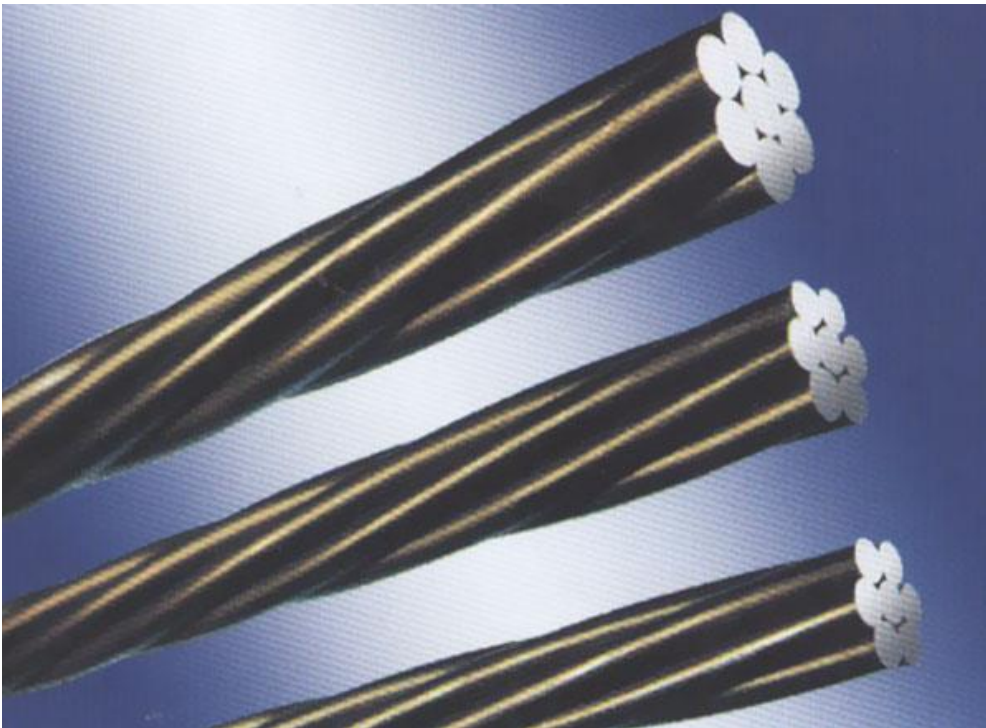


Environmental Product Declaration

In accordance with ISO 14025 and EN 15804+A2

Prestressed concrete steel strand, PC strand



FerROMETALL

Owner of the declaration:
Ferrometall AS

Product name:
PC strand

Declared unit:
1 kg of PC strand

Product category /PCR:
EN 15804:2012+A2:2019 serves as core PCR.
NPCR 013:2019 Part B for Steel and Aluminium
for Construction Products version 4.0, issued
06.10.2021

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-4849-4075-EN

Registration Number:
NEPD-4849-4075-EN

Issue date: 28.08.2023

Valid to: 28.08.2028

General information

FeRROMETALL

Product:

PC strand

Program Operator:

The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Tlf: +47 23 08 80 00
e-mail: post@epd-norge.no

Declaration Number:

NEPD-4849-4075-EN

This declaration is based on Product Category Rules:

EN 15804:2012+A2:2019 serves as core PCR
NPCR 013:2019 Part B for Steel and Aluminium
Construction Products. Version 4.0.

Statements:

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

Declared unit:

1 kg of PC strand

Declared unit with option:

1 kg of PC strand, cradle-to-gate A1-A3, with options A4, C1-C4, D

Functional unit:

-

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

internal

external

Sign

Ole M. K. Iversen

Independent verifier approved by EPD Norway

Owner of the declaration:

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Contact person: Rune Humlebekk
Phone: +47 48 29 04 29
e-mail: rune@ferrometall.no

Manufacturer:

Ferrometall AS
Gyldenløves plass 1, 3044 Drammen
Phone: +47 32 89 10 30
e-mail: info@ferrometall.no

Place of production:

Tianjin, China

Management system:

EN ISO 9001, EN ISO 14001, BS/EN 1090

Organisation no:

995 727 064

Issue date:

28.08.2023

Valid to:

28.08.2028

Year of study:

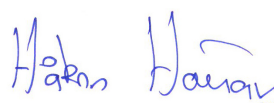
2023

Comparability:

EPDs from other programmes than EPD Norge may not be comparable.

The EPD has been worked out by:

Dan André Johansen, Asplan Viak AS



Approved (Manager of EPD Norway)

Product

Product description:

Prestressed concrete steel strand, known as a PC strand, is a typical construction material used for reinforcing concrete elements used in buildings and infrastructure. PC strands are wire rods of solid steel that have been twisted together and are used in pre-stressing concrete elements.

Products start out as pre-produced steel wire rods of specific dimensions manufactured at various locations in China. The steel components are twisted together, and the PC strand will vary in dimension depending on the number of rods twisted together and the dimensions of each thread.

Product specification:

Materials	kg	%
Steel with alloys	1,00	100

Technical data:

The dimensions evaluated in this report are 12,7-12,9 mm and 15,2-15,9 mm, which are in the range of the standard dimensions for this product type.

Market:

Norway and Scandinavia

Reference service life, product:

60 years

Reference service life, building:

60 years

LCA: Calculation rules

Declared unit:

1 kg of PC strand, cradle-to-gate A1-A3 with options A4, C1-C4 and D.

Data quality:

General requirements and guidelines concerning the use of generic and specific data and the quality of those are as described in EN 15804: 2012+A2:2019, clause 6.3.7 and 6.3.8., including ISO14044:2006, 4.2.3.6. The data is representative according to temporal, geographical and technological requirements. Generic data is from LCA databases such as ecoinvent v3.8, Agri-footprint 5 and World Steel Association LCI data which is found in the Industry data 2.0 ecoinvent extension (See also Worldsteel, 2017). Calculations have been carried out using Simapro v9. Characterization factors from EN15804:2012 + A2:2019.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Production activities, energy, water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

System boundary:

Modules are declared according to NPCR 013 Part B. Declared modules are shown in Figure 1. Gray boxes denote modules not declared.

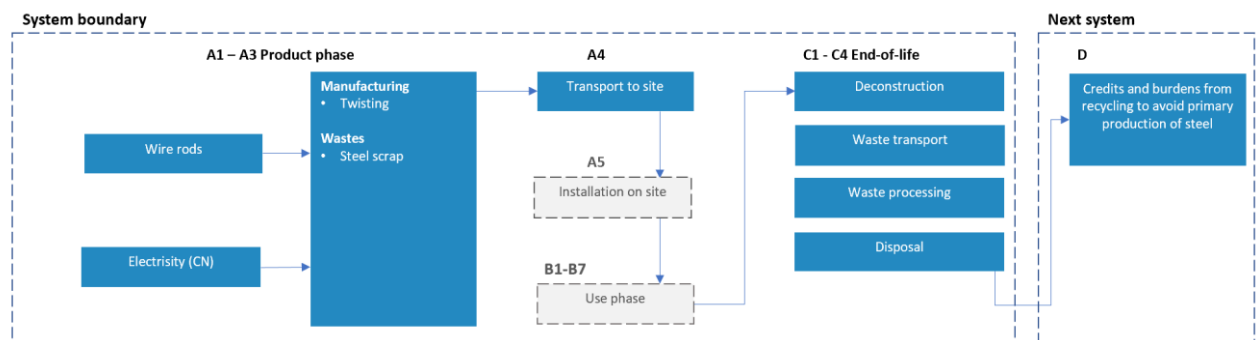


Figure 1: System boundaries

Cut-off criteria:

All major raw materials and all the essential energy is included. The production process for raw materials and energy flows that are included with very small amounts (<1% energy, mass, impact) are not included. This cut-off rule does not apply for hazardous materials and substances.

LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

Transport from production place to Moss, Norway, and transport by truck to the user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	value (kg/t)
Truck	Unspecified	Lorry, unspecified	120	0,025 kg/tkm	3
Ship	100%	50 000 DWT	20 468	0,0016 kg/tkm	33
Ship	80%	5 000 DWT	967	0,014 kg/tkm	14
Truck	80%	Lorry>32t	300	0,025 kg/tkm	7,5

Scenario for distance to building site according to NPCR 013 Part B.

End of Life (C1, C3, C4)

	Unit	Value
Hazardous waste disposed	kg	0
Collected as mixed construction waste	kg	0
Reuse	kg	0
Recycling	kg	0,95
Energy recovery	kg	0
To landfill	kg	0,05

Net new scrap is calculated by subtracting the scrap content of outgoing steel from the recycling rate. The scrap content is 58 % from suppliers. Note that outgoing scrap and the parameter for Secondary Material content (SM) differ, wherein the latter accounts for the total amount of scrap needed in the system to fulfill the declared unit.

A 95% recovery rate is assumed, wherein 5% is assumed landfilled - in effect providing a 95% recycling rate. Reuse is not included in this scenario.

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	value (l/t)
Waste collection	50 %	Lorry 21t	19	0,4 l/tkm	7,4
Truck	26 %	Lorry 16-32t EURO5	278	0,04 l/tkm	12,2

To provide a plausible scenario for transportation to waste processing, a study of Norwegian waste treatment was used as proxy data (Raadal et al., 2009).

Benefits and loads beyond the system boundaries (D)

	Unit	Value
Steel waste	kg	0,05

Module D is calculated as net scrap * LCI for scrap, where the scrap LCI is calculated as the credit for avoided primary production of steel, minus the burden of recycling steel scrap to make new steel, multiplied by the process yield. LCI for scrap has been provided by worldsteel (Eurofer, 2019; Worldsteel, 2017).

Additional technical information

Not relevant.

LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document. Impact assessment results are presented with core and additional impact indicators presented in EN15804+A2. Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009

System boundaries (X=included, MND= module not declared, MNR=module not relevant)

Product stage			Assembly stage		Use stage							End of life stage				Benefits & loads beyond system boundary
Raw materials	Transport	Manufacturing	Transport	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	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

Core environmental impact indicators

Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	2,10E+00	2,11E-01	2,14E-02	6,99E-02	2,12E-04	2,64E-04	-6,28E-01
GWP-fossil	kg CO2 eq.	2,10E+00	2,11E-01	2,14E-02	6,97E-02	2,00E-04	2,63E-04	-6,27E-01
GWP-biogenic	kg CO2 eq.	2,32E-03	8,24E-05	1,85E-05	1,46E-04	1,21E-05	9,28E-07	-4,06E-04
GWP-LULUC	kg CO2 eq.	7,91E-04	1,72E-05	2,14E-06	2,02E-05	5,41E-07	2,49E-07	9,08E-05
ODP	kg CFC11 eq.	7,38E-08	1,18E-08	4,58E-09	1,58E-08	2,13E-11	1,07E-10	-3,41E-16
AP	mol H ⁺ eq.	1,18E-02	4,28E-03	2,23E-04	3,30E-04	1,63E-06	2,48E-06	-1,13E-03
EP-freshwater	kg P eq.	7,50E-05	3,92E-07	7,10E-08	3,64E-07	6,73E-09	2,76E-09	-1,28E-07
EP-marine	kg N eq.	2,72E-03	1,26E-03	9,85E-05	1,17E-04	4,45E-07	8,56E-07	-1,68E-04
EP-terrestrial	mol N eq.	2,54E-02	1,38E-02	1,08E-03	1,29E-03	5,02E-06	9,42E-06	-1,64E-03
POCP	kg NMVOC eq.	7,15E-03	3,46E-03	2,97E-04	4,24E-04	1,44E-06	2,74E-06	-8,59E-04
ADP-M&M	kg Sb eq.	1,92E-05	1,25E-07	1,10E-08	1,81E-07	1,22E-08	6,01E-10	-1,33E-06
ADP-fossil	MJ	2,06E+01	2,73E+00	2,94E-01	1,01E+00	2,90E-03	7,35E-03	-5,46E+00
WDP	m ³	7,65E-01	2,85E-03	4,19E-04	2,17E-03	1,05E-04	3,30E-04	-7,16E-02

GWP-total: Global Warming Potential; **GWP-fossil:** Global Warming Potential fossil fuels; **GWP-biogenic:** Global Warming Potential biogenic; **GWP-LULUC:** Global Warming Potential land use and land use change; **ODP:** Depletion potential of the stratospheric ozone layer;

AP: Acidification potential, Accumulated Exceedance; **EP-freshwater:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; See “additional Norwegian requirements” for indicator given as PO4 eq. **EP-marine:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-terrestrial:** Eutrophication potential, Accumulated Exceedance; **POCP:** Formation potential of tropospheric ozone; **ADP-M&M:** Abiotic depletion potential for non-fossil resources (minerals and metals); **ADP-fossil:** Abiotic depletion potential for fossil resources; **WDP:** Water deprivation potential, deprivation weighted water consumption

Additional environmental impact indicators

Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
PM	Disease incidence	1,90E-07	3,31E-08	5,90E-09	6,39E-09	2,73E-11	4,85E-11	-1,90E-08
IRP	kBq U235 eq.	3,22E-02	3,55E-03	1,25E-03	4,38E-03	3,80E-05	3,01E-05	1,65E-02
ETP-fw	CTUe	6,78E+01	6,96E-01	1,72E-01	7,14E-01	6,68E-03	4,64E-03	2,39E-02
HTP-c	CTUh	1,53E-08	8,99E-11	6,65E-12	2,06E-11	8,30E-13	1,18E-13	1,88E-10
HTP-nc	CTUh	8,22E-08	1,60E-09	1,25E-10	6,91E-10	8,45E-12	3,05E-12	-8,40E-09
SQP	Dimensionless	9,00E+00	7,05E-01	3,74E-02	5,36E-01	1,73E-02	1,54E-02	1,38E-01

PM: Particulate matter emissions; **IRP:** Ionising radiation, human health; **ETP-fw:** Ecotoxicity (freshwater); **ETP-c:** Human toxicity, cancer effects; **HTP-nc:** Human toxicity, non-cancer effects; **SQP:** Land use related impacts / soil quality

Classification of disclaimers to the declaration of core and additional environmental impact indicators

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
	Acidification potential, Accumulated Exceedance (AP)	None
ILCD type / level 2	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

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

Disclaimer 2 – 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 experienced with the indicator

Resource use

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
RPEE	MJ	2,06E+00	1,07E-02	1,65E-03	1,15E-02	1,52E-02	6,27E-05	4,50E-02
RPEM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	2,06E+00	1,07E-02	1,65E-03	1,15E-02	1,52E-02	6,27E-05	4,50E-02
NRPE	MJ	2,07E+01	2,73E+00	2,94E-01	1,01E+00	2,90E-03	7,36E-03	-5,46E+00
NRPM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	2,07E+01	2,73E+00	2,94E-01	1,01E+00	2,90E-03	7,36E-03	-5,46E+00
SM	kg	5,92E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
W	m ³	2,13E-02	8,62E-05	1,48E-05	1,09E-04	1,11E-04	7,83E-06	-2,76E-03

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE Total use of non renewable primary energy resources; SM Use of secondary materials; RSF Use of renewable secondary fuels; NRSF Use of non renewable secondary fuels; W Use of net fresh water

End of life - Waste

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
HW	kg	1,23E-02	4,82E-05	8,57E-06	4,48E-05	9,39E-07	5,73E-07	0,00E+00
NHW	kg	8,03E-01	5,61E-02	3,92E-04	3,75E-02	1,04E-04	5,00E-02	0,00E+00
RW	kg	3,75E-05	5,09E-06	2,03E-06	6,90E-06	2,35E-08	4,82E-08	0,00E+00

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

End of life – output flow

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
CR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MR	kg	2,00E-02	0,00E+00	0,00E+00	0,00E+00	9,50E-01	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit	Value
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in the accompanying packaging	kg C	0,00E+00

Additional Norwegian requirements

Greenhouse gas emission from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process(A3).

National electricity grid	Unit	Value
Ecoinvent v3.8 - China	kg CO ₂ -eq/kWh	1,09
Ecoinvent v3.8 - Norway	kg CO ₂ -eq/kWh	0,0289

Additional environmental impact indicators required in NPCR Part A for construction products

In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
GWP-IOBC	kg CO ₂ eq.	2,10E+00	2,11E-01	2,14E-02	6,99E-02	2,12E-04	2,64E-04	-6,28E-01

GWP-IOBC Global warming potential calculated according to the principle of instantaneous oxidation.

Hazardous substances

The declaration is based upon reference to threshold values and/or test results and/or material safety data sheets provided to EPD verifiers. Documentation available upon request to EPD owner.

- The product contains no substances given by the REACH Candidate list or the Norwegian priority list.
- The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.
- The product contain dangerous substances, more then 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.
- The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskitfen, Annex III), see table.

Indoor environment






No tests have been carried out on the product concerning indoor climate - Not relevant.

Carbon footprint

Carbon footprint has not been worked out for the product.

Bibliography

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
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Raadal et al. (2009)	Klimaregnskap for avfallshåndtering. Fase I og II: Glassemballasje, metallemballasje, papir, papp, plastemballasje, våtorganisk avfall, treavfall og restavfall fra husholdninger. ISBN: 82- 8035-073-X.

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