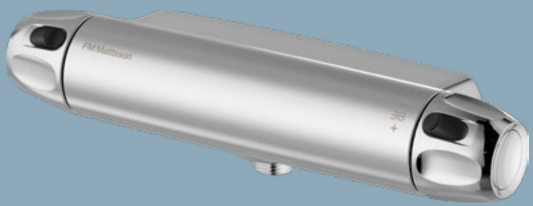
Environmental Product Declaration



Programme	The International EPD® System
Programme Operator	EPD International AB
EPD Registration Number	S-P-05747
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An EPD should provide current information and may be updated if conditions change.
The stated validity is therefore subject to the continued registration and publication at www.environdec.com

In accordance with ISO 14025:2006 & EN 15804:2012+A2:2019/AC:2021 for
Shower Mixers, FM Mattsson 9000XE

From
FM Mattsson Group

General information

Programme information

Programme	The International EPD® System
Address	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden
Website	www.environdec.com
E-mail	info@environdec.com

Accountabilities for PCR, LCA & independent, third-party verification

Product Category Rules (PCR)	CEN standard EN 15804 serves as the Core Product Category Rules (PCR) Product Category Rules (PCR): Construction products, 2019:14, version 1.2.5 PCR review was conducted by: The Technical Committee of the International EPD® System. Chair of the PCR review: Claudia A. Peña. The review panel may be contacted via info@environdec.com
Life Cycle Assessment (LCA)	LCA accountability: Uniben Tettey Organization: RISE Research Institutes of Sweden
Third-party verification	Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☑ EPD verification by individual verifier Third-party verifier: Hannu Karppi, Ramboll Finland Oy Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier	☐ Yes ☑ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmers may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner Of The EPD	FM Mattsson Group
Contact	Phone: +46 250 59 60 00 Email: info@fmmattssongroup.com www.fmmattsson.com
Description Of The Organisation	FM Mattsson Group conducts the sale, manufacturing and product development of water mixers and related products under the established brands of FM Mattsson, Mora, Damixa, Hotbath, Aqualla and Adamsez. Our vision is to become customer's first choice in the bathroom and kitchen. In 2021 the business generated sales of more than 1.8 billion SEK from its companies in Sweden, Norway, Denmark, Finland, Benelux, UK, Germany and Italy and had 532 employees. FM Mattsson Group is listed on Nasdaq Stockholm.
Product/Management System Related Certifications	ISO 9001:2015 ISO 14001:2015
Address Production Site	FM Mattsson Group Östnorsvägen 95 792 95 Mora, Sweden

Sustainable flows

Responsible use of water is about protecting vital resources and all our futures. At FM Mattsson, we are constantly working to identify new solutions that use and distribute water in ways that are sustainable both for the environment and for people.

Consumers, architects, property owners, builders, companies, municipalities, and governments – we all benefit from saving water and energy. And we all have a responsibility to protect our shared resources for future generations.

FM Mattsson develops energy-efficient products for the future - continuing over 150 years of development and a passion for sustainable solutions. The Research Institute of Sweden, RISE, carried out a two-year project analysing different energy-efficient mixers from multiple brands, including FM Mattsson, in an apartment building (Folkeson et al., 2017). It was found that considerable savings can be made in both newly constructed and existing buildings – and that energy-efficient mixers offer hot water savings of up to 28 percent.

FM Mattsson also works to drive change in people's habits and their relationship with water, both privately and professionally. It is about simple changes, such as not wasting drinking water and reducing the amount of water being heated and hot water being consumed unnecessarily. Minor adjustments and new habits reduce energy consumption and create positive change –for people's personal finances and our planet.

The average person in Sweden consumes around 140 litres of water per day at home, of which approximately 60 litres is hot water. Therefore, FM Mattsson has developed the concept of sustainable water habits – a collection of tips and advice to save water and energy in day-to-day life.

A sustainable flow of water for the future, that's our mission.

Product information

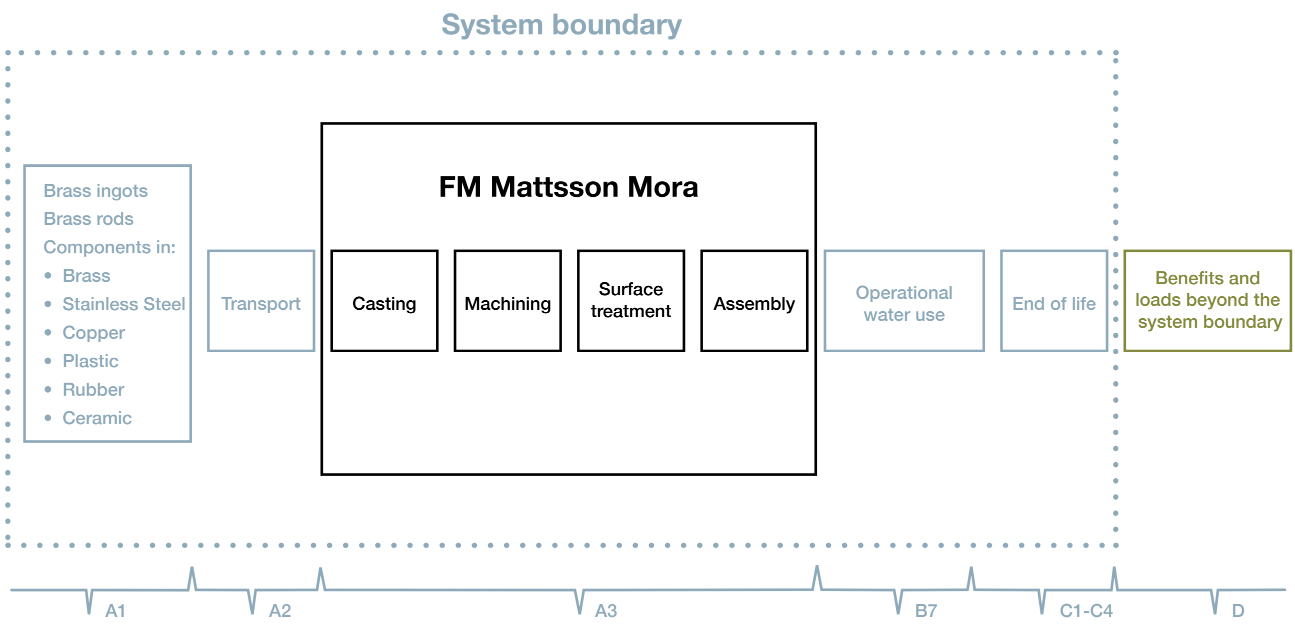
Product Name	Shower mixers, FM Mattsson 9000XE
Reference Product	The reference product Shower mixer 86800000 was chosen as the representative product based on high sales volume.
Product Identification	Thermostatic mixing valve for shower, vertical mounted, two hole exposed, according to EN 1111
Product Description	FM Mattsson 9000XE Shower mixers include built-in features for limitation of water flow and temperature limitation to ensure a sustainable product life cycle with efficient use of water and energy during the usage phase and fulfills e.g. the flow rate requirements of the EU Taxonomy.
UN CPC Code	42911 - Sinks, washbasins, baths and other sanitary ware and parts thereof, of iron, steel, copper or aluminium
Geographical Scope	Europe

LCA information

Functional Unit/Declared Unit	One shower mixer, FM Mattsson 9000XE
Reference Service Life[1]	16 years
Time Representativeness	Bill-of-material from 2022. Operations in Mora represented with data from 2021.
Cut-Off Criteria	All materials and energy used to manufacture the shower mixer are included.
Databases and LCA Software Used	Ecoinvent 3.8 SimaPro 9.4.0.2
Description of System Boundaries	Cradle to gate (A1-A3) with options, i.e., also operational water use module B7, waste management modules C1–C4 and beyond end-of-life module D..

[1] The reference service life is defined based on (Cordella M. et al., 2014).

System diagram



More information

LCA Practitioner	Uniben Tettey, RISE Research Institutes of Sweden
Additional information	Modelling of all components from production bill-of-material. Supplier specific electricity mixes and corresponding GWP impact: China, Guangdong province 931 g CO2/kWh; Lithuania 490 g CO2/kWh; Spain 323 g CO2/kWh; Denmark 292 g CO2/kWh; Sweden 46 g CO2/kWh; and European average 392 g CO2/kWh).
Electricity used in module A3	Electricity for operations in Mora is 100% renewable based with a mix from hydro, wind and solar with a GWP impact of 11.4 g CO2-eq/kWh.
Information about scenarios and additional technical information	Information about the scenario for operational water use for this product is provided under "Additional Information" below.

Modules declared

Geographical scope, share of specific data (in GWP-GHG indicator) & data variation

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X	X
Geography	Global /EU	Global /EU	SE										EU	EU	EU	EU	EU
Specific data used	90% for GWP in A1-A3					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10% for GWP in A1-A3					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%, all A3 in one site					-	-	-	-	-	-	-	-	-	-	-	-

Modules explained

LCA modules

A1 Raw material supply
This module relates to raw material extraction and processing, processing of secondary material input (e.g. recycling processes), transport to component manufacturing and component manufacturing.

C2 Waste Transport
This module relates to the transport of the dismantled shower mixer to final waste disposal. An average distance of 100 km from demolition site to waste processing site is assumed.

A2 Transportation
This module relates to transport from raw material extraction and processing, and component manufacturing to FM Mattsson Mora.

C3 Waste processing
This module covers impacts related to sorting and recycling processes for the relevant material components of the shower mixers. It is assumed that 90% of the brass and non-brass metals as well as 74% of the packaging wastes are recovered for recycling.

A3 manufacturing
This module covers the relevant production processes for the 9000XE shower mixers at FM Mattsson Mora. The processes cover casting, machining, surface treatment and assembling of components. Treatment of waste and wastewater are also included.

C4 Waste disposal
This module relates to waste disposal processes such as landfilling or incineration. For the shower mixers it is assumed that the remaining material components i.e. plastics, rubber, etc. as well as the remaining 10% of the brass and non-brass metals and 26% of the packaging wastes are incinerated.

B7 Operational
This module covers the production, heating and wastewater treatment of tap water use over the reference service life of one shower mixer used by one person. Further details on the scenario for operational water use are given in “Additional Information” below.

D Benefits and loads beyond system boundary
This module covers benefits and loads associated with recovery/ recycling beyond the defined system boundary for the shower mixer. This includes benefits from recycling and waste incineration.

C1 De-construction
This module relates to the dismantling of the shower mixers at the end-of-life. It is assumed that the dismantling is done manually and the related impacts are assumed to be negligible.

Content information

Product components	Weight, g	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Brass	1109.1	80	0
Stainless steel	12.0	50	0
Plastic	292.2	0	0
Rubber	3.4	0	0
Ceramic	9.7	0	0
Nickel	20.7	35	0
Copper	19.4	15	0
Chrome	0.9	15	0
Total	**1467.4**	**-**	**-**
Packaging materials	**Weight, g**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg product**
Corrugated board	288.0	19.6	0.10
Paper	33.3	2.3	0.01
Total	**321.3**	**21.9**	**0.11**

Dangerous substances from the candidate list of SVHC for Authorisation	EC No.	CAS No.	Weight-% per functional or declared unit
Lead	231-100-4	7439-92-1	<0.1
This product do not contain substances which exceed the limits for registration at the European Chemicals Agency regarding the Candidate List of Substances of Very High Concern for authorization.			

Environmental information

Potential environmental impact - mandatory indicators according to EN 15804

Results per shower mixer, FM Mattsson 9000XE											
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	7.88E+00	7.37E-01	1.79E+00	1.04E+01	2.86E+03	0.00E+00	2.02E-02	7.88E-02	7.02E-01	-5.45E+00
GWP-biogenic	kg CO_2 eq.	-8.61E-02	7.31E-04	1.11E-01	2.58E-02	1.35E+02	0.00E+00	1.74E-05	7.49E-03	1.09E-01	4.10E-02
GWP-luluc	kg CO_2 eq.	7.67E-03	3.77E-04	2.36E-05	8.07E-03	1.68E+00	0.00E+00	8.08E-06	1.59E-04	1.46E-05	-1.43E-02
GWP-total	kg CO_2 eq.	7.81E+00	7.38E-01	1.91E+00	1.05E+01	3.00E+03	0.00E+00	2.02E-02	8.67E-02	8.11E-01	-5.43E+00
ODP	kg CFC 11 eq.	5.46E-07	1.61E-07	9.09E-08	7.98E-07	2.16E-04	0.00E+00	4.67E-09	5.03E-09	5.12E-09	-3.62E-07
AP	mol H+ eq.	1.00E-01	1.08E-02	5.38E-03	1.16E-01	1.47E+01	0.00E+00	5.74E-05	4.21E-04	2.18E-04	-4.11E-01
EP-freshwater	kg P eq.	3.61E-03	3.85E-05	4.82E-04	4.13E-03	1.28E+00	0.00E+00	1.32E-06	6.75E-05	6.16E-06	-3.27E-02
EP-marine	kg N eq.	9.21E-03	2.64E-03	1.65E-03	1.35E-02	8.32E+00	0.00E+00	1.17E-05	8.83E-05	1.11E-04	-2.18E-02
EP-terrestrial	mol N eq.	9.20E-02	2.92E-02	1.69E-02	1.38E-01	2.28E+01	0.00E+00	1.27E-04	7.88E-04	1.00E-03	-2.94E-01
POCP	kg NM-VOC eq.	2.92E-02	7.90E-03	4.18E-03	4.13E-02	8.76E+00	0.00E+00	4.88E-05	2.33E-04	2.52E-04	-8.07E-02
ADP-minerals & metals*	kg Sb eq.	4.61E-04	1.90E-06	1.14E-06	4.64E-04	4.99E-03	0.00E+00	7.16E-08	2.45E-07	1.19E-07	-1.01E-02
ADP-fossil*	MJ	1.04E+02	1.05E+01	1.41E+01	1.29E+02	3.63E+04	0.00E+00	3.06E-01	1.54E+00	1.76E-01	-7.69E+01
WDP*	m^3	1.90E+01	2.69E-02	3.54E+02	3.73E+02	5.65E+03	0.00E+00	9.33E-04	1.64E-02	1.48E-01	-7.21E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP- minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential environmental impact - additional mandatory & voluntary indicators

Results per shower mixer, FM Mattsson 9000XE											
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	7.89E+00	7.38E-01	1.79E+00	1.04E+01	2.86E+03	0.00E+00	2.02E-02	7.90E-02	7.02E-01	-5.47E+00

Use of resources

Results per shower mixer, FM Mattsson 9000XE											
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1.63E+01	1.27E-01	2.80E+02	2.97E+02	4.28E+03	0.00E+00	4.38E-03	2.47E-01	1.35E-02	-2.09E+01
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	1.63E+01	1.27E-01	2.80E+02	2.97E+02	4.28E+03	0.00E+00	4.38E-03	2.47E-01	1.35E-02	-2.09E+01
PENRE	MJ	1.04E+02	1.05E+01	1.41E+01	1.29E+02	3.63E+04	0.00E+00	3.06E-01	1.54E+00	1.76E-01	-7.69E+01
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.04E+02	1.05E+01	1.41E+01	1.29E+02	3.63E+04	0.00E+00	3.06E-01	1.54E+00	1.76E-01	-7.69E+01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	5.24E-02	1.41E-03	1.53E-02	6.91E-02	3.14E+02	0.00E+00	5.71E-05	3.34E-04	1.88E-04	-9.44E-02
Acronyms	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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water										

[1] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

Waste production & output flows

Waste production

Results per shower mixer, FM Mattsson 9000XE											
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	0.00E+00	0.00E+00	3.94E-01	3.94E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	0.00E+00	0.00E+00	7.04E-01	7.04E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Radioactive waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Output flows

Results per shower mixer, FM Mattsson 9000XE											
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	1.35E+00	1.35E+00	0.00E+00	0.00E+00	0.00E+00	1.16E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Additional information

Overall, the results for the entire life cycle indicate that the use phase (B7) related to operational water use is by far the most significant contributor to the environmental impacts of this product. It illustrates the importance of the use phase in reducing environmental impacts associated with sanitary fitting products. Design of energy-efficient products, choice of renewable energy sources during the use phase as well as appropriate user behaviour can play a significant role in this regard. Studies have shown that up to 40% energy savings can be realized through energy-efficient taps and showers (Dodoo et al. 2017; Folkeson et al., 2017).

Operational water use scenario

For this product, the scenario for operational water use has been modelled based on average performance parameters for shower mixers derived from a study by Cordella M. et al. (2014), on different sanitary products within the EU and information from the European Water Label (EWL, 2022). The parameters used to estimate the water use for the shower mixer as well as the energy mix for water heating are given in the tables below. Based on the given parameters and assumptions, the annual average water consumption for this product is 20 440 liters per person. About 90% of this is assumed to be hot water use and the corresponding annual energy use to heat the water is estimated to 482 kWh. Note that the corresponding climate impact in B7, 3000 kg CO_2-eq for 16 years of use by one person also includes water production and distribution, and waste water treatment.

Parameters for operational water use modelling for shower mixers, FM Mattsson 9000XE		
Parameter	**Value**	**Unit**
Reference flow	8	l/minute
Use cycles	1	cycles/person/day
Duration of use cycle	7	Minute
Share of hot water use	90	%
Cold water inlet temperature	15	ºC
Outlet mixed water temperature	38	ºC
Specific heat capacity of water	4.18	kJ/(kg·K)
Density of water	0.981	kg/l
Reference service life	16	years

The energy mix for the operational water use scenario is modelled based on data for different fuel mixes for water heating in EU households for 2020 (Eurostat, 2022). In 2020, 15% of the total final energy use in the EU was for water heating in the residential sector.

Energy mix for operational water heating modelling	
Energy source	**Share, %**
Solid fossil fuels and peat	8.97
Natural gas	22.18
Oil and petroleum products	16.78
Renewables and biofuels	11.84
Electricity	13.79
Heat	26.44
Total	**100**
Corresponding GWP	346 g CO_2-eq/kWh

Differences versus previous versions

This is the first version of the EPD so there are no differences versus previous versions of the EPD.

References

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SimaPro. SimaPro LCA Package, Pré Consultants, the Netherlands, www.pre-sustainability.com

www.environdec.com

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