Environmental Product Declaration

EPD of multiple products, based on worst-case results in accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

KaDius

from

Kampmann GmbH & Co. KG

Programme:	The International EPD® System, www.environdec.com
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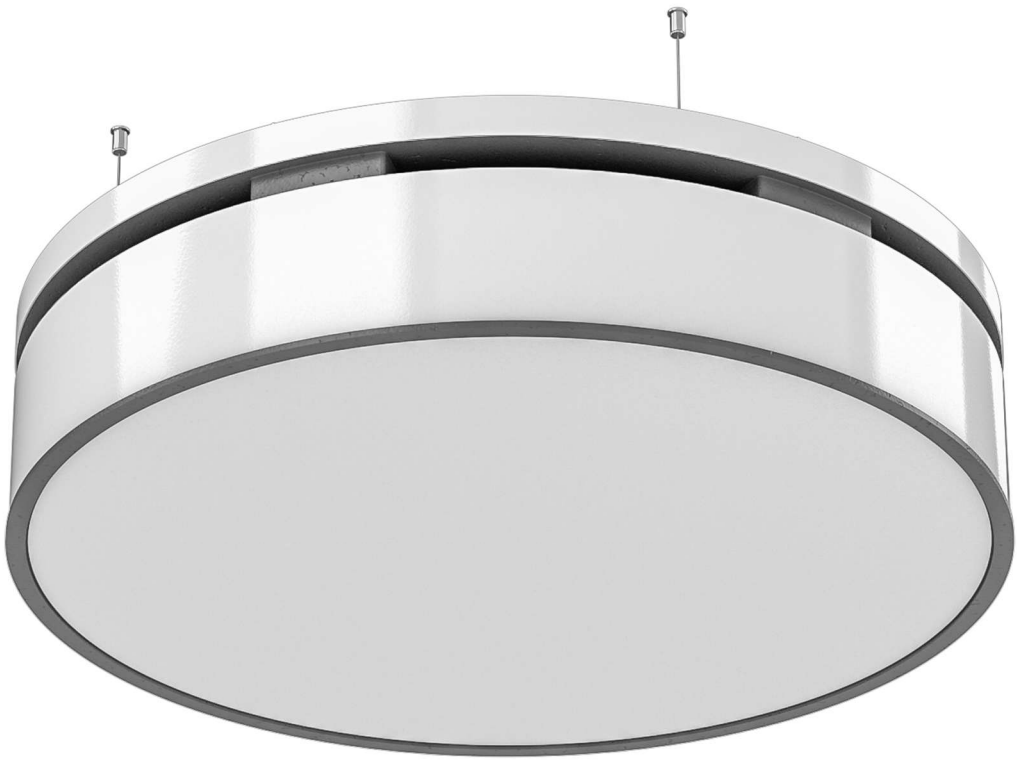


General information

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:	support@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 Construction products, version 1.3.4 and c-PCR-027 Fan coils (c-PCR to PCR 2019:14)
PCR review was conducted by: The Technical Committee of the International EPD® System. Review chair: Claudia A. Peña, University of Concepción, Chile c-PCR review was conducted by: Gorka Benito Alonso
Life Cycle Assessment (LCA)
LCA accountability: Imke Klompmaker, Kampmann GmbH & Co. KG, +49 591 7108-279, imke.klompmaker@kampmann.de
Verification
External and independent ('third-party') verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification through an individual EPD verification Third-party verifier: Hüdai Kara PhD, Metsims Sustainability Consulting, Oxford, U.K. 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 published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison.

Company information

Owner of the EPD: Kampmann GmbH & Co. KG, Friedrich-Ebert-Str. 128-130, 49811 Lingen (Ems)

Contact: Imke Klompmaker, imke.klompmaker@kampmann.de, +49 591 7108-279

Description of the organisation: Kampmann GmbH & Co. KG develops, produces and sells high-quality, customised systems for heating, cooling and ventilating buildings. Kampmann has set itself the goal of creating a feel-good climate in cooperation with its customers and partners. For this reason, the company's employees work for a good climate, for innovations, for sustainability and for cooperation with customers and partners in a spirit of partnership. In terms of sustainability, the goal for our products is to operate as efficient as possible, have a long service life, be versatile and be made of recyclable materials.

The company's main site is located in Lingen (Germany). There is an additional production site in Łęczyca (Poland). The product groups include trench units, fan coils, unit heaters, door air curtains, decentralised ventilation units and air diffusers. The areas of application are, for example, office buildings, commercial and industrial buildings, hotels, retail chains, sales buildings and multi-functional halls.

Product-related or management system-related certifications: The company is certified according to DIN EN 9001 and DIN EN ISO 50001.

Location of production site: 49811 Lingen (Ems), Germany

Product information

Product name: KaDius

Product identification: Hydronic fan coil units (FCU) are defined as factory-made single assemblies which provide the functions of cooling and/or heating but do not include the source of cooling or heating (EN 1397:2022).

Product description: The fan coil KaDius is a designer suspended ceiling unit for ideal indoor climate control in new and existing buildings. The device is ideal for efficient heating and cooling, particularly in rooms with open ceilings and high design requirements. The KaDius offers a wide range of design options, making the integration of the device into design concepts for the room very flexible.

Thanks to the innovative design, all necessary accessory components can be installed in the appliance. The protected design allows installation particularly close to the ceiling with a closed underside. The horizontal 360° discharge behaviour ensures uniform air movement. In order to safely discharge the condensate produced, the units are equipped with a condensate tray and a condensate pump. The use of expanded polypropylene (EPP) ensures an optimum air flow and it is a sustainable material as it is 100% recyclable.

UN CPC code: 43912 (Air-conditioning machines)

Technical data: The product KaDius can be configured based on customer demand with different casing and control options and can operate in different voltages. The environmental performance of different configurations were investigated and the results of this study are provided for the partially cased option. Technical data is shown in the table below.

Temperature conditions in cooling mode:

- Liquid inlet temperature: 7°C
- Liquid outlet temperature: 12°C
- Air dry bulb temperature: 27°C

Temperature conditions in heating mode – 2-pipe units:

- Liquid inlet temperature: 45°C
- Liquid outlet temperature: 40°C
- Air dry bulb temperature: 20°C

KaDius			
Speed	Low (2V)	Med (6V)	High (10V)
Air flow [m³/h]	282	578	896
Total cooling capacity [kW]	2,142	3,957	5,691
Total heating capacity [kW]	2,134	4,021	5,801
Electrical power input [W]	7	19	55
Dimensions [mm]	852 x 852 x 224		

This EPD follows additional requirements for construction products considered as Electronic and Electrical equipments.

Geographical scope: Global

LCA information

Functional unit: The functional unit is 1 kWh of thermal energy exchanged with the air of the room in cooling and/or heating mode by a heating/cooling equipment using small scale HVAC as defined in CPC 43912 and HS 8415.83 and, specifically, using an Hydronic Fan Coil Unit as defined into EN1397. The environmental impacts are given per functional unit.

Reference service life: The reference service life is considered to be 20 years.

Time representativeness: The data used for the LCA study concerns the year 2023.

Database(s) and LCA software used: For all LCA modelling and calculation, Ecoinvent - allocation, cut-off by classification database (v3.10) and SimaPro (v9.6) LCA software were used. Characterization factors of EN 15804 reference package based on EF 3.1 are utilized.

Description of system boundaries: Cradle to grave and module D (A + B + C + D).

A1 – Raw material supply

This stage includes raw materials extraction and pre-treatment processes before production. Main materials used in the product are steel, aluminium, copper and various types of plastics. Environmental impacts of these materials are considered in this stage.

A2 – Transport

This stage is relevant for the delivery of raw materials to the production plant and within the plant. Highway transport is the dominant mean of transport at this stage. Transport routes and distances are supplier-specific and provided by the manufacturer.

A3 – Manufacturing

The following production steps are included: production of the required sheet metal parts in the sheet metal prefabrication, final assembly of the sheet metal parts and the other components of the product, testing of products according to the quality management system ISO 9001 and packing of the products for the final shipment.

A4 – Transport

This stage is relevant for the delivery of final product to the intended markets and customers. Highway, seaway and airway transportation are involved in this stage. The transport routes and distances are supplier-specific and provided by the manufacturer.

A5 – Construction installation

The product is suspended from the ceiling using threaded pins and wire ropes. For the installation, four threaded pins and four wire ropes are used. The construction is fixed by a screwdriver. There is no energy used.

B1 – Use

There is no release of substances by the product, thus there are no environmental impacts which result from the use of the product.

B2 – Maintenance

The recommended maintenance cycle for the product is cleaning it two times per year. During the cleaning, the product is vacuum cleaned (approximately 2 minutes per product). Per year, this results in 4 minutes of cleaning with a vacuum cleaner. In addition, common cleaning agent of approximately 10 ml (0.01 l) is used per product per year. Thus, the impact of vacuuming and cleaning agent use are considered, and their impacts are represented by the functional unit.

B3 – Repair

The only repair of the product, which can be necessary during the life cycle, is the repairing of minor optical damages with a bit of paint. The material use for the repairing is approximately 30 ml of paint in 5 years, which results in 6 ml (0.006 l) per year.

B4 – Replacement

The fan and valves have to be replaced every 10 years and the PCB every 15 years. Thus, these impacts based on the material level are analysed and represented by the functional unit.

B5 – Refurbishment

There is no refurbishment necessary during the life cycle of the product.

B6 – Operational energy use

Considering the optimum working conditions of the product for heating demands and product's service life (20 years), product's energy use is determined. German market grid mix is considered (Electricity, medium voltage {DE}| market for electricity, medium voltage; 0.421 kg CO_2 eq./kWh). Thus, energy use-related impacts are represented by the functional unit. Annually, 1500 heating hours in 70% low speed, 25% medium speed and 5% high speed and 1100 cooling hours in 65% low speed, 30% medium speed and 5% high speed are considered.

B7 – Operational water use

There is no use of water during the life cycle of the product.

C1 – De-construction demolition

This stage includes the impacts during the dismantling of the product from the building. It is assumed that no energy and additional material are needed for the dismantling of the product.

C2 – Transport

This stage includes the transportation of discarded products to the waste processing/disposal area. 50 km distance by trucks is assumed.

C3 – Waste processing

According to the JRC report, Annex C V.2.1, end-of-life coefficients for plastics and metals are determined. Metals are mostly assumed recycled after accounting the losses. According to the type of plastic materials, their end-of-life fate is determined and modelled.

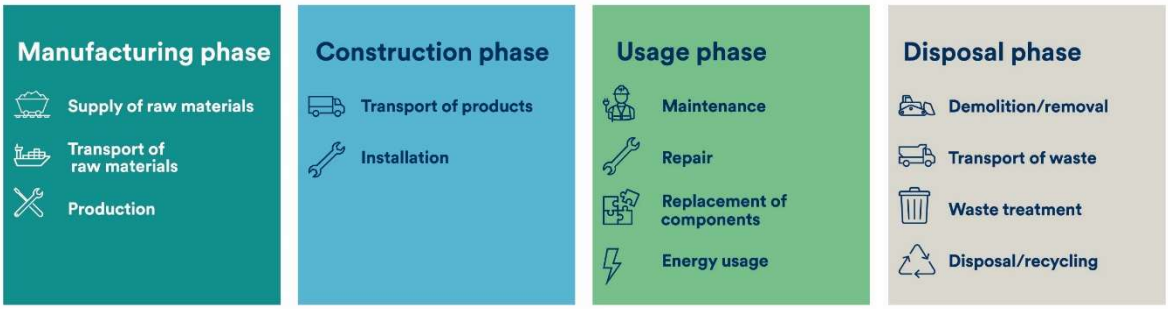
C4 – Disposal

Impact of any material that do not go to recycling scheme are included at this stage.

D – Reuse-Recovery-Recycling-potential

Metals that are recycled are assumed to substitute the use of virgin metals. In addition, the benefits of heat recovery from the incineration of plastics are included.

System diagram:



Cut-off rules: The criteria for exclusion were set so that individual input flows less than 1% of the total, with a cumulative limit of less than 5%, could be omitted. This was contingent upon confirming that these excluded flows did not significantly alter the reported data, with "significant" defined as affecting the total by less than 5%.

REACH-regulation: No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

LCA modelling, calculation and data quality: The results of the LCA with the indicators as per EPD requirements are given in the LCA result tables. All energy calculations were obtained using Cumulative Energy Demand (LHV) methodology, while freshwater use is calculated with selected inventory flows in SimaPro according to the PCR. There are no co-product allocations within the LCA study underlying this EPD. The regional energy datasets were used for all energy calculations. For use phase energy calculations, environmental impacts are calculated for one year of operation and German market grid mix is used.

Source of electricity: The modelled electricity data for the manufacturing of the product is taken from Ecoinvent 3.10 database which has a carbon intensity of 0.804 kg CO2 eq. / kWh for medium voltage residual mix electricity production in Germany. The selected electricity data consists of 60.88% electricity production from hard coal, 25.49% natural gas, 12.00% nuclear, 1.60% oil and around 0.30% from various other sources.

Allocation rules: Energy consumption and raw material transportation were weighted according to 2023 production figures. In addition, hazardous and non-hazardous waste amounts were also allocated from the total waste generation in 2023. For end of life allocation, Annex C version 2.1 (May 2020) of JRC report is utilized to determine the final fate (recycling, landfilling, incineration etc.) of materials and their percentages.

Assumptions: Upstream and downstream road transportation are assumed to be carried out with EURO6 motor vehicles with a size class of > 32 metric tonnes where distances acquired through Google Maps. In addition, 50 km distance for the waste transport at C2 stage is assumed.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	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	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	GLO	GLO	DE	GLO	GLO	DE	DE	DE	DE	DE	DE	DE	GLO	GLO	GLO	GLO	GLO
Specific data used	10.6%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	-19.2%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%					-	-	-	-	-	-	-	-	-	-	-	-

(X = Module included, DE = Germany, GLO = Global)

Content information (referred to 1 unit of KaDius)

Material	Weight, kg	Post-consumer recycled material, weight-% of product	Biogenic material, weight-% of product	Biogenic material, kg C / product
Steel	13.0	9.8	0	0
Expanded Polypropylene (EPP)	3.2	0	0	0
Aluminium	2.9	0	0	0
Copper	2.5	0	0	0
Stainless steel	2.1	0	0	0
Polyamide (PA)	0.8	0	0	0
Brass	0.7	0	0	0
Polypropylene (PP)	0.4	0	0	0
Printed circuit board (PCB)	0.2	0	0	0
Polyvinylchloride (PVC)	0.2	0	0	0
Others (ferrite, PE, EPDM, neodymium, adhesive, PUR)	0.4	0	0	0
Total	**26.4**	**9.8**	**0**	**0**

Packaging material	Weight, kg	Weight-% (versus the product)	Biogenic material, kg C / product
Core board	2.5	9.5	0.2
Total	**2.5**	**9.5**	**0.2**

Results of the environmental performance indicators

Mandatory impact category indicators according to EN 15804+A2

Results per 1 kWh of thermal energy exchanged with the air of the room in cooling and/or heating mode

Indicator	Unit	A1-A3	A4	A5	B2	B3	B4	B6	C1	C2	C3	C4	D
GWP - fossil	kg CO_2 eq.	9.16E-04	1.91E-05	9.54E-06	7.94E-06	3.27E-06	1.48E-04	1.87E-03	0.00E+00	9.31E-07	3.52E-05	1.99E-06	-2.81E-04
GWP - biogenic	kg CO_2 eq.	-4.95E-06	0.00E+00	4.95E-06	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
GWP - luluc	kg CO_2 eq.	4.35E-06	3.64E-09	2.29E-08	3.54E-07	6.52E-07	2.60E-07	3.87E-06	0.00E+00	3.30E-10	1.26E-10	1.67E-10	-2.48E-06
GWP - total	kg CO_2 eq.	9.16E-04	1.91E-05	1.45E-05	8.29E-06	3.93E-06	1.48E-04	1.88E-03	0.00E+00	9.32E-07	3.52E-05	1.99E-06	-2.83E-04
ODP	kg CFC-11 eq.	1.59E-11	3.37E-13	7.72E-14	1.46E-13	7.04E-14	4.39E-12	1.95E-11	0.00E+00	1.94E-14	9.62E-15	1.53E-14	-3.31E-12
AP	mol H^+ eq.	1.53E-05	7.32E-08	3.48E-07	3.79E-08	5.44E-08	1.64E-06	3.87E-06	0.00E+00	2.20E-09	5.27E-09	3.27E-09	-2.39E-06
EP - freshwater	kg P eq.	9.45E-08	8.38E-11	1.79E-09	8.10E-10	2.17E-10	1.84E-08	2.71E-07	0.00E+00	7.52E-12	7.12E-12	5.39E-12	-1.62E-08
EP - marine	kg N eq.	2.17E-06	2.55E-08	2.11E-08	1.05E-08	7.63E-09	1.91E-07	7.69E-07	0.00E+00	5.65E-10	2.43E-09	1.87E-09	-2.32E-07
EP - terrestrial	mol N eq.	1.52E-05	2.80E-07	2.88E-07	8.18E-08	3.47E-08	2.29E-06	8.94E-06	0.00E+00	6.24E-09	2.61E-08	1.41E-08	-2.81E-06
POCP	kg NMVOC eq.	5.29E-06	1.04E-07	8.32E-08	2.50E-08	1.65E-08	8.43E-07	2.87E-06	0.00E+00	3.82E-09	6.65E-09	5.59E-09	-1.04E-06
ADPE*	kg Sb eq.	1.86E-07	2.48E-11	4.59E-09	5.84E-11	2.59E-11	3.63E-08	3.62E-09	0.00E+00	2.60E-12	1.40E-12	1.16E-12	-1.64E-08
ADPF*	MJ	1.31E-02	2.67E-04	1.07E-04	1.27E-04	4.75E-05	1.99E-03	2.97E-02	0.00E+00	1.40E-05	4.58E-06	1.16E-05	-3.63E-03
WDP*	m^3 depriv.	3.36E-05	7.72E-07	7.47E-06	4.49E-06	2.67E-06	5.04E-05	8.28E-05	0.00E+00	6.66E-08	1.78E-07	8.40E-08	-3.65E-05
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; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = 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.*

Stages B1, B5 and B7 are omitted for clarity as they do not lead to environmental impacts (see system boundaries).

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. The results of this EPD should not be used without the consideration of module C.

Additional mandatory and voluntary impact category indicators

Results per 1 kWh of thermal energy exchanged with the air of the room in cooling and/or heating mode

Indicator	Unit	A1-A3	A4	A5	B2	B3	B4	B6	C1	C2	C3	C4	D
GWP-GHG[1]	kg CO_2 eq.	9.24E-04	1.91E-05	9.58E-06	8.33E-06	3.94E-06	1.48E-04	1.89E-03	0.00E+00	9.34E-07	3.52E-05	2.15E-06	-2.84E-04
PM	disease inc.	7.00E-11	8.92E-13	1.09E-12	3.56E-13	2.67E-13	9.47E-12	1.64E-11	0.00E+00	9.04E-14	2.51E-14	7.44E-14	-1.98E-11
IR**	kBq U-235 eq.	8.28E-04	6.93E-08	3.10E-07	3.07E-07	8.68E-08	6.19E-06	1.09E-04	0.00E+00	6.16E-09	6.58E-09	1.03E-08	-1.13E-05
ETP – FW	CTUe	2.91E-02	3.83E-05	7.33E-04	7.83E-05	2.39E-04	4.16E-03	6.53E-03	0.00E+00	3.31E-06	8.77E-05	6.23E-04	-1.30E-02
HTP -C*	CTUh	3.03E-11	6.27E-14	9.80E-13	3.11E-14	1.39E-14	3.63E-12	3.20E-12	0.00E+00	5.96E-15	4.77E-15	4.38E-15	-4.52E-11
HTP – NC*	CTUh	1.38E-10	1.87E-13	3.56E-12	7.35E-14	4.79E-14	1.20E-11	1.15E-11	0.00E+00	8.97E-15	4.27E-14	7.73E-14	-1.81E-11
SQP*	Pt	7.68E-03	1.31E-04	1.23E-04	8.15E-05	6.24E-05	8.60E-04	4.94E-03	0.00E+00	1.41E-05	1.33E-06	2.52E-05	-8.14E-04
Acronyms	PM = Respiratory inorganics - particulate matter, IR = Ionising radiation, ETP-FW = Ecotoxicity freshwater, HTP-C = Cancer human health effects, HTP-NC = Non-cancer human health effects, SQP = Land use related impacts, soil quality												

*** Disclaimer: 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.*

Stages B1, B5 and B7 are omitted for clarity as they do not lead to environmental impacts (see system boundaries).

Resource use indicators

Results per 1 kWh of thermal energy exchanged with the air of the room in cooling and/or heating mode

Indicator	Unit	A1-A3	A4	A5	B2	B3	B4	B6	C1	C2	C3	C4	D
PERE	MJ	2.19E-03	2.34E-06	2.02E-05	3.58E-05	1.17E-05	2.40E-04	7.12E-03	0.00E+00	2.16E-07	3.36E-07	4.85E-07	-7.40E-04
PERM	MJ	2.08E-04	0.00E+00	-2.08E-04	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	2.40E-03	2.34E-06	-1.88E-04	3.58E-05	1.17E-05	2.40E-04	7.12E-03	0.00E+00	2.16E-07	3.36E-07	4.85E-07	-7.40E-04
PENRE	MJ	1.31E-02	2.67E-04	1.07E-04	1.27E-04	4.75E-05	1.99E-03	2.97E-02	0.00E+00	1.40E-05	4.58E-06	1.16E-05	-3.63E-03

[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.

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	0.00E+00	0.00E+00
PENRT	MJ	1.31E-02	2.67E-04	1.07E-04	1.27E-04	4.75E-05	1.99E-03	2.97E-02	0.00E+00	1.40E-05	4.58E-06	1.16E-05	-3.63E-03
SM	kg	1.76E-05	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	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	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	0.00E+00	0.00E+00
FW	m^3	4.83E-05	7.73E-07	7.64E-06	4.46E-06	2.57E-06	5.10E-05	8.16E-05	0.00E+00	6.66E-08	1.59E-07	1.27E-07	-3.77E-05
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												

Stages B1, B5 and B7 are omitted for clarity as they do not lead to environmental impacts (see system boundaries).

Waste indicators

Results per 1 kWh of thermal energy exchanged with the air of the room in cooling and/or heating mode

Indicator	Unit	A1-A3	A4	A5	B2	B3	B4	B6	C1	C2	C3	C4	D
HWD	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	0.00E+00	0.00E+00
NHWD	kg	1.23E-05	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	0.00E+00
RWD	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	0.00E+00	0.00E+00
Acronyms	HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed												

Stages B1, B5 and B7 are omitted for clarity as they do not lead to environmental impacts (see system boundaries).

Output flow indicators

Results per 1 kWh of thermal energy exchanged with the air of the room in cooling and/or heating mode

Indicator	Unit	A1-A3	A4	A5	B2	B3	B4	B6	C1	C2	C3	C4	D
CRU	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	0.00E+00	0.00E+00
MFR	kg	3.10E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-04	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	1.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-05	0.00E+00	0.00E+00

EE (Electric)	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	0.00E+00	9.62E-06
EE (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	0.00E+00	2.57E-04
Acronyms	CRU = Components for reuse, MFR = Material for recycling, MER = Materials for energy recovery, EE (Electric) = Exported energy electrical, EE (Thermal) = Exported energy thermal												

Stages B1, B5 and B7 are omitted for clarity as they do not lead to environmental impacts (see system boundaries).

Additional information

Thermal/Electrical Energy Calculation

The total thermal energy provided/to subtracted from the air of the room and the total electrical energy consumption along fan coil lifetime has been calculated by the following formula, according to c-PCR 027 Fan coils (based on Technical Certification Rules Of The Eurovent Certified Performance Mark – Fan Coil Unit – Rev 00 2021):

Total Thermal Energy (kWh) = Cooling Energy + Heating Energy

where:

$$Cooling\ energy = (5\%\ P\ (c)_{high} + 30\%\ P\ (c)_{med} + 65\%\ P\ (c)_{low}) * h_{cooling} * Lifetime$$

$$Heating\ energy = (5\%\ P\ (h)_{high} + 25\%\ P\ (h)_{med} + 70\%\ P\ (h)_{low}) * h_{heating} * Lifetime$$

Total Electrical Consumption (kWh) = Electricity use for cooling + Electricity use for heating + Stand-by electricity use

where:

$$Electricity\ use\ for\ cooling = (5\%\ P\ (c)_{high} + 30\%\ P\ (c)_{med} + 65\%\ P\ (c)_{low}) * h_{cooling} * Lifetime$$

$$Electricity\ use\ for\ heating = (5\%\ P\ (h)_{high} + 25\%\ P\ (h)_{med} + 70\%\ P\ (h)_{low}) * h_{heating} * Lifetime$$

$$Stand\text{-}by\ electricity\ use = P_{stby} * h_{stby} * Lifetime$$

- *$P\ (c)_{high}$ / $P\ (c)_{med}$ / $P\ (c)_{low}$ = Total cooling capacity (kW) at high/medium/low speed in cooling mode at standard rating conditions, according to EN 1397*
- *$P\ (h)_{high}$ / $P\ (h)_{med}$ / $P\ (h)_{low}$ = Total heating capacity (kW) at high/medium/low speed in heating mode at standard rating conditions, according to EN 1397*
- *$Pe\ (h)_{high}$ / $Pe\ (h)_{med}$ / $Pe\ (h)_{low}$ = Total electrical power input (kW) at high/medium/low speed in heating mode according to EN 1397*
- *$Pe\ (c)_{high}$ / $Pe\ (c)_{med}$ / $Pe\ (c)_{low}$ = Total electrical power input (kW) at high/medium/low speed in cooling mode according to EN 1397*
- *P_{stby} = Stand-by electrical power input (kW) of the unit in stand-by mode*
- *$h_{cooling}$ and $h_{heating}$ are the yearly operational hours in cooling and heating mode, with $h_{cooling}$ + $h_{heating}$ = 2600 h. For a module B with Global or European geographical scope, 1100 h in cooling and 1500 h in heating shall be used. For calculation valid only for specific a region, a different distribution between cooling and heating hours can be used, provided that the total yearly operating hours are 2600 h. Such assumption shall be clearly declared, and the module B scope cannot be Global or European.*
- *h_{stby} is the yearly operational hour in stand-by mode = 6160 h (8760 h - 2600 h)*
- *Lifetime= 20 years*

Stand-by electricity consumption is set to 0.

The following table shows the Total Thermal Energy and the Total Electrical consumption:

Total Thermal Energy (kWh)	Total Electrical Consumption (kWh)
146,680	658

Version history

This EPD declaration differs from the previous version mainly due to: adaptation to the newly published c-PCR 027 Fan coils. This includes:

- Adaptation of the functional unit
- Adaptation of the total electricity use in the use phase
- Textual additions

References

ISO 9001:2015/ Quality Management Systems

ISO 50001:2018/ Energy Management Systems

General Programme Instructions of the International EPD® System. Version 5.0.0

ISO 14020:2000/ Environmental Labels and Declarations — General principles

EN 15804:2012+A2:2019/AC:2021 Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products

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

ISO 14040/44/ DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO14040:2006) and Requirements and guidelines (ISO 14044:2006)

PCR for Construction Products and Construction Services/ Prepared by IVL Swedish Environmental Research Institute, Swedish environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, 2019:14 Version 1.3.4

c-PCR-027 Fan coils (c-PCR to PCR 2019:14) (2025-04-23)

The International EPD® System/ The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD®s as well as keeping a library of EPD®s and PCRs in accordance with ISO 14025. www.environdec.com

Ecoinvent / Ecoinvent Centre, www.ecoinvent.org

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

www.kampmanngroup.com/

European Commission, JRC report, Annex C version 2.1, May 2020

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