



Environmental Product Declaration

In accordance with ISO 14025 for:



Steel fibre with hooked ends

from

KrampeHarex GmbH & Co. KG



KRAMPE HAREX®

Programme:	The International EPD® System, www.environdec.com
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Programme information

Programme:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
PCR: Construction products 2019:14 (EN 15804:A2) (1.2.5)
PCR review was conducted by: IVL Swedish Environmental Research Institute, Secretariat of the International EPD System
Life Cycle Assessment (LCA)
LCA accountability: Ran Tao and Susanne Jorre, TÜV Rheinland Energy GmbH
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:
<input checked="" type="checkbox"/> EPD verification by individual verifier
Third-party verifier: Prof. Ing Vladimír Kočí, PhD., Prague, Czech Republic, vladimir.koci@lca.cz
Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third-party verifier:
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Company information

Owner of the EPD:

KrampeHarex GmbH & Co. KG
 Pferdekamp 6-8, 59075 Hamm
 Phone: +49 2381 977 977
 E-mail: info@krampeharex.com

Description of the organisation:

KrampeHarex GmbH & Co. KG is the world's largest private owned fibre producer and employs around 140 people at 4 locations in Germany, Austria and the Czech Republic. Their focus is on consistent specialisation, continual development, service that is far above average, efficient quality management and economic sustainability. They offer their customers the whole package, which has enabled them to grow as a healthy company over the years. All along the way KrampeHarex GmbH & Co. KG has always operated as a family company and lived familial values with their employees as well.

Name and location of production site:

Pferdekamp 6-8, 59075 Hamm, Germany

Product information

Product name:

Steel fibre with hooked ends

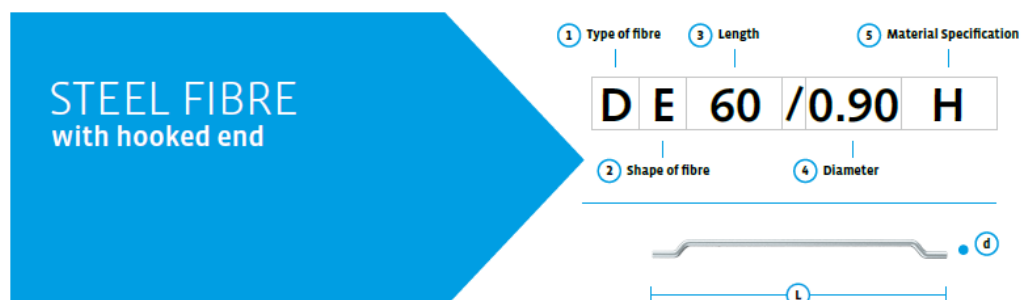
Product description:

KrampeHarex steel fibres with hooked ends are used as concrete reinforcement in combination with or as a substitution to rebars or meshes. The steel fibres bridge cracks of small width, distribute the stresses and increase the strength of the concrete in the cracked state. By adding a determined number of fibres in the concrete, tensile and shear strength, impact strength and fatigue resistance are increased.

KrampeHarex steel fibres with hooked ends for concrete reinforcement covered by this EPD are manufactured in their own manufacturing plant in Hamm, Germany. Steel fibres with hooked ends are produced in different diameters and lengths, depending on the application field and customer requirements. The surface of the fibre is usually slightly grained. For special applications stainless steel fibres and for example copper or zinc coated fibres are available as well. The fibres are usually packed either in big bags or boxes of different dimensions.

KrampeHarex fibres are used all over the world for different applications like industrial floors, tunnel constructions, precast elements, sprayed concrete linings, traffic areas, security technology, refractory concrete, mines etc.

Product identification:



Fibres covered by this EPD:

Type of fibre & Shape of fibre	Length [mm]	Diameter [mm]	Material Specification	Nominal Tensile Strength [N/mm ²]
DE	25 to 60	0.40 to 1.2	N = Normal Tensile Strength M = Middle Tensile Strength H = High Tensile Strength U = Ultra High Tensile Strength	960 – 1,350 > 1,350 – 1,800 >1,800 – 2,000 >2,000

LCA information

Functional unit / declared unit:

Production of 1 kg steel fibres with hooked ends (mass excluding packaging)

Reference service life:

n/a

Time representativeness:

2021 as reference year

Database(s) and LCA software used:

GaBi Professional Datenbank, Version 2023.1; Ecoinvent Datenbank, Version 3.8

Description of system boundaries:

Cradle-to-gate (A1-A3) with options: A4 (Transport to customers), A5 (Installation), C2 (Transport to End of life), C3 (Waste processing), C4 (Disposal) and D (Reuse-Recycling-recovery-potential)

Excluded lifecycle stages:

All phases of the use stage B (as there are no emissions during the use of the product), C1 (Deconstruction: no data available)

LCA Practitioner:

Ran Tao and Susanne Jorre
 TÜV Rheinland Energy GmbH
 Am Grauen Stein
 51105 Cologne, Germany

System diagram:

	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	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X	
Geography	DE	DE	DE	EU	EU	-	-	-	-	-	-	-	EU	EU	EU	EU	EU	
Specific data used	Data from raw material supplier and from production site in Hamm Germany					-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	Average product in reference year 2021					-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%, One site in Hamm, Germany					-	-	-	-	-	-	-	-	-	-	-	-	-

Further information:

All inputs and outputs of the production by KrampeHarex GmbH & Co. KG were considered in the calculation. Generic data from relevant EPD document was used for the considered raw materials from the supplier due to the fact that these materials are not produced by KrampeHarex GmbH & Co. KG.

Assumptions were made for modules A2, A3, A5 and C2. Supplier-specific distances of raw materials to manufacturing site (A2) were provided by KrampeHarex GmbH & Co. KG via container ship driven by heavy fuel oil (1.0 wt.% S) with capacity of 5.000 to 200.000 t and via truck with the assumption of the parameters: Euro 0-6 mix, more than 32 t, 85% utilization. For input packaging waste treatment in A3 85% of steel scraps are assumed to be recycled and 15% are assumed to be incinerated (JRC:2020). For A5 a distance of 50 km to waste treatment plant by truck (Euro 0-6 mix, more than 32 t, 85% utilization) were assumed. For C2 the distance to waste treatment plant is also provided by KrampeHarex GmbH & Co. KG.

According to the information from KrampeHarex GmbH & Co. KG after the use of steel fibres 95% of the material is assumed to be recycled and 5% is assumed to be landfilled. The low impact from shredding in C3 is neglected.

Needed machines, plants and further infrastructure for the production at KrampeHarex GmbH & Co. KG 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 in module A5 are allocated to module D. At end-of-life phase benefits of material recycling are also considered (avoided burden approach).



Content declaration

Packaging

Input packaging:

Hot-rolled coil steel is used for the wire rods packaging.

Product packaging:

Disposable pallets, PE-film, big bags and cartons are used for product packaging.

Recycled material

Provenience of recycled materials (pre-consumer or post-consumer) in the product:

According to the EPD documentation of the input material wire rods, the raw materials for wire rods are considered as pre-consumer and post-consumer steel scraps.

Content information

Product component	Weight, kg	Post-consumer material, weight%	Biogenic material, kg C/kg
Hot-rolled wire rod	1	68%-69%	0

Packaging materials	Weight, kg	Weight-% (versus product)	Biogenic material, kg C/kg packaging
Pallet	0,022	2,2%	0,53
PP fibres (big bag)	0,000152	0,0152%	0,046
PE film	0,0012	0,12%	0,059
carton	0,0129	1,29%	0,015
Sum	0,036	3,6%	0,012

During the product life cycle, no hazardous substances of the 'Candidate List of Substances of Very High Concern (SVHC) for authorization' was used in a percentage greater than 0,1% of the product weight.

Environmental performance

Potential environmental impact

ENVIRONMENTAL IMPACT: 1 kg steel fibres with hooked ends								
		Production	Transport	Assembly	Waste transport	Waste processing	Disposal	Credits
Parameter	Unit	A1 - A3	A4	A5	C2	C3	C4	D
GWP-total	[kg CO ₂ -Eq.]	2,57E-01	1,96E-02	4,25E-02	1,27E-03	0,00E+00	2,39E-03	-2,15E-01
GWP-fossil	[kg CO ₂ -Eq.]	2,84E-01	1,96E-02	-1,29E-02	1,28E-03	0,00E+00	2,42E-03	-2,09E-01
GWP-biogenic	[kg CO ₂ -Eq.]	-2,89E-02	-1,18E-04	5,53E-02	-1,79E-05	-5,02E-03	-2,78E-05	-4,83E-03
GWP-LULC	[kg CO ₂ -Eq.]	1,55E-03	1,20E-04	1,18E-06	1,17E-05	0,00E+00	2,38E-06	-1,31E-03
ODP	[kg CFC11-Eq.]	7,51E-09	6,78E-14	-1,26E-09	1,11E-16	0,00E+00	3,86E-15	-5,42E-09
AP	[mole H ⁺ -Eq.]	1,61E-03	9,46E-05	-9,56E-05	2,09E-06	0,00E+00	7,50E-06	-5,28E-04
EP-freshwater	[kg P-Eq.]	1,17E-05	6,06E-08	-3,47E-10	4,62E-09	0,00E+00	2,12E-09	-3,57E-06
EP-marine	[kg N-Eq.]	4,57E-04	3,01E-05	-1,81E-06	8,31E-07	0,00E+00	1,89E-06	-1,59E-04
EP-terrestrial	[mole N-Eq.]	4,48E-03	3,33E-04	-8,80E-06	9,55E-06	0,00E+00	2,07E-05	-1,41E-03
POCP	[kg ethene-Eq.]	1,46E-03	8,00E-05	-1,22E-05	1,85E-06	0,00E+00	5,90E-06	-6,71E-04
ADPE	[kg Sb-Eq.]	3,54E-07	1,52E-09	2,97E-11	8,16E-11	0,00E+00	6,40E-11	-5,87E-08
ADPF	[MJ]	3,23E+00	2,88E-01	-2,39E-01	1,72E-02	0,00E+00	3,50E-02	-2,34E+00
WDP	[m ³ world equiv.]	1,43E+00	9,41E-04	5,71E-03	1,46E-05	0,00E+00	-3,18E-05	-1,69E-01
GWP-GHG	[kg CO ₂ -Eq.]	2,86E-01	1,97E-02	-1,29E-02	1,29E-03	0,00E+00	2,42E-03	-2,11E-01

GWP= Global Warming Potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources

Use of resources

RESOURCE USE: 1 kg steel fibres with hooked ends								
		Production	Transport	Assembly	Waste Transport	Waste processing	Disposal	Credits
Parameter	Unit	A1 – A3	A4	A5	C2	C3	C4	D
PERE	[MJ]	8,88E+00	5,86E-02	-2,14E-02	1,22E-03	0,00E+00	3,14E-03	-1,48E-03
PERM	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	8,88E+00	5,86E-02	-2,14E-02	1,22E-03	0,00E+00	3,14E-03	-2,60E+00
PENRE	[MJ]	3,50E+00	2,89E-01	-2,39E-01	1,73E-02	0,00E+00	3,50E-02	-5,03E+00
PENRM	[MJ]	2,78E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,64E-02
PENRT	[MJ]	3,52E+00	2,89E-01	-2,39E-01	1,73E-02	0,00E+00	3,50E-02	-2,61E+00
SM	[kg]	0,00E+00	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
FW	[m ³]	3,29E-02	5,06E-05	1,34E-04	1,34E-06	0,00E+00	3,94E-07	-3,38E-03

PERE = Renewable primary energy as energy carrier; PERM = Renewable primary energy as material utilization; PERT = Total renewable primary energy resources; PENRE = Non-renewable primary energy as energy carrier; PENRM = Non-renewable primary energy as material utilization; PENRT = Total non-renewable primary energy resources; SM = Use of secondary material; RSF = Renewable secondary fuels; NRSF = Non-renewable secondary fuels; FW = Use of net fresh water

Waste production and output flows (optional)

OUTPUT FLOWS AND WASTE CATEGORIES: 1 kg steel fibres with hooked ends								
		Production	Transport	Assembly	Waste Transport	Waste processing	Disposal	Credits
Parameter	Unit	A1 - A3	A4	A5	C2	C3	C4	D
HWD	[kg]	9,17E-06	-5,18E-12	2,00E-13	6,38E-14	0,00E+00	2,89E-12	-8,71E-06
NHWD	[kg]	3,50E-02	8,51E-05	5,92E-04	2,49E-06	0,00E+00	5,01E-02	-2,54E-02
RWD	[kg]	1,63E-05	1,23E-05	-2,01E-05	2,23E-08	0,00E+00	4,07E-07	-1,47E-05
CRU	[kg]	7,47E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	[kg]	4,35E-02	0,00E+00	0,00E+00	0,00E+00	9,51E-01	0,00E+00	-9,51E-01
MER	[kg]	2,62E-02	0,00E+00	1,43E-02	0,00E+00	0,00E+00	0,00E+00	-1,43E-02
EEE	[MJ]	0,00E+00	0,00E+00	3,67E-02	0,00E+00	0,00E+00	0,00E+00	-3,67E-02
EET	[MJ]	0,00E+00	0,00E+00	6,62E-02	0,00E+00	0,00E+00	0,00E+00	-6,62E-02

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

Interpretation of LCA Results

In the interpretation, following representative impact categories are selected for considered product: GWP-total, ODP, AP, EP-freshwater, POCP, ADP-mineral and metals (ADPE) as well as ADP-fossil (ADPF). A1 has the largest share in categories 'GWP-total', 'ODP', 'POCP' and 'ADPF', which means the production of raw materials wire rods is the main driver for these impacts. In addition, A1 has significant influence in categories 'AP' and 'EP-freshwater'. Besides, A2 is the main driver in category 'AP' and has strong influence in 'POCP', which is mainly caused by transport of raw materials via container ship.

A3 has the largest share in categories 'EP-freshwater' and 'ADPe', in which the highest impacts results from the production of packaging materials and from energy consumption, respectively. In categories 'ODP', 'AP', 'POCP' and 'ADPF', A5 has negative influence due to the incineration of wooden pallets.

References

DIN EN ISO 14020:2000, Environmental labels and declarations - General principles

DIN EN ISO 14021: 2016, Environmental labels and declarations - Self-declared environmental claims (Type II environmental labelling)

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

Ecoinvent Database, Version 3.5, 2020

EN 15804:2012+A1:2014+A2:2019, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

GaBi Professional Database (Sphera), Version 2022.1

General Programme Instructions of the International EPD® System. Version 4.0.

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

PCR 2019:14 Construction products (EN 15804:2012+A2:2019) (1.2.5)

JRC: 2020: https://eplca.jrc.ec.europa.eu/permalink/Annex_C_V2.1_May2020.xlsx

EPD document of raw material: hot-rolled wire rod for steel fabric proceeding from an electric arc furnace using 100% renewable energy

ISO 14040, 2021: International Standard (ISO), Europäisches Komitee für Normung (CEN), Umweltmanagement- Ökobilanz – Grundsätze und Rahmenbedingungen

ISO 14044, 2021: International Standard (ISO), Europäisches Komitee für Normung (CEN), Umweltmanagement- Ökobilanz – Anforderungen und Anleitungen

