ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	Hansgrohe Group
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-HAN-20230024-ICC1-EN
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Valid to	23.02.2028

Kitchen faucets

Hansgrohe Group

Institut Bauen und Umwelt e.V.

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1. General Information

Hansgrohe Group	Kitchen Faucets
Programme holder IBU – Institut Bauen und Umwelt e.V. Hegelplatz 1 10117 Berlin Germany	**Owner of the declaration** Hansgrohe Group Auestraße 5 - 9 77761 Schiltach Germany
Declaration number EPD-HAN-20230024-ICC1-EN	**Declared product / declared unit** One (1) piece of an average kitchen faucet incl. packaging
This declaration is based on the product category rules: Fittings and showers, 07.2014 (PCR checked and approved by the SVR) **Issue date** 24.02.2023 **Valid to** 23.02.2028	**Scope:** This average EPD was determined on the basis of a weighted average of production volume from 2021 and relates to the plants in Offenburg and Schiltach, Germany, Shanghai, China and Alpharetta, USA. This average EPD is valid for the whole product group of chrome plated kitchen faucets. The EPD was formed from >85% of the products involved in the sales quantity. 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*.
Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	**Verification** The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data according to *ISO 14025:2011* ☐ internally ☒ externally
Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	Dr Naeem Adibi (Independent verifier)

2. Product

2.1 Product description/Product definition

Kitchen faucets essentially comprise of a metal housing in most cases made of brass, a plastic valve with ceramic discs and several assembly parts of various materials. The faucet surface is usually chrome-plated by means of various galvanic process stages.

For the use and application of the products the respective national provisions at the place of use apply, in Germany for example the building codes of the federal states and the corresponding national specifications.

The products comply with the applicable standards and regulations listed below.

Following standards depending on the operating mechanism may apply to taps and roughs to prove product safety:

- *EN 816:2017*: Sanitary tapware – Automatic shut-off valves PN 10
- *EN 817:2008*: Sanitary tapware – Mechanical mixing valves (PN 10)
- *EN 200:2008*: Sanitary tapware – Single taps and combination taps for water supply systems of type 1 and type 2
- *ISO 3822*: Acoustics – Laboratory tests on noise emission from appliances and equipment used in water supply installations

2.2 Application

Kitchen faucets are fixtures that mix hot and cold water, shut off water, and regulate the amount of water. They are mechanically operated by handles and are used for dish washing, washing of vegetables and fruits, filling pots with water and hand washing in kitchens.

2.3 Technical Data

Constructional data

Name	Value	Unit
Maximum load temperature permanent operation	65	°C
Maximum load temperature temporary operation	90	°C
Flow rate (indications for pressure range of 1-3 bar)	Depending on the product 0,09 to 1,2	m^3/h
Sound emissions	< 30	dB

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

2.4 Delivery status

The Kitchen Faucets are delivered singularly packaged. The packaging is customized to the size of the product and supplies. Customers can order single products or multiple products with outer packaging. The products with the smallest and the largest volume have dimensions between 280x65x370 mm and 325x118x558 mm.

2.5 Base materials/Ancillary materials

The material composition (incl. packaging) of an average kitchen faucet is as follows:

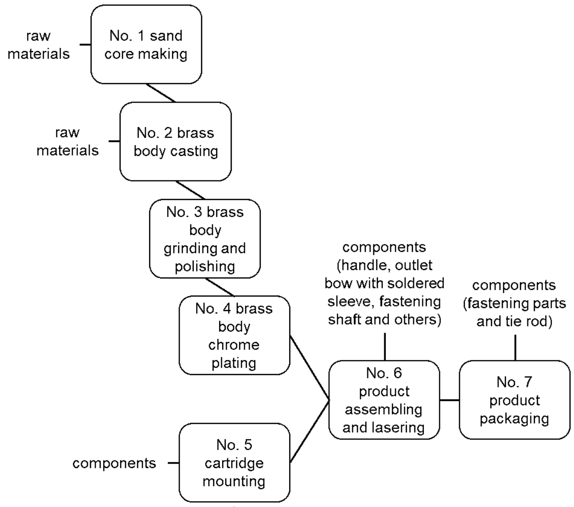
Name	Value	Unit
Lead	3.0	%
Stainless Steel	1.9	%
Brass	44.8	%
Steel	0.1	%
Zinc	17.0	%
Polyphenylensulfide	3.2	%
Polyethylene	5.8	%
Other Plastics	4.0	%
Other Materials	1.0	%
Cardboard, Paper	19.0	%

The parts which are made of brass contain between 0.2 and 1.4% lead.
This product contains substances listed in the candidate list (date: 17.12.2021) exceeding 0.1 percentage by mass: Lead (CAS number 7439-92-1) as a component of the brass alloy has been on the candidate list of the Reach Regulation (Regulation (EC) No. 1907/2006) since 27.06.2018.

This product/article/at least one partial article contains other 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



No. 1: The sand core for the base body is made.
No. 2: The body of the faucet is cast from brass using the sand core.
No. 3: After casting, the brass body is grinded and polished.
No. 4: To protect the product and make it durable, the body is galvanized with chrome.
No. 5: Meanwhile, the individual parts of the cartridge are assembled.
No. 6: The product parts (chrome plated brass body, cartridge, chrome-plated outlet bow with soldered sleeve, chrome plated handle and others) are assembled.
No. 7: The preassembled product is packed together with the remaining components (like fastening parts).

Any production waste generated is disposed accordingly. In individual cases, the production may differ slightly from the procedure (for example, if the brass body is purchased and not manufactured in-house).

2.7 Environment and health during manufacturing

Hansgrohe SE tries to keep the impact on people and the environment as low as possible when manufacturing its products.
Hazards at workplaces are regularly assessed and reduced to a minimum.
For example, in basic production, sawing or grinding work is mainly carried out by robots, and in electroplating, chemicals are dosed automatically via appropriate pump stations.
Emissions that are hazardous to health are extracted directly at the source and cleaned by filter systems.
Workplace and emission limits are regularly monitored and are far below the prescribed limits.
To reduce environmental impact, water and production waste are recycled wherever possible.
In addition, all production sites are certified according to the *DIN EN*
ISO standards *14001* (environment), *50001* (energy), *4 5001* (occupational health and safety)
and *9001* (quality). Continuous improvement of environmental and occupational safety performance is thus guaranteed.

2.8 Product processing/Installation

The fitting is screwed to the kitchen sink or countertop (tools: wrench or screwdriver).
The supply hoses are connected to the angle valve.

The handle is removed to adjust the temperature setting of the cartridge and to adjust the anti-scald protection (tools: hexagonal offset screwdriver and pliers).
The handle is then reattached (tool: hexagonal offset screwdriver).

2.9 Packaging
For product protection the kitchen faucets are individually packed in a cardboard box, which consists of approximately 80% recycled material. The cardboard is always printed with lead-free ink and in some cases additionally coated with clear topcoat. The inlay of the packaging consists of folded cardboard, fiber form or plastic bags, depending on the product. The packaging can be fully recycled.
All packaged products fit on a reusable euro pallet.

2.10 Condition of use
To protect the kitchen faucets and make them durable, the body and handle are made of chrome-plated metal. Nevertheless, there are no unhealthy contaminants in the water and drinking water quality is guaranteed. To ensure the longevity of the product, it should be used daily and cleaned regularly.

2.11 Environment and health during use
Our products do not emission any contaminants or substances that are harmful to the environment or health during the use phase.

2.12 Reference service life
The quality and durability of our kitchen faucets is designed for a product life of about ten years. Which on average is approximately the duration of use by the consumers.

With few exceptions, all products have a five-year warranty. Furthermore, an after-sale service warranty of 15 years is provided.

2.13 Extraordinary effects

Fire

The products are not classified as building materials (building products) and are not subject to *DIN 4102* and *EN 13501-1*.

Fire protection

Name	Value
Building material class	-
Burning droplets	-
Smoke gas development	-

Water
If a room in which the products offered by Hansgrohe are installed is flooded with water, the electronic faucets may be destroyed. All other products are not affected in their function.
There will be no environmental impact.

Mechanical destruction
If the surface of the coating is destroyed by a mechanical stress, there is a possibility of corrosion. In the event of mechanical damage, the products may need to be replaced due to possible sharp cut edges.

2.14 Re-use phase
The basin faucets are not taken back by the manufacturer for the purpose of reuse. Users can disassemble the products repeatedly within the reference utilization period and reuse it elsewhere.

2.15 Disposal
The waste code of the product is *AVV* 20 03 01.
Disassembly of the products consists of the same steps as assembly, in reverse order.
All metal components can be recycled (as scrap).
All plastic components have a high calorific value and can be sent for thermal recycling.
In countries where no thermal recycling or substance recycling is established, disposal takes place via the waste incineration plant.

2.16 Further information
Additional information about our products can be found at https://www.hansgrohe.com.

3. LCA: Calculation rules

3.1 Declared Unit
The results of this EPD are valid for the following functional unit:
Provide sanitary function for one (1) average kitchen faucet unit used in accordance with the manufacturer's recommendations for a 10-year life, following the manufacturer's operating instructions. An average conditioned kitchen faucet is considered the baseline flow.

Weighted averaging based on production tonnages in 2021 is chosen as basis for creating the environmental profile. 133 different kitchen faucets were considered.

Functional unit

Name	Value	Unit
Declared unit	1	pce.
Functional unit	1	pce.
Functional unit with packaging	2.45	kg
Packaging	0.48	kg
Weight range of the products examined	1.52 - 5.75	kg

3.2 System boundary
This representative EPD follows the EPD type "cradle to gate - with options". The following life cycle modules are declared:
Modules A1-A3:
The product stage begins with considering the production of the necessary raw materials and energies, including all corresponding upstream chains and the actual procurement transports. Furthermore, the entire manufacturing phase was mapped, including the treatment of production waste until the end-of-waste status (EoW) was reached. Green electricity from hydropower is used for the manufacturing processes in Germany. US electricity mix is used for the US production site. Chinese electricity mix is used for the Chinese production site, although electricity from photovoltaic is partly used there.
Module A4:
All distribution transports to the customers were considered.
Module A5:

This module covers the installation process with the corresponding packaging waste generated that needs to be disposed.

Modules B1 & B3-B5:
These modules were considered, but evaluated as not relevant for the products and considered as zero.

Module B2:
Maintenance expenses are declared in this module and consist of weekly cleaning expense and cartridge replacement.

Module B6:
This module considers the energy input required to bring water to a certain temperature for the use of a gas low temperature boiler (scenario B6/1) and for the use of an electric instantaneous water heater (scenario B6/2).

Module B7:
This module considers the water consumption that can be expected depending on the function of the product family.

Modules C1-C4:
The modules include the environmental impacts for dismantling of the products and the treatment of the waste fractions until the end-of-waste status (EoW) is reached, including the associated transports at the end of the product life cycle.

Module D:
Identification of the benefits and costs of the product outside the system boundary. For waste, paper and plastics, these consist of energy credits from thermal utilization (A3, A5 and C3) in the form of the average European electricity mix or thermal energy from natural gas. Recycling of paper, plastic and metal scrap results in credits of the respective raw materials for the primary material portion of the input. The loads of the waste incineration and recycling processes are assigned to the respective modules (A3, A5 and C3) and not to module D.

3.3 Estimates and assumptions

Energy and water consumption, material amount for coating as well as waste during production could only be determined on concrete, existing products and not on the average product. The highest value of all inputs and outputs for energy, waste and coating of the top seller, the lightest and the heaviest product was used for the calculation of energy, water, waste and coating. For the incineration with energy recovery (thermal and electric) of waste, an r1 value of > 0.6 is assumed. The net efficiency for the average waste incinerated is between 38 % and 44 %, depending on the type of waste respectively the disposal data set.

3.4 Cut-off criteria

The effect associated with the neglected mass shares is less than 5% of the effect categories per module. The minimum limit of 1% total mass and the use of renewable and nonrenewable primary energy is not exceeded.

3.5 Background data

The LCA software *GaBi* 10.6 was used to model the life cycle. The entire manufacturing process, as well as energy consumption, were modelled on the basis of manufacturer specific data.
However, generic background datasets were used for the upstream and downstream processes. The majority of the background datasets used were taken from the current version (2021.2) of the *GaBi* database. *Ecoinvent* Version 3.6 (2019) datasets were only used when suitable *GaBi* datasets were not available.

3.6 Data quality

The background datasets used for accounting purposes mainly originate from the respective updated GaBi databases at the time of calculation. The data for the examined products was captured on the basis of evaluations of internal production and environmental data, the collection of LCA relevant data within the supply chain, as well as the evaluation of relevant data for the energy supply. The collected data were checked for plausibility and consistency. Good representativity can be assumed.

For the assessment of the variability of the results, all products were balanced in addition to the average product. See at chapter 6 for explanation of the variability.

3.7 Period under review

Life cycle assessment data were collected in 2021.

3.8 Allocation

For the production process nearly all raw materials, precursors and supplies could be assigned to the declared product. Energy, water, galvanization process and production waste were assigned to the highest value of either the heaviest, lightest or most sold product of the product group. No byproducts are produced and no allocation is required.
Some of the brass losses from brass processing in module A3 are directly reused by Hansgrohe and are modelled as a closed loop. Another part of the brass losses (brass particles and dusts) is disposed of as waste (without debits and credits).
Credits for plastics, paper and cardboard recycled in A5 and metallurgical waste in C3 are credited in module D.
Credits for the energy recovery of incinerated production waste in A1-3, paper, cardboard and plastics in A5 and plastics and other materials in C3 are credited in module D.
The loads for waste water treatment and waste disposal of core sand, waste oil and hazardous waste from the manufacturing phase are allocated to module A3.
Packaging:
For paper and cardboard, recycling (91 %) and energy recovery (9 %) are considered on a pro rata basis. For plastic, a proportionate recycling (52 %), energy recovery (48 %) considered, based on *Eurostat.*
Deconstructed product at the end of life:
Since the product is predominantly made of metal, it is assumed that most of its metallic components are recycled. 95 % of the non-metallic components are incinerated with energy recovery and 5 % are disposed in landfill. For the metal components, it is assumed that 90 % are sent for material recycling, 5 % for incineration with energy recovery (C3) and 5 % are disposed in landfill (C4).

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 database used is GaBi 10.6 in the database version 2021.2

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic carbon

Information on describing the biogenic Carbon Content at factory gate
The biogenic carbon content was calculated based on the factors from the *Thünen Intitute.*

Name	Value	Unit
Biogenic carbon content in accompanying packaging	0.18	kg C

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

Transport to the building site (A4)

Name	Value	Unit
Transport distance (Truck)	731	km
Capacity utilisation (including empty runs) (Truck)	55	%
Transport distance (Container Ship)	2454	km
Capacity utilisation (Container Ship)	80	%

Installation into the building (A5)
No additional resources or energy are required for the installation. The packaging is disposed either by recycling or incineration.

Name	Value	Unit
Packaging (Paper, cardboard and plastic)	0.481	kg

Maintenance (B2)
For module B2, it is assumed that a weekly cleaning of the product takes place, with 0.5 liter of water containing 1.5% soap. The cartridge is replaced once during its service life.

Name	Value	Unit
Maintenance cycle (cleaning)	520	Number/RSL
Water consumption/Cycle weekly (cleaning)	0.5	Liter/cycle
Soap concentration (cleaning)	1.5	%
Water consumption (cleaning)	0.26	m^3
Auxiliary Soap/Tensides (cleaning)	3.9	kg
Maintenance Cycle (cartridge replacement)	1	Number/RSL
Cartridge (cartridge replacement)	0.0581	kg/RSL

Service life
Hansgrohe SE declares a Service Life of 10 years as an empirical value for the kitchen faucets when used in accordance with the care instructions. This value is based on their technical service centre's statistics on service life in the market and complaints.

Name	Value	Unit
Life Span according to the manufacturer	10	a

Operational energy use (B6) and Operational water use (B7)

Name	Value	Unit
Water consumption	25.187	m^3
Energy demand	1172	kWh

End of life (C1-C4)

Name	Value	Unit
Collected separately	1.967	kg
Recycling	1.479	kg
Energy recovery	0.389	kg
Landfilling	0.098	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information
The energy generated from energy recovery as well as recycled materials are assigned to module D as possible potentials or avoided loads in subsequent systems. Credits are only given for the primary portion of the inputs.

5. LCA: Results

The following table shows the result of the LCA for 1 piece of an average kitchen faucet. The results in the B-module are based on a lifetime of 10 years. Scenario B6/1 shows the result for the use of a gas low temperature boiler. Scenario B6/2 shows the result for the use of an electric instantaneous water heater.

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	X	X	X	X	X	X	X	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 piece average kitchen faucet incl. packaging

Core Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6/1	B6/2	B7	C1	C2	C3	C4	D
GWP-total	[kg CO_2-Eq.]	5.98E+0	2.03E-1	7.07E-1	0.00E+0	1.31E+1	0.00E+0	0.00E+0	0.00E+0	3.13E+2	4.67E+2	1.49E+1	0.00E+0	3.36E-2	7.87E-1	5.12E-3	-4.55E+0
GWP-fossil	[kg CO_2-Eq.]	6.62E+0	2.02E-1	5.00E-2	0.00E+0	1.01E+1	0.00E+0	0.00E+0	0.00E+0	3.13E+2	4.66E+2	1.49E+1	0.00E+0	3.33E-2	7.87E-1	5.12E-3	-3.90E+0
GWP-biogenic	[kg CO_2-Eq.]	-6.57E-1	0.00E+0	6.57E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-6.41E-1
GWP-luluc	[kg CO_2-Eq.]	1.40E-2	1.24E-3	9.08E-5	0.00E+0	3.01E+0	0.00E+0	0.00E+0	0.00E+0	1.58E-2	6.59E-1	1.21E-2	0.00E+0	2.73E-4	9.20E-5	4.95E-6	-9.90E-3
ODP	[kg CFC11-Eq.]	4.36E-8	3.52E-17	3.29E-16	0.00E+0	5.43E-7	0.00E+0	0.00E+0	0.00E+0	1.13E-13	1.12E-11	1.41E-13	0.00E+0	6.59E-18	2.06E-10	1.20E-17	-4.39E-8
AP	[mol H^+-Eq.]	7.13E-2	2.11E-3	4.93E-5	0.00E+0	3.37E-2	0.00E+0	0.00E+0	0.00E+0	1.92E-1	9.69E-1	3.67E-2	0.00E+0	5.58E-5	2.13E-4	1.61E-5	-4.74E-2
EP-freshwater	[kg P-Eq.]	8.67E-4	4.63E-7	9.55E-8	0.00E+0	2.91E-4	0.00E+0	0.00E+0	0.00E+0	2.85E-5	1.25E-3	1.59E-2	0.00E+0	9.92E-8	1.51E-7	2.03E-7	-7.51E-4
EP-marine	[kg N-Eq.]	9.33E-3	5.90E-4	1.70E-5	0.00E+0	7.70E-3	0.00E+0	0.00E+0	0.00E+0	8.16E-2	2.30E-1	6.96E-2	0.00E+0	2.20E-5	7.16E-5	4.11E-6	-5.30E-3
EP-terrestrial	[mol N-Eq.]	1.01E-1	6.51E-3	2.02E-4	0.00E+0	9.18E-2	0.00E+0	0.00E+0	0.00E+0	8.91E-1	2.42E+0	1.10E-1	0.00E+0	2.51E-4	9.38E-4	4.36E-5	-5.78E-2
POCP	[kg NMVOC-Eq.]	2.77E-2	1.60E-3	4.25E-5	0.00E+0	3.06E-2	0.00E+0	0.00E+0	0.00E+0	2.38E-1	6.25E-1	2.81E-2	0.00E+0	4.98E-5	1.90E-4	1.28E-5	-1.61E-2
ADPE	[kg Sb-Eq.]	4.57E-3	1.50E-8	4.76E-9	0.00E+0	1.15E-5	0.00E+0	0.00E+0	0.00E+0	1.68E-5	1.37E-4	1.94E-6	0.00E+0	2.96E-9	1.46E-8	3.49E-10	-3.89E-3
ADPF	[MJ]	9.76E+1	2.64E+0	2.83E-1	0.00E+0	2.30E+2	0.00E+0	0.00E+0	0.00E+0	5.37E+3	8.29E+3	1.54E+2	0.00E+0	4.45E-1	6.15E-1	7.35E-2	-4.80E+1
WDP	[m³ world-Eq deprived]	9.17E+0	1.49E-3	1.06E-2	0.00E+0	3.49E+0	0.00E+0	0.00E+0	0.00E+0	8.20E-1	7.47E+1	4.59E+0	0.00E+0	3.10E-4	7.81E-2	-5.33E-5	-7.40E+0

Caption	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 piece average kitchen faucet incl. packaging

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6/1	B6/2	B7	C1	C2	C3	C4	D
PERE	[MJ]	1.81E+1	1.19E-1	7.85E+0	0.00E+0	4.72E+1	0.00E+0	0.00E+0	0.00E+0	4.67E+1	3.82E+3	4.52E+1	0.00E+0	2.56E-2	2.95E-1	5.34E-3	-1.50E+1
PERM	[MJ]	7.76E+0	0.00E+0	-7.76E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	2.59E+1	1.19E-1	9.15E-2	0.00E+0	4.72E+1	0.00E+0	0.00E+0	0.00E+0	4.67E+1	3.82E+3	4.52E+1	0.00E+0	2.56E-2	2.95E-1	5.34E-3	-1.50E+1
PENRE	[MJ]	8.54E+1	2.65E+0	1.11E+0	0.00E+0	2.30E+2	0.00E+0	0.00E+0	0.00E+0	5.37E+3	8.29E+3	1.54E+2	0.00E+0	4.46E-1	1.16E+1	7.35E-2	-4.82E+1
PENRM	[MJ]	1.24E+1	0.00E+0	-8.26E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.10E+1	0.00E+0	0.00E+0
PENRT	[MJ]	9.78E+1	2.65E+0	2.83E-1	0.00E+0	2.30E+2	0.00E+0	0.00E+0	0.00E+0	5.37E+3	8.29E+3	1.54E+2	0.00E+0	4.46E-1	6.15E-1	7.35E-2	-4.82E+1
SM	[kg]	7.20E-1	0.00E+0	0.00E+0	0.00E+0	2.46E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.28E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m³]	2.15E-1	1.37E-4	2.90E-4	0.00E+0	8.19E-2	0.00E+0	0.00E+0	0.00E+0	5.24E-2	3.72E+0	1.31E-1	0.00E+0	2.93E-5	1.94E-3	9.18E-7	-1.67E-1

Caption	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 piece average kitchen faucet incl. packaging

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6/1	B6/2	B7	C1	C2	C3	C4	D
HWD	[kg]	1.40E-6	1.12E-10	5.83E-11	0.00E+0	4.25E-3	0.00E+0	0.00E+0	0.00E+0	1.00E-6	2.19E-6	3.16E-8	0.00E+0	2.35E-11	1.76E-10	1.30E-11	-6.93E-6
NHWD	[kg]	1.15E+0	3.80E-4	3.12E-3	0.00E+0	3.68E-1	0.00E+0	0.00E+0	0.00E+0	7.06E-1	5.88E+0	2.45E+1	0.00E+0	7.00E-5	2.43E-2	9.82E-2	-8.57E-1
RWD	[kg]	3.75E-3	4.37E-6	1.47E-5	0.00E+0	2.14E-3	0.00E+0	0.00E+0	0.00E+0	1.19E-2	1.23E+0	1.26E-2	0.00E+0	8.09E-7	4.28E-5	8.41E-7	-2.52E-3
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	4.28E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.48E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.01E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	2.54E-2	0.00E+0	1.50E-1	0.00E+0	1.58E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.20E-2	3.21E-4	0.00E+0
EET	[MJ]	5.73E-2	0.00E+0	2.71E-1	0.00E+0	2.87E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.00E-2	0.00E+0	0.00E+0

Caption	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 piece average kitchen faucet incl. packaging

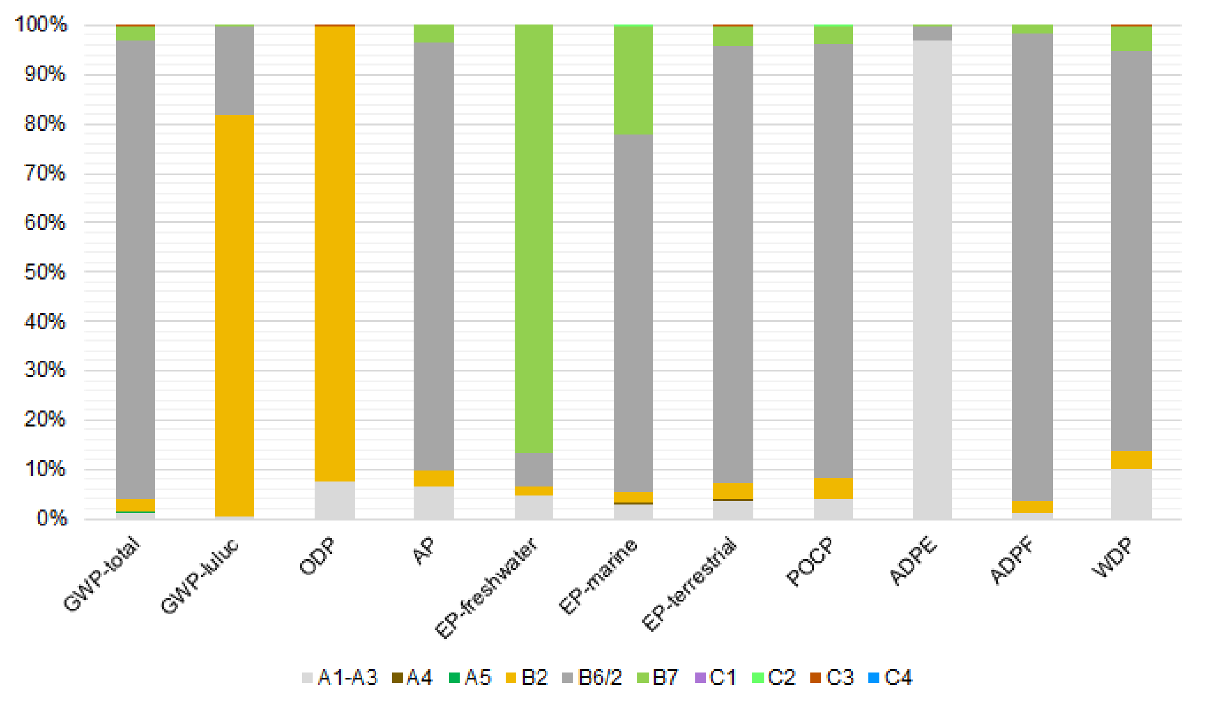
Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6/1	B6/2	B7	C1	C2	C3	C4	D
PM	[Disease Incidence]	6.84E-7	3.33E-8	3.27E-10	0.00E+0	1.66E-6	0.00E+0	0.00E+0	0.00E+0	1.33E-6	8.17E-6	4.12E-7	0.00E+0	3.49E-10	1.46E-9	1.72E-10	-4.28E-7
IRP	[kBq U235-Eq.]	2.38E+0	6.36E-4	1.84E-3	0.00E+0	1.08E+0	0.00E+0	0.00E+0	0.00E+0	1.89E+0	2.03E+2	1.99E+0	0.00E+0	1.18E-4	4.09E-3	1.20E-4	-1.97E+0
ETP-fw	[CTUe]	2.96E+2	1.95E+0	1.48E-1	0.00E+0	1.02E+2	0.00E+0	0.00E+0	0.00E+0	7.34E+1	3.48E+3	2.17E+3	0.00E+0	3.30E-1	5.04E-1	3.19E-2	-1.38E+2
HTP-c	[CTUh]	7.76E-8	3.86E-11	4.46E-12	0.00E+0	1.61E-8	0.00E+0	0.00E+0	0.00E+0	1.57E-8	9.87E-8	7.36E-8	0.00E+0	6.67E-12	1.30E-11	2.67E-12	-7.72E-9
HTP-nc	[CTUh]	4.68E-7	2.00E-9	2.08E-10	0.00E+0	3.82E-7	0.00E+0	0.00E+0	0.00E+0	1.66E-6	3.72E-6	7.57E-6	0.00E+0	3.55E-10	7.39E-10	2.58E-10	-2.82E-7
SQP	[-]	4.95E+1	6.98E-1	1.05E-1	0.00E+0	1.59E+2	0.00E+0	0.00E+0	0.00E+0	3.13E+1	2.61E+3	7.58E+1	0.00E+0	1.53E-1	2.44E-1	5.39E-3	-4.40E+1

Caption	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 dominance analysis shows that modules B2, B6 and B7 are the dominant life cycle stages in most of the categories. The contribution of B2 is due to the demand of soap and water for cleaning. Module B6 dominates most of the indicators due to the energy demand for water heating and module B7 has a high contribution to EPfreshwater due to the wastewater treatment. The module A1-A3 has a very low contribution to all categories except of ADPE. In this indicator the provision of brass and zinc has the largest contribution. The end-of-life stage has no significant influence on the environmental indicators.
The environmental burdens from the transports (modules A4 and C2) account for less than 1% of the total burdens of the respective indicators in all cases.
The possible potentials of avoided loads of subsequent systems (module D) lie outside the considered system boundaries and relate exclusively to credits from recycling and thermal recycling by means of incineration with energy recovery of the different materials.
731,675 kitchen faucets of 133 different product types were produced. For the assessment of the variability of the results, all products were balanced and compared to the average product weighted by production volume. The different types of products all have the same function and differ mainly in terms of design, which has an influence on construction and materials used. The basic structure of the product types is always similar. Material type and quantity proportions do not differ much, as also shown in the average material composition table.
The deviation of the GWP fossil in modules A1-C4 has a maximum of 48% and a minimum of -54% with scenario B6/1 (gas low temperature boiler). The deviation of the GWP fossil in modules A1-C4 has a maximum of 45% and a minimum of -50% with scenario B6/2 (electric instantaneous water heater). For an average scenario, where 50% of water is heated with gas low temperature boiler and 50% with electric instantaneous water heater, 63% of the kitchen faucets produced are above the average GWP fossil value. Whereas 37% reflect the average or are lower than the average. However, 92% of the ones which are above the average just deviate between +4 and +13 %.
Modules B6 and B7 account for more than 90% of the GWP indicator. The deviation from the average is mainly caused by the flow rate in module B7. The deviation from the average is mainly caused by the flow rate in module B7. The higher the deviation from the average GWP, the higher the flow rate. The flow rate ranges between 4.6 and 16 l/min. Consequently, the production phase has a minor influence on the LCA results.

7. Requisite evidence

The drinking water regulation determines the quality of drinking water at the point of withdrawal. This result in requirements for used materials in drinking water installations in general and therefore in sanitary fittings in particular.
All materials used by Hansgrohe SE, which are in contact with drinking water, fulfill the drinking water regulation.
Regulations for metals (Europe-wide):

- Acceptance of metallic materials used for products in contact with drinking water: 4MS Common Approach
  - Part A – Procedure for the acceptance
  - Part B – 4MS Common Composition List
- Metal recommendation of the federal environment agency: metal materials suitable for drinking water hygiene

Regulations for other materials (Germany):

- KTW: Assessment basis for plastics and other organic materials in contact with drinking water
- Elastomer guideline: Guideline for the

hygienic assessment of elastomers in contact with drinking water
- Thermoplastic elastomers: Recommendation for the hygienic assessment of products made of thermoplastic elastomers in contact with drinking water (TPE transition recommendation)
- Ceramics: draft assessment basis for enamels and ceramic materials: assessment basis for enamels and ceramic materials in contact with drinking water (enamel/ceramic assessment basis)
- Lubricants: Guideline for the hygienic assessment of lubricants in contact with drinking water (sanitary lubricants), (Lubricant Guideline)

Regulation for other materials (France):
- ACS: Attestation de Conformité Sanitaire (plastics, elastomers, metals)

Regulation for other materials (UK):
- BS 69 20: Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of water (plastics, elastomers)

Products of the Hansgrohe SE are therefore uncritical to use with any drinking water.

8. References

Standards

EN 200
EN 200:2008: Sanitary tapware – Single taps and combination taps for water supply systems of type 1 and type 2

EN 816
EN 816:2017: Sanitary tapware – Automatic shut-off valves PN 10

EN 817
EN 817:2008: Sanitary tapware – Mechanical mixing valves (PN 10)

ISO 3822
ISO 3822: Acoustics – Laboratory tests on noise emission from appliances and equipment used in water supply installations

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

DIN EN ISO 9001
DIN EN ISO 9001:2015: Quality management systems - Requirements (ISO 9001:2015)

DIN EN 13501-1
DIN EN 13501-1:2019-05: Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests; German version EN 13501-1:2018

DIN EN ISO 14001
DIN EN ISO 14001:2015, Environmental management systems — Requirements with guidance for use, 2015-09

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

EN 15804
DIN EN 15804:2012+A2:2019+AC:2021: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

DIN EN ISO 45001
DIN EN ISO 45001:2018: Occupational health and safety management systems — Requirements with guidance for use. 2018-03

DIN EN ISO 50001
DIN EN ISO 50001:2018: Energy management systems — Requirements with guidance for use. 2018-08

Further References

AVV
Draft General administrative provision relating to the Order on the European list of wastes (Waste List Order – German designation: AVV) of 10 December 2001.

ECHA
European Chemicals Agency (ECHA) Candidate List of Substances of Very High Concern (SVHC) for Authorisation https://echa.europa.eu/de/candidate-listtable

Ecoinvent
ecoinvent 3.6 Database on Life Cycle Inventories (Life Cycle Inventory data), ecoinvent Association, Zürich, 2020

EU Ordinance on biocide Products No. 528/2012
European Parliament, 2012. Regulation (EU) no 528/2012 of the European parliament and of the council of 22 May 2012 concerning the making available on the market and use of biocidal products

Eurostat
Eurostat, last update 26/10/2021 on https://ec.europa.eu/eurostat/databrowser/view/ten00063/default/table?lang=en

GaBi
GaBi 10.6, GaBi Software System and Database for Life Cycle Engineering version 2021.2, Sphera Solutions GmbH, Leinfelden-Echterdingen, 1992-2021

IBU 2021
General Instructions 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

PCR Part A
Institut Bauen und Umwelt e.V. (IBU), Product Category Rules for Building-Related Products and Services. Part A: Calculation rules for the life cycle assessment and requirements on the project report. Version 2.1, Berlin, 11/2021

PCR Part B
Institut Bauen und Umwelt e.V. (IBU), Requirements on the EPD for fittings and showers. Version 1.1, Berlin, 03/2022

Thünen Institute
Diestel, Sylvia / Weimar, Holger: Der Kohlenstoffgehalt in Holz- und Papierprodukten - Herleitung und Umrechnungsfaktoren. Thünen Working Paper 38. Johann Heinrich von Thünen-Institut. Hamburg, 2014

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