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## PROBET-DASAG

Terrazzo tiles

Concrete pavings

Concrete precast elements



### EPD Program Operator:

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ITB is the verified member of The European Platform for EPD program operators and LCA practitioner [www.eco-platform.org](http://www.eco-platform.org)

### Basic information

This declaration is the type III Environmental Product Declaration (EPD) based on EN 15804:2012+A2:2019 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment. Their aspects were verified by the independent body according to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all the compared data were created according to PN-EN 15804:2012+A2:2020 (see point 5.3 of the standard).

**Life cycle analysis (LCA):** A1-A3, C1-C4 and D modules in accordance with EN 15804:2012+A2:2019 (Cradle to Gate with options)

**The year of preparing the EPD:** 2020

**Product standards:** EN 13748-1, EN 13748-2, EN 1339

**Service Life:** 50 years

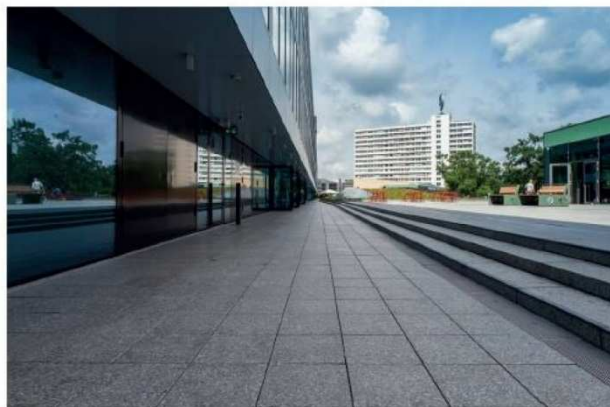
**PCR:** ITB-PCR A (PCR based on EN 15804)

**Declared unit:** 1 tonne (1 Mg)

**Reasons for performing LCA:** B2B

**Representativeness:** Polish production, year 2019

## MANUFACTURER



**The Probet-Dasag** company was founded in 1983 and since then has been dealing in the production of precious concrete products, continuing the tradition of the German company DASAG dating back to 140 years. To meet the high expectations Probet-Dasag uses selected aggregates and the best cements in the production process, and thanks to innovative technologies, all products are characterized by high quality and comfort of use. Economies of scale and optimization of production processes, including pro-ecological activities, allow to offer the high quality products.

## PRODUCTS DESCRIPTION

**Probet-Dasag** products include concrete based: outdoor surfaces (tiles, paving flags), precast elements, concrete plates, indoor floors, facades, street furniture.

Base materials are as follows: cement 11%, aggregates 80%, PFA 4%, Water 3%. The mix also contains admixtures and pigments. No REACH substances of very high health concern are included.

Table 1. **Probet-Dasag** products

Line	Product size	Thickness	Finishing
1. Terrazzo tiles and concrete paving plates, line Promenada Prato	40x40 cm 50x50cm 60x40cm 60x60 cm	8 cm	Chamfered, sandblasted, coated
2. Terrazzo tiles and concrete paving plates, line Favilla Prato	40x40 cm 50x50 cm 60x40 cm 60x60 cm	4 cm	
3. Terrazzo tiles and concrete paving plates, line Ateny Prato	40x40 cm 60x40 cm 60x60 cm	4 cm	
4. Terrazzo tiles and concrete paving plates, line Indigo Bello	40x40 cm	4 cm	Chamfered, grinded
5. Terrazzo tiles and concrete paving plates, line Indigo Prato	40x40 cm 60x40 cm 60x60 cm	4 cm	Chamfered, sandblasted, coated
6. Terrazzo tiles and concrete paving plates, line Bavaria Lago	40x40 cm	4,5 cm	Washed
7. Terrazzo tiles and concrete paving plates, line Toscana lave	40x40 cm	4,5 cm	Structured

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8. Terrazzo tiles and concrete paving plates, line Madera prato	40x40 cm	4,5 cm	Structured, sandblasted
9. Terrazzo tiles and concrete paving plates, line Eleganza Gravita	40x40 cm 60x40 cm 60x60 cm	4,5 cm	Structured, brushed, coated
10. Terrazzo tiles and concrete paving plates, line Boston prato	40x40 cm	4 cm	Chamfered, sandblasted, coated
11. Terrazzo tiles and concrete paving plates, line Berliner Prato	35x35 cm	5 cm	Sandblasted, coated
12. Terrazzo tiles and concrete paving plates, line Berliner Prato	35x35 cm	8 cm	Sandblasted, coated
13. Terrazzo tiles, line Select	30x30cm	3 cm	Grinded
14. Terrazzo tiles, line Select	40x40 cm 50x50 cm 60x40 cm 60x60 cm	4 cm 4 cm 4 cm 4 cm	Grinded
15. Terrazzo tiles, line Basics	30x30 cm	3 cm	Grinded
16. Terrazzo tiles, line Basics	40x40 cm 50x50 cm 60x40 cm 60x60 cm	4 cm 4 cm 4 cm 4 cm	Grinded
17. Terrazzo tiles, line Terrastone	60x60 cm	2 cm	Grinded
18. Terrazzo tiles, line Nordic	40x40 cm 50x50 cm 60x40 cm 60x60 cm	4 cm 4 cm 4 cm 4 cm	Grinded
19. Terrazzo tiles, line Nordic	30x30 cm	3 cm	Grinded
20. Terrazzo tiles, line Forza	24,7x24,7 cm 30x30 cm 30x30 cm	4,0 cm 3,0 cm 3,5 cm	Grinded
21. Terrazzo tiles and concrete paving flags (Sondermuster)	Ind.	3 cm	Ind.
22. Terrazzo tiles and concrete paving flags (Sondermuster)	Ind.	4 cm	Ind.
23. Terrazzo tiles and concrete paving flags (Sondermuster)	Ind.	8 cm	Ind.
24. Other products of hermetic press	Ind., e.g. 50x13,7 cm	Ind., e.g. 5,5 cm	Raw
25. Terrazzo precast steps window sills, wall facings and other flat elements	Length up to 220 cm, Width up to 50 cm	4,0 - 8,0 cm	Grinded or sandblasted, coated
26. SCC - Terrazzo precast steps, large size concrete plates, window sills, wall facings and other flat elements	Length up to 300 cm, Width up to 190 cm	Ind. up to 18,0 cm	Grinded, smooth or sandblasted, coated
27. SCC Architectural concrete elements respecting street furniture and garden products	Ind.	Ind.	Smooth, sandblasted, coated

### TECHNICAL PROPERTIES

Products meet the requirements of EN 13748-1:2005 „Terrazzo tiles for internal use”, PN-EN 13748-2:2006 „Terrazzo tiles for external use”, PN-EN 1339:2005 „Concrete paving slabs - requirements and test methods”, DIN 18500: 2006-12 "Betonwerkstein". Intended for horizontal and vertical laying of the steps and platforms.,

### APPLICATION

**Probet-Dasag** Products can be used as:

- Terrazzo tiles for internal and external use
- Concrete paving slabs
- Non-load-bearing concrete elements
- Horizontal and vertical laying of the steps and platforms

### LIFE CYCLE ASSESSMENT (LCA) – general rules applied

#### Unit

The declared unit is 1 Tonne of concrete based product.

#### System boundary

The life cycle analysis of the declared products covers “Product Stage”, A1-A3, C2, C3, C4 and D modules (Cradle to Gate with options) accordance with PN-EN 15804:2012+A2:2020 and ITB PCR A.

#### Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of the Probet-Dasag Products is a line process in one factory in Żagań (Poland). Allocation was done on product mass basis. All impacts from raw materials extraction are allocated in A1 module of the LCA (not included 0,8% of secondary production inputs). 100% of impacts from line production were allocated to product covered by this declaration. Utilization of packaging material was not taken into consideration. Module A2 includes transport of raw materials such as cement, aggregates, pigments, additives and ancillary materials from their suppliers to manufacturing plant. Municipal wastes of factory were allocated to module A3. Energy supply was inventoried for whole factory and 100% was allocated to the product assessed. Emissions in the factory are measured and were allocated to module A3.

#### System limits

The details of systems limits are provided in product technical report. 99,2% materials and 100% energy consumption inventoried in factory and were included in calculation. In the assessment, all significant parameters from gathered production data are considered, i.e. all material used per formulation, utilized thermal energy, internal fuel and electric power consumption, direct production waste, and all available emission measurements. It can be assumed that the total sum of omitted processes does not exceed 1% of all impact categories. In accordance with PN-EN 15804:2012+A2:2020, machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

#### A1 and A2 Modules: Raw materials supply and transport

Cement, stones, aggregates and additives come mainly from Polish suppliers. Data on transport of the different products to the manufacturing plants were inventoried in details and modelled by assessor. Means of transport include trucks. For calculation purposes Polish and European fuel averages are applied.

### A3: Production

The production process is presented in Fig. 1.

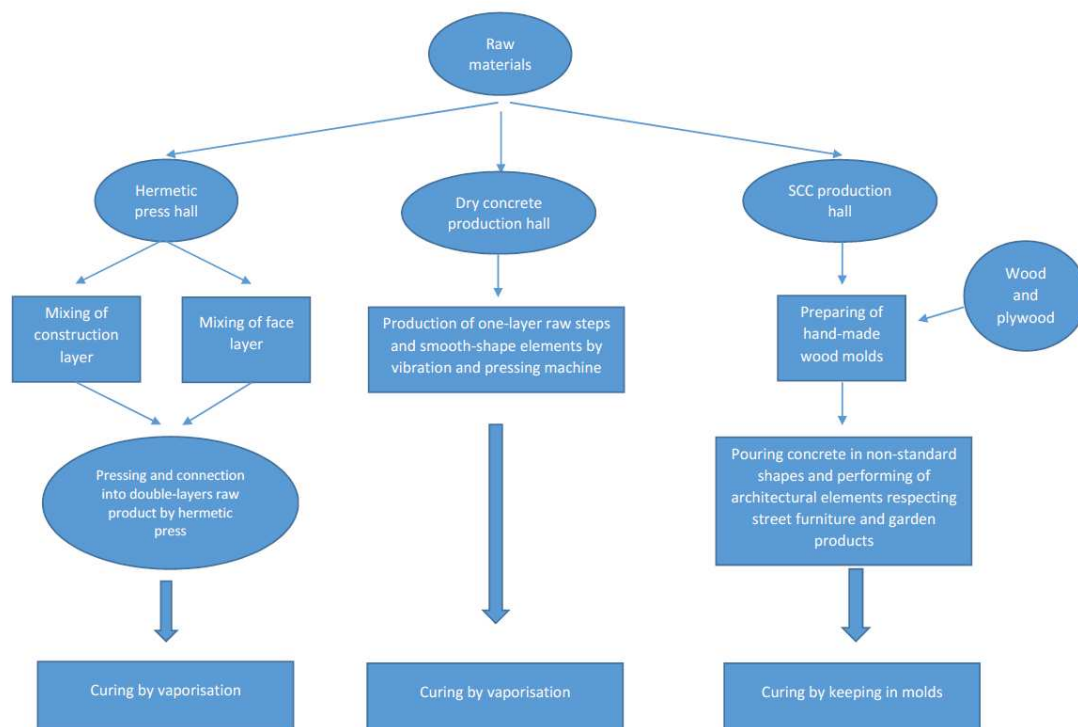


Fig. 1. A scheme of manufacturing of the Probet-Dasag products in manufacturing plant in Żagań (Poland)

### End of life scenarios (C module)

It is assumed in phase C1 that products are removed manually (without environmental impacts). It is assumed that at the end of life the transport distance from the product deconstruction place to waste processing (C2) is 10 km on > 16 t loaded lorry with 75% capacity utilization and fuel consumption of 35 l per 100 km. Materials recovered from dismantled products are recycled and landfilled according to the Polish treatment practice of industrial waste what is presented in Table 2. Recovered panel's material is used as aggregates for road foundation, building plate or ballast. The reuse, recovery and recycling potential for a new product system is considered beyond the system boundaries (module D).

Table 2. End of life scenarios for concrete tiles and plates

Dasag products	Material recovery	Recycling	Landfilling	Reuse
Tiles and paving elements	90%	45%	10%	45%

### Data collection period

The data for manufacture of the declared products refer to period between 01.01.2019 – 31.12.2019 (1 year). The life cycle assessments were prepared for Poland as reference area.

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### Data quality - production

The values determined to calculate A3 originate from verified Probet-Dasag LCI inventory data.

### Assumptions and estimates

The impacts of the representative products were aggregated using weighted average. No co-products are manufactured. Carbonation process included.

### Calculation rules

LCA was done in accordance with ITB PCR A document.

### Databases

The background data for the processes come from the following databases: Ecoinvent v.3.5, specific EPDs (Polish Cement production 2020, Polish aggregates production by ITB), ÖKOBAUDAT, KOBIZE and Tauron (Polish electricity mix and combustion factors for fuels). Specific data quality analysis was a part of external ISO 14001 audit. Characterization factors are CML ver. 4.2 based. ITB algorithms were used for calculations, not any commercial software was used. The time related quality of the data used is valid and not older than 5 years.

## LIFE CYCLE ASSESSMENT (LCA) – Results

### Declared unit

The declaration refers to the unit FU– 1 tonne of the Probet-Dasag product.

Table 2. System boundaries (modules included) in a product assessment

Environmental assessment information (MA – Module assessed, MNA – Module not assessed, INA – Indicator Not Assessed)																	
Product stage			Construction process		Use stage							End of life			Benefits and loads beyond the system boundary		
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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	
MA	MA	MA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MND	MA	MA	MA	MA	

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Table 3. Environmental product characteristic – 1 tonne of concrete element

Environmental impacts: (FU) 1 tonne of concrete element									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
Global warming potential	kg CO <sub>2</sub> eq.	3,37E+02	1,57E+01	6,26E+00	0,00E+00	2,35E+01	1,61E+00	1,11E+00	-1,36E+02
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	1,63E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,78E-07	2,93E-07	-6,60E-06
Acidification potential of soil and water	kg SO <sub>2</sub> eq.	7,39E-01	1,15E-01	3,30E-03	0,00E+00	3,08E+00	1,21E-02	8,27E-03	-2,99E-01
Formation potential of tropospheric ozone	kg Ethene eq.	2,08E-01	8,34E-03	0,00E+00	0,00E+00	2,25E-01	5,18E-04	5,08E-04	-8,41E-02
Eutrophication potential	kg (PO <sub>4</sub> ) <sup>3-</sup> eq.	2,38E-01	2,04E-02	6,12E-04	0,00E+00	5,44E-01	2,81E-03	1,60E-03	-9,63E-02
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	1,36E+00	0,00E+00	2,32E-05	0,00E+00	0,00E+00	2,47E-06	1,25E-05	-5,51E-01
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	8,65E+02	1,96E+02	8,96E+02	0,00E+00	7,95E-01	2,22E+01	2,50E+01	-3,50E+02
Environmental aspects: (FU) 1 tonne of concrete element									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	1,37E+01	4,65E+01	0,00E+00	5,56E-02	3,33E+00	3,75E+00	-4,91E+01
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	2,63E+02	1,37E+01	4,65E+01	0,00E+00	5,56E-02	3,35E+00	5,32E+00	-1,07E+02
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	9,51E+02	2,05E+02	9,59E+02	0,00E+00	8,35E-01	2,35E+01	2,61E+01	-3,85E+02
Use of secondary material	kg	1,09E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-4,40E+00
Use of renewable secondary fuels	MJ	1,30E+02	1,03E+01	0,00E+00	0,00E+00	4,17E-02	0,00E+00	0,00E+00	-5,28E+01
Use of non-renewable secondary fuels	MJ	1,89E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-7,64E+01
Net use of fresh water	m <sup>3</sup>	1,32E-03	1,00E-03	4,61E-01	0,00E+00	7,55E-03	2,01E-03	1,02E-03	-5,34E-01
Other environmental information describing waste categories: (FU) 1 tonne									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1,70E-02	4,60E-03	0,00E+00	0,00E+00	2,53E-08	6,08E-05	4,88E-05	-6,89E-03
Non-hazardous waste disposed	kg	4,90E+00	4,27E+00	4,78E-01	0,00E+00	2,35E-05	2,64E-02	1,00E+02	-2,17E+00
Radioactive waste disposed	kg	5,56E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,55E-04	1,64E-04	-2,26E-04
Components for re-use	kg	0,00E+00	0,00E+00	1,56E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	1,02E-07	0,00E+00	6,90E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-4,11E-08
Materials for energy recover	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

### INTERPRETATION

Interpretation of the results has been carried out considering the methodology, data-related assumptions and any limitations declared in the EPD. Interrogation of the LCA results show that the cradle-to-grave GWP (Global Warming Potential) impact of 1 tonne of concrete paving products is 359 kgCO<sub>2</sub>e. For GWP, A1-A3 accounts for 90% of the lifecycle impact with carbonation in the post-demolition, reducing the overall impact of paving products. Carbonation in alone reduces the GWP impact by 4%.

The LCA results show that the cradle-to-grave-primary energy demand of fossil fuels by the declared unit is 1960 MJ. Analysis of the PERT/ PENRT (Total use of renewable primary energy resources/ Total use of non-renewable primary energy resources) figures show the largest contributors are cement 31(%), transport 10 (%) and electricity used in production 28 (%). For primary energy demand, A1-A3 accounts for 45% of the lifecycle impact. Almost all waste are recycled and reused. During manufacturing 460 l of fresh water is used on one tonne of product. 70% of this water is used directly to concrete mix.

### VERIFICATION

The process of verification of this EPD was in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804:2012+A2:2019 and ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3.)
<input checked="" type="checkbox"/> external <input type="checkbox"/> internal
External verification of EPD: Ph.D. Eng. Halina Prejzner LCA, LCI audit and input data verification: Ph.D. Eng. Michał Piasecki, m.piasecki@itb.pl Verification of LCA: Ph.D. Eng. Justyna Tomaszewska, j.tomaszewska@itb.pl

### Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- PN-EN 13748-1 Płytki lastrykowe Część 1: Płytki lastrykowe do zastosowań wewnętrznych
- PN-EN 13748-2 Płytki lastrykowe Część 2: Płytki lastrykowe do zastosowań zewnętrznych
- Engelsen, C. and Justnes, H. (2014) CO<sub>2</sub> binding by concrete - Summary of the state of the art and an assessment of the total binding of CO<sub>2</sub> by carbonation in the Norwegian concrete stock. SINTEF Building and Infrastructure, Oslo, Norway.







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# CERTIFICATE No 120/2020 of TYPE III ENVIRONMENTAL DECLARATION

Product:

concrete products and components

Manufacturer:

**PROBET-DASAG Sp. z o.o.**

Fabryczna 4-6, 68-100 Żagań, Poland

confirms the correctness of the data included in the development of  
Type III Environmental Declaration and accordance with the requirements of the standard

**PN-EN 15804+A2**

Sustainability of construction works.

Environmental product declarations.

Core rules for the product category of construction products.

This certificate, issued for the first time on 30<sup>th</sup> June 2020 is valid for 5 years  
or until amendment of mentioned Environmental Declaration

Deputy Head of the Thermal Physic, Acoustics  
and Environment Department

*D. Kaczorek*  
Dobrosława Kaczorek, PhD



Deputy Director  
for Research and Innovation

*Krzysztof Kuczyński*  
Krzysztof Kuczyński, PhD

Warsaw, June 2020