

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804




Owner of the Declaration	Franz Kaldewei GmbH & Co. KG
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-KAL-20190057-IBC1-EN
Issue date	26.06.2019
Valid to	26.06.2024

Shower surfaces, bathtubs and washbasins made of
KALDEWEI steel enamel
Franz Kaldewei GmbH & Co. KG

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



1. General Information

Franz Kaldewei GmbH & Co. KG		Shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel	
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany		Owner of the declaration Franz Kaldewei GmbH & Co. KG Beckumer Str. 33-35 59229 Ahlen Germany	
Declaration number EPD-KAL-20190057-IBC1-EN		Declared product / declared unit The declared unit is 1 m ² steel enamel for manufacturing Kaldewei shower surfaces, bathtubs and washbasins.	
This declaration is based on the product category rules: Sanitary products made from composite materials, 12.2018 (PCR checked and approved by the SVR)		Scope: Shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel, exclusively manufactured in the Ahlen plant of Franz Kaldewei GmbH & Co. KG, Germany.	
Issue date 26.06.2019		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.	
Valid to 26.06.2024		Verification The standard <i>EN 15804</i> serves as the core PCR Independent verification of the declaration and data according to <i>ISO 14025:2010</i> <input type="checkbox"/> internally <input checked="" type="checkbox"/> externally	
 Prof. Dr.-Ing. Horst J. Bossenmayer (chairman of Institut Bauen und Umwelt e.V.)		 Angela Schindler (Independent verifier appointed by SVR)	
 Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.)			

2. Product

2.1 Product description/Product definition

Enamelled shower surfaces, bathtubs and washbasins consist of a deep-drawn body made of steel suitable for enamelling which is coated on both sides with base enamel and on the front with finishing enamel. The declared unit is 1 m² steel enamel for manufacturing Kaldewei shower surfaces, bathtubs and washbasins. The steel thickness and enamel thickness vary depending on the product. Accordingly, there are certain deviations for the specific product in terms of environmental impacts depending on the thickness of steel and enamel.

Directive (EU) No. 305/2011 (CPR) applies for placing the products on the market in the EU/EFTA (with the exception of Switzerland). The products require a Declaration of Performance taking consideration of /DIN EN 14516/ "Bathtubs for domestic purposes", /DIN EN 14527/ "Shower trays for domestic purposes", /DIN EN 14688/ "Sanitary appliances – Washbasins –

Functional requirements and test methods", and CE marking. Use is governed by the respective national regulations.

2.2 Application

Steel enamel shower surfaces, bathtubs and washbasins manufactured by KALDEWEI are used as self-supporting or non self-supporting elements in sanitary areas.

2.3 Technical Data

The products consist of a deep-drawn body made of steel suitable for enamelling which is coated on both sides with base enamel and on the front with finishing enamel. The following chart depicts sample data on some shower surfaces, bathtubs and washbasins.

Model no.	Type	Dimensions (LxWxH) [mm]	Surface area [m²]	Weight [kg]
545	Shower tray	900 x 900 x 65	1.006	approx. 21.9
396	Shower tray	900 x 900 x 140	1.151	approx. 24.4
391	Shower tray	1,000 x 1,000 x 25	1.146	approx. 25.1
786	Shower tray	1,000 x 1,000 x 23	1.161	approx. 25.2
312	Bathtub	1,700 x 700 x 390	2.193	approx. 25.4
373	Bathtub	1,700 x 750 x 410	2.367	approx. 48.8
375	Bathtub	1,800 x 800 x 430	2.640	approx. 53.8
3180	Washbasin bowl	Ø 450 mm, H: 122 mm	0.235	approx. 5.3
3157	Top-mounted washbasin	600 x 460 x 125	0.635	approx. 10.8
1127	Bathtub with panelling	1,700 x 750 x 610	4.899	approx. 107.3
1128	Bathtub with panelling	1,800 x 800 x 610	5.429	approx. 118.9

For KALDEWEI products, the ratio of bathtub/tray surface to the projection surface is determined as follows:

For bathtubs:

bathtub surface [m²] ~ 1.5 x projection surface [m²] + 0.5 [m²]

For shower trays lower than 140 mm:

tray surface [m²] ~ 1.14 x projection surface [m²] + 0.06 [m²]

For shower trays with a depth of 140 mm:

tray surface [m²] ~ 1.24 x projection surface [m²] + 0.13 [m²]

For shower trays with a depth of 250 mm:

tray surface [m²] ~ 1.45 x projection surface [m²] + 0.24 [m²]

Built-in and under-counter washbasins:

washbasin surface [m²] ~ projection surface [m²] x 1.19 + 0.02 [m²]

Wall-mounted and top-mounted washbasins:

washbasin surface [m²] ~ projection surface [m²] x 1.86 + 0.04 [m²]

Bathtubs with panelling:

bathtub surface [m²] ~ projection surface [m²] x 1.5 + panelling length [m] x bathtub height [m] 0.5 [m²]

The basis weight of the steel body used for enamelling is 18 to 22 kg/m² for shower surfaces and bathtubs, 10 to 11 kg/m² for bathtubs with a reduced steel thickness (primarily for export), and 15 to 21 kg/m² for washbasins.

Depending on the respective model, features and construction specifications on the test bench, KALDEWEI shower surfaces, bathtubs and washbasins comply with individual or several sound insulation standards. These include DIN 4109, DIN 4109/A1, VDI 4100 SST I-III and SIA 181. All sound insulation certificates are available on www.kaldewei.de.

The maximum service temperature of the enamelled steel parts is significantly higher than 500 °C. The enamel is at least 0.2 mm thick on the upper side.

The optional enamel-based "Anti-slip", "Full anti-slip" or "KALDEWEI SECURE PLUS" surface finishes comply with evaluation group B for wet-loaded barefoot areas /DIN 51097/ and evaluation group R 10 for anti-slip properties in workrooms and fields of activities with increased risk of slipping /DIN 51130/.

Construction data

Name	Value	Unit
Installation sound level LAFeq,nT acc. to VDI 4100, depending on the model, equipment and installation	≤ 24 (SST III)	dB(A)
Chemical resistance acc. to DIN EN 14516/14527 (for bathtubs and shower trays)	-	-
Installation sound level LAFeq,nT acc. to DIN 4109, depending on the model, equipment and installation	≤ 30	dB(A)
Total sound level LH,tot acc. to SIA 181, depending on the model, equipment and installation	≤ 25 (functional noise), ≤ 35 (service noise)	dB(A)
Temperature change resistance in accordance with DIN EN14516/14527 (for bathtubs and shower trays)	passed	-
Resistance to chemicals, resistance to alkaline solutions acc. to DIN EN 14516/14527	Wear < 8	g/m²
Resistance to chemicals, resistance to boiling citric acid acc. to DIN EN 14516/14527	Wear < 5	g/m²
Anti-slip classification acc. to DIN 51097 (for bathtubs and shower trays with "Anti-slip", "Full anti-slip" or "KALDEWEI SECURE PLUS")	B	-

The products' performance values correspond with the Declaration of Performances in terms of their essential properties in accordance with /DIN EN 14516/ "Bathtubs for domestic purposes", /DIN EN 14527/ "Shower trays for domestic purposes", /DIN EN 14688/ "Sanitary appliances – Washbasins – Functional requirements and test methods".

2.4 Delivery status

Shower surfaces are available in a square, rectangular or pentagonal design or as quadrant-shaped showers with dimensions from 750 x 700 mm to 1500 x 1500 mm or 1800 x 1000 mm, with depths of between 16 and 250 mm.

Bathtubs are available in a square, hexagonal or oval design with dimensions from 1400 x 700 mm to 2000 x 1200 mm or 2140 x 900 mm, with depths of between 315 and 810 mm. The capacity excluding average displacement of 70 litres is between 53 and 435 litres. Bathtubs with panelling are available in a rectangular or oval design with dimensions from 1700 x 750 mm to 1800 x 900 mm, with depths of between 425 and 485 mm. These bathtubs are 610 mm high.

Washbasins are available as top-mounted, built-in and counter-mounted washbasins as well as wall-mounted or free-standing models with dimensions from 500 x 300 mm or 460 x 385 mm to 1200 x 500 mm or 1300 x 460 mm. The rim height is between 2 and 120 mm; the bowl depth is between 102 and 157 mm.

Shower surfaces are between approx. 0.7 and 2.7 m² in size, bathtubs are between approx. 1.8 and 4.1 m², bathtubs with panelling are between approx. 4.0 and 6.2 m², and washbasins are between approx. 0.2 and 1.7 m².

2.5 Base materials/Ancillary materials

Base materials for the manufacture of KALDEWEI steel enamel shower surfaces, bathtubs and washbasins:

Component / % by mass

Steel suitable for enamelling acc. to EN 10209: 91.3%

Quartz (purity > 99%): 3.4%

Borax (purity > 99%): 1.6%

Potassium and sodium feldspar: 1.3%

Titanium dioxide (purity > 99%): 0.6%

Soda (purity > 99.3%): 0.4%

Clay (purity > 99%): 0.2%

Other inorganic raw materials: 1.2%

Auxiliaries/Additives

Declaration of auxiliary materials and additives:

- Drawing oils: 0-3 g/kg steel (depends on model)

- Alkalis for degreasing (as 25% solution):

0.1-1.8 g/kg steel

- Tensides (as 15 or 45% solution):

0.05-0.8 g/kg steel

- Pickle with sulphuric acid:

0.5-2.5 g/kg steel

- Temporary corrosion protection (chrome-free, as 50% solution): 0.1 - 0.3 g/kg steel

Material explanation

Explanation/Origin of preliminary products and additives:

The cold-rolled steels used are unalloyed or low-alloy quality steels in accordance with DIN EN 10209 "Cold-rolled low-carbon steel flat products for vitreous enamelling". Tensile strengths (Rm) are between 270 and 390 N/mm²; the minimum breaking strain values (A80) are between 30% and 38%.

The main raw materials for enamel manufacture come from Heerlen in the Netherlands (quartz), California in the USA (borax), Novara in Italy and Turkey (feldspar), and China (titanium dioxide).

Regional and general availability of raw materials

As a mass-produced material for a wide variety of applications, steel is generally available in large quantities. Steel is easily recycled. The use of recycled steel helps to conserve resources. As is the case with other types of glass, the raw materials for

manufacturing enamel involve minerals which, for the most part, occur naturally in the earth's crust and are thus also available in large quantities.

The product / At least one partial product contains substances from the candidate list (09.04.2019) exceeding 0.1 percentage by mass: no

The product / At least one partial product contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass in at least one partial product: 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

The manufacturing process for enamelled shower surfaces, bathtubs and washbasins is subdivided into the following processes:

- Manufacture of the steel blanks
- Cleaning the blanks
- Manufacture of the enamel frits
- Manufacture of the enamel slips
- Enamelling

The process steps associated with these sub-processes are outlined as follows:

1. Manufacture of the steel blanks

The blanks are manufactured in automatic, continuous press lines in the following process stages:

- Deep-drawing: The blanks acquire the required shape by deep-drawing electrostatically-oiled steel blanks in 2-part drawings with forces of 8,000–10,000 kN.
- Processing the blank: After deep-drawing, the outlets, overflows and sometimes holes for handles are punched in the blanks and the base frame brackets mounted.
- In the case of bathtubs with panelling, these are welded on after deep-drawing the bathtub blanks.
- In the case of wall-mounted washbasins as well as built-in and top-mounted washbasins, the washbasin edges are welded.

- Working the edges of the raw bath/tray: The edge contours of the raw bathtubs/trays are produced by folding over and trimming the edges in several steps.

2. Cleaning the blanks

The raw steel bathtubs and trays are cleaned in a continuous, automated facility according to the following sub-steps:

- Degreasing the blanks: After they have been produced, the blanks are covered with a film of corrosion-protection oils, deep-drawing oils and abraded metal particles from the deep-drawing process which are washed off by spraying them with alkali tenside solutions.
- Acidic rinsing of the blanks: Any impurities remaining on the blanks after degreasing are washed

off by spraying with a strongly-diluted solution of sulphuric acid.

- Alkali rinsing of the blanks: A temporary rust-inhibiting layer is formed on the blanks by spraying them with a slightly alkaline amine solution.

3. Manufacture of the enamel frits

Enamel frits are the glass granulate used for enamelling and are produced in the following sub-steps:

- Formulation and mixing of the raw materials for the glass:
The raw materials for the glass are weighed and mixed in mixing plants.

- Smelting the enamel frit: The raw material mixtures for the glass are smelted in batch-type smelters for 2-3 hours at temperatures of between 1100 and -1300 °C. When the smelting process is complete, the glass melt is poured into water to quench it and thus granulated.

- Drying the enamel frit: The surface water adhering to the grains of the enamel frit is partially removed by drying.

4. Manufacture of the enamel slips

Enamel slips are the suspensions of glass granulate in water used for enamelling and are produced in the following sub-steps:

- Formulation of the raw materials for the slip: Solid raw materials are weighed and filled into batch-operated mills along with the liquid, volumetrically-dosed raw materials.
- Grinding process: The raw materials for the slip are ground to enamel slips in drum mills.
- Preparation of the enamel slips: After the grinding process, the enamel slips are pumped through systems of sieves and magnetic separators in order to separate off coarse mechanical and magnetic metallic impurities.

5. Enamelling

Enamelling is the production of a layer of glass on a metal surface and is carried out in the following sub-steps:

- Coating the cleaned blanks with enamel slip: Robots in automatic spray booths spray the fronts and backs of the blanks with enamel slips.
- Drying the enamel coating: The water remaining in the enamel coating is evaporated in continuous drying ovens.
- Firing the enamel coating at 820-860 °C: The enamel coating is fired onto the blanks in continuous furnaces so that the coating on the upper side of the washbasin or bathtub/tray has a thickness of 200-300 µm.
- Packaging: An automated system applies the company logo before the enamelled parts are packaged.

2.7 Environment and health during manufacturing

Via a heat exchanger, furnace waste heat incurred during enamelling is utilised several times for upstream processes.

Apart from procuring energy from the grid, KALDEWEI also operates its own combined heat and power plant in order to utilise the energy advantages of cogeneration.

KALDEWEI also operates an energy management system in accordance with /DIN EN ISO 50001/.

2.8 Product processing/Installation

Installation recommendations:

When handling KALDEWEI steel enamel shower surfaces, bathtubs and washbasins, care must be taken to ensure that they are treated correctly. This applies to their transport, unpacking and installation. Kaldewei recommends that shower surfaces, bathtubs and washbasins are fitted at the fine-installation stage, i.e. after the bathroom has been tiled, and that they are covered up until all other building work has been completed.

Various installation systems are available for positioning a shower surface, bathtub or washbasin, depending on the respective model. The installation instructions enclosed with the installation guide must be observed.

Sound insulation:

The requirements of /DIN 4109/A1/ governing sound insulation in building construction or the /VDI 4100/ Regulation can generally only be met if suitable sound insulation is fitted. The KALDEWEI BWS or DWS sound insulation sets in combination with the installation systems referred to above comprise several matched components which together guarantee the best possible insulation. The site conditions such as how the bathroom, toilet etc. are arranged with respect to living rooms and bedrooms, construction of walls and floors, must conform to the requirements of /DIN 4109/, "Guidelines for planning and execution" or the regulations outlined in /VDI 4100/.

Equipotential bonding:

According to the DIN VDE 0100-701 Directive, equipotential bonding must be provided where necessary.

Industrial safety:

When assembling or installing KALDEWEI steel enamel shower surfaces, bathtubs and washbasins, no additional health protection measures are required beyond the job safety measures required by public law (e.g. safety footwear or protective gloves).

2.9 Packaging

The shower surfaces, bathtubs and washbasins are packed in cardboard packaging materials on wooden pallets and fixed to the pallets by means of plastic straps or polyethylene film. Some models have polystyrene spacers between the parts for protection. The packaging of KALDEWEI steel enamel shower surfaces, bathtubs and washbasins is recycled as part of the authorised waste disposal and recycling system for commercial users (Interseroh).

2.10 Condition of use

The constituents of KALDEWEI steel enamel during the use phase correspond to the base materials outlined in 2.5.

2.11 Environment and health during use

There is no detrimental impact to the environment or health if KALDEWEI steel enamel shower surfaces, bathtubs and washbasins are used according to their designated function.

2.12 Reference service life

The RSL can not be calculated in accordance with /ISO 15686/. Figures are based on an estimate by the manufacturer.

Shower surfaces, bathtubs and washbasins made from KALDEWEI steel enamel are light resistant, UV resistant and temperature resistant. The non-porous glass surface is formed by a chemically largely inert finishing enamel which, when used normally, according to its function and in accordance with the care instructions, lasts beyond the useful life of 30 years.

2.13 Extraordinary effects

Fire

In accordance with /DIN 4102-1/ "Fire behaviour of building materials and building components", KALDEWEI steel enamel shower surfaces, bathtubs and washbasins comply with building material class A. In accordance with /DIN EN 13501-1/ "Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests", KALDEWEI steel enamel shower surfaces, bathtubs and washbasins comply with class A1. As a steel/glass composite material, it is therefore neither combustible nor oxidising. The softening temperature of the enamel-steel composite is above 700 °C.

Fire protection

Name	Value
Building material class in accordance with DIN EN 13501-1	A1

Water

In the event of flooding, there is no detrimental impact on the environment.

In order to avoid consequential damage, it must be ensured that no moisture remains in the fabric of the building and especially in the cavity below or behind the bathtub or shower tray when the water has subsided.

Mechanical destruction

Mechanical damage to the enamel as far as the steel surface can lead to corrosion of the steel.

2.14 Re-use phase

KALDEWEI steel enamel shower surfaces, bathtubs and washbasins can be easily sorted and separated at the end of their service life. They are 100% recyclable without the need to separate the steel from the enamel coating. The material is recycled either in the production of oxygen steel, the production of steel in electric furnaces or in the production of cast steel.

2.15 Disposal

No environmental pollution is caused during dismantling and separation. Enamelled shower surfaces, bathtubs and washbasins are never just discarded because the enamelled steel is used as a raw material for the production of steel without the need for further separation.

Recycling should be through certified companies (specialist disposal companies), e.g. scrap dealers.

2.16 Further information

www.kaldewei.de

3. LCA: Calculation rules

3.1 Declared Unit

1m² of surface of the declared average product weighs 17.93 kg.

The average basis weight of steel is 16.64 kg/m². This gives rise to an average calculated steel thickness of 2.1 mm for these products.

The average basis weight across the various products is 1.29 kg/m² for enamel. This gives rise to a calculated enamel thickness of 517 µm, including enamelling on the front and back.

Declared unit

Name	Value	Unit
Declared unit (conversion)	17.93	kg/m ²
Layer thickness enamel (average)	0.517	mm
Mass enamel (average)	1.29	kg
Conversion factor to 1 kg	0.0558	-

3.2 System boundary

Type of EPD: cradle to gate – with options

The LCA for the steel enamel shower surfaces, bathtubs and washbasins manufactured by KALDEWEI considers the life cycle phases of production (A1-A3) as well as recycling of packaging during installation (Module A5). Disposal in terms of reuse or treatment (C3) and landfilling (C4) is also considered in this study. An analysis of the modules under review gives rise to credits and debits beyond the system boundary (Module D), especially as a result of the steel recycling potential which is fully allocated to this module.

Transport to the building (Module A4), dismantling at the end-of-life (C1), transport for the end-of-life (C2) and the use stage (Module B) are not considered in this study.

3.3 Estimates and assumptions

Transporting raw materials is considered in the analysis. The data on the raw materials of most relevance in terms of mass originates from information provided by Franz Kaldewei GmbH & Co. KG. Steel is transported by truck.

95% of the products used are collected and directed to recycling. The steel is reused. This involves re-melting.

Energy and material losses are assumed and considered in line with industrial data supplied by the "World Steel Association". Between 85% and 98% of the steel components installed in buildings is recycled /Brimacombe 2005/. A collection rate of 95% can be assumed as a conservative estimate for bathtubs etc. on account of their size. 5% of used products are not collected and end up on landfills as inert material.

3.4 Cut-off criteria

The sorbent limestone and filter cake waste products are not considered in the LCA. For the manufacture of enamel frits, all base materials under 1% were cut off; the total of all cut-off enamel constituents corresponds to < 0.4% as a mass ratio to the product. Apart from these substances, all data from the operating data survey was taken into consideration in the analysis, i.e. all starting materials used according to the formulation, the thermal energy used as well as electricity and diesel consumption. It can be assumed that the processes ignored would have contributed less than 5% to the impact categories under review.

3.5 Background data

The life cycle for the manufacture and disposal of the shower surfaces, bathtubs and washbasins declared by Franz Kaldewei GmbH & Co. KG was modelled using the /GaBi ts software/ system for life cycle assessment developed by thinkstep AG. The consistent data sets contained in the GaBi data base are documented and can be viewed in the online GaBi documentation /GaBi ts documentation/. In order to guarantee comparability of the results, exclusively the consistent background data from the GaBi data base was used in the LCA (e.g. data sets on energy, transport, auxiliaries and consumables). The shower surfaces, bathtubs and washbasins are manufactured in Ahlen, Germany. The Life Cycle Assessments were therefore drawn up for Germany as a reference area. This means that apart from the production processes under these boundary conditions, the pre-stages also

of relevance for Germany such as provision of electricity or energy carriers were used.

3.6 Data quality

Despite some deviations in terms of geographical representativity and the availability of public documentation, the overall data quality can be regarded as good. The corresponding data sets (or estimates) were available in the GaBi Database for all of the relevant preliminary products and auxiliaries used.

All primary data refers to 2017; the background data in the GaBi Database refers to the years 2016 and 2017.

3.7 Period under review

The period under review concerns production year 2017.

3.8 Allocation

No co-product allocation rules were applied. Packaging material is burned in a waste incineration plant. It is modelled in an input-specific manner here. Module D includes credits for exported energy from waste disposal processes. Energy gained by thermal recycling of packaging waste is offset by an equivalence process. As the production location is in Germany, the current average "German power mix" was applied for electricity and "Thermal energy from natural gas" was applied for heat. In terms of incineration of the packaging material after installation of the product, credits are allocated to Module D for thermal recovery while emissions and debits incurred by incineration are allocated to Module A5.

3.9 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.

The background data in the /GaBi ts software/ system for life cycle assessment has been used..

4. LCA: Scenarios and additional technical information

At the end-of-life of an average shower surface, bathtub or washbasin, a collection/recycling rate of 95% is assumed and the corresponding credits/loads are allocated. As a conservative estimate, it is assumed that 5% of steel parts are directed to a waste disposal site.

This results in a credit of 17.09 kg in Module D. Only recycling of packaging was considered for installation in the building, Module A5.

Installation in the building (A5) – Recycling packaging materials

Name	Value	Unit
Polystyrene	0.013	kg
Wood	0.008	kg
Film	0.012	kg
Cardboard	0.486	kg

End of Life (C3)

Name	Value	Unit
Scrap collection	17.93	kg
Recycling	15.81	kg
Landfilling	2.12	kg

Reuse, recovery and recycling potential (D), relevant scenario details

Name	Value	Unit
Credit	16.8	kg

This credit is due to the steel in the product accounting for 15.8 kg plus approx. 1 kg steel in production residue. Production residue is recycled within A1-A3 in order to meet the steel scrap requirements associated with steel manufacturing. The excess scrap is recycled at the end of life (i.e. net flow approach).

5. LCA: Results

The environmental impacts of 1 m² surface of KALDEWEI steel enamel shower surfaces, bathtubs and washbasins manufactured in Germany by Franz Kaldewei GmbH & Co. KG are depicted below. The following tables depict the results of the indicators concerning the estimated impact, use of resources as well as waste and other output flows in relation to 1 m² surface of bathtubs and shower trays. Modules marked "x" in accordance with /EN 15804/ are addressed here.

The CML April 2012 characterisation factors are applied for calculating the environmental impacts.

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

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² Shower surfaces, bathtubs or washbasins

Parameter	Unit	A1-A3	A5	C3	C4	D
Global warming potential	[kg CO ₂ -Eq.]	6.45E+1	7.63E-2	3.01E-2	3.37E-2	-2.80E+1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	3.14E-11	1.69E-15	1.22E-13	7.50E-15	5.26E-14
Acidification potential of land and water	[kg SO ₂ -Eq.]	1.63E-1	1.77E-5	8.75E-5	1.99E-4	-5.41E-2
Eutrophication potential	[kg (PO ₄) ³ -Eq.]	1.70E-2	1.95E-6	9.64E-6	2.75E-5	-3.77E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.82E-2	7.70E-7	5.84E-6	1.57E-5	-1.31E-2
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	6.06E-4	9.62E-9	1.48E-8	1.30E-8	-4.72E-4
Abiotic depletion potential for fossil resources	[MJ]	6.48E+2	2.87E-2	3.28E-1	4.36E-1	-2.63E+2

RESULTS OF THE LCA - RESOURCE USE: 1 m² Shower surfaces, bathtubs or washbasins

Parameter	Unit	A1-A3	A5	C3	C4	D
Renewable primary energy as energy carrier	[MJ]	7.48E+1	7.12E-3	1.91E-1	5.61E-2	1.94E+1
Renewable primary energy resources as material utilization	[MJ]	6.95E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	8.18E+1	7.12E-3	1.91E-1	5.61E-2	1.94E+1
Non-renewable primary energy as energy carrier	[MJ]	6.78E+2	3.24E-2	5.37E-1	4.52E-1	-2.53E+2
Non-renewable primary energy as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	6.78E+2	3.24E-2	5.37E-1	4.52E-1	-2.53E+2
Use of secondary material	[kg]	4.34E+0	0.00E+0	0.00E+0	0.00E+0	1.68E+1
Use of renewable secondary fuels	[MJ]	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
Use of net fresh water	[m ³]	4.54E-2	1.87E-4	2.59E-4	8.61E-5	-5.18E-2

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

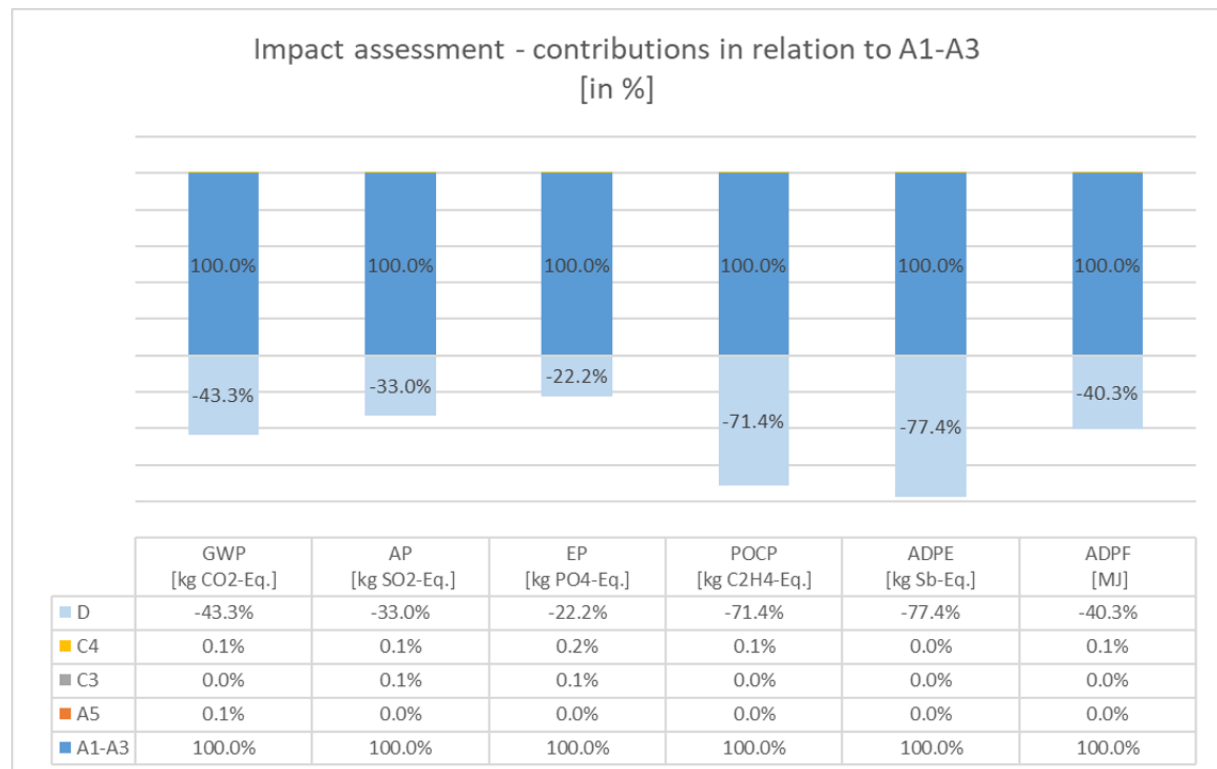
1 m² Shower surfaces, bathtubs or washbasins

Parameter	Unit	A1-A3	A5	C3	C4	D
Hazardous waste disposed	[kg]	4.93E-6	1.66E-10	2.58E-9	7.78E-9	-3.23E-5
Non-hazardous waste disposed	[kg]	3.80E+0	6.29E-3	3.55E-4	2.12E+0	3.01E+0
Radioactive waste disposed	[kg]	1.20E-2	1.47E-6	8.30E-5	6.48E-6	-1.89E-5
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	0.00E+0	1.68E+1	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
Exported electrical energy	[MJ]	0.00E+0	1.33E-1	0.00E+0	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	3.06E-1	0.00E+0	0.00E+0	0.00E+0

6. LCA: Interpretation

The production phase (Modules A1-A3) is decisive for all environmental categories. Credits / Avoided debits for the subsequent system in Module D can be offset

for all environmental categories on account of steel recycling.



The manufacture of 1 m² surface of shower surfaces, bathtubs and washbasins is dominated by Module A1 (raw material supply) in terms of all environmental impacts (steel production, raw materials), followed by Module A3 (energy provision and auxiliaries). The contributions made by recycling packaging (A5), transport (Module A2) and waste processing (C3) are less than 2% for all environmental impact categories.

The credits in Module D are attributable to recycling the steel scrap.

The influence of variance in the steel basis weight between the various product groups is relatively high. A bath with an enamelled basis weight of 11.59 kg/m² has a 7-30% lower environmental impact than the average product while a shower tray product with an enamelled basis weight of 23.49 kg/m² has 6-26% higher impacts in the impact categories under review.

7. Requisite evidence

Not of relevance

•

8. References

/IBU 2016/

IBU (2016): General EPD programme instructions of Institut Bauen und Umwelt e.V. (IBU), version 1.1, Institut Bauen und Umwelt e.V., Berlin

Institut Bauen und Umwelt e.V.: PCR guidelines for building-related products and services, Part B: Requirements on the EPD for sanitary products made from composite materials, version 1.6, 2017

/ISO 14025/

DIN EN /ISO 14025:2011-10/, Environmental labels and declarations – Type III environmental declarations – Principles and processes

/Brimacombe 2005/

Brimacombe L.G. et al, The Sustainability of Steel and the Value in Recycling, 2005

/EN 15804/

/EN 15804:2012-04+A1 2013/, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products

/BImSchG/

Federal Immission Control Act (BImSchG): Act protecting against harmful environmental impact caused by air pollution, noise, shocks and similar processes, 2013

/PCR: Sanitary products made from composite materials/

/DIN 4102-1/

DIN 4102-1:1998-05, Fire behaviour of building materials and building components – Part 1: Building materials; concepts, requirements and tests

/DIN EN 13501-1/

DIN EN 13501-1: 2007-5, Classification of construction products and methods by fire performance – Part 1: Classification with the results of tests on reaction to fire of construction products

/DIN 4109/

DIN 4109:1989-11, Sound insulation in buildings; Requirements and testing

/DIN 4109/A1/

DIN 4109/A1: 2001-01, Sound insulation in buildings – Requirements and testing; Amendment A1

/DIN 51097/

DIN 51097: 1992-11, Testing of floor coverings – Determination of anti-slip properties – Wet-loaded barefoot areas – Walking method – Ramp test

/DIN 51130/

DIN 51130: 2014-02, Testing of floor coverings – Determination of anti-slip properties – Workrooms and fields of activities with slip danger – Walking method – Ramp test

/DIN EN 10209/

DIN EN 10209: 2013-09, Cold-rolled low-carbon steel flat products for vitreous enamelling – Technical delivery conditions; German version EN 10209:2013

/DIN EN 14516/

DIN EN 14516: 2015-12, Bathtubs for domestic purposes

/DIN EN 14527/

DIN EN 14527: 2016-12, Shower trays for domestic purposes

/DIN EN 14688/

DIN EN 14688: 2015-10, Sanitary appliances – Washbasins – Functional requirements and test methods

/DIN EN ISO 50001/

DIN EN ISO 50001: 2011, Energy management systems – Requirements with guidance for use

/GaBi ts software/

Gabi ts Software and Databases for life cycle engineering; LBP, University of Stuttgart and thinkstep AG, 2018

/GaBi ts documentation/

GaBi ts: documentation of the GaBi data sets for Life Cycle Engineering; LBP, University of Stuttgart and thinkstep AG, 2018. <http://documentation.gabi-software.com>

/ISO 15686/

ISO:15686-8:2008-06, Buildings and constructed assets – Service life planning - Part 8: Reference service life and service life estimation

/TA Air/

Technical guidelines for air pollution control; first general administrative specification under the Federal Immission Control Act (BIMSchG), 2002

/VDI 4100/

VDI 4100:2012-10, Sound insulation between rooms in buildings – Dwellings – Assessment and proposals for enhanced sound insulation between rooms, Verein Deutscher Ingenieure

/DIN VDE 0100-701/

DIN VDE 0100-701:2008-10, Requirements for special installations or locations – Locations containing a bath or shower

**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**

thinkstep AG
Hauptstraße 111- 113
70771 Leinfelden-Echterdingen
Germany

Tel +49 711 341817-0
Fax +49 711 341817-25
Mail info@thinkstep.com
Web <http://www.thinkstep.com>

**Owner of the Declaration**

Franz Kaldewei GmbH & Co. KG
Beckumer Str. 33
59229 Ahlen
Germany

Tel 02382 785 0
Fax 02382 785 200
Mail info@kaldewei.com
Web www.kaldewei.com