Nansen Instrumentos de Precisão Ltda

ENVIRONMENTAL PRODUCT DECLARATION

PRODUCT NAME

Meter Jobi-M

SITE

Av. Abiurana, 1655 – Distrito Industrial I, Manaus – AM – Brazil

In accordance with ISO 14025 and EN 50693:2019

Program Operator	EPDItaly
Publisher	EPDItaly

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GENERAL INFORMATION

EPD OWNER	
Name of the company	Nansen Instrumentos de Precisão Ltda
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PROGRAM OPERATOR	
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INFORMATION ON THE EPD	
Product name (s)	Jobi-M
Site (s)	Av. Abiurana, 1655 – Distrito Industrial I, Manaus – AM – Brazil
Short description and technical information of the product (s)	Device for measuring electrical energy consumption.
Field of application of the product (s)	Measuring electrical energy consumption.
CPC Code (number) https://unstats.un.org/unsd/classifications/Econ	4621 – electricity distributor or control apparatus.

VERIFICATION INFORMATION	
PCR (title, version, date of publication or update)	Core-PCR: EPDITALY007 "Electronic and electrical product and systems" Rev. 3.1 from 11/12/2024 Sub-PCR: EPDITALY011 "Electronic and electrical product and systems - Meters" Rev. 1 from 07/01/2024 EN 50693:2019: Product category rules for life cycle assessments of electronic and electrical products and systems
EPDItaly Regulation (version, date of publication or update)	EPDITALY Regulation, Rev 6.0, from 30/10/2023
Project Report LCA	Life Cycle Assessment – Energy Meter Jobi manufactured by Nansen, version 1.3, from 14/04/2025
Independent Verification Statement	The PCR review was performed by XXXX - info@epditaly.it. Independent verification of the declaration and data, carried out according to ISO 14025: 2010. ☐ Internal ☑ External Third party verification carried out by: ICMQ S.p.A., via Gaetano De Castillia n ° 10 - 20124 Milan, Italy. Accredited by Accredia.
Comparability Statement	Environmental statements published within the same product category, but from different programs, may not be comparable.
Liability Statement	The EPD Owner releases EPDItaly from any non-compliance with environmental legislation. The holder of the declaration will be responsible for the information and supporting evidence. EPDItaly accepts no responsibility for the information, data and results provided by the EPD Owner for the life cycle assessment.

Introduction

This Environmental Product Declaration (EPD) describes the environmental impacts of one energy meter Jobi-M produced by Nansen in the mufacturing site of Manaus/AM, Brazil, for an expected service life of 20 years. The energy meter Jobi-M can be installed in buildings for measuring electricity consumption.

The EPD follows the EPDItaly regulation, in conformity with ISO 14025, and the Product Categorogy Rules EPDItaly011, which provides guidance for the assessment of energy meters.

Organization

Nansen is a company that provides technology and complete solutions in electrical energy measurement, focused on Smart Grids, infrastructure for electric mobility and solar electrical energy generation. Nansen is one of the most traditional meter manufacturers in the world, serving Brazilian energy utilities and other countries on the continent. Today it is known in the market not only for its 93-year tradition but also for its culture of innovation, with high performance, precision and reliable products.

Nowadays Nansen, through a partnership with Sanxing Electric, operates with a high capacity for technological innovation and supply, allowing it to operate in several countries on all continents.

Scope and Type of EPD

The scope of the EPD is according to the PCR EPDItaly011 and is detailed in the following chart.

Functional Unit / Declared Unit	1 energy meter
Reference Service Life (RSL)	The reference service life is 20 years, according to EPDItaly011
System Boundaries	The boundaries of the analysed product system are defined as 'cradle-to-grave', in other words, it includes the production of raw materials, processing and assembly, transports, installation, use, and the end-of-life of the product and its packaging system.
Cut-off rules	Mass flows under 1% of the total mass input; and/or energy flows representing less than 1% of the total primary energy usage of the associated unit process may be omitted. However, the total amount of energy and mass omitted must not exceed 5% per module. All processes and flows that are attributable to the analyzed system were included, apart from: i. Any extraordinary maintenance done on the meter, ii. Material and energy flows related to dismantling phase; iii. Devices external to the meter itself (e.g. switchboards) required for installation; iv. The capital goods – such as buildings, machinery, tools, and infrastructure.
Allocations	The assembling efforts represent the annual average of the production year of 2022. To calculate the electricity consumption, the annual electricity consumption of all assembling lines producing energy meters in the plant was divided by the annual amount of produced meters. The Cut-Off approach has been adopted for considering materials sent to recovery. This approach does not predict benefits and burdens arising from the possibility of recycling products at End-of-Life or recycling waste generated throughout the process.
Geographical coverage and time period	The information was established over the year 2022. The information collected comes from the one site producing the energy meter Jobi-M model in Manaus/AM – Brazil. The distribution, use and End-of-Life happen in Brazil.
Background data sorces	Ecoinvent 3.9.1 (cut-off model) data were used to represent background data.
Software	SimaPro 9.5.0.0, from April 2023

The modules included in the evaluation are defined under PCR EPDItaly011 and are shown in Table 1.

Table 1 Life cycle modules

<table>
<tr><td colspan="2">MANUFACTURING STAGE</td><td>DISTRIBUTION STAGE</td><td>INSTALLATION STAGE</td><td>USE & MAINTENANCE STAGE</td><td>END OF LIFE STAGE</td></tr>
<tr><td>UPSTREAM MODULE</td><td>CORE MODULE</td><td colspan="4">DOWNSTREAM</td></tr>
<tr><td>Extraction of raw materials, including waste recycling processes and the production of semi-finished and ancillary products</td><td>Manufacturing of the product constituents, including all the stages</td><td colspan="4" rowspan="4">IN ACCORDANCE WITH EN 50693</td></tr>
<tr><td>Transportation of raw materials to the manufacturing company</td><td>Product assembly</td></tr>
<tr><td></td><td>Packaging</td></tr>
<tr><td></td><td>Waste recycling processes</td></tr>
</table>

Primary data was used to represent the energy meter assembly process, logistics and the mass of components demanded for the energy meter production. The mass of each electronic component mounted on the Printed Wiring Board and the material composition of the Relay ware determined according to primary data. Primary data from suppliers was also collected to represent the transformation process of the plastic structure. The data precision, completeness, technological, temporal and geographical correlation are considered good.

Production process

The energy meter Jobi-M is a device for measuring electrical energy consumption. Its main application is measuring the electricity consumption of buildings. The declared unit of this study is one energy meter.

The production process of the energy meter starts with the assembly of the electronic devices onto the Printed Wiring Board. Another main electronic component used in the meter is the relay. Both are produced by a supplier located in China and transported to Brazil by oceanic ships.

The transformation of plastic parts is performed by a supplier located in Manaus/AM – Brazil.

The assembly of the energy meter occurs in an assembly line at the Nansen industrial plant located in Manaus/AM – Brazil. The life cycle and process steps are presented in Figure 1a and Figure 1b.

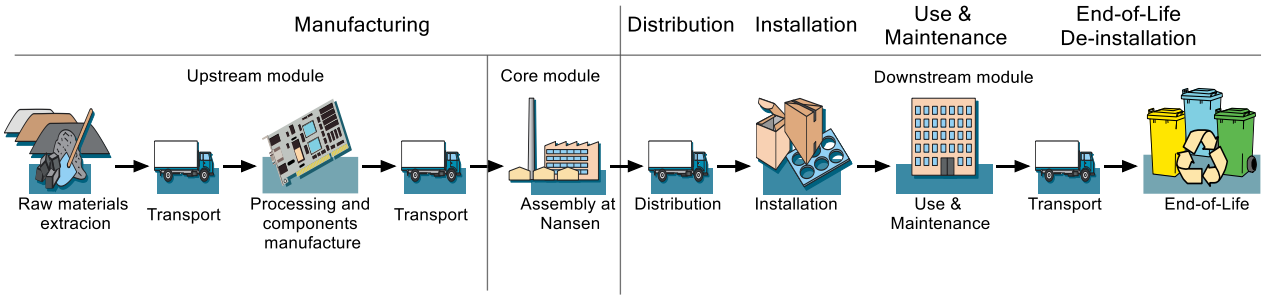

Figure 1a Life cycle steps of the JOBI-M

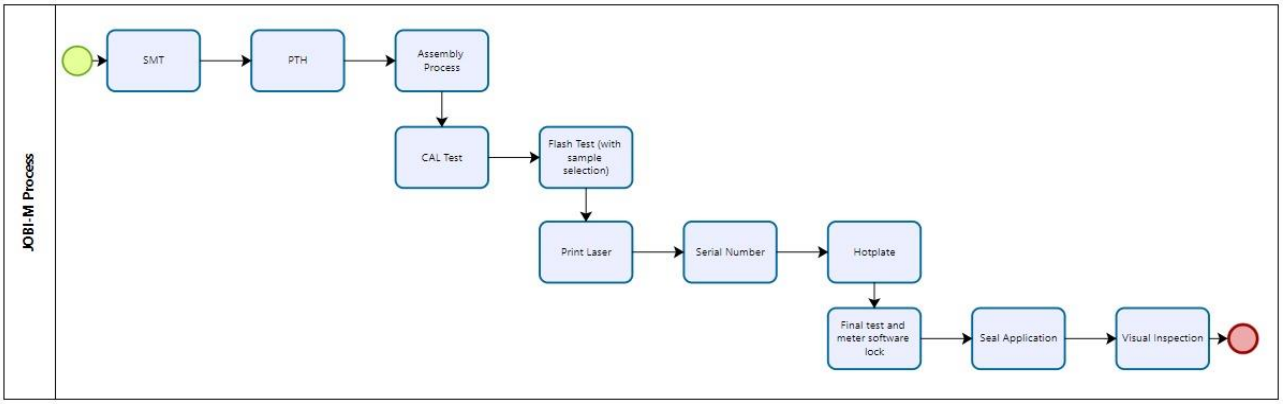

Figure 2b Process steps of the JOBI-M assembly line

In SMT (Surface Mount Technology) the PWB goes through a process of automatic insertion and soldering of electronic components; in PTH (Pin Through Hole) the components are manually inserted into the board and soldered. In the assembly process, the mechanical parts are assembled with the board, along with a series of tests on all meters and a selection of samples for more specific quality tests. After the meters pass the tests, the following steps take place: Laser engraving on the cover, recording the serial number in the meter's memory, mechanical closing by hotplate of the cover on the meter base, application of the seal, and visual inspection.

Once the energy meter is cleared from the final assembly tests, it is packed in a corrugated board box and plastic film. It is further transported on inland waterways and roads to the final installation site.

Use phase

The energy meter is assumed to operate for 20 years.

The use phase accounts for the electricity consumed by the energy meter during its service life. The total electricity consumption is calculated according to the following formula:

$$E_{use}\,[kWh] = \frac{P_{use} * 8760 * RSL}{1000}$$

Where,

P_{use} is the power consumed by the meter, which is 1 W, representing the operation in active mode, according to the producer;

RSL is the service life of the product, assumed to be 20 years;

8760 is the number of hours in a year;

1000 is the conversion factor that allows the energy consumed in kWh over the product's service life to be expressed.

Therefore, the calculated electricity consumed by the energy meter in the use phase is 175.2 kWh.

Detailed Product Description

The specifications and material composition of the energy meter Jobi-M are reported in Table 2 and Figure 2, respectively.

Table 2 Specifications of the Jobi-M product

Nominal voltage	240 V
Frequency	60 Hz
MID meter performance class	B
Current intensity	Minimum = 0,6 A; Base = 15 A; Maximum = 100 A
Total weight (without packaging)	974.3 g
Total weight (with packaging)	1082.4 g

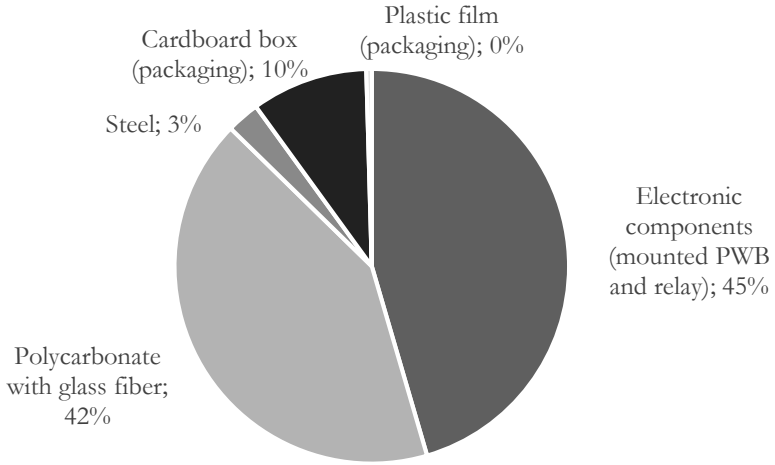

Figure 2 Material composition of the Jobi-M product and packaging

There is no "Substance of Very High Concern" (SVHC) in concentration above 0.1% by weight, and neither does the packaging, following the European REACH regulation (Registration, Evaluation, Authorization and Restriction of Chemicals).

LCA Results

Environmental Footprint (EF) method version 3.1 has been used as the impact model, adapted to consider the characterization factors of +1 and −1 for biogenic carbon dioxide emissions and removals, respectively, for the Climate Change – Biogenic impact category. All result Tables (3 to 6) refer to a functional unit of 1 energy meter and an expected average service life of 20 years.

The core indicators from the EF method are reported in this EPD (i.e. Climate Change, Climate change – Fossil, Climate change – Biogenic, Climate change – Land use and LU change, Ozone depletion, Acidification, Eutrophication – freshwater, Eutrophication – marine, Eutrophication – terrestrial, Photochemical ozone

formation, Resource use – minerals and metals1[1], Resource use – fossil[1], and Water Use[1]. The additional indicators for the categories Ionizing Radiation[2], Particulate Matter, Land Use[1], Human Toxicity – cancer[1], Human Toxicity – Non-cancer[1], and Ecotoxicity – freshwater[1] are not declared.

[1] Disclaimer 1 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

[2] Disclaimer 2 – 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.

Table 3 Results of the core environmental indicators from the EF method

Impact Categories	Manufacturing		Distribution	Installation	Use	End-of-Life	
	Upstream	Core	Downstream				**Total**
Climate change - Total (kg CO_2 eq)	75.77	0.40	0.41	0.20	43.20	0.74	**120.72**
Climate change - Biogenic (kg CO_2 eq)	0.40	0.12	0.01	0.20	17.36	7.47E-04	**18.08**
Climate change - Fossil (kg CO_2 eq)	75.24	0.26	0.39	0.00	22.03	0.74	**98.66**
Climate change - Land use and LU change (kg CO_2 eq)	0.14	0.02	0.02	5.66E-05	3.81	0.001	**3.98**
Ozone depletion (kg CFC11 eq)	7.82E-06	5.13E-09	1.52E-08	4.93E-11	6.08E-07	1.55E-09	**8.45E-06**
Acidification (mol H^+ eq)	0.62	0.002	0.002	5.69E-06	0.15	4.16E-04	**0.77**
Eutrophication, freshwater (kg P eq)	1.46E-02	4.11E-05	1.34E-06	9.42E-09	5.14E-04	1.93E-06	**1.52E-02**
Eutrophication, marine (kg N eq)	0.09	5.68E-04	0.001	2.15E-05	0.03	2.97E-04	**0.12**
Eutrophication, terrestrial (mol N eq)	0.94	0.01	0.01	1.71E-05	0.28	1.59E-03	**1.24**
Photochemical ozone formation (kg NMVOC eq)	0.31	0.002	0.002	1.63E-05	0.09	4.58E-04	**0.40**
Resource use, minerals and metals (kg Sb eq)	1.13E-02	2.79E-04	5.03E-08	1.66E-10	3.68E-06	1.12E-08	**1.16E-02**
Resource use, fossils (MJ)	981.00	3.60	5.14	0.02	324.06	0.94	**1314.74**
Water use (m^3 depriv.)	10.74	0.29	0.06	0.000	75.19	0.024	**86.32**

Table 4 Results of the parameters describing the use of resources

	Manufacturing		Distribution	Installation	Use	End-of-Life	
	Upstream	Core	Downstream				**Total**
PERE (MJ, net calorific value)	103.82	3.68	0.17	7.24E-04	839.44	0.06	**947.17**
PERM (MJ, net calorific value)	1.33	0.35	0.00	0.00	0.00	0.00	**1.68**
PERT (MJ, net calorific value)	105.15	4.03	0.17	7.24E-04	839.44	0.06	**948.84**
PENRE (MJ, net calorific value)	966.47	2.92	5.14	0.02	319.62	0.94	**1295.10**
PENRM (MJ, net calorific value)	14.47	0.68	0.00	0.00	0.00	0.00	**15.15**
PENRT (MJ, net calorific value)	980.94	3.60	5.14	0.02	319.62	0.94	**1310.25**
SM (kg)	0.19	1.19E-03	6.71E-06	1.36E-07	7.40E-04	2.53E-07	**0.19**
RSF (MJ, net calorific value)	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
NRSF (MJ, net calorific value)	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
FW (m3)	0.58	0.02	0.01	2.57E-05	4.20	1.15E-03	**4.80**

Legend:
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 (primary energy and primary energy resources used as raw materials);
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;
SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water.

Table 5 Results of other environmental information describing waste categories

	Manufacturing		Distribution	Installation	Use	End-of-Life	
	Upstream	Core	Downstream				**Total**
HWD (kg)	0.04	7.44E-04	4.70E-05	6.56E-07	0.04	5.51E-02	**0.13**
NHWD (kg)	4.03	0.01	0.00	0.02	0.51	7.09E-01	**5.29**
RWD (kg)	2.20E-03	7.48E-06	1.29E-07	3.80E-09	7.93E-04	1.20E-06	**3.00E-03**

Legend:
HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed.

Table 6 Results of parameters describing output flows to recovery

	Manufacturing		Distribution	Installation	Use	End-of-Life	
	Upstream	Core	Downstream				Total
CRU (kg)	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
MFR (kg)	0.01	0.04	3.21E-06	0.09	4.47E-04	0.28	**0.42**
MER (kg)	0.05	9.71E-05	1.46E-04	1.64E-06	2.92E-03	2.89E-06	**0.052**
EEE (electrical) (MJ per energy carrier)	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
EET (thermal) (MJ per energy carrier)	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**

Legend:
CRU = Components for re-use;
MRF = Materials for recycling;
MER = Materials for energy recovery;
EEE = Exported electrical energy;
EET = Exported thermal energy.

Scenarios and Additional Technical Information

Manufacturing stage (Upstream and Core)

- **Production and Supply of Components (Upstream):** Components used in the energy meter comprise mainly polycarbonate with glass fiber, the mounted Printed Wiring Board, and the relay. The upstream module considers the activities to extract raw materials and their further processing and manufacture into final components, including the production of the energy meter's packaging. Moreover, the inbound logistics related to the supply of such components to Nansen assembly plant are also included in this module.
- **Energy Meter assembly (Core):** This stage represents the production of the energy meter, which occurs in an assembly line at the Nansen industrial plant located in Manaus/AM/Brazil.

Distribution stage (Downstream)

- Once the energy meter is cleared from the final assembly tests, it is packed in a corrugated board box and plastic film. It is then delivered to the installation site on inland waterways for 1.650 km and roads for 3.000 km. This module accounts for the transportation activities to deliver the packaged energy meter to the final user.

Installation (Downstream)

- The installation step considers the waste treatment of the energy meter's packaging. It is assumed to follow the Brazilian average waste scenario for cardboard boxes and plastics including recycling and landfills, i.e. 85% recycling rate for the cardboard box and 23.1% for the plastic film (CEMPRE, 2023).

Use phase (Downstream)

- The energy meter is assumed to operate for 20 years. Impacts related to this phase derive from the electricity consumed by the respective meter during the reference service life in Brazil.

End-of-Life (Downstream)

- The energy meter consists of a plastic structural part and electronic components, which are sent to dismantle and recycle, traveling an average road distance of 203.7 km. Material recovery rates are retrieved from EN 50693:2019, although materials for energy recovery are assumed to be treated in landfills instead, because of the average Brazilian waste treatment scenario.

Biogenic carbon content at the production gate

The energy meter does not contain biogenic carbon. Its packaging has a biogenic carbon content of 46.53 g C.

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

Release of dangerous substances to indoor air, soil and water

There is no release of dangerous substances into indoor air, soil and water during the use stage.

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