epd-norway
Global Program Operator

Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A2:2019 for:

Meter Connectivity Module CMi6110-G2

from

ELVACO AB

Programme:	The Norwegian EPD Foundation. https://www.epd-norge.no/
Programme operator:	The Norwegian EPD Foundation
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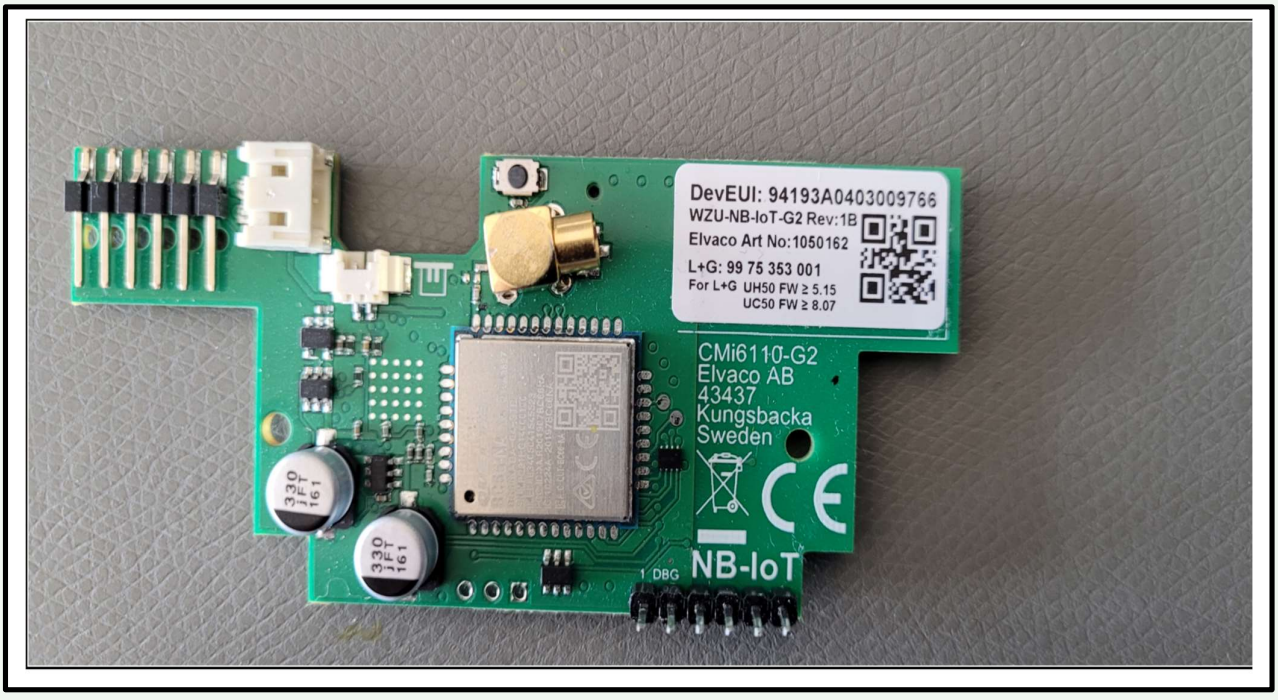
An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at https://www.epd-norge.no/



1. General information

1.1 Programme information

Programme:	The Norwegian EPD Foundation
Address:	PO Box 5250 Majorstuen N-0303 Oslo Norway
Website:	https://www.epd-norge.no/
E-mail:	post@epd-norge.no

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): ELECTRONIC AND ELECTRICAL PRODUCTS AND SYSTEMS – METERS. PCR EPDItaly011. PCR EPDItaly007: Electronic and Electrical Products and Systems
PCR review was conducted by: EPDItaly - info@epditaly.it Moderator - Stefano Rossi, Life Cycle Engineering. PCR Committee: Bticino S.p.A., CESI S.p.A., ECAMRICERT, Take Care International, ENEL S.p.A.
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier: Silvia Vilčeková silcertsro@gmail.com Approved by: The Norwegian EPD Foundation
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No
LCA and EPD Practitioner Company: EANDO AB https://eando.se/ Author of the reports: Mr. Amit Lotan Amit.lotan@eando.se

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

1.2 Company information

Owner of the EPD: Elvaco

Contact: Tobias Unbeck. Email: Tobias.unbeck@elvaco.se

Elvaco, Kabelgatan 2T, 434 37 Kungsbacka, Sweden

Description of the organisation: Elvaco provides open end-to-end solutions for utility metering, aiming to support their customers to develop their sustainable business. They are specialized in energy connectivity and infrastructure, from meters and sensors to cloud-based systems and services.

Product-related or management system-related certifications ISO 9001 and 14001 certificates

Name and location of production sites: Production of electronic components in China, Assembly of the product in Poland

1.3 Product information

Product name: CMi6110

Product identification: CMi6110 is a Meter Connectivity Module to be mounted inside Landis+Gyr UH50/UC50 meters.

Product description:

CMi6110 is a Meter Connectivity Module to be mounted inside Landis+Gyr UH50/UC50 meters. As soon as the device has been mounted and deployed it will start to deliver meter data to a receiving system via a NB-IoT network. The product is easily configured through Elvaco OTC mobile app or via DM-system, has several different message formats and is ideal for applications where long range is required. Meter data delivery and device management utilizes standard protocols, such as MQTT-SN and LWM2M for easy integration to existing systems.

Technical functions:

- Nominal voltage: 3V DC
- Current consumption (max): 400 mA
- Current consumption (sleep mode): 6 uA

Service life time: 10 Years

UN CPC code: 4621 “Electricity distribution or control apparatus”

Registration Number: 1050162

2. LCA information

2.1 **Functional unit declared unit:** 1 Unit - CMi6110

2.2 **Reference service life:** 10 Years

2.3 **Time representativeness:** Year covered by the data used for the LCA calculation: 01/2021 – 12/2021

2.4 **Database(s) and LCA software used:** GaBi software system and database for life cycle engineering - Version 10.6.2.9. Sphera solutions GmbH. an integrated Ecoinvent database 3.7.0. In addition, Extension Database 6, Electronics 2022

2.5 **Description of system boundaries:**

Figure 1- system Boundaries

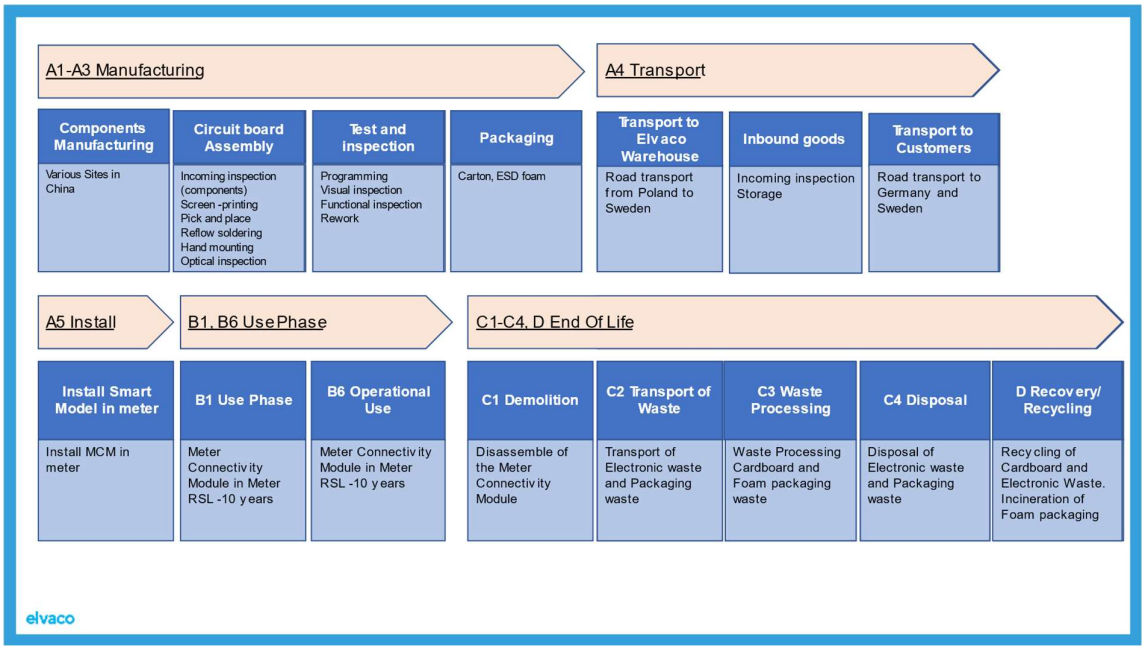


Table 1 - Modules declared.

	Product stage			Installation process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Demolition	Transport	Waste processing	Disposal	Recovery-Recycling
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

2.6 **Product-Specific EPD:**

This EPD is a product specific EPD. The declaration is for the Meter Connectivity Module CMi6110 manufactured by Elvaco AB.

2.7 **Application:**
The product covered in this declaration is an integral part to be mounted inside a Landis+Gyr UH50/UC50 meters. Which is then being fixed in Infrastructure and construction.

2.8 **Declaration of Methodological Framework:**
In this project, a full LCA approach was considered with some simplification on data modeling using generic data for most background systems. The EPD analysis uses a cradle-to-grave system boundary. No known flows are deliberately excluded from this EPD.
To calculate the LCA results for the product maintenance stage, a 10-year reference service life (RSL) was assumed for the declared product.

2.9 **Material Composition:**
The main raw materials of the CMi6110 device include PCB board, electronic components, solder wire, packaging etc. The type and ratio of raw materials per CMi6110 are listed in Table 2 below.

2.10 **Placing on the Market / Application Rules:**
According to Elvaco, the CMi6110 is installed and consumed mainly in Sweden.

2.11 **Manufacturing:**
The manufacturing process of the CMi6110 is shown in Figure 1. For simplification purpose, only the main stages of manufacturing are presented. Processes that are considered in the LCA but not shown in the flow chart include:
• Raw and auxiliary material production and transportation
• Recycling of waste materials
• Wastewater and off-gas treatment
• Water recycling and reuse system
• Supply of natural gas/water/electricity

2.12 **Packaging:**
The device has two packaging layers, the inner ESD foam packaging, cardboard, and the outer pallet packaging - wrap belt and wood or plastic pallet.

2.13 **Transportation:**
Most of the modules are installed in meters on the Swedish market. Road and oceanic transportation distance for product delivery was estimated with reference from information provided by the company.

2.14 **Product Installation:**
For installation, only a few tools such as gloves, scissors, and screwdriver are necessary. As such tools are reusable, the production and disposal stage of any tools was omitted from the LCA study. It was estimated based on previous experience that 0.003 kWh electricity will be consumed for the installation of one device.

2.15 **Use and Maintenance:**
After installation, very little effort is required to use and maintain the Meter Connectivity Module. Energy consumption during the use stage was calculated to be 0.013 kWh per device.
No repair, replacement or refurbishment was assumed necessary during the 10-year service life.
2.16 **Reuse, Recycling, Energy Recovery and Disposal:**

The majority of the CMi6110 modules are consumed in Sweden. For the LCA study, the disposal of the used products adopted a country- and region-based weighted average disposal mode following literature review and Ecoinvent database. End-of life disposal treatment process (C4) from Ecoinvent was used in this LCA study. The waste scenario assumed 100 km of road transportation (C2) from an installation site to an MSW treatment site. De-installation (C1) of the meter and dismantling of the CMI6110 (C3) during the disposal stage was considered using generic data from Ecoinvent for electronic product dismantling.

2.17 **Estimates and Assumptions:**

The key assumptions of this LCA study are as follows:

- Transportation of raw materials, components and other equipment or auxiliary materials to produce the CMi6110 was assumed to be 1000 km within China.
- Transportation vehicles in China were assumed to be Euro 4 truck and in Europe Euro 6. A sensitivity analysis was conducted.
- The input and output data during the installation of the device was based on experience, which represents the average installation of a CMi6110 according to information from the manufacturer. It was assumed that regardless of meter, the installation of the CMI6110 will use the same amount of structural, electronic, and mechanical equipment.
-It was assumed that the annual operation and maintenance (OM) will consume the same amount of energy and material during the 10 years' service life of the device.
- For the waste scenario, the study assumed a moderate distance of 100 km for the road transportation (C2) required from an installation site to an MSW treatment site.
- Waste-to-energy was not considered in this modeling.
- Production will generate 1% scrap and the scrap follows the same end-of-life disposal scenario as the dismantled product at end-of-life stage.

2.18 **Cut-off Criteria:**

The following procedures were followed for the exclusion of inputs and outputs:

- All inputs and outputs to a (unit) process were included in the calculation where data was available. Data gaps were filled by conservative assumptions with average or generic data. Any assumptions for such choices were documented.
- In case of insufficient input data or data gaps for a unit process, according to the PCR EPDItaly007, the cut-off criteria chosen is 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process. The total neglected input flows of the cradle to grave stage, e.g., per module A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and module D shall be a maximum of 5% of energy usage and mass. In this study, the neglected flow is demonstrated in the table 3 below

Table 2 – Cut-off flows

FLOW NAME	PROCESS STAGE	REASON FOR CUT-OFF	TOTAL MASS %
PACKAGING MATERIAL FOR RAW MATERIAL	RAW MATERIAL A1	USED REPEATEDLY BY THE SUPPLIERS OR RECYCLED (CUT OFF FROM SYSTEM BOUNDARY)	<0.1%
RAW MATERIALS (BOM): TRACE ELEMENTS	RAW MATERIAL A1	ALL MATERIALS FROM THE BOM IS INCLUDED IN THE MODEL EXEPT MINOR COMPONENTS BT WEIGHT THAT WERE NOT EXIST AT THE ELECTRONIC EXTENSION DATABASE	<1%
TRANSPORTATION AND STORAGE WITHIN THE PLANT	MANUFACTURING A3	CONSUMPTION<0.1%	<0.1%
INSPECTION DURING MAINTENANCE OF METER	MAINTENANCE B2	NOT ROUTINE OPERATION	<0.1%

PACKAGING MATERIAL FOR WASTE TRANSPOR	WASTE DISPOSAL C4	ASSUMED TO BE 0	<0.1%
Total			**<1%**

2.19 **Data Sources:**

In the study, the key parameters for producer-specific foreground data are based on yearly production amounts and extrapolations of measurements on specific machines and plants. The specific production data refers to an average of 12 months from Jan 2021 to Dec 2022. The input data of raw materials and transportation refers to an average of production scenario using data from bill of material (BOM) sheet. As for the data for installation of the device, operation, maintenance and disposal, scenarios based on representative data and situation were developed. Most of the necessary life cycle inventories for the basic materials are available in the GaBi database using generic data.
The last update of the database was in 2022 with the version GaBi 10.6.2.9 is the main source for generic data for this study.

2.20 **Data Quality:**

The data quality requirements for this study were as follows:
- The LCI data related to the geographical locations where the processes took place, e.g., electricity and transportation data from China, disposal data in the Europe, and etc. were utilized.
- The scenarios represented the average technologies at the time of data collection.

2.21 **Allocation:**

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

2.22 **Comparability:**

No comparisons are included in this EPD. LCA results across EPDs can be calculated with different databases, modeling assumptions, geographic scope and time periods, all of which are valid and acceptable according to the Product Category Rules (PCR) and ISO standards. The user of the EPD should take care when comparing EPDs from different companies. Assumptions, data sources, and assessment tools may all impact the uncertainty of the results and make comparisons misleading.

2.23 **Life Cycle Scenarios:**

The following information describe two different scenarios in the different modules of the EPD.

1. The CMi6110 is transported from the production site in Poland to Sweden, from where 45% of the products are transported to Germany. The first scenario is changing the route and directly transport those 45% from Poland to Germany.
   The distance in km is has been altered from 2237 km to 955 km in this scenario.

2. The ESD foam packaging goes in the EOL to incineration and therefore a scenario of cutting down this package by 50% as conducted. Instead of 1.02 gr of foam for every unit a review on 0.51 gr per unit has been entered into the model.

3. Content information

Table 3 - List of components for the manufacturing of oneCMi6110

Product components	Weight, g	Weight-% (versus the product)
PCB	8.3	58.00
Connector	2.13	14.88
NB-IoT modem	1.124	7.85
Capacitor	0.6688	4.67
Flash	0.653	4.56
Header	0.586	4.10
MAHDA	0.13	0.91
Led	0.096	0.67
Solder Paste	0.09	0.63
Load Switch	0.069	0.48
IC TRNSLTR	0.04	0.28
Inverter	0.02	0.14
Transistor	0.012	0.08
Resistor	0.0104	0.07
Diode	0.009	0.06
Clamp for SIM Card Interface	0.007	0.05
Power, Signal Line Ferrite Bead	0.004	0.03
NFC Forum Type	0.0034	0.02
ESD Suppressor	0.0002	0.00
TOTAL	**14.01**	
Packaging materials	**Weight, g**	**Weight-% (versus the Packed product)**
Cardboard	5.19	25.71
Foam - Expanded Polyethylene	1.02	5.07
TOTAL	**6.21**	

4. Environmental Information

LCA Results

Potential environmental impact – mandatory indicators according to EN15804+A2

Indicator	Unit	Total	A1	A2	A3	A4	A5	B1	B6	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	**2.53E +00**	2.50E +00	9.65E -04	4.16E -03	5.69E -03	0.00E +00	0.00E +00	0.00E +00	3.44E -04	2.84E -04	1.55E -04	1.38E -02	-5.40E-03
GWP-fossil	kg CO2 eq.	**2.52E +00**	2.49E +00	9.17E -04	4.08E -03	5.41E -03	0.00E +00	0.00E +00	0.00E +00	3.27E -04	2.70E -04	1.47E -04	1.38E -02	-5.91E-03
GWP-biogenic	kg CO2 eq.	**5.67E -03**	5.81E -03	4.79E -05	7.97E -05	2.81E -04	0.00E +00	0.00E +00	0.00E +00	1.70E -05	1.41E -05	7.65E -06	1.34E -06	-5.68E-04
GWP-luluc	kg CO2 eq.	**1.44E -03**	1.38E -03	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	1.23E -07	-5.74E-05
ODP	kg CFC 11 eq.	**1.81E -05**	1.18E -10	0.00E +00	1.81E -05	0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00	4.38E -15	-1.84E-14
AP	mol H+ eq.	**1.22E -02**	1.20E -02	5.42E -06	1.11E -04	2.77E -06	0.00E +00	0.00E +00	0.00E +00	1.54E -07	2.18E -07	6.84E -08	6.83E -06	-2.09E-05
EP-freshwater	kg P eq.	**1.06E -05**	1.05E -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	1.86E -09	-6.90E-08
EP-freshwater	kg N eq.	**1.99E -03**	1.95E -03	2.84E -06	3.16E -05	1.40E -06	0.00E +00	0.00E +00	0.00E +00	7.66E -08	1.07E -07	3.39E -08	3.30E -06	-6.89E-06
EP-terrestrial	mol N eq.	**2.16E -02**	2.11E -02	3.12E -05	3.46E -04	1.56E -05	0.00E +00	0.00E +00	0.00E +00	8.64E -07	1.22E -06	3.83E -07	3.83E -05	-7.39E-05
POCP	kg NMVOC eq.	**5.88E -03**	5.76E -03	5.23E -06	8.37E -05	2.82E -06	0.00E +00	0.00E +00	0.00E +00	1.55E -07	2.07E -07	6.84E -08	8.56E -06	-2.13E-05
ADP-minerals&metals*	kg Sb eq.	**1.65E -04**	1.65E -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	7.30E -11	-1.77E-09
ADP-fossil*	MJ	**3.34E +01**	3.31E +01	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	9.58E -03	-2.73E-01
WDP	m3	**4.48E -01**	4.45E -01	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	2.63E -03	-8.45E-04
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.*

Use of resources

Indicator	Unit	Total	A1	A2	A3	A4	A5	B1	B6	C1	C2	C3	C4	D
PERE	MJ	**6.35E+00**	6.33 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.36 E-03	-2.10E-02
PERM	MJ	**0.00E+00**	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	-0.00E+00
PERT	MJ	**6.35E+00**	6.33 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.36 E-03	-2.10E-02
PENRE	MJ	**3.35E+01**	3.32 E+01	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	9.57 E-03	-2.74E-01
PENRM	MJ.	**3.35E+01**	3.32 E+01	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	9.57 E-03	-2.74E-01
PENRT	MJ	**3.35E+01**	3.32 E+01	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	9.57 E-03	-2.74E-01
SM	kg	**0.00E+00**	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00E+00
RSF	MJ	**0.00E+00**	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00E+00
NRSF	MJ	**0.00E+00**	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00E+00
FW	m^3	**1.34E-02**	1.33 E-02	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	6.20 E-05	-3.93E-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													

Waste production and output flows

Waste production

Indicator	Unit	Total	A1	A2	A3	A4	A5	B1	B6	C1	C2	C3	C4	D
Hazardous waste disposed	kg	**8.46E-07**	8.46 E-07	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	9.22 E-13	-1.95E-11
Non-hazardous waste disposed	kg	**6.44E-02**	6.04 E-02	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	3.98 E-03	-7.84E-05
Radioactive waste disposed	kg	**1.53E-03**	1.52 E-03	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	4.59 E-07	-3.10E-06

Output flows

Indicator	Unit	Total	A1	A2	A3	A4	A5	B1	B6	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	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	3.02E-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	3.02E-06	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	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	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	0.00E+00	0.00E+00	0.00E+00

Information on biogenic carbon content

Results per functional or declared unit		
BIOGENIC CARBON CONTENT	**Unit**	**QUANTITY**
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	0.00571

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

Additional information

LCA Interpretation

The stage contribution analysis of the CMi6110 on various impact categories reveals that raw material supply stage (A1) on upstream is the main contribution stages to all environmental impact categories, accounting for around 95-99% of the total impact, leaving other stages such as raw material transportation, manufacturing, maintenance, and disposal stage with minor contribution with 1-5% of the total impact.

Indoor environment

During installation and use, the device does not emit pollutants or substances which are dangerous for the environment and for health.

Dangerous substances

The product contains no substances given by the REACH Candidate list or the Norwegian priority list.

References

SUSTAINABILITY REPORTING STANDARDS

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