ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	**thyssenkrupp Steel Europe AG**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-TKS-20210207-IBD1-EN
Issue date	01/12/2021
Valid to	30/11/2026

pladur®
thyssenkrupp Steel Europe AG

Institut Bauen und Umwelt e.V.

www.ibu-epd.com | https://epd-online.com

ECO PLATFORM EPD VERIFIED

General Information

thyssenkrupp Steel Europe AG

Programme holder
IBU – Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-TKS-20210207-IBD1-EN

This declaration is based on the product category rules:
Thin walled profiles and profiled panels of metal, 11.2017
(PCR checked and approved by the SVR)

Issue date
01/12/2021

Valid to
30/11/2026

Dipl. Ing. Hans Peters
(chairman of Institut Bauen und Umwelt e.V.)

Dr. Alexander Röder
(Managing Director Institut Bauen und Umwelt e.V.))

pladur®

Owner of the declaration
thyssenkrupp Steel Europe AG
Kaiser-Wilhelm-Straße 100
D-47166 Duisburg

Declared product / declared unit
The EPD refers to 1 m^2 of hot-dip coated steel sheet with organic coating. These organic coated strips and sheets are distributed under the pladur® brand name.

Scope:
This environmental product declaration refers to hot-dip coated sheets and strips produced at the facilities of thyssenkrupp Steel Europe AG in Duisburg, Kreuztal-Eichen and Kreuztal-Ferndorf.

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 14025:2010*
☐ internally ☒ externally

Matthias Klingler
(Independent verifier)

Product

Product description/Product definition
Hot-dip coated steel sheet in accordance with EN 10346 and SEW 022 with optimum mechanical and physical properties for structural steel qualities with conventional hot-dip coatings made out of:
zinc (Z); zinc-magnesium (ZM); and galfan® (ZA).
Further possible hot-dip coatings: zinc-iron (ZF); galvalume® (AZ); and aluminum-silicon (AS).
The product is also equipped with organic coatings in accordance with DIN 55634 and EN 10169.
The organic coated strips and sheets are distributed under the pladur® brand name.

No Declaration of Performance in accordance with the CPR or similar legal provisions is required to place pladur® on the market, as pladur® is a semi-finished product and therefore not a product that is ready for immediate use within the meaning of corresponding regulations.

Application
The organic coil-coated strips and/or sheets are used as semi-finished products for the manufacture of numerous construction products and other applications:

- roofing (trapezoidal sheets, roof tiles)
- façade cladding (trapezoidal sheets, sandwich elements, wall cassettes)
- interior cladding (trapezoidal sheets, sandwich elements, wall cassettes)
- flat sheets (coverings, structural sheets, wall closures, roof edgings)
- roof drainage systems (gutters, downpipes, eaves flashings and accessories)
- automotive (vehicle construction, trailers, refrigeration bodies)
- garage industry
- white goods (household appliances)
- brown goods (household appliances, housings for consumer electronics)

Technical Data
Technological values: in accordance with EN 10346: 2009, see table.
The CPR and similar legal provisions do not apply to pladur®, as this is a semi-finished product and thus not

a product ready for immediate use within the meaning of corresponding regulations.

Structural data

Name	Value	Unit
Thickness (sheet)	0.45 - 1.5	mm
Grammage	3.91 - 11.7	kg/m²

Base materials/Ancillary materials

The base materials of the primary product steel are pig iron and scrap. Non-alloy steels are protected from corrosion by metallic coatings.

Auxiliary materials/Additives

Zinc coating (Z):
Conventional fire-refined coating with a zinc percentage of at least 99% that has been commonly used in Germany since as early as 1959. The material is heat resistant up to a maximum of 200 °C.

Zinc-iron coating (ZF):
A variant of hot-dip galvanized steel sheet. An annealing process employed immediately after galvanizing converts the zinc coat into a zinc-iron alloy coat with an iron percentage of 8% to 12%. This coat is particularly suitable for welding and varnishing. The material is heat resistant up to a maximum of 250 °C.

Zinc-magnesium coating (ZM):
The properties correspond to those of the Z and ZA coatings, with good forming properties, achieving the same level of protection from corrosion with a finished coating that is only half as thick, an advantage that conserves resources. The coating contains up to 8% magnesium and aluminum in total. It is heat resistant up to 200 °C.

Zinc-aluminum coating (ZA):
The surface appearance differs from conventional galvanized surfaces. The galfan® product is characterized by good forming properties. The molten zinc bath contains 5% aluminum. The material is heat resistant up to a maximum of 230 °C.

Aluminum-zinc coating (AZ):
Distributed under the galvalume® name, this product has a coating of 185 g/m2 on both sides and corresponds to corrosion category C5-M in accordance with DIN 55634. The molten zinc contains 55% aluminum and 1.6% silicon. The material is heat resistant up to a maximum of 315 °C.

Aluminum-silicon coating (AS):
The material is heat resistant up to a maximum of 700 °C and, when combined with specific varnishes, is suitable for applications in the upper temperature range of up to a maximum of 500 °C. The molten aluminum bath contains 8% to 11 % silicon.
To protect and further refine the hot-dip coated base materials (known as duplex systems), one of the following organic coatings is additionally applied: polyester (SP); polyurethane (PUR); polyvinylidene chloride (PVDF). Decorative films are also affixed.
The composition of the organic coating materials varies depending on the shade of color. For polyester and polyurethane coatings, the following percentages can be assumed: resin percentage approx. 40%; solvents approx. 30%; pigments approx. 20%; and approx. 10% additives. For polyvinylidene chloride, the percentages are: Kynar approx. 25%; acrylate approx. 15%; solvents approx. 35%; and approx. 10% additives.

The product does not contain any substances listed on the ECHA Candidate List of substances of very high concern (date: 01-19-2021) above 0.1 by mass that need to be considered for approval.

Reference service life

Service life depends on the location of the building, the impact of weather conditions, and the desired coating.

LCA: Calculation rules

Declared Unit

The declaration refers to 1 m2 of organic coated steel sheet (reference thickness: 0.78 mm). The declared unit refers to the “product at the plant gate.” Installation materials and losses in the installation phase have not been considered. The table below shows the configuration for 1 m2 of steel sheet.
For pladur® products of thicknesses other than the reference thickness, LCA results must be calculated by kg by means of linear conversion.

Declared Unit

Name	Value	Unit
Declared unit	1	m²
conversion factor [Mass/Declared Unit]	6.084	-

The EPD refers to the average annual production at the locations in question for the reference year 2018 and related to 1 m2 of average pladur® product.

System boundary

EPD type: Cradle to Gate – with options.
The calculated LCA addresses the product stage of the life cycle as well as a recycling scenario. The product stage comprises Module A1 (Raw material supply and manufacture of primary product); A2 (Transport); and A3 (Manufacturing). The recycling scenario comprises Module C1 (De-construction demolition); C2 (Transport to disposal/waste processing); and C4 (Disposal). Module D depicts benefits and loads beyond the system boundaries in accordance with EN 15804

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.

Background database GaBi 2021.2 was used to calculate LCA results.

LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic Carbon

The declared product does not contain any biogenic carbon.

Packaging has not been considered within the context of the study.

End of Life Stage (C1-C4)

Name	Value	Unit
Collected separately steel scrap	6.08	kg
Recycling steel scrap	5.78	kg
Landfilling steel scrap	0.304	kg

Reuse-, Recovery- and Recyclingpotential

Name	Value	Unit
Net flow of steel scrap	5,55	kg

The scenario at hand contains a recycling rate of 95%. As ThyssenKrupp externally purchases scrap to manufacture pladur®, this has been offset against the gross steel scrap that is fed into recycling.

LCA: Results

The following table contains the LCA results for the declared unit of 1 m² pladur®.

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	ND	ND	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m² pladur®

Core Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Global warming potential - total	[kg CO_2-Eq.]	1.79E+1	1.46E-2	1.59E-2	0.00E+0	4.48E-3	-1.08E+1
Global warming potential - fossil fuels	[kg CO_2-Eq.]	1.78E+1	1.84E-2	1.58E-2	0.00E+0	4.60E-3	-1.08E+1
Global warming potential - biogenic	[kg CO_2-Eq.]	5.19E-2	-4.61E-3	-1.88E-5	0.00E+0	-1.34E-4	1.89E-2
GWP from land use and land use change	[kg CO_2-Eq.]	5.19E-3	8.44E-4	1.29E-4	0.00E+0	1.35E-5	-2.55E-4
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	4.14E-9	7.09E-17	3.12E-18	0.00E+0	1.79E-17	5.07E-14
Acidification potential, accumulated exceedance	[mol H^+-Eq.]	4.53E-2	7.94E-5	1.61E-5	0.00E+0	3.27E-5	-2.99E-2
Eutrophication, fraction of nutrients reaching freshwater end compartment	[kg PO_4-Eq.]	3.35E-5	3.12E-7	4.70E-8	0.00E+0	7.72E-9	-1.87E-6
Eutrophication, fraction of nutrients reaching marine end compartment	[kg N-Eq.]	1.14E-2	1.80E-5	5.01E-6	0.00E+0	8.50E-6	-6.22E-3
Eutrophication, accumulated exceedance	[mol N-Eq.]	1.19E-1	2.24E-4	5.97E-5	0.00E+0	9.34E-5	-6.73E-2
Formation potential of tropospheric ozone photochemical oxidants	[kg NMVOC-Eq.]	3.23E-2	6.24E-5	1.39E-5	0.00E+0	2.58E-5	-2.08E-2
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.66E-4	9.90E-9	1.40E-9	0.00E+0	4.34E-10	2.32E-7
Abiotic depletion potential for fossil resources	[MJ]	1.75E+2	1.47E+0	2.11E-1	0.00E+0	6.10E-2	-7.90E+1
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	[m^3 world-Eq deprived]	2.14E+0	1.33E-3	1.47E-4	0.00E+0	4.93E-4	0.00E+0

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m² pladur®

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	[MJ]	6.71E+0	9.62E-2	1.21E-2	0.00E+0	8.21E-3	1.01E+1
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	6.71E+0	9.62E-2	1.21E-2	0.00E+0	8.21E-3	1.01E+1
Non-renewable primary energy as energy carrier	[MJ]	1.75E+2	1.48E+0	2.11E-1	0.00E+0	6.10E-2	-7.99E+1
Non-renewable primary energy as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	1.75E+2	1.48E+0	2.11E-1	0.00E+0	6.10E-2	-7.99E+1
Use of secondary material	[kg]	2.26E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.55E+0
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m^3]	4.28E-2	1.08E-4	1.39E-5	0.00E+0	1.50E-5	-7.29E-3

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m² pladur®

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	[kg]	1.71E-7	8.28E-11	1.11E-11	0.00E+0	6.48E-12	9.69E-9
Non-hazardous waste disposed	[kg]	2.73E-1	2.49E-4	3.32E-5	0.00E+0	3.04E-1	-1.57E-1
Radioactive waste disposed	[kg]	1.17E-3	8.11E-6	3.84E-7	0.00E+0	6.39E-7	1.30E-3
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	5.78E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m² pladur®

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Potential incidence of disease due to PM emissions	[Disease Incidence]	ND	ND	ND	ND	ND	ND
Potential Human exposure efficiency relative to U235	[kBq U235-Eq.]	ND	ND	ND	ND	ND	ND
Potential comparative toxic unit for ecosystems	[CTUe]	ND	ND	ND	ND	ND	ND
Potential comparative toxic unit for humans - cancerogenic	[CTUh]	ND	ND	ND	ND	ND	ND
Potential comparative toxic unit for humans - not cancerogenic	[CTUh]	ND	ND	ND	ND	ND	ND
Potential soil quality index	[-]	ND	ND	ND	ND	ND	ND

The additional and optional impact categories in accordance with EN 15804-A2 have not been declared, as this is not required in accordance with PCR Part A.

Comment 1 regarding the indicator “Potential human exposure efficiency relative to U235”. This impact category primarily deals with the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects that can be traced back to possible nuclear accidents and occupational exposure nor the disposal of nuclear waste in underground facilities; nor does this indicator measure ionizing radiation potentially emitted by the ground, radon and some construction materials.

Comment 2 regarding the indicators “Abiotic depletion potential for non-fossil resources”; “Abiotic depletion potential for fossil resources”; “Water (user) deprivation potential, deprivation-weighted water consumption (WPD)”; “Potential comparative toxic unit for ecosystems”; “Potential comparative toxic unit for humans – cancerogenic”; “Potential comparative toxic unit for humans - not cancerogenic”; “Potential soil quality index”. The results of these environmental indicators must be applied with caution, as the uncertainties of these results are high or there is only limited experience on these indicators.

References

EN ISO 14025
EN ISO 14025:2010-08, Environmental labels and declarations – Type III environmental declarations – Principle and procedures

EN 13046
EN 10346:2015-10, Continuously hot-dip coated steel flat products for cold forming – Technical delivery conditions

SEW 022
SEW 022:2010-03, Continuously hot-dip coated steel flat products – Zinc-magnesium coatings; Steel Iron Material Specification {STAHL-EISEN Werkstoffblatt, SEW} issued by the Steel Institute VDEh.

DIN 55634
DIN 55634:2018-03, Paints, varnishes and coatings – Corrosion protection of supporting thin-walled building components made of steel

EN 10169
DIN EN 10169:2012-06, Continuously organic coated (coil coated) steel flat products – Technical delivery conditions

CEN/TR 15941:2010-11
Sustainability of construction works – Environmental product declarations – Methodology for selection and use of generic data

CPR
Regulation (EU) No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

EN 15804
EN 15804:2012+A2:2019, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

GaBi 2021.2
GaBi Software System and Database for Life Cycle Engineering, 1992-2021, Sphera Solutions GmbH

IBU 2021
IBU 2021, General Instructions for the EPD programme of Institut Bauen und Umwelt e.V. Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021www.ibu-epd.de

PCR Part A
Product category rules for building-related products and services. Part A: Calculation rules for the LCA and project report requirements, Version 1.1.1. Berlin: Institut Bauen und Umwelt e.V. (Publisher). www.ibu-epd.com, 2021

PCR: Thin-walled profiles and profiled panels of metal
Product category rules for building-related products and services. Part B: Environmental product declaration requirements for thin-walled profiles and steel profiled sheets, Version X. X. Berlin: Institut Bauen und Umwelt e.V. (Publisher). www.ibu-epd.com, 2019

Publisher
Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Programme holder
Institut Bauen und Umwelt e.V.
Panoramastr 1
10178 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Author of the Life Cycle Assessment
Sphera Solutions GmbH
Hauptstraße 111- 113
70771 Leinfelden-Echterdingen
Germany

Tel +49 711 341817-0
Fax +49 711 341817-25
Mail info@sphera.com
Web **www.sphera.com**

Owner of the Declaration
thyssenKrupp Steel Europe AG
Kaiser-Wilhelm-Straße 100
47166 Duisburg
Germany

Tel +49 201 844 0
Fax +49 201 844 536000
Mail info@thyssenkrupp.com
Web **https://www.thyssenkrupp.com**