Hexing Electrical Co., Ltd.

ENVIRONMENTAL PRODUCT DECLARATION

Product Name: Smart meters of HXE110, HXE310, HXF300

Site: No.1418-35, Moganshan Road, Shang Cheng Industrial Zone, Hangzhou, China.

Environmental Product Declaration in accordance with ISO 14025 and EN 50693

Program Operator	EPD Italy
Publisher	EPD Italy

Declaration Number	HEXINGSMARTMETER2025
Registration Number	EPDITALY1041

Issue Date	29/07/2025
Valid to	29/07/2030

ENVIRONMENTAL PRODUCT DECLARATION

海兴电力 Hexing Electrical Co.,Ltd.

smart meters of Hexing: HXE110, HXE310 and HXF300

GENERAL INFORMATION

EPD Program and Program Website	EPD Italy http://www.epditaly.it
General Program Instructions and Version Number	Regulations of the EPDItaly Programme, revision 6.0
Manufacturer Name and Address	Hexing Electrical Co., Ltd. No.1418-35, Moganshan Road, Shang Cheng Industrial Zone, Hangzhou, China
Declaration Number	HEXINGSMARTMETER2025
Declared Product & Functional Unit	Three types of smart meters of Hexing: HXE110, HXE310 and HXF300 A single smart meter which monitors the consumption of electricity starting from the primary measurement of electricity power, during the service life of 20 years
Reference PCR and Version Number	EPDItaly 007: PCR for electronic and electrical products and systems, REV. 3.1 - 2024/11/12 EPDItaly 011: PCR Part B for meters, REV. 1 - 2024/07/01
Description of product application/use	Smart meters track energy usage and send data to utilities, helping optimize energy management.
Product RSL Description (if Appl.)	The RSL for a smart meter is 20 years.
Markets of Applicability	Global
Date of Issue	29/07/2025
Period of Validity	5 Years
EPD Type	Product-Specific
EPD Scope	Cradle-to-Grave
Year(s) of reported primary data	January 2023 – December 2023
LCA Software & Version Number	SimaPro 10.2
LCI Database(s) & Version Number	Ecoinvent 3.11
LCIA Methodology & Version Number	EN 15804 A2:2019 aligned methodology with the Environmental Footprint (EF) 3.1 method
This PCR review was conducted by:	EPD Italy Programme Committee PCR Moderator & Review Committee info@epditaly.cn
This declaration was independently verified in accordance with ISO 14025: 2010. ☐INTERNAL ☑ EXTERNAL	ICMQ S.p.A., via Gaetano De Castillia n ° 10 - 20124 Milan, Italy. Accredited by Accredia.
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	

Limitations

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs relating to the same category of products but belonging to different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

smart meters of Hexing: HXE110, HXE310 and HXF300

1. Product Definition and Information

1.1. Description of Company/Organization

Established in 1992, Hexing is a multi-national company offering variety of electrical equipment and relevant solutions to global power utilities, and focus on smart metering and energy management, accumulating rich experience in meter design, quality control, supply chain management and on-site service.

Hexing places a high emphasis on technological innovation and has independent research and development capabilities, earning numerous technical and product certificates, and hold certificate ISO 9001, ISO 14001 etc.

1.2. Product Description

The products covered in this report are the smart meters of HXE110, HXE310 and HXF300. The CPC code is 4621 electricity distributor or control apparatus.

HXE110 is a smart single phase direct connected residential meter. HXE310 is a smart three phase direct connected meter. HXF300 is a smart three phase indirect connected meter with high accuracy.

Table 1 Technical specifications of smart meters

Technical specification		HXE110	HXE310	HXF300
Accuracy	Active	Class 1 (IEC) Class A (EN) Class B (EN)	Class 1 (IEC) Class A (EN) Class B (EN)	Class 0.5S/0.2S(IEC) Class C (EN)
	Reactive	Class 2 (IEC) Class 3 (IEC)	Class 2 (IEC) Class 3 (IEC)	Class 2/1S (IEC)
Voltage	Reference voltage	1P2W: 127V, 220V, 230V, 240V	3P4W: 3×127/220V, 3×220/380V, 3×230/400V, 3×240/415V	3P4W: 3x57.7/100V, 3x63.5/110V, 3x127/220V, 3x220/380V, 3x230/400V, 3x240/415V 3P3W: 3x100V, 3x110V
	Operation voltage range	70%-120%Un	70%-120%Un	80%-120%Un
Current	Basic current	5A, 10A	5A, 10A	1A, 5A
	Starting current	≤0.4%Ib(active) ≤0.5%Ib(reactive)	≤0.4%Ib	≤0.1%In
Nominal frequency		50Hz or 60Hz	50Hz or 60Hz	50Hz or 60Hz
Performance class according to reference standard		EN IEC62052-11, IEC62053-21, IEC62053-23, IEC62056-21, IEC62056-42, IEC62056-46, IEC62056-47, IEC62056-53, IEC62056-61, IEC62056-62, EN50470-1, EN50470-3		

smart meters of Hexing: HXE110, HXE310 and HXF300

1.3. Application

Smart meters enable utilities to monitor all essential factors of power grid such as voltage, current, power factor and power quality items. Hot plug module design enables utilities to deploy it in different environments with different communication requirements. As multiple I/O extensible property is an important factor in smart meter to guarantee future smart grid application.

1.4. Material Composition

The main raw materials of smart meters include PCB board, electronic components, PC shell, packaging etc. The type and ratio of raw materials per smart meter are listed in table 2 below.

Table 2 Raw materials contents of product

Raw material cluster	Ratio		
	HXE110	HXE310	HXF300
Metals	22.85%	9.76%	9.73%
Plastics	42.19%	41.24%	46.33%
Electronics	26.70%	43.01%	36.74%
Packaging	8.26%	5.99%	7.20%
Total weight (kg)	1.12	2.02	1.73

1.5. Declaration of Methodological Framework

This LCA follows the EPD Italy PCR 007 – electronic and electrical products and systems, PCR 011 -meters guideline and use the recommended impact method for the analysis, the EN 15804+A2:2019 method was used in this report. The EN 15804 A2:2019 revision has aligned their methodology with the Environmental Footprint (EF) 3.1 method, except for their approach on biogenic carbon.

2. Life Cycle Assessment Background Information

2.1. Functional Unit

In this study the functional unit is a single smart meter which monitors the consumption of electricity starting from the primary measurement of electricity power, during the service life of 20 years. See table 1 for more technical parameters.

2.2. System Boundary

This study covers the cradle-to-grave lifecycle of smart meters, divided into three modules: upstream (raw material extraction and transport to factory), core (assembly, packaging, and waste treatment), and downstream (transport to installation site, use, maintenance, and end-of-life processes). The study follows PCR guidelines, using a cut-off allocation approach and making simplifying assumptions for the downstream module, especially for the 20 years end-of-life scenario.

smart meters of Hexing: HXE110, HXE310 and HXF300

Table 3 System boundaries in accordance with PCR - 011

PHASES	MANUFACTURING STAGE	DISTRIBUTION STAGE	INSTALLATION STAGE	USE & MAINTENANCE STAGE	END-OF-LIFE STAGE De-installation	BENEFITS AND LOADS
	IN ACCORDANCE TO EN 50693					
Phases declared	X	X	X	X	X	MND

Note: X=Declared Module, MND=Module not Declared

This project declared the manufacturing stage, distribution stage, installation stage, use and maintenance stage, and end-of-life stage. According to PCR, benefits and loads stage is optional thus not declared.

- Manufacturing stage: acquisition of raw materials, transport to manufacturing site, component/parts manufacturing, assembly, packaging, end-of-life treatment of generated waste.
- Distribution stage: transport of product.
- Installation stage: installation, end-of-life treatment of generated waste.
- Use stage: usage, maintenance, end-of-life treatment of generated waste.
- End-of-life stage: de-installation, collection and transport, end-of-life treatment.

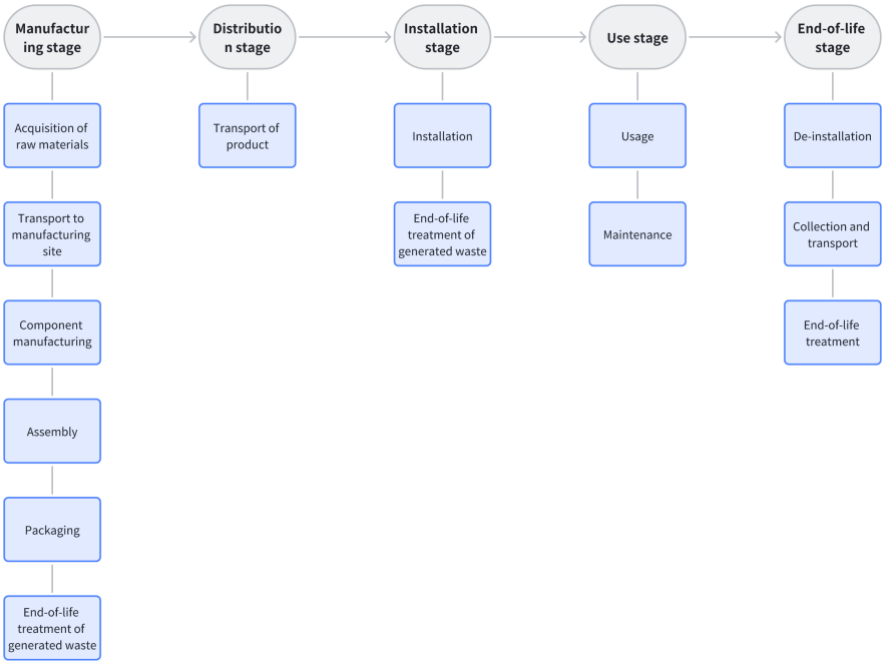

Figure 1 life cycle stages flowchart of Hexing smart meters

2.3. Estimates and Assumptions

The key assumptions of this LCA study are as follows:

- Transportation: Assumed distances and vehicles for smart meter distribution.
- Installation: Data based on Hexing's average experience, assuming consistent use of structural, electronic, and mechanical equipment.
- Operation and Maintenance (OM): Assumed constant energy and material use over the 20 years RSL.
- End-of-Life: Assumed 100km transport of waste smart meters to treatment or disposal facilities.
- Waste to Energy: Not considered in this model.

2.4. Cut-off Criteria

The following procedure was followed for the exclusion of inputs and outputs:

- Include all inputs/outputs with available data, fill gaps with conservative assumptions.
- For insufficient data, apply for 2% cut-off criteria for mass and energy of the unit process.
- Total neglected flows for cradle-to-grave stage should not exceed 2% of energy and mass (details in table 4).

Table 4 Cut off flows

Flow name	Process stage	Reason cut off	Total cut off mass % estimated
Packaging material for raw material	Upstream	Used repeatedly by the suppliers or recycled (cut off from system boundary)	<0.1%
Raw materials: trace elements	Upstream	All materials from the BOM is included in the model	0%
Transportation and storage within the plant	Core	Energy<0.1%	<0.1%
Inspection travel during maintenance of meter	Downstream	Not routine operation	<0.1%
Total			<1%

Cut-off criteria were applied to capital equipment production and maintenance. It was assumed that the impacts associated with these aspects were sufficiently small enough to fall below cut-off when it is scaled down to the declared unit.

Material and energy flows known to have the potential to cause significant emissions into air and water or soil related to the environmental indicators of this study will be included in the assessment. So far according to review of the Material Safety Data Sheet and relevant physical, chemical and other information of the flows listed in table above, no significant negative emission to the environment from above listed flows is identified.

2.5. Reference Service life and Estimated Building Service Life

The reference service life (RSL) for smart meters is 20 years.

2.6. Data Sources

In this LCA study, specific data related to materials or energy flows within the production was calculated and submitted by HEXING, generic data for certain processes were sourced from Ecoinvent 3.11 in SimaPro 10.2.

2.7. Data Quality

Steps were taken to ensure that the life cycle inventory data were reliable and representative. The type of data that was used is clearly stated in the Inventory Analysis, be it measured or calculated from primary sources or whether data are from the life cycle inventory databases. In this study, generic data for certain processes were sourced from the databases in SimaPro 10.2, and data regarding polycarbonate, PCB and some metal and electronic components are adapted with first-hand information received from upstream manufacturers in China. Due to confidentiality reason, information received from supplier and confirmed by Hexing are only used for supporting modelling and not revealed in any other circumstance. SimaPro is the world's most widely used LCA software and the data in it comes predominantly from Ecoinvent datasets, with the world's most complete and widely used set of data on industrial processes, material production, packaging production, transport and so on.

The data quality requirements for this study were as follows:

- Precision
- Completeness
- Representativeness
  - Time - related coverage
  - Geographic coverage
  - Technology coverage
- Consistency

All the above data quality requirements are met.

2.8. Allocation

Allocation refers to partitioning of input or output flows of a process or a product system between the product systems under study and one or more other product systems. In this report, in plant recycling for substrate production is considered and assumed as a close loop, meaning all the environment impact from recycling of substrate scraps, and arrester scraps from cutting and edging treatment and benefit of using recycled material to avoid waste treatment for substrate production are allocated to the process of arrester production.

For recycling and disposal process of waste generated during the manufacturing, as described above, the benefits of recycling and recovery is out of boundary of the product system and will not be allocated to arrester product.

There is only one targeted product, and the metal oxide surge arrester is the only manufactured product in this system boundary. It is declared there is no co-product nor by-product, thus there is no need to allocate among multi-products.

Multi-input processes

For data sets in this study, all input data corresponded to right processes or products, no allocation is needed. For literature data, the source is generally referred to. In the input part, allocation is applied only in the background data, i.e. energy within the production site such as electricity, and some other raw material such as diesel, emission such as off gas among products, allocation is done via both mass and size of the specific series of product produced on a yearly average. The principle for choosing the mass and size is based on the linear relationship of the product output to the environmental impacts.

Multi-output processes

There is only one targeted product, and the metal oxide surge arrester is the only manufactured product in this system boundary. It is declared there is no co-product nor by-product, thus there is no need to allocate among multi-products. In the process of disposing wastes, the allocation within the disposal scenario follows mass allocation, which applies to waste treatment process inventory adopted from Ecoinvent data.

2.9. Electricity power mix

In this LCA, the grid mix data on electricity of for the site in Hangzhou is based on grid mixes of the State Grid East China Branch (ECGC). Electricity mix has been modelled from Ecoinvent database 3.11, which is valid from 2021 to 2024. The electricity inventory is based on the year of 2022 for Chinese electricity generation (China Energy Statistics).

In Chinese map of electricity generation, thermal power is the principal part of total national installed capacity and electricity generation in China. Development of hydropower is slower than the speed of thermal power development, and nuclear power is still in its initial step of development in China. Power generation from renewable energy resources, such as wind, solar energy and tide, is usually not included due to the small share in electricity generation in China, however the renewable energy was also considered in this study by considering the small ratio of wind, solar and other renewable energy generation in China.

According to HX, no solar panel electricity is used in 2023, and no GO is purchased as well.

2.10. Reference period

The study used primary data collected from January 2023 to December 2023.

2.11. Comparability and Benchmarking

No comparisons or benchmarking are included in this EPD. LCA results across EPDs can be calculated with different background 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.

2.12. Excluded Processes

The following steps/stages are not included in the system boundary due to the reason that the elements below are considered irrelevant or not within the boundary to the LCA study of meter:

- Production and disposal of the infrastructure and capital equipment (buildings, machines, transport media, roads, etc.) and their maintenance during product assembly, installation and maintenance.
- The load and benefit of recycling waste smart meters is excluded from the analysis.
- Storage phases and sales of smart meter products due to small impact.
- Product losses due to abnormal damage such as natural disasters or fire accidents. These losses would mostly be accidental.
- Recycling process of defective products.
- Handling operations at the distribution centre and retail outlet due to small contribution and negligible impact.

3. Life Cycle Assessment Scenarios

3.1. Raw material acquisition

The main raw materials of smart meters include PCB board, electronic components, PC shell, solder wire, packaging and etc. The type and ratio of raw materials per product are listed in Table 2. All raw materials are sourced domestically in China.

3.2. Transportation

According to Hexing, the raw materials are sourced from several provinces in China and delivered by lorry.

3.3. Manufacturing

The product assembly process of smart meters mainly includes assembly, inspection and testing, final inspection and packaging, which involves auxiliary materials, packaging materials and energy use during the process, which all occurs in China.

3.4. Distribution

According to Hexing, most of smart meter products are consumed in Europe, the Asian-Pacific region and Latin America. Oceanic and road transportation distance for product delivery is estimated with reference from external resources.

Table 5 Distance of product distribution

Market location	Ratio (%)			Distance (km)	Transport Vehicle
	HXE110	HXE310	HXF300		
EU	85.1%	72.8%	41.8%	100	Lorry
				24000	Container via Ship
the Asian-Pacific region	12.3%	10.4%	15.2%	100	Lorry
				16000	Container via Ship
Latin America	2.6%	16.8%	43.0%	100	Lorry
				20000	Container via Ship

3.5. Installation

The specific data regarding smart meters installation is taken from expert estimation from Hexing based on previous experience, the site (source) data chosen is considered representative. And this stage is treated as a global process.

Table 6 Components for installation (per FU)

Input/output component	Unit	Value
Electricity consumption	Wh	3
Transportation of waste packaging material	km	50
Screw	3	g

3.6. Use & Maintenance

According to HEXING, during the use and maintenance of the product, only electricity is consumed.

Table 7 Components for Use & Maintenance (per FU)

Input/output component	Unit	HXE110	HXE310	HXF300
Use				
Power consumed by the meter (P_{use})	W	0.8	0.9	0.9
Maintenance				
Electricity (for meter upgrade)	Wh/year	0.5		

According to the above table, the energy use during operation E_{use} is calculated following the formulation below:

$$Euse[kWh] = \frac{Puse * 24 * 365 * RSL}{1000}$$

3.7. End-of-Life

According to Hexing, the smart meters products are consumed overseas. The disposal of the used smart meters products will adopt a country and region average disposal mode following literature review and Ecoinvent. End-of-life disposal treatment process from Ecoinvent will be used in this LCA study. For the waste scenario, 100km of road transportation from operation site to waste treatment site was assumed. Deinstallation of smart meters is assuming using 2Wh per and dismantling of smart meters product during the disposal stage is considered using generic data from Ecoinvent for electronic product dismantling. And this stage is treated as a global process.

Table 8 Disposal of smart meters

Product component	Category		Value
Smart meters	Distance		50km
	De-installation		3Wh
	Recycling rate	PCBs	50%
		Metals	80%
		Plastics	50%
	Disposal rate	PCBs	50%
		Metals	20%
		Plastics	50%

4. Life Cycle Assessment Results

Table 9 Description of the system boundary modules

Stages	Module		Phases declared
Manufacturing stage	Upstream	In accordance to 50593	X
	Core		X
Distribution stage	Downstream		X
Distribution stage Installation stage			X
Use & Maintenance stage			X
End-of-life stage			X
Benefits and loads			MND

Note: X=Declared Module, MND=Module not Declared

4.1. Life Cycle Impact Assessment Results

Based on the model of arrester product, a life cycle impact assessment (LCIA) was conducted using PCR Italy methods and the results of core environmental impact indicators and additional environmental impact indicators were calculated, the tables below show the results. For more of the explanation of the calculation set up, please refer to the reference of transparency documentation. The impact estimate results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. Note that impact results are calculated based on one arrester.

Table 10 Life cycle impact assessment results of HXE110

Impact category	Unit	Total	Manufacturing	Distribution	Installation	Use & Maintenance	EoL
GWP-f	kg CO2 eq.	8.04E+01	2.48E+01	2.86E-01	1.95E-02	5.44E+01	8.51E-01
GWP-b	kg CO2 eq.	2.86E-01	1.34E-02	4.55E-05	8.23E-02	1.90E-01	3.63E-05
GWP-l	kg CO2 eq.	2.44E-01	4.62E-02	1.52E-04	9.04E-06	1.98E-01	1.78E-05
GWP-t	kg CO2 eq.	8.09E+01	2.49E+01	2.86E-01	1.02E-01	5.48E+01	8.51E-01
ODP	Kg CFC11 eq.	1.68E-06	8.78E-07	4.03E-09	7.24E-11	7.96E-07	4.53E-10
AP	mol H+ eq	7.00E-01	3.73E-01	7.84E-03	4.84E-05	3.19E-01	3.00E-04
EP-freshwater	kg P eq.	7.20E-02	3.11E-02	1.18E-05	4.87E-06	4.09E-02	1.97E-05
EP-marine	kg N eq	9.58E-02	3.87E-02	1.96E-03	4.77E-05	5.49E-02	1.72E-04
EP-terrestial	mol N eq	9.74E-01	4.30E-01	2.18E-02	1.28E-04	5.21E-01	1.43E-03
POFP	kg NMVOC-eq.	3.16E-01	1.54E-01	5.94E-03	4.32E-05	1.56E-01	3.76E-04
ADPE	kg Sb eq.	8.40E-03	7.78E-03	3.38E-07	6.35E-08	6.16E-04	8.80E-08
ADPF	MJ	1.42E+03	3.47E+02	3.54E+00	1.15E-01	1.07E+03	3.76E-01
WDP	m3 H2O eq.	1.87E+01	6.94E+00	8.78E-03	-1.26E-03	1.17E+01	2.05E-02

GWP-f = Global Warming Potential fossil fuels; GWP-b = Global Warming Potential biogenic; GWP-l = Global Warming Potential land use and land use change; GWP-t = Global Warming Potential total; 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; POFP = 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

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Table 11 Life cycle impact assessment results of HXE310

Impact category	Unit	Total	Manufacturing	Distribution	Installation	Use & Maintenance	EoL
GWP-f	kg CO2 eq.	1.29E+02	6.61E+01	5.04E-01	2.17E-02	6.12E+01	1.55E+00
GWP-b	kg CO2 eq.	3.95E-01	7.02E-02	8.02E-05	1.12E-01	2.13E-01	6.93E-05
GWP-l	kg CO2 eq.	3.47E-01	1.24E-01	2.68E-04	9.33E-06	2.23E-01	3.12E-05
GWP-t	kg CO2 eq.	1.30E+02	6.63E+01	5.05E-01	1.34E-01	6.16E+01	1.55E+00
ODP	Kg CFC11 eq.	2.99E-06	2.09E-06	7.10E-09	8.17E-11	8.95E-07	8.49E-10
AP	mol H+ eq	1.52E+00	1.15E+00	1.38E-02	5.21E-05	3.59E-01	5.58E-04
EP-freshwater	kg P eq.	1.38E-01	9.18E-02	2.08E-05	4.95E-06	4.60E-02	3.94E-05
EP-marine	kg N eq	1.76E-01	1.10E-01	3.46E-03	7.16E-05	6.18E-02	3.21E-04
EP-terrestial	mol N eq	1.87E+00	1.24E+00	3.84E-02	1.41E-04	5.86E-01	2.68E-03
POFP	kg NMVOC-eq.	6.44E-01	4.58E-01	1.05E-02	5.04E-05	1.75E-01	7.04E-04
ADPE	kg Sb eq.	2.63E-02	2.56E-02	5.98E-07	6.49E-08	6.93E-04	1.57E-07
ADPF	MJ	2.13E+03	9.18E+02	6.24E+00	1.23E-01	1.20E+03	6.90E-01
WDP	m3 H2O eq.	3.16E+01	1.84E+01	1.55E-02	-3.66E-03	1.31E+01	4.05E-02

GWP-f = Global Warming Potential fossil fuels; GWP-b = Global Warming Potential biogenic; GWP-l = Global Warming Potential land use and land use change; GWP-t = Global Warming Potential total; 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; POFP = 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

Table 12 Life cycle impact assessment results of HXF300

Impact category	Unit	Total	Manufacturing	Distribution	Installation	Use & Maintenance	EoL
GWP-f	kg CO2 eq.	9.35E+01	3.04E+01	4.07E-01	1.90E-02	6.12E+01	1.44E+00
GWP-b	kg CO2 eq.	3.47E-01	5.78E-03	6.50E-05	1.28E-01	2.13E-01	5.95E-05
GWP-l	kg CO2 eq.	2.81E-01	5.81E-02	2.16E-04	9.51E-06	2.23E-01	2.67E-05
GWP-t	kg CO2 eq.	9.41E+01	3.05E+01	4.08E-01	1.47E-01	6.16E+01	1.44E+00
ODP	Kg CFC11 eq.	2.03E-06	1.13E-06	5.74E-09	8.49E-11	8.95E-07	7.42E-10
AP	mol H+ eq	9.35E-01	5.64E-01	1.11E-02	5.32E-05	3.59E-01	4.97E-04
EP-freshwater	kg P eq.	8.41E-02	3.80E-02	1.70E-05	4.96E-06	4.60E-02	3.29E-05
EP-marine	kg N eq	1.12E-01	4.67E-02	2.78E-03	1.03E-04	6.18E-02	2.89E-04
EP-terrestial	mol N eq	1.15E+00	5.31E-01	3.09E-02	1.40E-04	5.86E-01	2.40E-03
POFP	kg NMVOC-eq.	3.64E-01	1.80E-01	8.42E-03	5.59E-05	1.75E-01	6.27E-04
ADPE	kg Sb eq.	8.49E-03	7.80E-03	4.87E-07	6.51E-08	6.93E-04	1.36E-07
ADPF	MJ	1.64E+03	4.31E+02	5.05E+00	1.28E-01	1.20E+03	6.00E-01
WDP	m3 H2O eq.	2.21E+01	8.96E+00	1.26E-02	-7.49E-03	1.31E+01	3.48E-02

GWP-f = Global Warming Potential fossil fuels; GWP-b = Global Warming Potential biogenic; GWP-l = Global Warming Potential land use and land use change; GWP-t = Global Warming Potential total; 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; POFP = 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

4.2. Additional environmental impacts

Table 13 Resource use of HXE110

Environmental Impact	Unit	Total	Manufacturing	Distribution	Installation	Use & Maintenance	EoL
PENRE	MJ	9.71E+02	1.65E+02	1.81E-01	6.72E-02	8.06E+02	7.70E-02
PERE	MJ	3.20E+02	3.69E+01	2.91E-02	1.13E-02	2.83E+02	1.20E-02
PENRM	MJ	1.48E+01	1.48E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ	4.15E-01	4.15E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	9.86E+02	1.80E+02	1.81E-01	6.72E-02	8.06E+02	7.70E-02
PERT	MJ	3.20E+02	3.73E+01	2.91E-02	1.13E-02	2.83E+02	1.20E-02
FW	M3	9.12E-01	2.16E-01	2.75E-04	6.25E-06	6.95E-01	6.48E-04
SM	kg	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
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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

Table 14 Resource use of HXE310

Environmental Impact	Unit	Total	Manufacturing	Distribution	Installation	Use & Maintenance	EoL
PENRE	MJ	1.37E+03	4.63E+02	3.20E-01	6.82E-02	9.07E+02	1.32E-01
PERE	MJ	4.17E+02	9.94E+01	5.14E-02	1.15E-02	3.18E+02	1.92E-02
PENRM	MJ	2.50E+01	2.50E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ	5.40E-01	5.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.40E+03	4.88E+02	3.20E-01	6.82E-02	9.07E+02	1.32E-01
PERT	MJ	4.18E+02	1.00E+02	5.14E-02	1.15E-02	3.18E+02	1.92E-02
FW	M3	1.37E+00	5.82E-01	4.86E-04	4.79E-05	7.82E-01	1.26E-03
SM	kg	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
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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

Table 15 Resource use of HXF300

Environmental Impact	Unit	Total	Manufacturing	Distribution	Installation	Use & Maintenance	EoL
PENRE	MJ	1.10E+03	1.96E+02	2.61E-01	6.86E-02	9.07E+02	1.16E-01
PERE	MJ	3.64E+02	4.55E+01	4.17E-02	1.15E-02	3.18E+02	1.71E-02
PENRM	MJ	2.43E+01	2.43E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00

PERM	MJ	5.58E-01	5.58E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.13E+03	2.20E+02	2.61E-01	6.86E-02	9.07E+02	1.16E-01
PERT	MJ	3.64E+02	4.61E+01	4.17E-02	1.15E-02	3.18E+02	1.71E-02
FW	M3	1.06E+00	2.76E-01	3.95E-04	1.43E-04	7.82E-01	1.09E-03
SM	kg	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
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
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							

Table 16 Waste production of HXE110

Environmental Impact	Unit	Total	Manufacturing	Distribution	Installation	Use & Maintenance	EoL
HWD	kg	8.64E-03	5.74E-03	1.88E-05	7.33E-07	2.88E-03	2.90E-06
NHWD	kg	5.64E+00	1.49E+00	1.71E-02	2.26E-02	4.09E+00	2.05E-02
RWD	kg	7.28E-03	5.87E-04	4.02E-07	1.26E-07	6.69E-03	1.61E-07
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MRF	kg	6.56E-01	0.00E+00	0.00E+00	5.44E-02	0.00E+00	6.02E-01
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; MER = Materials for energy recovery; MRF = Material for recycling; CRU = Components for re-use; ETE = Exported energy, thermal; EEE = Exported energy, electricity							

Table 17 Waste production of HXE310

Environmental Impact	Unit	Total	Manufacturing	Distribution	Installation	Use & Maintenance	EoL
HWD	kg	1.34E-02	1.01E-02	3.32E-05	7.93E-07	3.24E-03	5.49E-06
NHWD	kg	8.51E+00	3.80E+00	3.05E-02	3.82E-02	4.60E+00	4.01E-02
RWD	kg	9.14E-03	1.61E-03	7.09E-07	1.28E-07	7.53E-03	2.46E-07
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MRF	kg	1.08E+00	0.00E+00	0.00E+00	6.51E-02	0.00E+00	1.01E+00
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; MER = Materials for energy recovery; MRF = Material for recycling; CRU = Components for re-use; ETE = Exported energy, thermal; EEE = Exported energy, electricity							

Table 18 Waste production of HXF300

Environmental Impact	Unit	Total	Manufacturing	Distribution	Installation	Use & Maintenance	EoL
HWD	kg	1.44E-02	1.11E-02	2.69E-05	8.14E-07	3.24E-03	4.75E-06
NHWD	kg	6.62E+00	1.90E+00	2.60E-02	6.10E-02	4.60E+00	3.41E-02
RWD	kg	8.25E-03	7.22E-04	5.76E-07	1.29E-07	7.53E-03	2.21E-07
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

MRF	kg	9.08E-01	0.00E+00	0.00E+00	5.38E-02	0.00E+00	8.54E-01
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; MER = Materials for energy recovery; MRF = Material for recycling; CRU = Components for re-use; ETE = Exported energy, thermal; EEE = Exported energy, electricity							

5. References

EN 50693:2019 - Product category rules for life cycle assessments of electronic and electrical products and systems

EPDItaly 007: PCR for electronic and electrical products and systems – REV. 3.1 - 2024/11/12

EPDItaly 011: PCR Part B for meters – REV. 1 - 2024/07/01

ISO 14025: 2021, Environmental labels and declarations - Type III environmental declarations - Principles and procedures

ISO 14040: 2006, Environmental management – Life cycle assessment – Principles and framework

ISO 14044: 2006, Environmental management – Life cycle assessment – Requirements and guidelines

ISO 14067: 2018, Greenhouse gases - Carbon footprint of products - Requirements and guidelines

ISAE 3410: 2012, Assurance Engagements on Greenhouse Gas Statements

PAS 2050: 2011, Specification for the Assessment of the Life Cycle Greenhouse Gas Emissions of Goods and Services

LCA Report - LCA Report for HEXING's smart meters. Rev.3 - 2025/07/29

Ecoinvent, 2024. Swiss Centre for Life Cycle Assessment, v3.11 (www.ecoinvent.ch).

PRé Consultants, 2024. Software SimaPro v10.2 (www.pre.nl).

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