ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	Franz Kaldewei GmbH & Co. KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-KAL-20240483-IBC1-EN
Issue date	04.02.2025
Valid to	03.02.2030

Shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel

Franz Kaldewei GmbH & Co. KG

Institut Bauen und Umwelt e.V.

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KALDEWEI

1. General Information

Franz Kaldewei GmbH & Co. KG

Programme holder

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

Declaration number

EPD-KAL-20240483-IBC1-EN

This declaration is based on the product category rules:

Sanitary products made from composite materials, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

04.02.2025

Valid to

03.02.2030

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

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

Shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel

Owner of the declaration

Franz Kaldewei GmbH & Co. KG
Beckumer Straße 33-35
59229 Ahlen
Germany

Declared product / declared unit

The declared unit is 1 m^2 of steel enamel, from which shower trays, bathtubs and washbasins of the KALDEWEI brand are made.

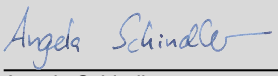
Scope:

Shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel, manufactured exclusively in the Ahlen plant of Franz Kaldewei GmbH & Co. KG, Germany.
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



Angela Schindler,
(Independent verifier)

2. Product

2.1 Product description/Product definition

Enamelled shower surfaces, bathtubs and washbasins consist of a deep-drawn base body made of steel which is able to be enamelled, which is coated on both sides with base enamel and on the visible side is additionally coated with covering enamel. The declared unit is 1 m² of steel enamel, from which shower trays, bathtubs and washbasins of the brand KALDEWEI are manufactured. Depending on the product, the steel thickness and enamel thickness varied. Therefore, there are certain variations in the environmental impacts for the specific product depending on the steel and enamel thickness. Regulation (EU) No. 305/2011 (CPR) applies to the placing on the market of products in the EU/EFTA (with the exception of Switzerland). The products require a declaration of performance taking into account DIN EN 14516 'Bathtubs for domestic use', DIN EN 14527 'Shower trays for domestic use' or DIN EN 14688 'Sanitary equipment – Wash basins – Functional requirements and test methods' and the CE marking. The respective national regulations apply to their use.

2.2 Application

Shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel are used as self-supporting or non-self-supporting elements in the sanitary sector.

2.3 Technical Data

The products consist of a deep-drawn base body made of steel which is able to be enamelled, which is coated on both sides with base enamel and additionally with top enamel on the front. The following table lists the data of some shower surfaces, bathtubs and washbasins as examples.

Modell no.	Type	Dimensions (LxBxH) [mm]	Surface area [m²]	Weight [kg]
545	Shower tray	900 x 900 x 65	1.004	approx. 22.3
396	Shower tray	900 x 900 x 140	1.150	approx. 25.5
391	Shower tray	1,000 x 1,000 x 25	1.146	approx. 25.4
786	Shower tray	1,000 x 1,000 x 23	1.161	approx. 25.8
373	Bathtub	1,700 x 750 x 410	2.367	approx. 42.1
375	Bathtub	1,800 x 800 x 430	2.640	approx. 47.0
3180	Washbasin bowl	∅ 450 mm, H: 122 mm	0.234	approx. 4.9
3157	Top-mounted washbasin	600 x 460 x 125	0.639	approx. 10.2
1127	Bathtub with panelling	1,700 x 750 x 610	4.899	approx. 104.8
1128	Bathtub with panelling	1,800 x 800 x 610	5.429	approx. 116.1

The ratio of the product area to the projection area can be determined as follows for KALDEWEI products:

For bathtubs:
Tub surface [m²] ~ 1.5 x projection area [m²] + 0.5 [m²]

For shower trays less than 140 mm deep:
Tub surface [m²] ~ 1.14 x projection area [m²] + 0.06 [m²]

For shower trays with a depth of 140 mm:
Tub surface [m²] ~ 1.24 x projection area [m²] + 0.13 [m²]

For shower trays with a depth of 250 mm:
Tub surface [m²] ~ 1.45 x projection area [m²] + 0.24 [m²]

Built-in and undercounter washbasins:
Washbasin surface [m²] ~ 1.19 x projection area [m²] + 0.02 [m²]

Wall-mounted and top-mounted washbasins:
Washbasin surface [m²] ~ 1.86 x projection area [m²] + 0.04 [m²]

Bathtubs with panelling:
Tub surface [m²] ~ 1.5 x projection area [m²] + panelling length [m] x tub height [m] + 0.5 [m²]

The surface weight of the steel base bodies used for enamelling is 17 to 21 kg/m² for shower surfaces and bathtubs and 15 to 20 kg/m² for washbasins.

Depending on the model, equipment and structural specifications, shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel meet one or more sound insulation standards in the test bench. These include DIN 4109 or DIN 4109/A1, VDI 4100 SST I-III and SIA 181. All sound insulation certificates are available at www.kaldewei.de.

The maximum load temperature of the enamelled steel parts is well above 500 °C. The thickness of the glass-lining on the working side is at least 0.2 mm.

The optional enamel-based anti-slip surface finishes 'Anti-slip', 'Full anti-slip' or 'KALDEWEI SECURE PLUS' meet the slip resistance classes B according to DIN EN 16165:2021-12 Annex A and R 10 according to DIN EN 16165:2021-12 Annex B.
The surface finish 'KALDEWEI INVISIBLE GRIP' meets slip resistance class C according to DIN EN 16165:2021-12 Annex A.

Structural data

Name	Value	Unit
Installation sound level LAFeq,nT according to VDI 4100, depending on model, equipment and installation	≤ 24 (SST III)	dB(A)
Installation sound level LAFeq,n according to DIN 4109, depending on model, equipment and installation	≤ 30	dB(A)
Sound level total value LH,tot according to SIA 181, depending on model, equipment and installation	≤ 25 (Functional-noise), ≤ 35 (operating noise)	dB(A)
Temperature change resistance according to DIN EN 14516/14527 (for bath and shower trays)	passed	-
Chemical resistance, resistance to alkaline solutions according to DIN EN 14516/14527	Abrasion < 8	g/m²
Chemical resistance, resistance to boiling citric acid according to DIN EN 14516/14527	Abrasion < 5	g/m²
Anti-slip classification according to DIN EN 16165:2021-12 Annex A and “DGUV Information 207-006” (for baths and shower trays with “Anti-slip”, “Full anti-slip” or “KALDEWEI SECURE PLUS”)	B	-
Rutschhemmungsklasse according to DIN EN 16165:2021-12 Annex A and “DGUV Information 207-006” (for baths and shower trays with KADEWEI INVIBLE GRIP)	C	-

Performance values of the products according to the performance declarations with respect to their essential characteristics according to *DIN EN 14516* 'Bathtubs for

domestic use', *DIN EN 14527* 'Shower trays for domestic use' or *DIN EN 14688* 'Sanitary equipment – Wash basins – Functional requirements and test methods'.

2.4 Delivery status

Shower surfaces are available as square, rectangular or pentagonal showers or as quadrant showers with dimensions from 700 x 700 mm to 1,500 x 1,500 mm or 1,800 x 1,000 mm with depths between 16 and 250 mm.

Bathtubs are available as rectangular, hexagonal, octagonal or oval models with dimensions from 1,400 x 700 mm up to 2,000 x 1,000 mm, 1,800 x 1,200 mm or 2,100 x 800 mm with depths between 390 and 485 mm. The net capacity minus an average displacement of 70 litres is between 67 and 273 litres.

Bathtubs with panelling are available as rectangular or oval models with dimensions from 1,600 x 700 mm up to 1,800 x 800 mm with depths between 425 and 485 mm. The standing height of these tubs is 580 to 610 mm.

Washbasins are available as countertop, built-in and undercounter washbasins as well as wall-mounted with dimensions from 460 x 385 mm or 470 x 381 mm up to 1,200 x 500 mm or 1,300 x 460 mm. The edge height is between 2 and 120 mm, the trough depth between 102 and 173 mm. Washbowls are available in round shape with diameters of 300 to 450 mm or in rectangular shape in the sizes 400 x 400 mm, 520 x 355 mm and 580 x 380 mm.

The size of the surface for shower areas is between approx. 0.6 to 2.6 m², for bathtubs between approx. 1.8 to 4.0 m², for bathtubs with panelling between approx. 4.0 to 6.2 m² and for washbasins between approx. 0.1 to 1.3 m².

2.5 Base materials/Ancillary materials

Basic materials for the production of shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel:

Component / mass %
-Steel that can be enamelled according to EN 10209 92.5%
-Quartz (purity > 99%) 3.0%
-Borax (purity > 99%) 1.4%
-Potassium and soda feldspar 1.1%
-Titanium dioxide (purity > 99%) 0.5%
-Soda (purity > 99.3%) 0.3%
-Clay (purity > 99%) 0.2%
-Other inorganic raw materials 1.0%

Auxiliary materials / additives
Declaration of auxiliary materials and additives:
-Drawing oils: 0-3 g/kg steel (depending on model)
-Alkalis for degreasing (as a 25% solution): 0.3-2.9 g/kg steel
-Surfactants (as a 45% solution): 0.1-1.0 g/kg steel
-Pickling with sulphuric acid: 0.5-2.5 g/kg steel
-Temporary corrosion protection (chrome-free, as a 50% solution): 0.1-0.4 g/kg steel

Explanation of the material
Explanation/origin of the precursors and additives:
The cold-rolled steels used are unalloyed or low-alloyed quality steels according to *DIN EN 10209* 'Cold-rolled flat products of mild steels for enamelling'. The tensile strengths (Rm) are between 270 and 390 N/mm², the minimum values for elongation at break (A80) are between 30 and 38%.

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

Regional and general availability of raw materials
As a mass material, steel is in principle available in large quantities for a wide variety of applications. Steel is very easy to recycle. The use of steel as a recycled material contributes to the conservation of resources. As with other types of glass, the raw materials for enamel production are also available in large quantities as minerals that mostly occur naturally in the earth's crust. The product/article/at least one sub-article contains substances from the candidate list (date 23.01.2024) above 0.1% by mass: no.
The product/article/at least one sub-article contains other CMR substances of category 1A or 1B which are not on the candidate list, above 0.1% by mass in at least one sub-article: no.
Biocidal products have been added to this construction product or it has been treated with biocidal products (it is therefore a treated product within the meaning of the Biocidal Products Regulation (EU) No. 528/2012): no.

2.6 Manufacture

The process for manufacturing enamelled shower surfaces, bathtubs and washbasins is divided into sub-processes:
-Production of steel blanks
-Cleaning of the raw parts
-Production of the enamel frits
-Production of the enamel slip
-Enamelling

The process steps of the sub-processes are to be described as follows:

1. Production of steel blanks
The raw parts are manufactured in automatic, continuous press lines with the following process steps:

• Deep drawing: The raw parts are formed by deep-drawing electrostatically oiled steel blanks in 2 sections with forces of 8,000-10,000 kN.

• Processing of the blank: After deep-drawing, the waste, overflow and, in some cases, handle holes are punched into the blanks and, if necessary, the fastenings for the base frame are attached.

• In the case of bathtubs with panelling, these are welded on after the tub blanks have been deep-drawn.

• For wall-mounted washbasins as well as for built-in and surface-mounted washbasins, the washbasin edges are welded.

• Edge processing of the tub blank: The edge contours of the raw tubs are created in several work steps by edging and trimming the tub edges.

2. Cleaning of the raw parts
The steel blanks are cleaned in a continuous, automatic system in the following stages:

• Degreasing of the raw parts: After production, the raw parts are covered with a film consisting of anti-corrosion oils, deep-drawing oils and metal abrasion from the deep-drawing process, which is washed off by spraying with alkaline surfactant solutions.

• Acid rinsing of the raw parts: Any impurities remaining on the raw parts after degreasing are washed off by spraying with a highly diluted sulphuric acid solution.

• Alkaline rinsing of the raw parts: The build-up of a temporary rust protection layer on the raw parts is achieved by spraying with a slightly alkaline amine solution.

3. Production of the enamel frit
Enamel frits are glass granules used for enamelling, which are produced in the following stages:

• Formulating and mixing the glass raw materials: The glass raw materials are weighed and mixed together in mixing plants.

• Smelting the enamel frit: The mixtures of glass raw materials are smelted in discontinuous smelting furnaces for 2-3 hours at temperatures of 1,100-1,300 °C. Once the smelting process is complete, the molten glass is poured into water to quench it and granulate it.

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

4. Production of the enamel slip
Enamel slips are suspensions of glass granules in water used for enamelling, which are produced in the following sub-steps:

• Formulation of the slip raw materials: Solid raw materials are weighed and filled into discontinuously operated mills together with the liquid, volumetrically dosed raw materials.

• Grinding process: The slip raw materials are ground into enamelled slips in drum mills.

• Preparation of the enamel slip: After the grinding process, the enamelled slip is pumped through screening systems and magnetic separators to remove coarse mechanical and magnetic metallic impurities.

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

• Coating the cleaned raw parts with enamel slip: The raw parts are sprayed with enamel slip on the front and back by robots in automatic spray booths.

• Drying the enamel layer: The water remaining in the enamel layer is vaporised in continuously operated drying furnaces.

• Firing the enamel layer at 820–860 °C: In continuously operated furnaces, the enamel layer is melted onto the raw parts, resulting in a layer thickness of 200–300 µm on the washbasin or bathtub top.

• Packaging: The enamelled parts are provided with a company logo and packaged in an automatic system.

2.7 Environment and health during manufacturing

The waste heat generated during enamelling is used several times for upstream processes via heat exchangers.
In addition to purchasing energy from the grid, KALDEWEI operates its own combined heat and power plant to exploit the energetic advantages of combined heat and power generation, as well as several photovoltaic systems.
Furthermore, KALDEWEI has an energy management system in accordance with *DIN EN ISO 50001*.

2.8 Product processing/Installation

Installation recommendations:
When dealing with shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel, care must be taken to ensure proper handling. This applies to transport, unpacking and installation.

KALDEWEI recommends installing shower surfaces, bathtubs and washbasins as part of the final installation, i.e. after the bathroom has been tiled, and covering them until all construction work has been completed.

Depending on the model, various installation systems are available for installing a shower surface, bathtub or washbasin. The installation instructions included with the installation aid must be observed.

Sound insulation:
The requirements for sound insulation in building construction in accordance with *DIN 4109/A1* or the *VDI 4100* guideline can generally only be met by installing suitable sound insulation. The KALDEWEI bathtub sound insulation sets (BWS) and shower tray sound insulation sets (DWS), in conjunction with the above-mentioned installation systems, consist of several harmonised components that together guarantee optimum protection. The on-site requirements, such as the arrangement of the sanitary rooms in relation to living rooms and bedrooms, wall and floor designs, must comply with the requirements of *DIN 4109*, chapter 'Notes for planning and execution', or analogue to the regulations in *VDI 4100*.

Equipotential bonding:
According to the guideline *DIN VDE 0100-701* if necessary, equipotential bonding must be provided.

Occupational safety:
When setting up or installing shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel, only the usual occupational safety measures on construction sites (such as safety shoes or protective gloves) need to be observed.

2.9 Packaging

The shower surfaces, bathtubs and washbasins are packed in cardboard boxes on wooden pallets, on which they are secured with plastic strapping or polythene film. On some models, polystyrene spacers are used between the parts to protect the surfaces. The packaging of shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel is recycled within the framework of the approved dual system for commercial users (Interseroh).

2.10 Condition of use

During the usage phase, the ingredients of KALDEWEI steel enamel correspond to the basic materials mentioned in point 2.5.

2.11 Environment and health during use

When used as intended, shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel cannot cause any environmental damage or health impairments.

2.12 Reference service life

The RSL cannot be determined according to *ISO 15686*. The information is based on an estimate by the manufacturer.

Shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel are light-fast, UV and temperature resistant. The pore-free glass surface is formed by a largely chemically inert covering enamel, which is durable beyond a service life of 30 years when used normally and as intended and when the care instructions are observed.

2.13 Extraordinary effects

Fire
In accordance with *DIN 4102-1* 'Fire behaviour of building materials and components', shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel fulfil the building material class A.
In accordance with *DIN EN 13501-1* 'Fire classification of construction products and building elements - Part 1: classification using the results of reaction to fire tests for construction products', shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel fulfil class A1. As a steel-glass composite material, they are therefore not flammable or fire-promoting. The softening temperature of the enamel-steel composite is above 700 °C.

Fire protection

Name	Value
Building material class according to DIN EN 13501-1	A1

Water
No adverse effects on the environment are possible in the event of flooding. In order to avoid subsequent damage, it must be ensured that no moisture remains in the building structure after the flood has drained away, especially in the cavity under or behind the tub.

Mechanical destruction
Mechanical damage to the enamel down to the steel surface can subsequently lead to corrosion of the steel.

2.14 Re-use phase
Shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel can easily be collected separately at the end of the usage phase. They are completely recyclable without the need to separate the steel and enamel layer. The recycling takes place either in the production of oxygen steel, the production of steel in electric furnaces or the production of cast steel.

2.15 Disposal
There is no impact on the environment during demolition and dismantling. Enamelled shower surfaces, bathtubs and washbasins are generally not disposed of, as the enamelled steel is used as a raw material for steel production without further separation.

Recycling should be carried out by certified companies (disposal companies), e.g. metal dealers.

2.16 Further information
www.kaldewei.de

3. LCA: Calculation rules

3.1 Declared Unit
1 m^2 surface area of the declared average product weighs 18.17 kg.

For steel, the average weight per unit area is 17.01 kg/m². This results in a calculated steel thickness of 2.16 mm on average across the products.

For the enamel, the average surface weight across the different products is 1.16 kg/m². This results in a calculated enamel thickness of 465 µm, which includes the front and back enamelling

Declared unit

Name	Value	Unit
Declared unit	1	m²
Grammage	18.17	kg/m^2
Layer thickness	0.0027	m
Layer thickness enamel (average)	0.465	mm
Mass enamel (average)	1.16	kg
Layer thickness of steel base body (average)	2.2	mm
Mass of steel base body (average)	17.01	kg
Conversion factor to 1 kg (in kg/m²)	0.055	-

3.2 System boundary
The system limit of the EPD of the type 'cradle to gate - with options' follows the modular structure according to *EN 15804*. The life cycle assessment for shower surfaces, bathtubs and washbasins made of KALDEWEI steel enamel takes into account the entire life cycle of the product and thus all of the following modules:

- A1-A3 (production stage): Raw material provision, transport to the manufacturer, production (including energy and water provision, provision of auxiliary materials, disposal of waste)
- A4-A5 (Setting up the structure): Transport to the construction site (100 km), manual installation in the building, recycling of packaging waste through incineration.
- C1-C4 (disposal stage): Dismantling of the product, transport for waste treatment, waste treatment, disposal
- D (avoided loads): Recycling loads and avoided loads, avoided loads for packaging including energy recovery

3.3 Estimates and assumptions
The transport of the raw materials was taken into account in the balance sheet. The origin data for the most relevant raw materials in terms of mass are taken from the information provided by Franz Kaldewei GmbH & Co. KG. The steel is transported by truck.

95% of used products are collected and recycled. The steel is recycled. To do so, the steel is remelted.
Energy expenditure and material losses are assumed and taken into account according to the industry data of the worldsteel association. According to Brimacombe 2005, between 85 and 98% of the steel parts used in buildings are recycled again. A collection rate of 95% can be used as a conservative estimate for bathtubs etc. due to their size.

5% of used products are not collected and end up in landfill as inert material.

3.4 Cut-off criteria
The waste products sorption lime and filter cake are not considered in the LCA. For the production of the enamel frit, all input materials below 1% were cut off, the sum of all cut off enamel ingredients is < 0.4% by mass of the product. Apart from these substances, all data from the operational data collection, i.e. all raw materials used according to recipe, the thermal energy used and the electricity and diesel consumption were taken into account in the balance. It can be assumed that the neglected processes would have contributed less than 5% to the impact categories considered.

3.5 Background data

To model the life cycle for the production and disposal of the declared shower surfaces, bathtubs and washbasins of Franz Kaldewei GmbH & Co. KG, the background data of the LCA FE software database from Sphera GmbH LCAFE 2023 were used. The consistent data records contained in the LCA FE database are documented and can be viewed online in the LCA FE documentation. To ensure comparability of the results only the consistent background data from the LCA FE database were used in the LCA (e.g. data records on energy, transport, auxiliary and operating materials). The shower surfaces, bathtubs and washbasins are manufactured in Ahlen, Germany. The life cycle assessments were therefore drawn up for the reference area of Germany.
As a result, in addition to the production processes under these boundary conditions, the upstream stages relevant for Germany, such as electricity or the provision of energy sources, were also used.

3.6 Data quality

Despite some discrepancies in geographical representativeness and availability of public documentation, the overall data quality can be considered good. Corresponding data records (or estimates) were available in the LCA FE database for all relevant preliminary products and auxiliary materials used. All foreground data refer to the year 2023, the background data in the LCA FE database have a reference year between 2019 and 2022.

3.7 Period under review

The period under review is the production year 2023.

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: Germany

3.9 Allocation

No co-product allocation rules were applied. Packaging materials are incinerated in a waste incineration plant. These are modelled in an input-specific way in the model.

Module D contains avoided loads for exported energy from waste disposal processes. Energy gained from thermal recycling of packaging waste is offset using an equivalence process. For electricity, the current average 'European electricity mix' was used and for heat 'thermal energy from natural gas' was used.

With regard to the incineration of the packaging material after installation of the product, avoided loads from thermal utilisation are allocated to module D, while emissions and loads resulting from incineration are allocated to module A5.

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.
Background database: LCA FE-Software – CUP 2023.2.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

Biogenic carbon is contained in the packaging materials (wooden pallets).

Information describing the biogenic carbon content at the factory gate

Name	Value	Unit
Biogenic carbon content in accompanying packaging	0.26	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

The following technical information is the basis for the declared modules.

Transport to the construction site (A4)

Module A4 considers a 100 km long truck transport from the production plant in Germany (Ahlen) to the construction site in Germany/Europe.

Name	Value	Unit
Litres of fuel	0.04	l/100km
Transport distance	100	km
Capacity utilisation (including empty runs)	61	%

Installation in the building (A5) – Recycling of packaging materials

Name	Value	Unit
Output substances following waste treatment on site	0.635	kg

Packaging material:
Cardboard boxes: 0.596 kg/m²
Polystyrene: 0.0151 kg/m²
Foil: 0.0137 kg/m²
Wood: 0.0101 kg/m²

Reference service life

Name	Value	Unit
Life Span nach Angabe Hersteller	30	a

End of life path (C1-C4)

The dismantling of the product is done manually (C1).
The transport to waste recycling is 50 km (C2). At the end of life for an average shower surface, bathtub or washbasin, a collection/recycling rate of 95% is assumed and allocated to the avoided loads. As a conservative estimate, it is assumed that 5% of the steel parts are sent to a landfill (C3 and C4).

Name	Value	Unit
Scrap collection	18.17	kg
Recycling	16.16	kg
Landfilling	2.01	kg

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

Name	Value	Unit
Benefits	16.84	kg

The benefits result from the steel content of 16.16 kg in the product plus approx. 0.7 kg of excess steel in the production residues. Production residues are returned within A1-A3 to satisfy the steel scrap demand of steel production. The excess scrap is recycled at the end of its life cycle (i.e. net flow consideration).

5. LCA: Results

The following is an illustration of the environmental impact for 1 m^2 surface area of shower trays, bathtubs and washbasins made of KALDEWEI steel enamel, manufactured by Franz Kaldewei GmbH & Co. KG in Germany.

The following tables show the results of the indicators of the environmental impact assessment, the additional environmental impact assessment, the use of resources, waste and other output flows, based on 1 m^2 surface area of shower surfaces, bathtubs and washbasins.
The modules labelled 'X' in accordance with *EN 15804* are addressed here. The characterisation factors of *EN 15804+A2 (EF3.1)* are used to calculate the environmental impact.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = 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 m² Shower surfaces, bathtubs or washbasins

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	6.14E+01	1.53E-01	1.04E+00	0	7.22E-02	2.46E-02	2.99E-02	-3.34E+01
GWP-fossil	kg CO_2 eq	6.22E+01	1.51E-01	8.57E-02	0	7.14E-02	2.45E-02	2.98E-02	-3.34E+01
GWP-biogenic	kg CO_2 eq	-8.75E-01	3.47E-04	9.53E-01	0	1.64E-04	1.5E-04	5.18E-09	5.28E-02
GWP-luluc	kg CO_2 eq	2.29E-02	1.42E-03	8.63E-07	0	6.7E-04	2.79E-05	9.4E-05	-1.4E-02
ODP	kg CFC11 eq	7.65E-11	1.99E-14	1.69E-14	0	9.41E-15	4E-13	7.69E-14	9.9E-11
AP	mol H^+ eq	1.98E-01	2.27E-04	1.36E-05	0	1.06E-04	6.04E-05	2.15E-04	-7.62E-02
EP-freshwater	kg P eq	8.11E-05	5.6E-07	4.28E-09	0	2.64E-07	9.08E-08	6.09E-08	-2.56E-06
EP-marine	kg N eq	6.09E-02	8.24E-05	3.11E-06	0	3.83E-05	1.77E-05	5.54E-05	-1.83E-02
EP-terrestrial	mol N eq	6.67E-01	9.75E-04	6.24E-05	0	4.53E-04	1.89E-04	6.1E-04	-1.98E-01
POCP	kg NMVOC eq	1.78E-01	1.99E-04	8.68E-06	0	9.26E-05	4.82E-05	1.67E-04	-6.09E-02
ADPE	kg Sb eq	1.86E-05	1.02E-08	1.35E-10	0	4.8E-09	3.53E-09	1.4E-09	-3.54E-07
ADPF	MJ	6.5E+02	2.09E+00	2.75E-02	0	9.85E-01	4.93E-01	4.03E-01	-2.51E+02
WDP	m^3 world eq deprived	1.22E+00	1.85E-03	9.15E-03	0	8.74E-04	4.86E-03	3.32E-03	-4.84E-01

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 m² Shower surfaces, bathtubs or washbasins

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	4.63E+01	1.52E-01	9.69E+00	0	7.17E-02	2.75E-01	6.56E-02	4.14E+01
PERM	MJ	9.68E+00	0	-9.68E+00	0	0	0	0	0
PERT	MJ	5.6E+01	1.52E-01	8.66E-03	0	7.17E-02	2.75E-01	6.56E-02	4.14E+01
PENRE	MJ	6.53E+02	2.1E+00	1.08E+00	0	9.89E-01	4.93E-01	4.03E-01	-2.54E+02
PENRM	MJ	1.05E+00	0	-1.05E+00	0	0	0	0	0
PENRT	MJ	6.54E+02	2.1E+00	2.75E-02	0	9.89E-01	4.93E-01	4.03E-01	-2.54E+02
SM	kg	4.41E+00	0	0	0	0	0	0	1.68E+01
RSF	MJ	5.7E-21	0	0	0	0	0	0	0
NRSF	MJ	6.7E-20	0	0	0	0	0	0	0
FW	m^3	6.28E-02	1.66E-04	2.16E-04	0	7.85E-05	2.23E-04	1.02E-04	-2.17E-02

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 m² Shower surfaces, bathtubs or washbasins

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	1.97E-07	6.49E-12	-1.93E-13	0	3.06E-12	-3.55E-11	8.78E-12	-6.79E-10
NHWD	kg	4.53E+00	3.2E-04	3.88E-03	0	1.51E-04	3.39E-04	2.02E+00	-5.02E-01
RWD	kg	1.04E-02	3.92E-06	1.08E-06	0	1.85E-06	7.25E-05	4.59E-06	4.39E-03
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	1.68E+01	0	0
MER	kg	0	0	0	0	0	0	0	0
EEE	MJ	0	0	1.63E-01	0	0	0	0	0
EET	MJ	0	0	3.31E-01	0	0	0	0	0

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 m² Shower surfaces, bathtubs or washbasins

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	2.1E-06	1.87E-09	1.15E-10	0	9.1E-10	5.49E-10	2.64E-09	-1.11E-06
IR	kBq U235 eq	9.03E-01	5.85E-04	1.33E-04	0	2.76E-04	1.21E-02	5.29E-04	4.83E-01
ETP-fw	CTUe	2.02E+02	1.5E+00	1.04E-02	0	7.06E-01	1.53E-01	2.54E-01	-3.87E+01
HTP-c	CTUh	8.32E-08	3.03E-11	9.79E-13	0	1.43E-11	7.24E-12	3.38E-11	-5.21E-08
HTP-nc	CTUh	2.45E-06	1.35E-09	4.99E-11	0	6.37E-10	1.3E-10	3.57E-09	4E-08
SQP	SQP	8.22E+01	8.72E-01	8.53E-03	0	4.12E-01	1.95E-01	9.78E-02	2.34E+01

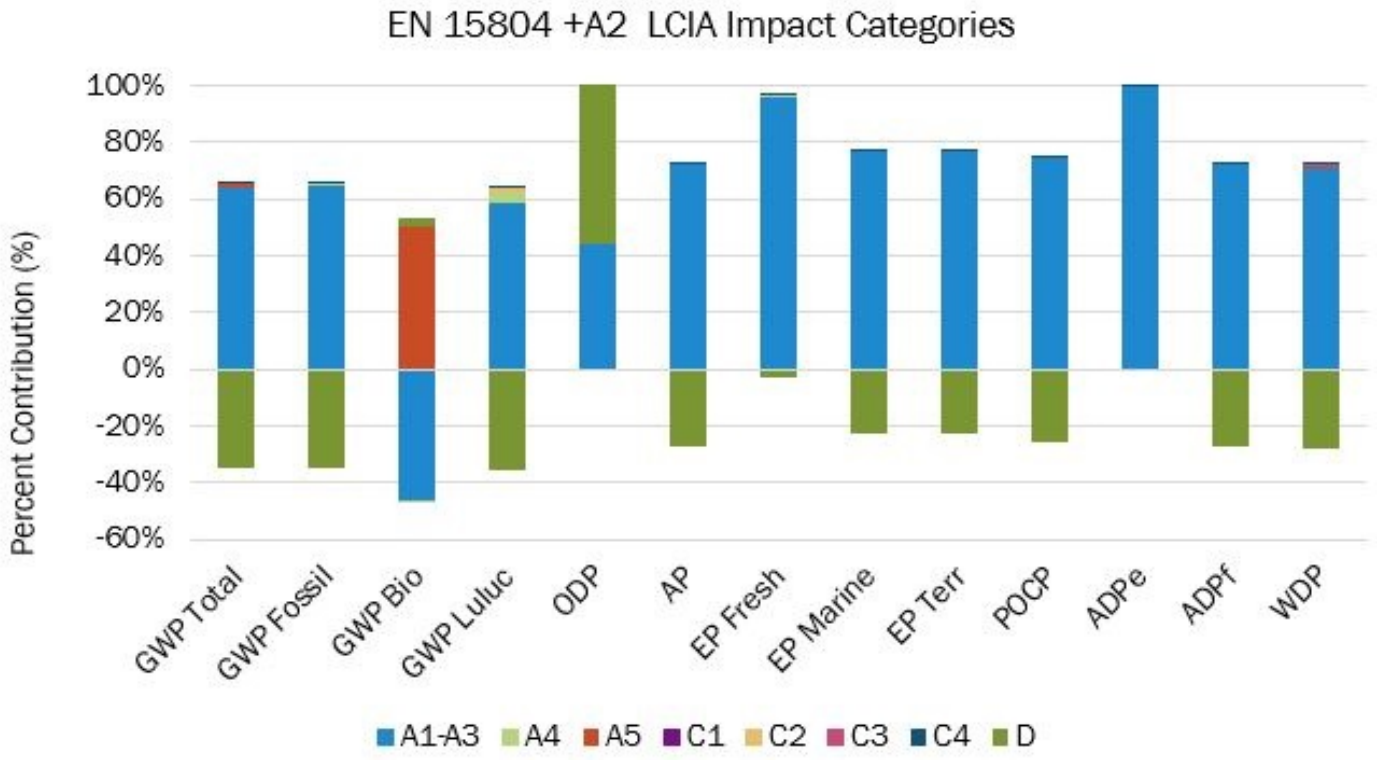
PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic);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

Restriction note 1 – applies to the indicator 'Potential effect from human exposure to U235'.
This impact category mainly deals with the possible effect of low dose ionising radiation on human health in the nuclear fuel cycle. It does not take into account impacts resulting from possible nuclear accidents and occupational exposure, nor from the disposal of radioactive waste in underground facilities. The potential ionizing radiation emitted by soil, radon and some building materials is also not measured by this indicator.

Restriction note 2 – applies to the indicators: 'Potential for depletion of abiotic resources non-fossil resources', 'Potential for depletion of abiotic resources fossil fuels', 'Water withdrawal potential (user)', 'Potential ecosystem toxicity comparison unit', 'Potential human toxicity comparison unit carcinogenic effect', 'Potential human toxicity comparison unit non-carcinogenic effect', 'Potential soil quality index'. The results of this environmental impact indicator must be used with caution because of the high uncertainties in these results or because there is limited experience with the indicator.

6. LCA: Interpretation

For all environmental categories, the manufacturing phase (Modules A1-A3) is essential.
For all environmental categories, benefits / avoided loads from the recycling of steel can be taken into account in the EOL in Module D.



The production of 1 m^2 of shower surface, bathtub and washbasin is dominated by module A1 (raw material supply) for all environmental impacts (steel production, raw materials), followed by module A3 (energy supply and auxiliary materials). The contributions from the recycling of packaging (A5), transport (Module A2) and waste treatment (C3) are below 2% in all environmental impact categories. The GWPBiogen of packaging materials is balanced from A1-A3 to A5. The avoided loads in Module D are created by recycling steel scrap. The influence of the variance in the weight per unit area of the steel between the different product groups is relatively strong. A bathtub with an enamelled surface weight of 16.22 kg/m^2 has 4-9% less environmental impact than the average product. In contrast, a shower tray product with an enamelled surface weight of 22.01 kg/m^2 has a 7-17% higher impact in the impact categories considered.

7. Requisite evidence

Not relevant.

8. References

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