

ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	Ideal Standard International NV
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Issue date	24.05.2023
Valid to	23.05.2028

Ceramic Vitreous China product
Ideal Standard International

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1. General Information

Ideal Standard International

Programme holder

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

Declaration number

EPD-IDE-20230005-IBD1-EN

This declaration is based on the product category rules:

Sanitary ceramics, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

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Valid to

23.05.2028



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Ceramic Vitreous China product

Owner of the declaration

Ideal Standard International NV
Da Vincilaan 2
1935 Zaventem
Belgium

Declared product / declared unit

1 kg of ceramic vitreous china product

Scope:

The EPD contains the result of 1 kg of ceramic vitreous china product produced by Ideal Standard. It is representative for those ceramic products categories: bowls (mounted and floor standing), urinals, bidets, washbasins and pedestals, manufactured in Sevlievo (Bulgaria), Armitage (United Kingdom) and Teplice (Czech Republic). As the result is for 1kg of ceramic, the user can easily calculate the results for ceramic products, noted above according to the weight. The factory in Egypt is not included in the scope of the EPD.

Foreground data has been provided directly by Ideal Standard and background LCA data is based on Ecoinvent 3.8 and Industry 2.0 data. 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 14025:2011		
☐	internally	☒ externally



Vito D'Incognito,
(Independent verifier)

2. Product

2.1 Product description/Product definition

This product under study is 1 kg of standard white vitreous china product. Product categories included in this EPD are: bowls (mounted and floor standing), urinals, bidets, washbasins and pedestals, (manufacturing sites are listed above).

The manufacturer can - within the framework of the *European Regulation N° 305/2011 (CPR)* - present the Declaration of Performance (DOP) of the product confirming that the product has a CE marking.

2.2 Application

The products are used in private and public bathrooms. The product can be used in new construction and renovation work for hygienic and household use.

2.3 Technical Data

Constructional data

Name	Value	Unit
Crazing test Internal test - 1hr in autoclave with 5bar steam	Minimum 1 cycle without crazing	-
Water absorption EN997 for WC pans (toilets) and so by extension to the Vitreous China products	<0.5	%
Impact resistance Internal test – Ball bearing dropped from fixed height	Minimum 1 drop without breaking	-
Resistance to temperature change EN 14688 for Wash Basins. 1000 hot (75 degC) / cold (15 degC) water cycles without visible damage	No visible damage	-
Resistance to chemicals and staining EN 14688 for Wash Basins therefore by extension to other Ceramic Products. Specific chemicals in contact then cleaned with specific apparatus without permanent marking	No remaining chemical evident	-
Resistance to abrasion EN 14688 for Wash Basins therefore by extension to other Ceramic Products. Loaded diamond tool (scratch) / Loaded abrasive paper wheel (abrasion) for repeated cycles.	No scratches through outer (glaze) layer	-
Load resistance	400	Kg

The manufacturer can - within the framework of the *European Regulation N° 305/2011 (CPR)* - present the Declaration of Performance (DOP) of the product confirming that the product has a CE marking.

2.4 Delivery status

The products are packed: wooden pallet, PE plastic and cardboard, and are accompanied with an instruction and guarantee sheet.

The products can come in different shapes and dimensions. An overview of all included products in this EPD can be provided by Ideal Standard.

2.5 Base materials/Ancillary materials

This EPD include different product categories: bowls, urinals, bidets, washbasin and pedestals.

The composition of the Vitreous china ceramic is:

- 20-30 % clay
- 20-30 % China clay
- 20-30 % Feldspar
- 20-30 % Silica
- <5 % Glaze

This product/article/at least one partial article contains substances listed in the *candidate list* (date: 16.05.2023) exceeding 0.1 percentage by mass: no

This product/article/at least one partial article contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the *candidate list*, exceeding 0.1 percentage by mass: no

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) *Ordinance on Biocide Products No. 528/2012*): no

2.6 Manufacture

- Slip preparation**
Production of the ceramic mixture (slip) and unloading/storage of raw materials in the area.
- Glaze preparation**
Production of glaze with needed colour.
- Casting shop**
Casting of ceramic products in different moulds.
- Dryers**
Drying is the process of taking off the humidity and the final results are dried products.
- White inspection**
The first inspection of dried ceramic products. The main focus is checking the quality and cleaning the surface of the products. At the end of the process the products are grouped in three different directions: A grade products, products for repairing and scrap.
- Spraying**
Covering the ceramic product with glaze
- Kilns**
Firing of ceramic products
- Gloss inspection**
Final inspection for visual control of all products for visible defects. Separating the products again in three groups: for packaging, for repairing by hand or for grinding machines and scrap (pitcher).
- Packaging**
Different kinds of activities for the packaging of the products.

*Moulds making
Development of a new matrix for production of gypsum moulds
for casting and repairing of the damaged matrix.

*Mould shop
Production of gypsum moulds for casting ceramic products and
polyurethane setters for supporting the casting process.

2.7 Environment and health during manufacturing

Environmental, occupational health, safety and quality management at the Ideal Standard plants are in accordance with the following standards:

- ISO 14001

- ISO 9001
- ISO 45001

2.8 Product processing/Installation

It is considered that there is no assembly waste, based on the fact that the product is prefabricated and installed by hand.

2.9 Packaging

A wooden pallet, PE plastic bag and cardboard are used to pack and transport the product to the supplier/customer. The product is also accompanied by an instruction and guarantee sheet.

2.10 Condition of use

The product will not change in material composition over the reference service life.

2.11 Environment and health during use

Under normal conditions of use, the product do not cause any adverse health effects or release of volatile organic compounds (VOCs) into indoor air.

No environmental impact on water, air or soil is expected.

2.12 Reference service life

The reference service life is not relevant, as module B is not considered.

Description of the influences on the ageing of the product when applied in accordance with the rules of technology.

2.13 Extraordinary effects

Fire

Not subjected to fire classification

Water

No risks are expected to occur in terms of environmental and human health.

Mechanical destruction

In case of mechanical destruction, no risks are expected to occur in terms of environment and human health.

2.14 Re-use phase

It is possible to recycle ceramic products in the production process. This is already applied for production waste. The recycling of post-consumer waste depends on the sorting and take-back of these waste streams at the demolition site.

2.15 Disposal

According to the average European end-of-life scenario described in Annexe C of the Product Environmental Footprint Pilots (PEFCR) 6.3 guidance, the following disposal scenarios have been considered: 100 % of the ceramic is landfilled.

2.16 Further information

Additional information on vitreous china ceramic products manufactured by Ideal Standard can be found on: <https://www.idealstandard.com/>

3. LCA: Calculation rules

3.1 Declared Unit

The calculation made in the tool is relevant to 1 kg of ceramic vitreous china products.

The average weighted product is manufactured in Bulgaria. Then, this EPD is calculated using the production data of the factory in Bulgaria.

However, a variability study has been performed to show that the production in Bulgaria is representative for the production by Ideal Standard in the United Kingdom and the Czech Republic. The difference over the total life cycle of the product is less than 40 % for the three most relevant impact indicators (based on PEF single score), respectively Global warming potential, Resource use fossils and Particulate matter.

Name	Value	Unit
Declared unit	0.001	t

The user can easily calculate the results for ceramic products, noted above according to the weight. The products typically weigh between 4.5 and 38.8 kg.

3.2 System boundary

Cradle-to-gate with options, including modules A4, A5, C1, C2, C3, C4 and D

3.3 Estimates and assumptions

The following processes are excluded because data was not available:

- Packaging of raw materials used to produce the glaze of the ceramic products,
- Transport of the packaging of the final product,

- Packaging and transport of ancillary materials used during the production process,
- Packaging and transport of ancillary materials used during installation,

No further approximations have been made to replace the missing data, as they were considered to be not relevant based on the first iterations of the results.

3.4 Cut-off criteria

- Big bags used as packaging of some raw materials for the ceramic production, as they are reused.
- For production waste only most relevant production waste streams have been considered (waste of ancillary materials and smaller waste flows have been excluded).
- Only most relevant ancillary materials have been selected based on consumption rate and importance in the production process.
- Environmental impacts caused by the personnel of the production plants are not included in the LCA, e.g. waste from the cafeteria and sanitary installations or environmental effects caused by commuter traffic. Cooling of the plants in order to ensure a comfortable indoor climate for the personnel for example is also neglected.

3.5 Background data

Ecoinvent 3.8 and Industry 2.0

3.6 Data quality

Foreground data is specific to Ideal Standard and is collected for the reference year 2021. Background data is based on Ecoinvent 3.8 which is released in September 2021.

The LCA background report includes a variability study between the different factory plants, respectively Sevlievo (Bulgaria), Armitage (United Kingdom) and Teplice (Czech Republic). The results show that over the total life cycle (A1-

C4) the variance is less than 40 %.

3.7 Period under review

The data collected by Ideal Standard is based on data from the production year 2021.

3.8 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

3.9 Allocation

- Amounts of the raw materials/components (modules A1 and A2) and the packaging of the final product have been extracted from recipe used in the respective

factory. No allocation was necessary. Note that the production losses have been added to the recipe.

- The data for the production process (module A3) i.e input and outputs such as energy consumption, water consumption, production waste, ancillary materials and emissions are based on factory averages (total amount in the factory converted to 1 kg based on the total production volume in kg).

3.10 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.

Used background databases: *Ecoinvent 3.8* and *Industry 2.0*

4. LCA: Scenarios and additional technical information

Characteristic product properties biogenic carbon

The product does not contain biogenic carbon, but its accompanying packaging contains 8.77E-02 kg C per product in the form of paper, cardboard and wooden pallets.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.0877	kg C

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	260	l/100km
Transport distance	2000	km
Capacity utilisation (including empty runs)	-	%
Gross density of products transported	-	kg/m ³
Capacity utilisation volume factor	-	-

Installation into the building (A5)

It is considered that there is no assembly waste, based on the fact that the product is prefabricated and installed by hand.

Only the impact of packaging waste has been considered.

Name	Value	Unit
Packaging waste (paper and cardboard) PEF EOL scenario Europe for coverage carton packaging: 11 % incineration; 75 % recycling; 14 % landfill	0,085	Kg
Packaging waste (PE) PEF EOL scenario Europe for PE packaging: 32 % incineration; 29 % recycling; 39 % landfill	0,039338	Kg
Packaging waste (wooden pallet) PEF EOL scenario Europe for wooden pallets: 32 % incineration; 30 % recycling; 38 % landfill	0,110	Kg

End of life (C1-C4)

According to the average European end-of-life scenario described in Annexe C of the Product Environmental Footprint Pilots (PEFCR) 6.3 guidance, the following disposal scenarios have been considered: 100 % of the ceramic parts are landfilled.

Name	Value	Unit
Collected as mixed construction waste	1	kg
Landfill of ceramic	1	Kg

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

Module D contains low benefits and loads of recycling of the packaging of the final product and the benefits of energy recovery during the incineration of the plastic. There is no benefits and loads from the end of life of the product, because the product is 100 % landfilled.

Name	Value	Unit
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5. LCA: Results

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	X	X	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 Kg Declared unit

Parameter	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq	7.5E-02	1.45E-01	1.25E+00	4.03E-01	3.5E-01	1.54E-04	8.15E-03	0	6.53E-03	-2.11E-01
GWP-fossil	kg CO ₂ eq	7.47E-02	1.45E-01	1.54E+00	4.03E-01	4.72E-02	1.52E-04	8.14E-03	0	6.5E-03	-6.24E-02
GWP-biogenic	kg CO ₂ eq	1.9E-04	5.03E-05	-2.94E-01	1.44E-04	3.02E-01	8.44E-07	2.91E-06	0	2.92E-05	-1.48E-01
GWP-luluc	kg CO ₂ eq	8.02E-05	6.2E-05	8.9E-04	1.61E-04	3.16E-06	3.6E-07	3.26E-06	0	3.61E-06	-1.46E-04
ODP	kg CFC11 eq	1.09E-08	3.32E-08	1.56E-07	9.33E-08	1.67E-09	7.66E-12	1.89E-09	0	2.22E-09	-5.92E-09
AP	mol H ⁺ eq	4.35E-04	7.78E-04	5.19E-03	1.14E-03	4.23E-05	8.65E-07	2.31E-05	0	5E-05	-2.79E-04
EP-freshwater	kg P eq	3.58E-06	9.9E-07	1.23E-04	2.87E-06	1.07E-07	1.63E-08	5.81E-08	0	3.29E-07	-2.99E-06
EP-marine	kg N eq	7.24E-05	1.74E-04	8.92E-04	2.27E-04	1.63E-05	1.1E-07	4.6E-06	0	1.8E-05	-6.89E-05
EP-terrestrial	mol N eq	8.24E-04	1.93E-03	8.91E-03	2.53E-03	1.66E-04	1.27E-06	5.12E-05	0	2E-04	-7.56E-04
POCP	kg NMVOC eq	2.34E-04	6.05E-04	2.62E-03	9.73E-04	4.97E-05	3.5E-07	1.97E-05	0	5.66E-05	-2.55E-04
ADPE	kg Sb eq	3.8E-07	3.72E-07	1.31E-06	1.09E-06	2.04E-08	8.23E-10	2.21E-08	0	1.67E-08	-2.16E-07
ADPF	MJ	1.22E+00	2.17E+00	2.86E+01	6.1E+00	1.12E-01	3.23E-03	1.23E-01	0	1.68E-01	-1.46E+00
WDP	m ³ world eq deprived	9.59E-02	6.39E-03	4.95E-01	1.86E-02	6.35E-04	3.78E-05	3.76E-04	0	5.69E-04	-7.08E-02

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; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 Kg Declared unit

Parameter	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	1.27E-01	2.93E-02	1.29E+00	8.58E-02	6.53E-01	6.41E-04	1.74E-03	0	8.86E-03	0
PERM	MJ	0	0	2.92E+00	0	-2.14E+00	0	0	0	0	1.49E+00
PERT	MJ	1.3E-01	3E-02	4.21E+00	9E-02	-1.49E+00	0	0	0	1E-02	1.49E+00
PENRE	MJ	1.42E+00	2.17E+00	3.14E+01	6.13E+00	6.5E-01	3.83E-03	1.24E-01	0	1.76E-01	0
PENRM	MJ	0	0	1.67E-01	0	-1.02E+00	0	0	0	0	4.85E-01
PENRT	MJ	1.43E+00	2.18E+00	3.3E+01	6.14E+00	-3.7E-01	3.8E-03	1.24E-01	0	1.76E-01	4.85E-01
SM	kg	0	0	0	0	0	0	0	0	0	1.09E-01
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m ³	1.6E-03	1.53E-04	7.05E-03	4.49E-04	5.5E-05	2.43E-06	9.08E-06	0	1.71E-04	-1.63E-03

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA - WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 Kg Declared unit

Parameter	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	1.49E-06	5.4E-06	2.66E-05	1.59E-05	2.75E-07	2.45E-09	3.22E-07	0	2.08E-07	-1.09E-06
NHWD	kg	5.77E-02	1.06E-01	5.17E-01	3.2E-01	7.53E-02	1.18E-05	6.47E-03	0	1E+00	-7.94E-03
RWD	kg	5.36E-06	1.47E-05	7.71E-05	4.13E-05	7.14E-07	2.36E-08	8.34E-07	0	1.07E-06	-3.51E-06
CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	1.09E-01	0	0	0	0	-1.09E-01
MER	kg	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	1.19E-01	0	0	0	0	-1.19E-01
EET	MJ	0	0	0	0	2.37E-01	0	0	0	0	-2.37E-01

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

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

1 Kg Declared unit

Parameter	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	3.78E-09	1.1E-08	3.67E-08	3.24E-08	7.55E-10	2.39E-12	6.54E-10	0	1.03E-09	-5.51E-09
IR	kBq U235 eq	5.84E-03	9.41E-03	9.07E-02	2.65E-02	4.73E-04	2.86E-05	5.36E-04	0	6.95E-04	-3.66E-03
ETP-fw	CTUe	1.29E+00	1.68E+00	6.43E+00	4.79E+00	1.23E-01	2.04E-03	9.69E-02	0	1E-01	-6.35E-01
HTP-c	CTUh	3.68E-11	5.82E-11	5.34E-10	1.54E-10	2.12E-11	6.27E-14	3.12E-12	0	2.89E-12	-2.56E-11
HTP-nc	CTUh	1E-09	1.66E-09	1.18E-08	4.84E-09	1.7E-10	2E-12	9.79E-11	0	6.06E-11	-5.73E-10
SQP	SQP	1.17E+00	1.42E+00	2.07E+01	4.26E+00	1.02E-01	5.85E-04	8.6E-02	0	3.27E-01	-1.56E+01

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “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 this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

6. LCA: Interpretation

The manufacturing process (module A3), in particular the energy consumption, has the largest contribution on all impact categories. Besides the manufacturing, also the transport to the installation site (A4) has a significant contribution, due to the

weight of the products. The impact of the raw materials is less significant. There is no benefits and loads from the end of life of the product, because the product is 100 % landfilled.

7. Requisite evidence

8. References

Standards

EN 997

WC pans and WC suites with integral trap - constructional and performance requirements.

EN 14688

Sanitary appliances. Wash basins. Functional requirements and test methods

EN15804

EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

ISO 9001

ISO 9001:2015: Quality management systems — Requirements

ISO 14001

ISO 14001:2015: Environmental management systems — Requirements with guidance for use

ISO 14025

EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and

procedures.

ISO 14040

ISO 14040:2006: Environmental management – Life cycle assessment – Principles and framework

ISO 14044

ISO 14044:2006: Environmental management – Life cycle assessment – Requirements and guidelines.

ISO 45001

ISO 45001:2018: Occupational health and safety management systems Requirements with guidance for use

PCR Part A

Calculation rules for the Life Cycle Assessment and Requirements on the Background Report, Institut Bauen und Umwelt e.V., www.bauumwelt.com.

PCR Part B

Institut Bauen und Umwelt e.V, Berlin (pub.): PCR Guidance- Texts for Building-Related Products and Services From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU) : Requirements on the EPD for Toilet set

Further references

Biocide Products No. 528/2012

Biocide Products No. 528/2012 EU, REGULATION (EU) No 528/2012 OF THE EUROPEAN PARLIAMENT

CPR

European Regulation N° 305/2011 (CPR)

Ecoinvent

Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, [online] 21(9), pp.1218–1230. Available at: <http://link.springer.com/10.1007/s11367-016-1087-8>

IBU

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

Industry 2.0

Industry 2.0 (from PlasticsEurope, worldsteel and ERASM) LCA database as integrated in SimaPro 9.3.0.3.

PEFCR

European commission (2018). Product Environmental Footprint Category Rules PEFCR Guidance, version 6.3.

Pré Consultants (2021)

SimaPro 9.3.0.3 [Computer Software]. Amersfoort, The Netherlands.

REACH candidate list

ECHA, REACH Candidate List of substances of very high concern for Authorisation



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Author of the Life Cycle Assessment

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