD.

References

BBSR 2017	Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR): Service lives of building components. Service lives of building components for life cycle analyses according to the Assessment System for Sustainable Building (BNB), in: Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (ed.), 2017.
ecoinvent 3.9	ecoinvent V 3.9 (2023): Ecoinventory database version 3.8 of the Swiss Centre for Life Cycle Inventories, Dübendorf. www.ecoinvent.ch.
EN15804	EN 15804+A2: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
environdec	EPD International AB, https://environdec.com/home.
Fatzer	https://www.fatzer.com/de
ISO 14025	ISO 14025:2010 Environmental labels and declarations. Type III environmental declarations. Principles and procedures.
ISO 14040	DIN EN ISO 14040:2021-02: Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006 + Amd 1:2020).
ISO 14044	ISO 14044:2006 Environmental management. Life Cycle Assessment. Requirements and guidelines. Tools and databases.
ISO 15686	ISO 15686-1:2011-05: Buildings and civil engineering works - Design for durability - Part 1: General principles and framework.
ISO 9001	ISO 9001 DIN EN ISO 9001:2015-11, Quality management systems - Requirements.
PCR 2019:14	General Programme Instructions of the International EPD® System. PCR 2019:14. Construction products. Version 1.3.4.
SimaPro 9.4.0.1.	SimaPro 9.0 – LCA software by PRé Sustainability http://simapro.com.

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