

# ENVIRONMENTAL-PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A1

Owner of the Declaration	ArcelorMittal Europe – Flat Products
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-ARM-20170140-IBD2-EN
Issue date	25.01.2019
Valid to	24.07.2024

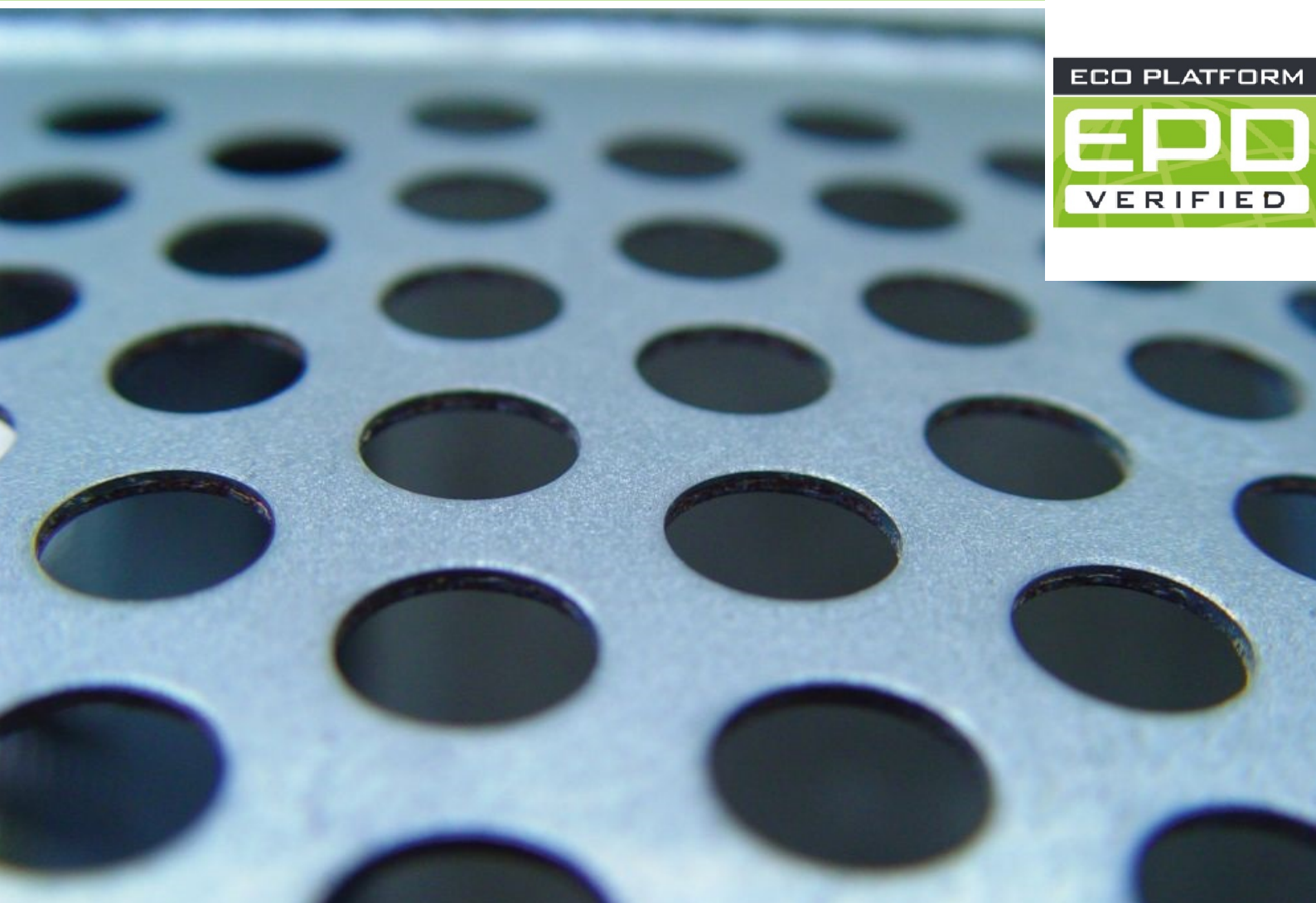
**Hot dip galvanized steel with Magnelis® coating**  
**ArcelorMittal**

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ECO PLATFORM

**EPD**  
VERIFIED



## General Information

### ArcelorMittal

#### Programme holder

IBU – Institut Bauen und Umwelt e.V.  
Hegelplatz 1  
10117 Berlin  
Germany

#### Declaration number

EPD-ARM-20170140-IBD2-EN

#### This declaration is based on the product category rules:

Structural steels, 01.08.2021  
(PCR checked and approved by the SVR)

#### Issue date

25.01.2019

#### Valid to

24.07.2024



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



Florian Pronold  
(Managing Director Institut Bauen und Umwelt e.V.)

### Hot dip galvanized steel with Magnelis® coating

#### Owner of the declaration

ArcelorMittal Europe – Flat Products  
Boulevard d'Avranches 24-26  
1160 Luxembourg  
Luxembourg

#### Declared product / declared unit

The declared unit is 1 metric ton of Magnelis® coated steel. (1mm steel thickness with 120 g/m<sup>2</sup> Magnelis® coating)

#### Scope:

The Life Cycle  
Assessment is based on data collected from the ArcelorMittal plants producing Magnelis® coated steel, representing 100% of the production in 2016. 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+A1. In the following, the standard will be simplified as *EN 15804 bezeichnet*.

#### Verification

The standard EN 15804 serves as the core PCR	
Independent verification of the declaration and data according to ISO 14025:2011	
<input type="checkbox"/>	internally
<input checked="" type="checkbox"/>	externally



Mr Carl-Otto Neven,  
(Independent verifier)

## Product

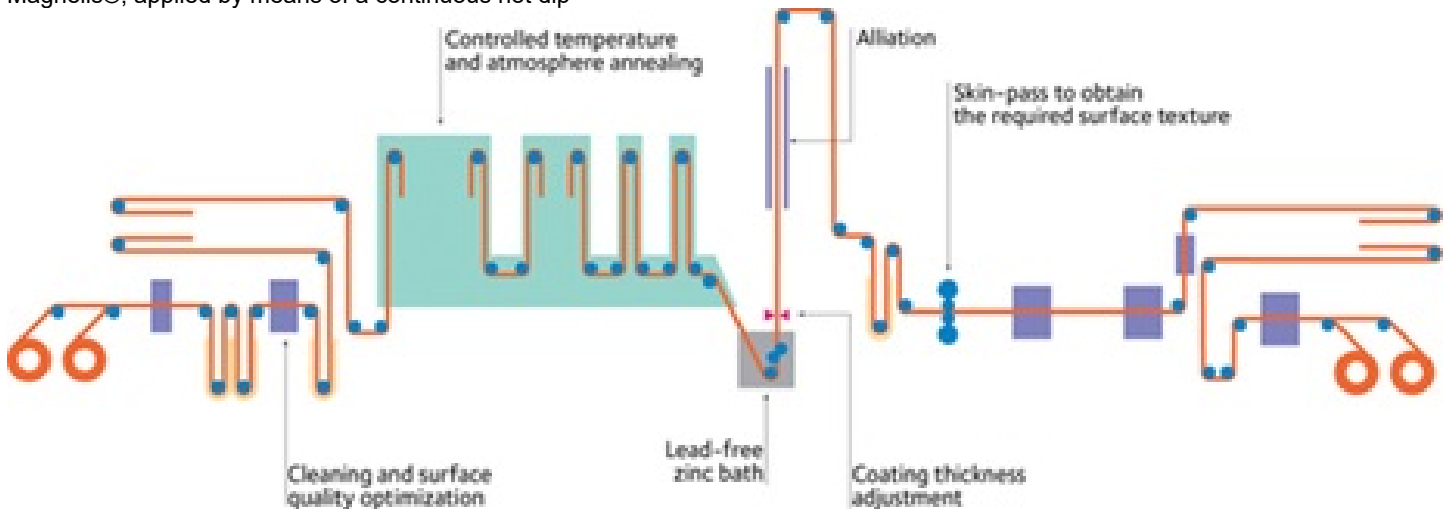
### Product description/Product definition

The declared products must be described.

In addition to a general product description, the trade names of the products/product groups (including any product codes) must be mentioned to which the EPD applies.

If the declaration of trade names is not meaningfully possible (e.g. in the context of association EPDs), the product description must clearly demarcate the products product groups to which the EPD applies.

This Environmental Product Declaration refers to a double-sided hot dip galvanized coated steel, consisting of steel substrate with a specific metallic alloyed zinc coating, Magnelis®, applied by means of a continuous hot dip



### Application

Magnelis® coated steel can be used in various industrial applications, such as:

- Construction: structural or non-structural profiles, roofing & cladding, decking, cable trays, expanded metal, gratings, composite flooring, concrete moulds
- Road and railway infrastructure: safety barriers, protection equipment, sound insulation wall panels, walls providing protection against hail
- Agriculture and farming: barns, greenhouse structures, agricultural equipment
- Solar energy generation: structures for photovoltaic plants
- Tubular applications: structural tubes for scaffolding, road signals, poles

Magnelis® coated steel is delivered in wide coils, slit coils or sheets. It can be processed by all conventional processing operations used for hot dip galvanized steel: bending, drawing, clinching, profiling, stamping, welding etc. The friction coefficient of Magnelis® coated steel is lower than the one of standard hot dip galvanized steel and is stable during cold forming operations.

### Technical Data

Due to its 3% magnesium content, Magnelis® coated steel offers self-healing on cut edges and corrosion resistance in chloride and ammonia atmospheres. This high corrosion resistance means that less metallic coating is required to insure an equivalent corrosion protection than with standard hot dip

galvanising process.

Magnelis® coated steel is a hot-dip galvanized carbon steel coated on both sides with a zinc-aluminium-magnesium alloy. This alloy, composed of 93.5% zinc, 3.5% aluminium and 3% magnesium, is applied by means of a continuous hot dip galvanising process. This chemical composition has been selected to provide an excellent corrosion resistance.

Magnelis® coated steel is described according to /EN 10346:2015/. Magnelis® coated steel is available in a very wide range of steel grades (steels for cold forming and deep drawing applications, structural steels and High Strength Low Alloy steels), and coating masses (from 90 to 430 g/m<sup>2</sup>). ZM is the symbol used in /EN 10346/ to refer to Zinc Magnesium coatings to which Magnelis® coated steel belongs.

galvanized steels. The coating process can apply various thickness of the Zinc Aluminium Magnesium layer, up to 430 g/m<sup>2</sup> (total of both sides). Specific mechanical properties are defined for each steel grade used as substrate and measured according to /EN ISO 6892/. The corrosion resistance performance can be evaluated with different indoor & outdoor tests. One of the most common tests is the 'Salt Spray Test' defined according to /EN ISO 9227/.

Please select one of the following options and delete the header of the selected [alternative]:

#### [Alternative 1a: Product according to the CPR, based on a hEN]:

- Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN xyz:date, title*.
- Voluntary data: *source, date, title* (not part of CE-marking).

#### [Alternative 1b: Product according to the CPR, based on an ETA]:

- Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *ETA no. xyz, date, title*.
- Voluntary data: *source, date, title* (not part of CE-marking).

#### [Alternative 2a: Product not harmonised in accordance with the CPR but in accordance with other provisions for harmonisation of the EU]:



Performance data of the product according to the harmonised standards, based on provisions for harmonization.

Voluntary data: *source, date, title* (not part of CE-marking).

**[Alternative 2b: Product harmonized as well in accordance with the CPR as with other legal provisions of the EU]:**

- Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN xyz: date, title* or *ETA no. xyz, date, title* respectively.
- Performance data of the product, based on the harmonised standards, in accordance with the other provisions for harmonization.
- Voluntary data: *source, date, title* (not part of CE-marking)

**[Alternative 3: Product for which no legal provisions for harmonisation of the EU exist]:**

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

**Base materials/Ancillary materials**

The substrates can be made of different steel grades (DX51D to DX57D, S220GD to S550GD, HX260LAD to HX500LAD, /EN10346:2015/) with Magnelis® coating ZM120 (120 g/m<sup>2</sup> total for both sides, equivalent to a coating thickness of 9µm /EN10346:2015/) and steel thicknesses ranging between 0.20 mm and 6.0 mm.

Detailed steel and coating properties and chemical compositions are available at: <http://industry.arcelormittal.com/catalogue/E35/EN>

The base material of Magnelis® coated steel is iron. Alloying elements are added on the form of ferroalloys or metals. The metallic coating includes only zinc, aluminum and magnesium.

**Environment and health during use**

**Reference service life**

Construction process (stages A4 & A5) and Use stage (B1-B7) are not declared in this EPD. A reference service life for Magnelis® coated steels is not declared, since the lifetime will depend on specific application as well as environmental conditions.

**LCA: Calculation rules**

**Declared Unit**

The declaration refers to the functional unit of 1 metric ton of double-sided Magnelis® coated steel as specified in Part B requirements on the EPD for Structural Steel /PCR Part B/. (1mm steel thickness with 120 g/m<sup>2</sup> Magnelis® coating)

**Declared unit**

Name	Value	Unit
Declared unit	1	t
Thickness (of sheet)	1	mm
Density	7828	kg/m <sup>3</sup>

For IBU core EPDs (where clause 3.6 is part of the EPD): for average EPDs, an estimate of the robustness of the LCA values must be made, e.g. concerning variability of the production process, geographical representativeness and the influence of background data and preliminary products compared to the environmental impacts caused by actual production.

**System boundary**

Type of the EPD: cradle to gate - with Options.

Module A1-A3, Module C3 and module D were considered.

**Modules A1-A3** of the structural steel production, include:

- The provision of resources, additives and energy
- Transport of resources and additives to the production site
- Production processes on site including energy, production of additives, disposal of production residues, and consideration of related emissions
- Recycling of production/manufacturing scrap. Steel scrap is assumed to reach the end-of-waste status once

is shredded and sorted, thus becomes input to the product system in the inventory.

**Module C3** takes into account the sorting and shredding of after-use steel, as well as the non-recovered scrap due to sorting efficiency which is landfilled. A conservative value of 2% landfill is considered.

**Module D** refers to the End-of-Life of the structural steel, including reuse and recycling.

**Data quality**

All relevant background datasets are taken from the GaBi software database /GaBi ts Software/. Regarding foreground data, this study is based on high quality of primary data, collected by ArcelorMittal.

The GaBi-database contains consistent and documented datasets which can viewed in the online GaBi-documentation /GaBi ts Documentation/.

**Geographic Representativeness**

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's lifespan: Europe

**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.

**LCA: Scenarios and additional technical information**

Current practice for the average hot dip galvanized steel consist of 98% recycling and 2% landfill according to the /European Commission Technical Steel Research/.

In case a **reference service life** according to applicable ISO standards is declared then the assumptions and in-use conditions underlying the determined RSL shall be declared. In addition, it shall be stated that the RSL applies for the reference conditions only.

The same holds for a service life declared by the manufacturer. Corresponding information related to in-use conditions needs

not be provided if a service life taken from the list on service life by BNB is declared.

**End of life (C3)**

Name	Value	Unit
Landfilling	2	%

**Reuse, recovery and/or recycling potentials (D), relevant scenario information**

Name	Value	Unit
Recycling	98	%

## LCA: Results

In Table 1 "Description of the system boundary", all declared modules shall be indicated with an "X"; all modules that are not declared shall be indicated with "MND" (As default the modules B3, B4, B5 are marked as MNR – module not relevant). In the following tables, columns can be deleted for modules that are not declared. Indicator values should be declared with three valid digits (eventually using exponential form (e.g. 1,23E-5 = 0,0000123). A uniform format should be used for all values of one indicator.

If several modules are not declared and therefore have been deleted from the table, the abbreviations for the indicators can be replaced by the complete names, while the readability and clear arrangement should be maintained; the legends can then be deleted. If due to relevant data gaps, an indicator cannot be declared in a robust way, then the abbreviation "IND" (indicator not declared) should be used for this indicator.

- 0 - calculated value is 0
- 0 - value falls under the cut-off
- 0 - assumption which exclude any flows (e.g. exported electricity A1-A3)
- IND – in cases where the inventory does not support the methodological approach or the calculation of the specific indicator IND shall be used.

If no reference service life is declared (see chapter 2.13 "Reference Service Life"), the LCA results of the modules B1-B2 and B6-B7 shall refer to a period of one year. This shall then be indicated as an explanatory text below the tables. In addition, the formula for the quantification of such B-modules over the total life cycle shall be provided.

### DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE 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	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	X	MND	X

### RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 metric ton of Magnelis® coated steel

Parameter	Unit	A1-A3	C3	D
Global warming potential (GWP)	kg CO <sub>2</sub> eq	2.57E+03	2E+00	-1.71E+03
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	5.14E-09	6.89E-12	3.36E-10
Acidification potential of land and water (AP)	kg SO <sub>2</sub> eq	4.53E+00	6.78E-03	-4.12E+00
Eutrophication potential (EP)	kg PO <sub>4</sub> <sup>3</sup> eq	4.69E-01	7.99E-04	-3.53E-01
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg Ethen eq	7.4E-01	4.75E-04	-5.29E-01
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	5.43E-02	9.53E-07	1.75E-04
Abiotic depletion potential for fossil resources (ADPF)	MJ	2.3E+04	2.25E+01	-1.35E+04

### RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A1: 1 metric ton of Magnelis® coated steel

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier (PERE)	MJ	1.12E+03	1.12E+01	1.24E+03
Renewable primary energy resources as material utilization (PERM)	MJ	0	0	0
Total use of renewable primary energy resources (PERT)	MJ	1.12E+03	1.12E+01	1.24E+03
Non renewable primary energy as energy carrier (PENRE)	MJ	2.34E+04	3.43E+01	-1.28E+04
Non renewable primary energy as material utilization (PENRM)	MJ	0	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	2.34E+04	3.43E+01	-1.28E+04
Use of secondary material (SM)	kg	8.32E+01	0	8.97E+02
Use of renewable secondary fuels (RSF)	MJ	0	0	0
Use of non renewable secondary fuels (NRSF)	MJ	0	0	0
Use of net fresh water (FW)	m <sup>3</sup>	5.61E+00	1.53E-02	5.99E-01

### RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A1: 1 metric ton of Magnelis® coated steel

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed (HWD)	kg	1.53E-05	2.18E-07	-8.97E-06
Non hazardous waste disposed (NHWD)	kg	1.18E+01	2.01E+01	-2.72E+01
Radioactive waste disposed (RWD)	kg	1.66E-01	4.7E-03	3.04E-01

Components for re-use (CRU)	kg	0	0	0
Materials for recycling (MFR)	kg	0	9.8E+02	0
Materials for energy recovery (MER)	kg	0	0	0
Exported electrical energy (EEE)	MJ	0	0	0
Exported thermal energy (EET)	MJ	0	0	0

Note: 83kg scrap is used in the manufacturing of 1 ton of Magnelis® coated steel. After use, 980 kg steel is recycled. The potential environmental benefit calculated for the end-of-life stage (module D) is based on the net amount of scrap in the system: 980 - 83 = 897 kg. The system has a net output of 897 kg scrap (which carries a potential credit), thus module D shows an environmental benefit.

## References

**/EN 10346:2015/** Continuously hot-dip coated steel flat products for cold forming. Technical delivery conditions

**/EN ISO 6892:2016/** Metallic materials — Tensile testing

**/EN ISO 9227:2017/** Corrosion tests in artificial atmospheres — Salt spray tests

**/European Commission Technical Steel Research/** Sansom, M. and Meijer, J.: Life-cycle assessment (LCA) for steel construction, European Commission technical steel research, 2001-12

**/GaBi ts Software/** GaBi ts. Software and Databasis for Life Cycle Engineering. LBP, University of Stuttgart und PE International, 2017.

**/GaBi ts Documentation/** Documentation of the GaBi datasets for Life Cycle Engineering. LBP, University of Stuttgart and PE International, 2017. <http://documentation.gabi-software.com>

**/PCR Part A/**, Product Category Rules for Building-Related Products and Services, Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. *Institut Bauen und Umwelt e.V.* (IBU) 2018 [www.bau-umwelt.de](http://www.bau-umwelt.de)

**/PCR Part B/**, Requirements on the EPD for Structural steels - *Institut Bauen und Umwelt e.V.*, Berlin (pub.): From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU), 2017

The literature referred to in the Environmental Product Declaration must be listed in full. Standards already fully quoted in the EPD do not need to be listed here again. The current version of PCR Part A and PCR Part B of the PCR document on which they are based must be referenced.



**Publisher**

Institut Bauen und Umwelt e.V.  
Hegelplatz 1  
10117 Berlin  
Germany

+49 (0)30 3087748- 0  
info@ibu-epd.com  
www.ibu-epd.com

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**Programme holder**

Institut Bauen und Umwelt e.V.  
Hegelplatz 1  
10117 Berlin  
Germany

+49 (0)30 3087748- 0  
info@ibu-epd.com  
www.ibu-epd.com

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thinkstep

**Author of the Life Cycle Assessment**

thinkstep AG  
Hauptstraße 111- 113  
70771 Leinfelden-Echterdingen  
Germany

+49 711 341817-0  
info@thinkstep.com  
www.thinkstep.com

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**Owner of the Declaration**

ArcelorMittal Europe – Flat Products  
Boulevard d’Avranches 24-26  
1160 Luxembourg  
Luxembourg

+352 4792-1  
flateurope.technical.assistance@arcelormittal.com  
flateurope.arcelormittal.com/