

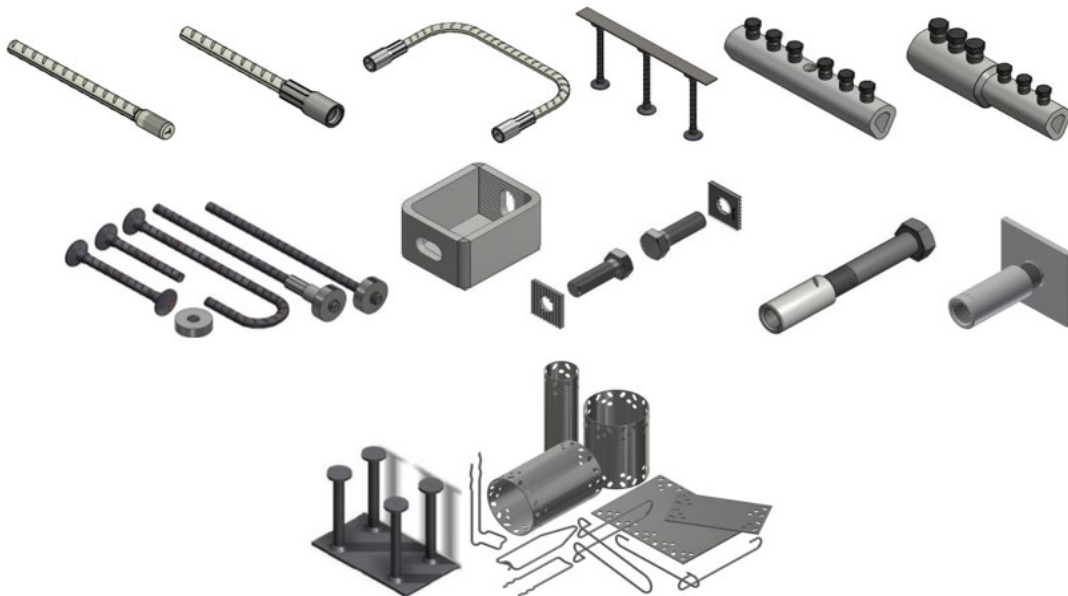
Environmental Product Declaration

Multiple products based on average results

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

Connecting Systems

TERWA B.V.



Programme

EPD Square | www.epdsquare.com

Programme operator

EPD Square, s.r.o.

EPD Registration number

SQ 00-021

Publication date

06.02.2025

Valid until

05.02.2030

General information

Product

Connecting Systems

Program operator

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Email: info@epdsquare.com

Registration number

SQ 00-021

Publication date

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Valid until date

05.02.2030

Owner of the declaration

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Manufacturer

TERWA Construction Systems

Sanzienei street,

507075 Ghimbav, Romania

Email: n.mate@terwa.com

Place of production

Sanzienei street, 507075 Ghimbav,

Romania

Product Category Rules (PCR)

The CEN standard EN 15804+A2 serves as the core PCR. In addition EPD Square PCR v1.0, 2024 is used.

Declared unit

1 kg

Mass per DU

1

UN CPC code

412

Geographical scope

Europe

Year of study

June 2023 to July 2024

Comparability

EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in the context of the building.

EPD author

Sarah Curpen, Silvia Vilčeková, EPD Clarity s.r.o.

Verification type

Independent verification of the declaration and data, according to ISO14025:2006

Internal:

External:

Verified by

Gaurav Das

GD

The owner of the declaration shall be liable for the underlying information and evidence.

EPD Square shall not be liable with respect to manufacturer, life cycle assessment data and evidence.

System boundaries

This is an EPD cradle to grave with options (A1-A3, A4, A5, C1-C4, D).

Modules declared and geographical scope

	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	✓	✓	✓	✓	✓	ND	ND	ND	ND	ND	ND	ND	✓	✓	✓	✓	✓
Geography	World	World	RO	EU	EU	-	-	-	-	-	-	-	EU	EU	EU	EU	EU

ND: Not Declared

Description of Organization

TERWA is a company with more than 25 years' experience in the production of metal components for construction and precast industry. TERWA deploys the latest technology and has developed long-term partnerships with companies throughout the world. TERWA defines itself as a quality producer, the company is certified to ISO 9001:2015, 3834-2 and 14001. TERWA products are certified and approved according to European and global norms and standards. The quality of TERWA products is constantly monitored throughout the entire production process and also by international specialist laboratories.

TERWA is in charge of the entire process of manufacturing a product, from the concept and the design right through to after-sales service. This allows for the adaptation to any requirements and to satisfy customers' needs. The most important tasks of the design and development departments are to create new products and to improve existing products, matching themselves to the demands of the construction and precast industry with the latest technical challenges adopted with innovative solutions.

Product information

Product name

Connecting Systems

Product description

This EPD covers the connecting systems manufactured at the Terwa Construction System facility located at Sânzieni 301-305, Ghimbav, Braşov, Romania. Connecting systems consist of metal components used in both precast and cast-in-situ concrete connections, encompassing a broad range of products. They may involve welded, bolted, or mechanical connections. At the Romania facility, products such as TBA, TBAP TPC, ALC, PSA, TSE, TFS, KB-F, TWSK, KB-W, TEC, anchor plates, TFA, TMA, TVH, TVB, TVA, TSPA, TFPT, TFPR, TSR, SB, fixing inserts and others are produced. For more detailed product information, including technical specifications, please visit the Terwa website at <https://www.terwa.com/index.html>.

Product application

Typically, these connecting systems are designed to link various building elements, including foundations, columns, beams, slabs, walls, floors, sandwich panels, and a variety of other connections. They also serve purposes in reinforcement, lifting, and transportation.

Geographical scope

Europe

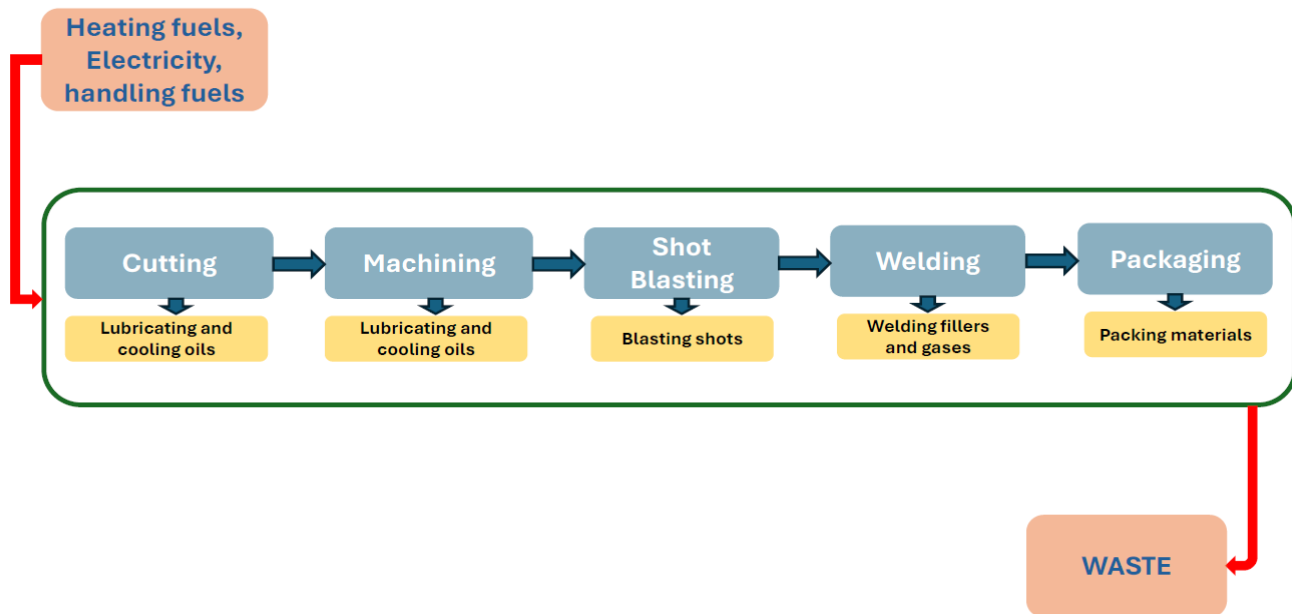
Product contents information

Product components	Weight, kg	Post-consumer material, weight-%	Renewable material, weight-%
Steel	0.995	59	-
Coating	0.005	-	-
TOTAL	1		
Packaging materials	Weight, kg	Weight-% (versus the product)	
Carton	0.00151	0.15	
Wood Particle Board	0.00202	0.20	
Wooden Pallet	0.0774	7.7	
TOTAL	0.0810	8.1	

Manufacturing process

The environmental impacts of raw material supply include emissions generated when raw materials are taken from nature, transported to industrial units for processing and processed, along with waste handling from the various production processes. The primary raw material is steel with varying percentages of recycled content depending on the origin. All major upstream processes are taken into consideration, including infrastructure. Loss of raw material and energy transmission losses are also taken into account. (A2) include exhaust emissions resulting from the transport of all raw materials from suppliers to Terwa production plant in Romania as well as the environmental impacts of production of the used diesel. The transportation distances and methods were provided mainly by Terwa Construction Systems located in Romania. The environmental impacts considered for the production stage (A3) cover the manufacturing of the production materials (welding gases and blasting steel shots) and fuels used by machines. The products packaging, and the electricity which is consumed during the manufacturing at the plant are accounted for here. Also handling of waste formed in the production processes at the production plant is covered. The study considers the losses of main raw materials occurring during the manufacturing process.

PRODUCT MANUFACTURING PROCESS



Life cycle assessment

This is an average EPD for multiple products with varying dimensions.

Cut-off criteria

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw materials and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass. Processes excluded from the assessment and the related cut-off criteria include Weight loss (waste streams) of ancillary materials (oils, cut liquids etc.), Mass, < 0.01 %. Mixed waste, Mass, < 0.01 %. Other waste streams (paper waste, energy waste etc.), Mass, < 0.1 % Modules B1 – B7 have not been calculated nor included in the LCA calculations. The production of capital equipment, construction activities

and infrastructure, maintenance and operation of capital equipment, personnel related activities, energy and water use related to company management and sales activities are also excluded

Allocation, estimations, and assumptions

Allocation is based on annual production rate and made with high accuracy and precision. The values for 1 kg of the products which are used within this study are calculated by considering the total product weight per annual production. In the production plant, several kinds of products are produced; since the production processes of these products are similar, the annual production percentages are taken into consideration for allocation. According to the ratio of the annual production of the declared product to the total annual production at the factory, the annual total energy consumption, packaging materials and the generated waste per the declared product are allocated. Subsequently, the produced products output fixed to 1 kg and the corresponding amount of product is used in the calculations.

Database(s) and LCA software

This EPD has been created using One Click LCA Pre-Verified EPD Generator. Ecoinvent v3.8 and One Click LCA databases were used as sources of environmental data.

LCA Scenarios and additional technical information

Manufacturing energy scenario

Electricity data source and quality	Electricity, high voltage, production mix (Reference product: electricity, high voltage) Romania, Ecoinvent 3.8
Electricity CO2e / kWh	0.39

End of Life (C1, C3, C4)

The fuel usage involved in the deconstruction and dismantling process is estimated based on the reference background process available in Ecoinvent v3.8 designed for this specific task. At this stage, the transport of the dismantled product system is also taken into account, with an assumed distance of 50 km to the disposal site. 98% of the waste product is recycled. In module C4, the waste disposal scenario involves sending 2% of the product as mixed construction waste.

	Value	Unit
Collected separately		kg
Collected as mixed construction waste	0.02	kg
Reuse		kg
Recycling	0.98	kg
Energy recovery		kg
To landfill		kg

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LCA results

Core environmental impact indicators – EN 15804+A2, PEF 3.0

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	3.4E+00	4.4E-01	2.3E-01	1.6E-02	1.1E-02	5.6E-02	1.3E-03	-4.2E-03
GWP-fossil	kg CO2 eq.	3.5E+00	4.4E-01	1.8E-03	1.6E-02	1.1E-02	5.6E-02	1.3E-03	-1.1E-02
GWP-biogenic	kg CO2 eq.	-8.8E-02	2.0E-04	2.3E-01	7.0E-06	4.9E-06	-5.7E-03	-3.0E-04	6.9E-03
GWP-LULUC	kg CO2 eq.	3.2E-03	2.1E-04	2.2E-06	3.8E-06	5.0E-06	5.6E-06	1.8E-07	-1.6E-05
ODP	kg CFC11 eq.	2.9E-07	1.0E-07	2.3E-10	1.2E-09	2.4E-09	1.2E-08	3.1E-10	-6.0E-10
AP	mol H ⁺ eq.	3.2E-02	1.3E-03	7.1E-06	3.8E-05	3.0E-05	5.9E-04	1.3E-05	-5.1E-05
EP-freshwater	kg P eq.	1.3E-04	3.6E-06	8.0E-08	1.3E-07	8.7E-08	1.9E-07	5.6E-09	-1.2E-06
EP-marine	kg N eq.	6.4E-03	2.4E-04	1.3E-06	1.1E-05	5.8E-06	2.6E-04	5.8E-06	-1.1E-05
EP-terrestrial	mol N eq.	7.2E-02	2.7E-03	1.4E-05	1.2E-04	6.4E-05	2.8E-03	6.4E-05	-1.2E-04
POCP	kg NMVOC eq.	2.1E-02	1.0E-03	4.6E-06	4.1E-05	2.5E-05	7.8E-04	1.8E-05	-6.4E-05
ADP-M&M	kg Sb eq.	1.1E-04	2.1E-06	8.9E-09	5.6E-08	5.0E-08	2.9E-08	1.1E-09	-2.2E-08
ADP-fossil	MJ	4.2E+01	6.5E+00	2.8E-02	1.7E-01	1.6E-01	7.6E-01	2.0E-02	-2.2E-01
WDP	m ³	1.1E+00	3.4E-02	4.7E-04	7.4E-04	8.2E-04	2.0E-03	7.0E-05	-7.7E-03

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 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

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Additional (optional) environmental impact indicators – EN 15804+A2, PEF 3.0

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	2.5E-07	3.0E-08	2.0E-10	5.2E-10	7.3E-10	1.6E-08	3.6E-10	-8.8E-10
IRP	kBq U235 eq.	3.3E-01	3.5E-02	4.2E-04	2.6E-04	8.5E-04	3.5E-03	9.2E-05	-3.9E-04
ETP-fw	CTUe	1.1E+02	5.6E+00	3.7E-02	1.3E-01	1.4E-01	4.6E-01	1.4E-02	-1.9E-01
HTP-c	CTUh	5.8E-08	2.0E-10	2.0E-12	6.7E-12	4.7E-12	1.8E-11	5.8E-13	-4.0E-12
HTP-nc	CTUh	8.6E-08	5.3E-09	2.6E-11	1.6E-10	1.3E-10	3.3E-10	9.5E-12	-6.9E-11
SQP	Dimensionless	3.1E+01	3.9E+00	1.2E-02	1.7E-02	9.5E-02	9.9E-02	9.0E-03	5.5E-02

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

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Use of Natural Resources

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
RPEE	MJ	8.2E+00	1.1E-01	2.6E-03	3.3E-03	2.7E-03	4.3E-03	2.0E-04	-2.0E-02
RPEM	MJ	8.3E-01	0.0E+00	-2.1E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.8E-01
TPE	MJ	9.1E+00	1.1E-01	-2.1E+00	3.3E-03	2.7E-03	4.3E-03	2.0E-04	4.6E-01
NRPE	MJ	4.2E+01	6.5E+00	2.8E-02	1.7E-01	1.6E-01	7.6E-01	2.0E-02	-1.4E-01
NRPM	MJ	3.4E-01	0.0E+00	-2.8E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E-04
TRPE	MJ	4.2E+01	6.5E+00	-2.5E-01	1.7E-01	1.6E-01	7.6E-01	2.0E-02	-1.4E-01
SM	kg	9.0E-01	2.7E-03	1.9E-05	1.0E-04	6.5E-05	3.0E-04	2.6E-05	3.1E-03
RSF	MJ	2.3E-02	3.1E-05	1.5E-07	6.1E-07	7.5E-07	9.7E-07	7.0E-08	-5.4E-07
NRSF	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
W	m ³	3.3E-02	9.1E-04	1.4E-05	1.8E-05	2.2E-05	4.6E-05	4.7E-06	-1.5E-04

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	A5	C1	C2	C3	C4	D
HW	KG	2.5E+00	8.5E-03	1.0E-04	4.3E-04	2.0E-04	0.0E+00	2.8E-05	-1.6E-04
NHW	KG	5.5E+00	1.5E-01	3.6E-03	5.1E-03	3.7E-03	0.0E+00	8.5E-03	-5.0E-03
RW	KG	1.7E-04	4.4E-05	1.8E-07	1.4E-07	1.1E-06	0.0E+00	1.4E-07	-3.5E-07

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

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End of life – Output flows

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
CR	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
MR	kg	1.1E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.8E-01	0.0E+00	0.0E+00
MER	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
EEE	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETE	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

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

Information describing biogenic carbon content at factory gate

Biogenic carbon content	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in the accompanying packaging	0.0792	kg C

Specific data (GWP-GHG) and data variation for A1-A3

Specific data and data variation	
Specific data	<60%
Variation - product	<10%
Variation - site	Not relevant

Hazardous substances

- The product does not contain any REACH SVHC substances in amounts greater than 0.1 %.

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Annex

Environmental impacts – EN 15804+A1, ISO 21930 PEF 3.0

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO ₂ eq.	3.4E+00	4.4E-01	1.8E-03	1.6E-02	1.1E-02	5.6E-02	1.3E-03	-1.1E-02
ODP	kg CFC11 eq.	2.4E-07	7.9E-08	1.9E-10	9.9E-10	1.9E-09	9.6E-09	2.4E-10	-5.3E-10
AP	kg SO ₂ eq.	2.6E-02	1.0E-03	5.8E-06	3.0E-05	2.5E-05	4.2E-04	9.6E-06	-4.2E-05
EP	kg PO ₄ eq.	6.5E-03	2.3E-04	6.1E-06	7.7E-06	5.6E-06	9.7E-05	2.4E-06	-9.2E-06
POCP	kg C ₂ H ₄ eq.	1.0E-03	5.3E-05	3.5E-07	3.8E-06	1.3E-06	9.1E-06	2.4E-07	-1.4E-05
ADP-M&M	kg Sb eq.	1.1E-04	2.0E-06	8.8E-09	5.6E-08	4.9E-08	2.8E-08	1.1E-09	-2.3E-08
ADP-fossil	MJ	4.2E+01	6.5E+00	2.8E-02	1.7E-01	1.6E-01	7.6E-01	2.0E-02	-2.2E-01

Environmental impacts – GWP-GHG

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP - GHG	kg CO ₂ e	3.5E+00	4.4E-01	1.8E-03	1.6E-02	1.1E-02	5.6E-02	1.3E-03	-1.1E-02

GWP- GHG Global Warming Potential, greenhouse gases