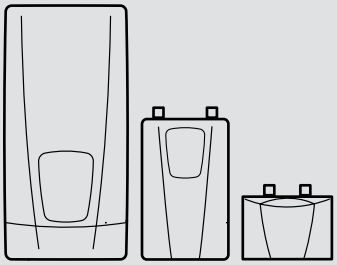
CLAGE

Product Carbon Footprint



Electric instantaneous water heater

Simply efficient.

Owner of the statement:

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The Product Life Cycle Accounting and Reporting Standard of the Greenhouse Gas Protocol (GHG Protocol) from 2011 was used to determine the carbon footprint.

Version 1.0, 10/2023

Explanation on the comparability of the data

The results presented in this report are specific to the assumptions and methods used by CLAGE GmbH. The results are not intended to serve as a basis for comparison with other companies or products. Even with similar products, different data qualities can lead to incomparable results. For a glossary and further insight into the process of PCF collection, the reader can refer to the GHG Protocol Product Life Cycle Accounting and Reporting Standard (WIR/WBCSD, 2011)[2].

INHALT

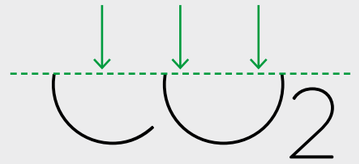
Claus-Holmer Gerdes began selling small instantaneous water heaters under the CLAGE brand in 1951. Today, as an owner-managed, medium-sized industrial company, we are still based in the Hanseatic City of Lüneburg in northern Germany. Around 290 employees work in the areas of development, production, sales and customer service. As a pioneer and market leader for small instantaneous water heaters, we also see ourselves as pioneers in the field of decentralised hot water supply. We are therefore constantly on the lookout for new detailed solutions for our range of electric instantaneous water heaters. Numerous awards and a high level of customer satisfaction are confirmation of our claim to be the experts for electric instantaneous water heaters.

Reliability, fairness and responsible action are key elements of our business success.

As a modern industrial company, we are actively committed to environmental protection and climate neutrality. Our production is based in Germany and we operate sustainably, ethically and socially.

TOP 100 top100.de Top-Innovator 2023

Corporate Responsibility



Environmentally friendly packaging

Appliance boxes with single-colour flexographic printing without offset paper and inserts with 30 % grass content conserve valuable natural resources.

Pallet packaging without film

The use of reusable rubber pallet straps saves over 67 km of plastic film every year.

100% renewable energy

The entire company (including production) has been powered by green electricity since 2019, which means no greenhouse gas emissions.

Water system for employees

No crates, no logistics and no plastic bottles thanks to the Zip HydroTap water system. This saves resources and greenhouse gas emissions.

Environmentally friendly advertising material

For printed matter and advertising materials, attention is paid to environmentally friendly and certified alternatives.

Electromobility

Since 2016, the fleet has been gradually converted to electric or hybrid vehicles. Such vehicles currently make up 43% of the fleet.

LED lighting

Almost all conventional light sources in the company (including production) have been replaced by LED technology.

Electric screwdriver

In production, compressed air screwdrivers are being replaced by more economical electric screwdrivers.

Development with foresight

We strive to develop repairable and recyclable appliances with low carbon footprint in order to conserve resources in the long term.

Energy-saving technology

Many of our instantaneous water heaters are equipped with an efficient energy-saving mode and also have a class A energy label.

Paper saving

The high degree of digitisation in the company avoids a lot of paper waste.

Climate-neutral parcel shipping

We have been sending our parcels via GLS climate-neutral shipping since 2019, which means that 60% of our shipments are climate-neutral.

1. Introduction

Sustainability and Carbon Footprint / Product Carbon Footprint (PCF)

Our endeavours towards sustainable and responsible corporate management and our commitment to environmental responsibility and quality management are already reflected in our DIN EN ISO 14001:2015, DIN EN ISO 9001:2015 and DIN EN ISO 50001:2018 certifications. This forms the basis for the systematic implementation of environmental standards, quality controls and energy management. At a time when the urgency of achieving climate neutrality is increasing worldwide, the PCF plays a crucial role. In addition to transparency, we can uncover potential savings and gradually take further measures to achieve increasing climate neutrality. This introduction provides an insight into our efforts to quantify the environmental impact of our products and ensure a sustainable future.

Connection between PCF and EPD

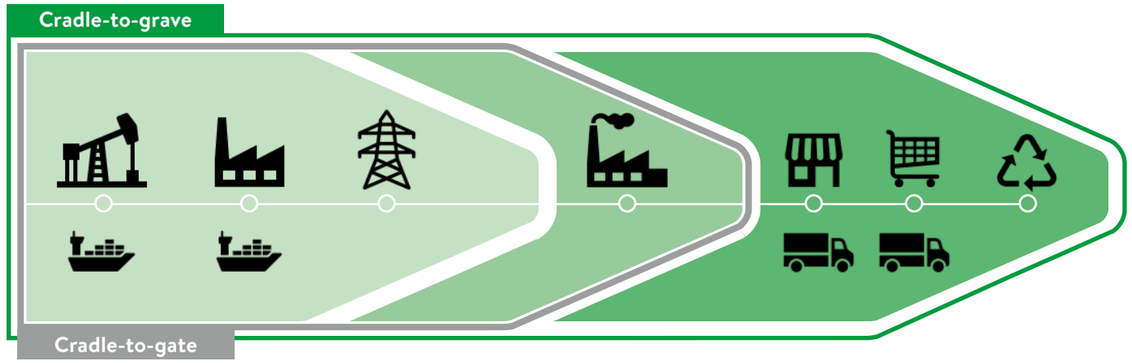
Product Carbon Footprint (PCF)	**Environmental Product Declaration (EPD)**
Balancing of greenhouse gas (GHG) emissions along the life cycle of a product	Quantification and assessment of the environmental impact of a product
No uniform international standard yet > **GHG Protocol Product standard** > ISO 14067 > PAS2050:2008	> GHG emissions > Water consumption > Soil pollution > etc.
Comparison only possible with the same standard and system limits	International standard according to ISO14040/44 > ISO 14025 > EN15804
	Comparison facilitated by Product Category Rules (PCR) within a product category

1.1 Carbon footprint according to GHG product standard and embodied carbon footprint according to WGBC

In addition to the Carbon footprint, the term "embodied carbon" is also frequently used. However, these terms describe different concepts and should not be used interchangeably.

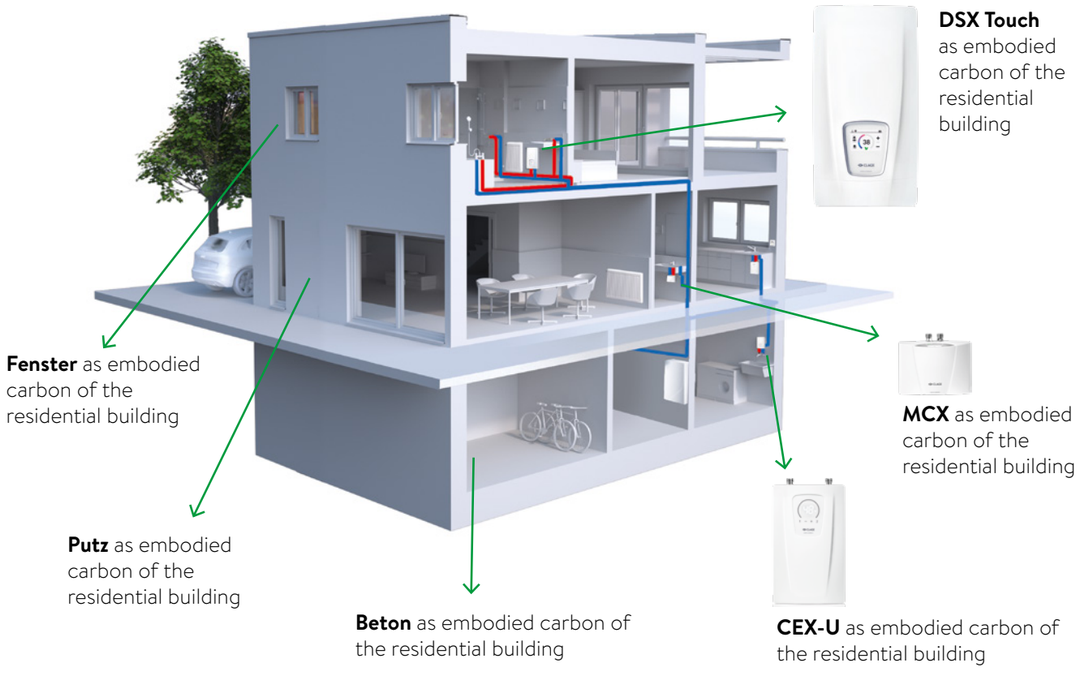
The GHG product standard classifies emissions into direct and indirect categories, known as Scope 1, 2, and 3.
The Product Carbon Footprint (PCF) records the Carbon footprint of a product or service by balancing greenhouse gas emissions and removals over the entire life cycle and thus mapping the climate impact along the value chain.

Connection between Scope 1-3 and cradle-to-cradle approachesGlobal



"Embodied carbon" refers to the CO_2 emissions caused by the production, transportation, construction, maintenance or disposal of materials. These emissions can be categorised as Scope 1, 2 or 3, depending on their source and who has control over them. Embodied carbon can therefore contribute to the calculation of the PCF.

Electronic instantaneous water heaters as part of the embodied carbon of a residential building



Components as part of the embodied carbon of an electronic instantaneous water heater

Hood as embodied carbon of the instantaneous water heater

Control panel as embodied carbon of the instantaneous water heater

Radio remote control as embodied carbon of the instantaneous water heater

1.2 Global Warming Potential (GWP) and GHG[1]

Some greenhouse gases, such as carbon dioxide, remain in the atmosphere for hundreds of years, while others disappear from the atmosphere after just a few years. Each substance also has a different effect in the atmosphere, depending on how much heat radiation it absorbs or reflects. One way of comparing the climate impact of greenhouse gases is the concept of global warming potentials: The climate impact within a defined time horizon (20, 100, 500 years) is related to carbon dioxide, so that all emissions are expressed as carbon dioxide equivalents (CO_2e). This makes it possible to specify total national greenhouse gas emissions on which, for example, reduction targets and obligations are based and which make the data from different countries comparable.

According to the Kyoto Protocol (2005), greenhouse gases include[1]:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Sulphur hexafluoride (SF_6)
- Partially halogenated hydrofluorocarbons (HFCs)
- perfluorinated hydrocarbons (PFCs)

2. Interpretation of the results

2.1 System limits

2.1.1 Lifecycle phases

CRADLE-TO-GATE	Start of the section	End of the section	Part of the survey
Raw material extraction and pre-processing	Extraction of raw materials from the environment Production of preliminary products, including transportation routes, which are generated in the upstream processes	Raw materials/pre-products reach the CLAGE GmbH production facility	Yes
Assembly*	Raw materials and preliminary products are received by CLAGE GmbH	Product leaves the CLAGE GmbH factory gate	Yes
Distribution and storage	Product leaves the production facility	Product becomes the property of the customer	follows
Utilisation	User takes possession of the product	User hands in the product for disposal	follows
Disposal/ recycling/ end-of-life	User hands over the product	Return to the ecosphere/ entry into another product life cycle	follows

When determining the carbon footprints, the cradle-to-gate approach is used, which assesses the emissions generated during the first two phases of use: Raw material extraction and pre-processing and assembly of the end product.

The background to this is the uncertainty of an "ideal" usage profile, as different results can be achieved depending on the installation situation and application. In addition, electronic instantaneous water heaters are efficient appliances for heating water, whereby we primarily want to analyse the savings potential in the area of raw materials and preliminary products and filter out potential for improvement. However, we are aiming to add the distribution and storage, use and disposal/end-of-life phases for subsequent versions.

In the following, the carbon footprints of selected reference products are presented below, which are of increased importance in terms of their environmental footprint due to various criteria.
The criteria include, among others:

- High market penetration
- Increased use of materials compared to other devices in the respective series

As a result, the respective calculation results can be regarded as maximum values for the respective appliance series due to the complexity of the products under consideration and thus the carbon footprints of the appliances, which are not part of this assessment, can also be derived.

Example: The PCF is required for the MBH 4 small hydraulic instantaneous water heater. As this assessment explains only the footprint of the MCX 3 electronic small instantaneous water heater, which has higher material and manufacturing costs due to additional components, a reference value of < 24 kg CO_2e can be assumed for the MBH 4.

***Carbon footprint of CLAGE GmbH:**

Avoid and reduce

We have optimised our CO_2-Emissions by 61% since 2015	**Using renewable energies**	
	What cannot be reduced is covered by renewable energies (green electricity contract since 2019)	**Compensate** We have been offsetting the CO_2-Emissions, that we cannot currently save, since the year 2021 through a certified climate protection project

By supporting climate protection projects, we are helping to reduce greenhouse gas emissions and preserve biodiversity. This enables us to fully offset the CO_2 emissions from our corporate processes.

Despite efforts to achieve emission-free operations, some sources of emissions can only be continuously eliminated by taking time-consuming measures. To counteract these emissions, CLAGE GmbH is involved in climate protection projects in addition to purchasing green electricity.

2.1.2 Cut-off criteria

In accordance with the GHG product standard, the reporting organisation is free to define its own cut-off criteria. In order to ensure the highest possible accuracy of the carbon footprint, the following criterion is based on the requirements of PAS 2050:2011 for quantitative recording of GHGs:

GHG emissions from components whose detailed material composition is not known and whose mass fraction would be less than 1% of the total weight or whose estimated emissions fraction would be less than 1% of the total emissions are not taken into account.

This means that < 0.1 % of the total weight and total emissions are not taken into account when determining the following product “DSX Touch”. For all other devices, it was not necessary to apply the cut-off criterion.

2.1.3 Accounting period with regard to the selected approach

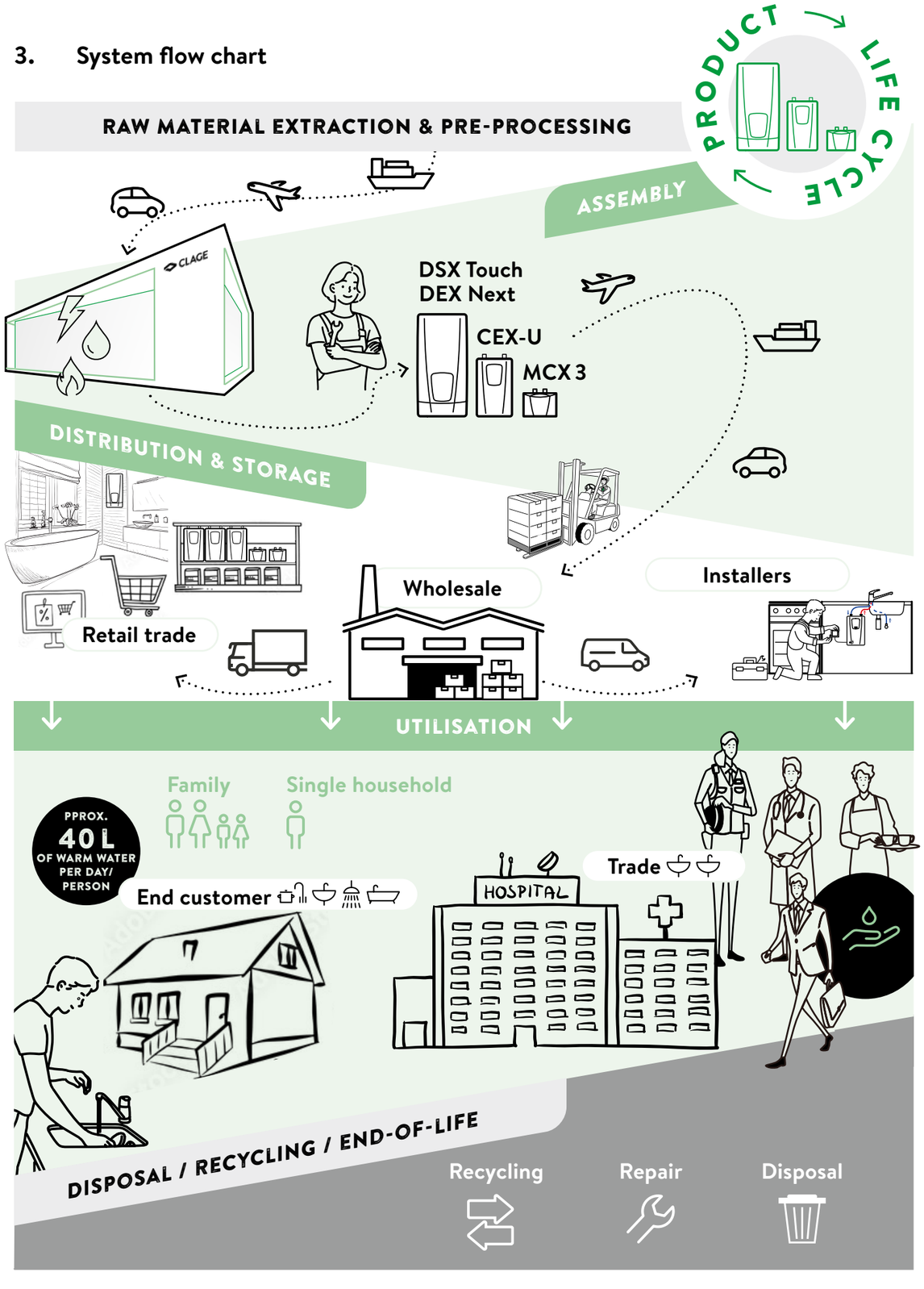
As the cradle-to-gate approach is used and therefore no reference can be made to the service life and disposal periods, the balance period covers the duration of the first two life phases of the products presented. The CO_2e factors from the Ecoinvent database used for invoicing are based on a GWP of 100 years and the IPCC report from 2021.

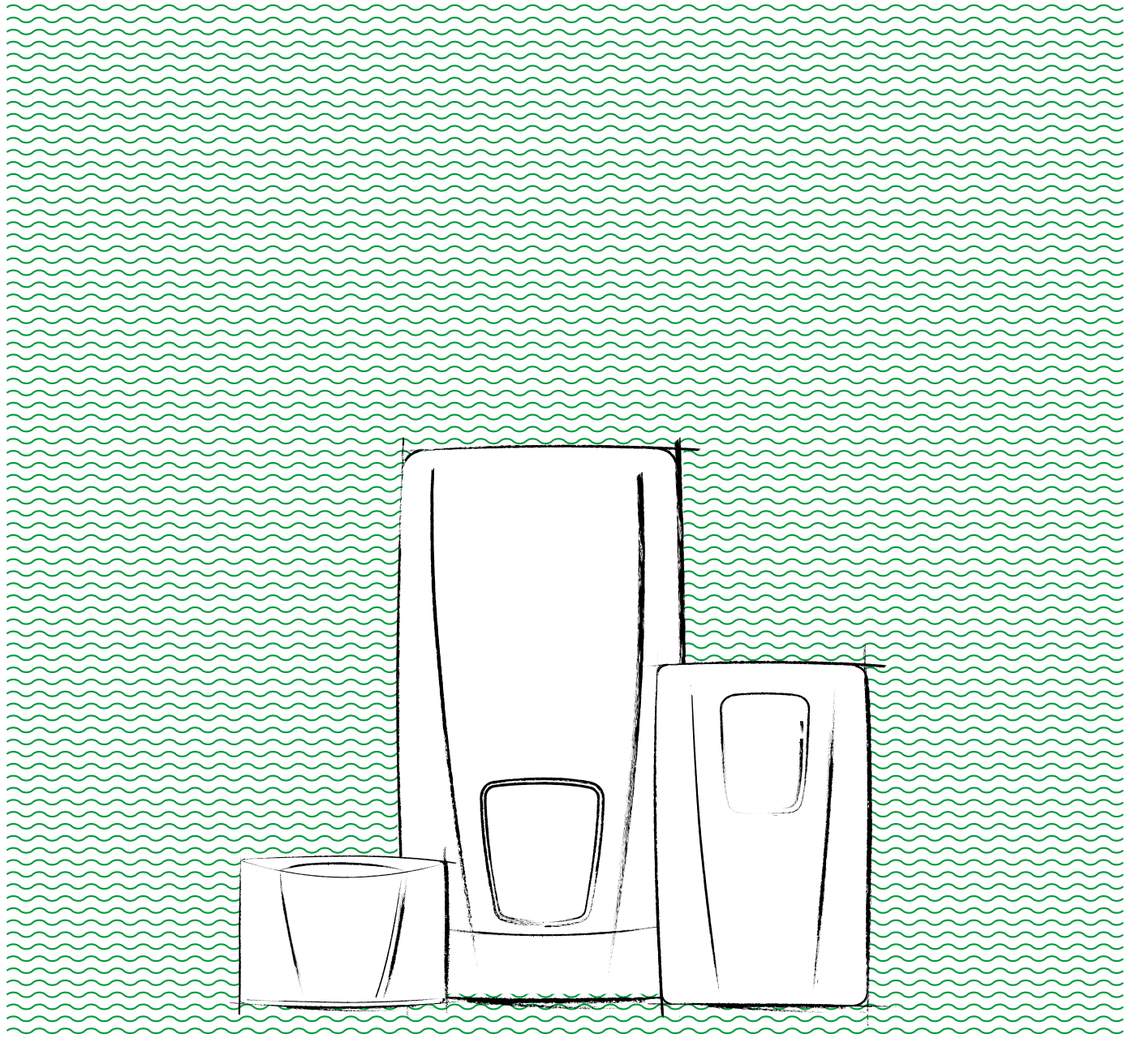
2.1.4 Allocation

Allocation is carried out using the cut-off approach. The background to this use is that there is insufficient information available from suppliers and their subcontractors, which means that it is not possible or only possible to a limited extent to split the production of preliminary and intermediate products into several individual processes.

"The underlying philosophy of this approach is that the primary (first) production of materials is always assigned to the primary user of a material. If a material is recycled, the primary producer does not receive credit for the provision of recyclable materials. As a result, reusable materials are available for recycling processes without being contaminated and secondary (recycled) materials only bear the effects of the recycling processes (...)[3].

3. System flow chart





Product presentations →

4. DSX Touch

4.1 Product presentation

Fully electronically controlled high-tech instantaneous water heater with real glass touch display and Bluetooth remote control for convenient and economical hot water supply to one or more tapping points.

Energy efficiency class A (Scale: A+ to F)	**DSX Touch ◯ / DSX Touch Black Edition ●**			
Permissible operating overpressure [MPa (bar)]:	1 (10) [1)]			
Water connections (screw connections):	G1/2"			
Hot water output at Δt = 28 K [2) 3) 4)] [l/min]:	9.2	10.7	12.3	13.8
Switch-on water volume / Max. Flow rate [l/min]:	1.5 / automatic [5)]			
Rated power [kW]:	18	21	24	27
Nominal voltage [3~ / PE 400 V AC]:	Fixed connection			
Rated current [3)] [A]:	26	30	35	39
Required cable cross-section [3)] [mm²]:	4.0	4.0	6.0	6.0
Test mark VDE GS & EMC / protection class:	✓ / IP 25			
Specific water resistance at 15 °C [Ωcm] ≥:	1100			
Nominal capacity [litres]:	0.4			
Weight with water ballast [kg]:	approx. 4.5			
Dimensions (height × width × depth) [cm]:	46.8 × 23.9 × 9.6			

Sales box: 53.5 × 29.2 × 16.5 cm / 5.85 kg PE = 36/9, PU = 4 1) Also approved for unpressurised operation 2) Temperature increase from, for instance, 12 °C to 40 °C
3) Depending on the set connected load 4) Mixed water 5) Depending on the line pressure, selected temperature and inlet temperature

4.2 Analysis unit and functional unit

The analysis unit is a fully electronically controlled instantaneous water heater for the convenient and economical supply of hot water to one or more tapping points.

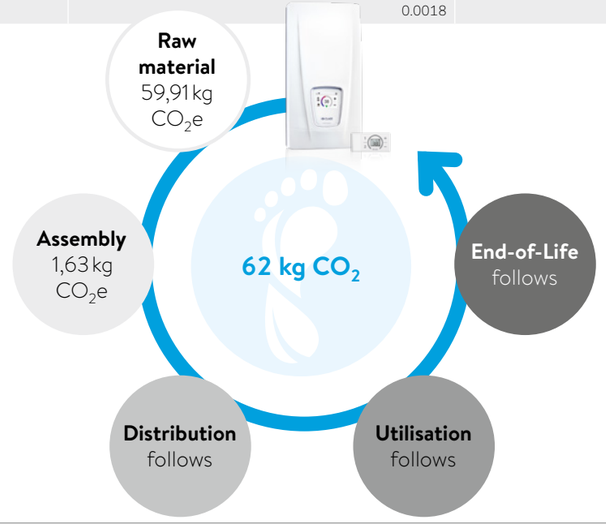
The Multiple Power System MPS® is used to set the maximum power consumption during installation: 18, 21, 24 or 27 kW. The maximum power consumption is independent of the materials used, which is why a more precise specification of the power for calculating the PCF is unnecessary.

4.3 Material declaration

Material	Weight in kg	Mass percentage
ABS plastic	1.6044	23.26%
Paper and cardboard	1.3667	19.82%
Copper	0.8213	11.91%
Printed circuit board	0.6179	8.96%
Electronic component	0.4987	7.23%
Plastic PPE	0.4928	7.15%
Iron	0.3396	4.92%
Glass	0.3342	4.85%
Plastic PA	0.2788	4.04%
Zinc	0.2057	2.98%
Synthetic rubber	0.1194	1.73%
Nickel	0.0523	0.76%
PE plastic	0.0282	0.41%
Chrome	0.0222	0.32%
Alkaline battery	0.022	0.32%
Lead	0.0096	0.14%
Adhesives	0.0094	0.14%
Aluminium	0.0081	0.12%
Plastic PBT	0.008	0.12%
PVC plastic	0.008	0.12%
Silicone	0.0079	0.11%
Oxygen	0.0068	0.10%
PP plastic	0.0041	0.06%
Cellulose fibres	0.0039	0.06%
PMMA plastic	0.0034	0.05%
Tin	0.0034	0.05%
POM plastic	0.0033	0.05%
Plastic PTFE	0.0029	0.04%
Silicon	0.002	0.03%
Plastic PC	0.0019	0.03%
PET plastic	0.0019	0.03%
Natural rubber	0.0019	0.03%
Manganese	0.0018	0.03%
Neodymium	0.0018	0.03%

4.4 Carbon Footprint

61.54 kg CO_2e per appliance



5. DEX Next

5.1 Product presentation

Electronically controlled comfort instantaneous water heater with real glass e-paper display and sensor buttons for high ease of use for convenient and economical hot water supply to one or more tapping points. The Multiple Power System MPS® is used to set the maximum power consumption during installation: 18, 21, 24 or 27 kW.

Energy efficiency class A (Scale: A+ to F)	**DEX Next** (18, 21, 24 or 27 kW adjustable)			
Permissible operating overpressure [MPa (bar)]:	1 (10) [1]			
Water connections (screw connections):	G 1/2"			
Hot water output at Δt = 28 K [2] [3] [l/min]:	9.2 [4]	10.7 [4]	12.3 [4]	13.8 [4]
Switch-on water volume / Max. Flow rate [l/min]:	1.5 / automatic [5]			
Rated power at 400 V [kW]:	18	21	24	27
Nominal voltage [3~ / PE 400 V AC]:	Fixed connection			
Rated current [3] [A]:	26	30	35	39
Required cable cross-section [3] [mm²]:	4.2	4.0	6.0	6.0
Test mark VDE GS & EMC / protection class:	✓ / IP 25			
Specific water resistance at 15 °C [Ωcm] ≥:	1100			
Nominal capacity [litres]:	0.4			
Weight with water ballast [kg]:	approx. 4.5			
Dimensions (height × width × depth) [cm]:	46.8 × 23.9 × 9.6			

Sales box: 53.5 × 29.5 × 16.5 cm / 5.04 kg PE = 36/9, PU = 5 1) Also approved for unpressurised operation 2) Temperature increase from e.g. 12 °C to 40 °C
3) Depending on the set connected load 4) Mixed water 5) Flow rate limited, for optimum temperature increase

5.2 Analysis unit and functional unit

The analysis unit is an electronically controlled instantaneous water heater for the convenient and economical supply of hot water to one or more tapping points.

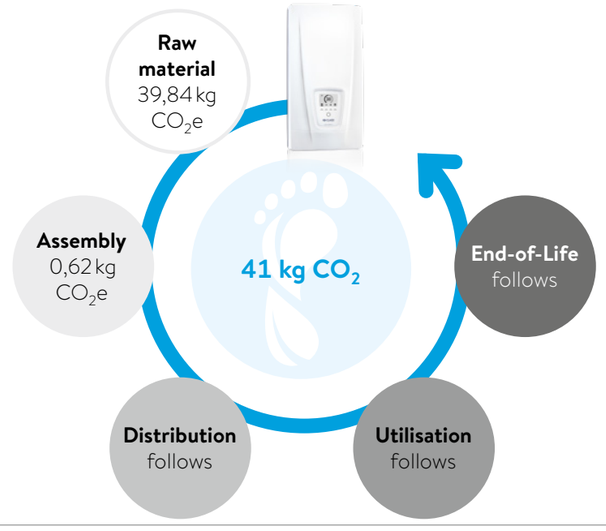
The Multiple Power System MPS® is used to set the maximum power consumption during installation: 18, 21, 24 or 27 kW. The maximum power consumption is independent of the materials used, which is why a more precise specification of the power for calculating the PCF is unnecessary.

5.3 Material declaration

Material	Weight in kg	Mass percentage
ABS plastic	1.3102	22.92%
Paper and cardboard	1.1236	19.66%
Copper	0.767	13.42%
Plastic PA	0.732	12.80%
Printed circuit board	0.561	9.81%
Glass	0.2913	5.10%
Iron	0.284	4.97%
Electronic component	0.2206	3.86%
Zinc	0.2052	3.59%
Synthetic rubber	0.0931	1.63%
PE plastic	0.0281	0.49%
Nickel	0.0193	0.34%
Chrome	0.01	0.17%
Lead	0.0097	0.17%
Adhesives	0.0094	0.16%
Aluminium	0.0079	0.14%
Silicone	0.0079	0.14%
Oxygen	0.0068	0.12%
Plastic PC	0.0047	0.08%
PVC plastic	0.004	0.07%
POM plastic	0.0035	0.06%
Plastic PBT	0.0027	0.05%
Plastic PTFE	0.0027	0.05%
Tin	0.0024	0.04%
Cellulose fibres	0.0021	0.04%
Natural rubber	0.0018	0.03%
PET plastic	0.0013	0.02%
Silicon	0.0012	0.02%

5.4 Carbon Footprint

41 kg CO_2e per appliance



6. CEX-U

6.1 Product presentation

Electronically controlled electric compact instantaneous water heater as an under-sink appliance for the energy-efficient supply of hot water to one or two taps, such as a kitchen sink or two washbasins.

Energy efficiency class A (Scale: A+ to F)	**CEX-U** (11 or 13.5 kW)	
Permissible operating overpressure [MPa (bar)]:	1 (10) [1]	
Water connections (screw connections):	G 3/8"	
Hot water output at Δt = 33 K [2] [3] [l/min]:	4.8	5.8 [4]
Switch-on water volume / Max. Flow rate [l/min]:	2 / 5 [5]	
Rated power [kW]:	11	13.5
Rated voltage [3~ / PE 380 - 415 V AC]:	Fixed connection	
Rated current [3] [A]:	16	20
Required cable cross-section [3] [mm²]:	1.5	2.5
Test mark VDE GS & EMC / protection class:	✓ / IP 24	
Specific water resistance at 15 °C [Ωcm] ≥:	1000	
Nominal capacity [litres]:	0.3	
Weight with water ballast [kg]:	approx. 2.7	
Dimensions (height × width × depth) [cm]:	29.4 × 17.7 × 10.4	

Sales box: 39.5 × 23 × 14.9 cm / 3.10 kg PE = 80/10, PU = 8 *) Please pay attention to deviating specifications for export articles. Temperature selection only up to 55° C 1) Also approved for unpressurised operation 2) Temperature increase from, for instance, 12 °C to 45 °C 3) Depending on the set connected load 4) Mixed water 5) Flow rate limited, for optimum temperature increase 6) Based on nominal voltage of 230 V or 400 V

6.2 Analysis unit and functional unit

The analysis unit is an electronically controlled under-sink instantaneous water heater in compact design for the convenient and economical supply of hot water to one or more tapping points.

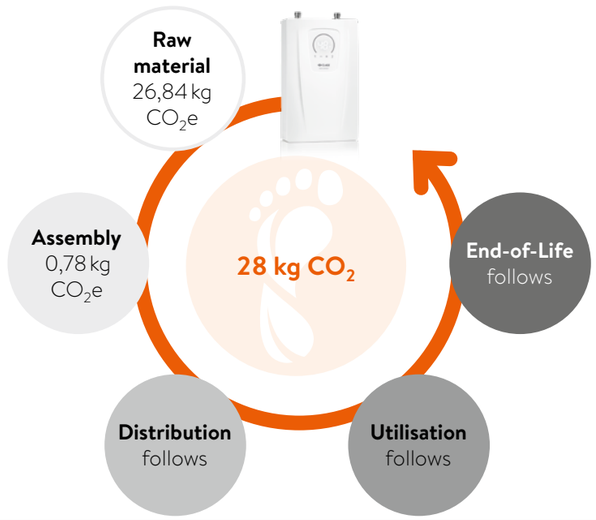
The Multiple Power System MPS® is used to set the maximum power consumption during installation: 11 or 13.5 kW. The maximum power consumption is independent of the materials used, which is why a more precise specification of the power for calculating the PCF is unnecessary.

6.3 Material declaration

Material	Weight in kg	Mass percentage
ABS plastic	0.692	21.76%
Paper and cardboard	0.6275	19.74%
Plastic PA	0.5315	16.72%
Copper	0.4478	14.08%
Glass	0.2223	6.99%
Iron	0.1367	4.30%
Electronic component	0.1207	3.79%
Zinc	0.1105	3.47%
PVC plastic	0.0895	2.81%
Synthetic rubber	0.0404	1.27%
Printed circuit board	0.038	1.19%
Nickel	0.0294	0.92%
PE plastic	0.0216	0.68%
Chrome	0.0191	0.60%
Natural rubber	0.0079	0.25%
Oxygen	0.0068	0.21%
Silicone	0.006	0.19%
Lead	0.0053	0.17%
Adhesives	0.0053	0.17%
Plastic PS	0.004	0.13%
Plastic PBT	0.0037	0.12%
POM plastic	0.0035	0.11%
Manganese	0.0017	0.05%
Tin	0.0015	0.05%
Plastic PC	0.0013	0.04%
Molybdaen	0.0013	0.04%
Silicon	0.0012	0.04%

6.4 Carbon Footprint

28 kg CO_2e per appliance



7. MCX3

7.1 Product presentation

Electronically controlled instantaneous water heater in mini format for the energy-efficient supply of a washbasin or kitchenette. The heat output is automatically regulated by the electronics. This ensures the perfect hot water temperature, and mixing with cold water is no longer necessary. Button control panel with colored LEDs for setting the outlet temperature to 35 °C, 38 °C or a maximum of 45 °C.

Energy efficiency class A (Scale: A+ to F)	**MCX 3**
Permissible operating overpressure [MPa (bar)]:	1 (10) [1)]
Water connections (screw connections):	G 3/8"
Hot water output at Δt = 25 K [2)] [l/min]:	2.0
Switch-on water volume / Max. Flow rate [3)] [l/min]:	1.2 / 2.0
Rated power [4)] [kW]:	3.5
Nominal voltage [1~ / N / PE 220 - 240 V AC]:	with plug
Rated current [4)] [A]:	15
Required cable cross-section [mm²]:	1.5
Test mark VDE GS & EMC / protection class:	✓ / IP 25
Specific water resistance at 15 °C [Ωcm] ≥:	1100
Nominal capacity [litres]:	0.2
Weight with water ballast [kg]:	approx. 1.5
Dimensions (height × width × depth) [cm]:	13.5 × 18.6 × 8.7

Sales box: 18.6 × 23.3 × 13.2 cm / 1.78 kg PE = 100/20, PU = 10 1) Also approved for unpressurised operation 2) Temperature increase from, for instance, 15 °C to 40 °C
3) Flow rate limited for optimum temperature increase, can be adjusted by adjusting the water volume 4) Based on nominal voltage of 230 V or 400 V

7.2 Analysis unit and functional unit

The analysis unit is a fully electronically controlled instantaneous water heater for the convenient and economical supply of hot water to a tapping point with an output of 3.5 kW.

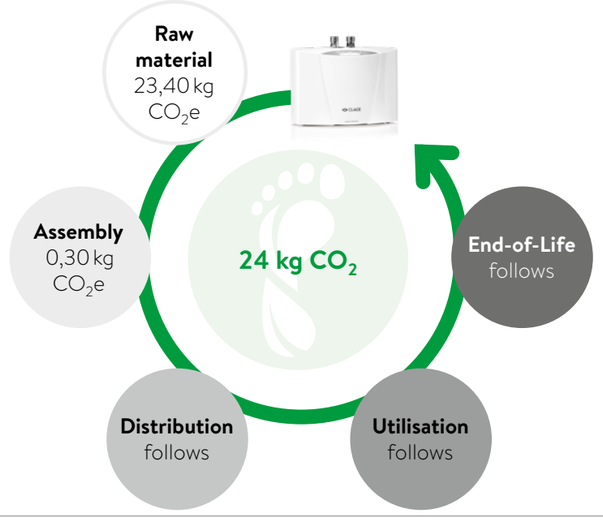
PRODUCT CARBON FOOTPRINT **DSX TOUCH, DEX NEXT, CEX-U, MCX3**

7.3 Material declaration

Material	Weight in kg	Mass percentage
Paper and cardboard	0.41	21.10%
Plastic PPE	0.2933	15.09%
Plastic PS	0.2907	14.96%
Copper	0.196	10.09%
Electronic component	0.181	9.31%
Glass	0.1438	7.40%
Iron	0.0962	4.95%
Zinc	0.0956	4.92%
Safety plug	0.051	2.62%
PVC plastic	0.0506	2.60%
Printed circuit board	0.0329	1.69%
PE plastic	0.0245	1.26%
Plastic PA	0.0155	0.80%
Synthetic rubber	0.0084	0.43%
Nickel	0.0078	0.40%
Chrome	0.0072	0.37%
Silicone	0.007	0.36%
Lead	0.0046	0.24%
Adhesives	0.0042	0.22%
Aluminium	0.004	0.21%
Natural rubber	0.004	0.21%
Oxygen	0.0034	0.18%
POM plastic	0.0026	0.13%
Tin	0.002	0.10%
PET plastic	0.0014	0.07%
Plastic PBT	0.0013	0.07%

7.4 Carbon Footprint

24 kg CO_2e per appliance



8. Quality assurance

8.1 Data

For some components whose manufacturing and processing methods were not known in detail at the time of the assessment, assumptions were made based on average or widely used manufacturing processes. These processes have been balanced in terms of their greenhouse effect and are therefore part of the first life cycle phase for resource extraction and preservation of primary products.

To establish the carbon footprint, primary data from the reference year 2022 was used for the assembly process phase and secondary data from the LCI database Ecoinvent and information from our suppliers was used for the upstream process, raw material extraction and procurement of preliminary products.

In addition, the PCFs determined in this version are those that are expected to decrease as a result of the collection of specific data from our suppliers.

The CO_2 equivalence factors used for the calculation are data sets that refer to a specific geographical location and are divided into the following geographies for the calculation of version 1.0:

GLO	DE	RoW	RER
Global	Germany	Rest of the World	Europe
Global market as a whole	Market for the geographical location Germany	If specific data is available for a geographical location, this is separated from the global market and the rest of the market is listed under "Rest of the World"	Market for the European region
72%	2%	13%	13%

8.2 Information on the audit declaration

The Climate and Policy Officer, Lea Welzel, hereby confirms that she has checked the plausibility of the contents of this report. The review ensured that the information and arguments presented are logically consistent, that relevant facts and sources were correctly cited and that the conclusions are reasonable and comprehensible in the context of the subject matter.

The plausibility check aims to ensure that the content presented is consistent with current scientific knowledge, political contexts and relevant discussions in the field of climate and politics.

Date: 04.10.2023

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8.3 Audit result

The data and results presented in this paper are current and correct to the best of our knowledge and belief at the time of submission. However, it should be noted that this information is based on available sources and data, which may be subject to continuous change and updating.

The Climate and Policy Officer, Lea Welzel, and contact person, Luisa Jarck, point out that it is possible that new findings, research results or updated data may be published after the submission of this paper, which may lead to a modification or revision of the results presented. The data and results presented here should therefore be viewed and interpreted in the context of these dynamic developments.

Date: 04.10.2023

9. List of abbreviations

ABS	Acrylonitrile-butadiene-styrene copolymer
CO_2e	CO_2 equivalents
CO_2-eq	CO_2 equivalent
DE	Germany
GHG	Greenhouse gas
GLO	Global
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
PA	Polyamide
PBT	Polybutylene terephthalate
PC	Polycarbonate
PCF	Product Carbon Footprint
PE	Polyethylene
PET	Polyethylene terephthalate
PMMA	Polymethyl methacrylate
POM	Polyoxymethylene
PP	Polypropylene
PPE	Polyphenylene ether
PS	Polystyrene
PTFE	Polytetrafluoroethylene
PVC	Polyvinyl chloride
RER	Europe
RoW	Rest of the World
THG	Greenhouse gas
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

10. Definitions

Scope 1	Includes all direct greenhouse gas emissions, such as primary energy sources consumed directly in company properties. Examples include natural gas, heating oil, petrol and diesel.
Scope 2	Includes indirect greenhouse gas emissions resulting from the generation of the procured energy
Scope 3	Includes other indirect greenhouse gas emissions that are primarily associated with the company's activities
Cradle-to-Gate	Cradle to factory gate: Analysis of processes from raw material extraction to the delivery process
Cradle-to-grave	From the cradle to the grave: Analysis of the processes of the entire life cycle
PAS2050:2011	Standard for calculating the carbon footprint from the British Standards Institution (BSI)
Embodied Carbon	Embedded emissions: CO_2-Emissions resulting from the production, transportation, construction, maintenance or disposal of materials that are part of a product or building
CO_2-Equivalents (CO_2e)	Unit of measurement to standardise the climate impact of greenhouse gases according to the IPCC

11. Sources

PCF for adhesives in CO_2e/kg
Industrieverband Klebstoffe e.V.: Typical "Product Carbon Footprint" (PCF) values for industrial adhesives, URL: https://www.klebstoffe.com/nachhaltigkeit/product-carbon-footprint/ (Status: 27.09.2023)

PCF for the plastics PC, ABS, POM, PBT, PA 6 and PA 6.6
Dr. Jochen Burkard: Presentation dated 28.07.2023

PCF for PTFE
Federal Office of Economics and Export Control: Information sheet CO_2-Factors, Version 2.0 (01.05.2023), URL: https://www.bafa.de/SharedDocs/Downloads/DE/Energie/eew_infoblatt_co2_faktoren_2023.html (as of 27.09.2023)

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Öko-Institut e.V.: Rechargeable batteries in standard sizes, development of the award criteria for a climate protection-related eco-label (18.06.2012), URL: https://www.oeko.de/impressum (27.09.2023)

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North ESG: The confusion surrounding "embodied carbon" and "scope emissions" (05.03.2024), URL: https://nordesg.de/die-verwirrung-um-embodied-carbon-und-scope-emissions/

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[1] Greenhouse gases and declaration acc. to Kyoto Protocol Greenhouse gases | Federal Environment Agency (04.09.2023)

[2] https://ghgprotocol.org/sites/default/files/standards/Product-Life-Cycle-Accounting-Reporting-Standard_041613.pdf (21.09.2023)

[3] https://ecoinvent.org/the-ecoinvent-database/system-models/#!/allocation-cut-off (21.09.2023)

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