



ENVIRONMENTAL PRODUCT DECLARATION

ROUTER
CPE FWA IDU 5G ID525TM

Lot M1, Lot F and Lot T1, Quang
Chau Industrial Zone, Nenh Ward,
Bac Ninh Province, Vietnam

In accordance with ISO 14025 and EN50693:2019

Program Operator	EPDItaly
Publisher	EPDItaly

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GENERAL INFORMATION

EPD OWNER

Name of the company	FUYU PRECISION COMPONENT COMPANY LIMITED
Registered office	Lot M1, Lot F and Lot T1, Quang Chau Industrial Zone, Nenh Ward, Bac Ninh Province, Vietnam
Contacts for information on the EPD	Rich.kl.lee@fii-foxconn.com

PROGRAM OPERATOR

EPDIItaly	Via Gaetano De Castillia n° 10 - 20124 Milano, Italy
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INFORMATION ON THE EPD

Product name (s)	CPE FWA IDU 5G ID525TM
Site (s)	Lot M1, Lot F and Lot T1, Quang Chau Industrial Zone, Nenh Ward, Bac Ninh Province, Vietnam
Short description and technical information of the product (s)	Router, equipped with LTE or 5G network capability to receive and transmit signals. The transceiver modulates and demodulates the signals, converting them into digital signals for transmission to the host device. It then shares the data with users via Wi-Fi signals, supporting both 2.4GHz and 5GHz Wi-Fi frequency bands. It also supports VOIP.
Field of application of the product (s)	Electronic and electrical products
Product (s) reference standards (if any)	EN 50693:2019 – Product category rules for life cycle assessment of electronic and electrical products and systems
CPC Code (number) https://unstats.un.org/unsd/classifications/Econ	47223 transmission or reception of voice, images or other data, including apparatus for communication in a wired or wireless network (such as a local or wide area network)

VERIFICATION INFORMATION

PCR	EPDIItaly007 Rev. 3.2 – 10/12/2025: “Electronic and electrical product and systems” EN 50693:2019 – Product category rules for life cycle assessment of electronic and electrical products and systems
EPDIItaly Regulation	EPDIItaly Regulations Rev 7.1 – 05/09/2025
Project Report LCA	SGS/2026/LCAR/E/0601 – 11/08/2026
LCA Consultant	Ruthe.Fan@sgs.com Chris.Zhao@sgs.com SGS-CSTC Standards Technical Services Co., Ltd
Independent Verification Statement	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	EPDs within same category of product in different programme operators are not suggested to be compared. 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 even applying the same PCR.
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 disclaims any responsibility for the information, data and results provided by the EPD Owner for life cycle assessment.

OTHER INFORMATION

Scope of EPD	This EPD is a specific EPD covering only the product manufactured at FUYU PRECISION COMPONENT COMPANY LIMITED under the declared functional unit. It is not an average or generic EPD.

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1. Company Information



Company Profile

Fuyu is a high-tech manufacturing enterprise and a member of the (Hon Hai Technology Group / Foxconn), one of the world's leading electronics manufacturing service providers. Established in December 2019, the company is located at Quang Chau Industrial Park, Bac Ninh Province, Vietnam.

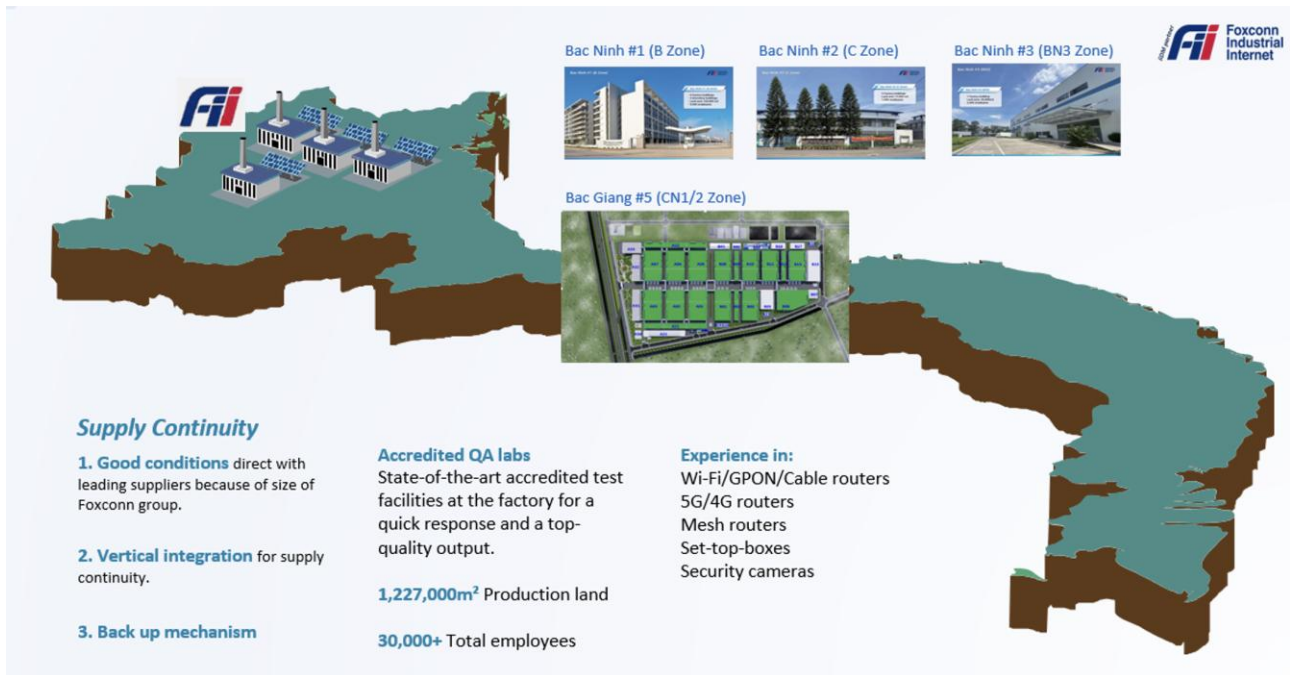
Since its establishment, FUYU Precision has rapidly expanded into one of the major manufacturing facilities within the Foxconn ecosystem in Vietnam, supported by advanced production capabilities, large-scale manufacturing infrastructure, and a highly integrated supply chain network. The company currently employs more than 10,000 personnel and serves global customers across the telecommunications, networking, and consumer electronics industries.

FUYU Precision specializes in the manufacturing and assembly of:

- Precision electronic components
- Networking and broadband devices
- XDSL, STB, Router, and IP Camera products
- Mobile device components
- Small-size display modules
- Communication and connectivity products

The company is committed to delivering high-quality manufacturing services with strong flexibility, rapid response capability, and reliable global supply chain support. Leveraging Foxconn's worldwide manufacturing expertise and technology resources, FUYU Precision continuously enhances operational efficiency, automation capability, and product quality to meet international customer requirements.

As part of Foxconn's strategic manufacturing expansion in Vietnam, FUYU Precision plays an important role in supporting global electronics and communication equipment production, serving customers in the United States, Hong Kong, and other international markets.



Supply Continuity

- 1. Good conditions** direct with leading suppliers because of size of Foxconn group.
- 2. Vertical integration** for supply continuity.
- 3. Back up mechanism**

Accredited QA labs
State-of-the-art accredited test facilities at the factory for a quick response and a top-quality output.

1,227,000m² Production land

30,000+ Total employees

Experience in:
Wi-Fi/GPON/Cable routers
5G/4G routers
Mesh routers
Set-top-boxes
Security cameras

Factory Locations:
 Bac Ninh #1 (B Zone)
 Bac Ninh #2 (C Zone)
 Bac Ninh #3 (BN3 Zone)
 Bac Giang #5 (CN1/2 Zone)

Foxconn Industrial Internet

2. Product Information

Product Name: CPE FWA IDU 5G ID525TM

Product Description: Router, equipped with LTE or 5G network capability to receive and transmit signals. The transceiver modulates and demodulates the signals, converting them into digital signals for transmission to the host device. It then shares the data with users via Wi-Fi signals, supporting both 2.4GHz and 5GHz Wi-Fi frequency bands. It also supports VOIP.

Table 1 Properties of Router

PROPERTIES	CPE FWA IDU 5G ID525TM
5G NR	Compliant to 3GPP Release 17 Support Band: n1, n3, n7, n8, n20, n28, n78 DL 4x4 MIMO Band: n1, n3, n7, n78 UL 2x2 Band: n78
4G LTE	Compliant to 3GPP Release 17 Support Band: B1, B3, B7, B8, B20, B28, B32 DL 4x4 MIMO Band: B1, B3, B7
Wi-Fi	Wi-Fi 802.11b/g/n/ax/be 2.4GHz 2x2 Wi-Fi 802.11a/n/ac/ax/be 5GHz 2x2 Support up to 128 client connections Support Wi-Fi Easy Mesh function

Interface Type	One Gbps WAN/LAN port + One Gbps LAN port One FXS port (VOIP) USB 2.0 – Type A port for debugging Nano SIM slot Power On/Off, WPS button, Reset button LED Display: Power, Wi-Fi, 4G, 5G, Status
Antenna	Peak gain – LB: 0-2dBi / MHB: 2-4dBi / UHB: 2-5dBi Efficiency – LB: > 30% / MHB: > 50% / UHB: > 50%
Physical & Environmental Specification	Power input: 12V/2A W Operation temperature: 0 ~ 40°C Humidity : 5 ~ 95% (non-condensing)

Manufacturing process: The router assembly process begins with the DL (Download) station, where the software is downloaded onto the device, followed by PT1 (Production Test 1) for checking hardware interfaces, and PT2 (Production Test 2) for 4G/5G non-signaling calibration to produce semi-finished product A; semi-finished product A then proceeds to PT3 (Production Test 3) for 4G/5G non-signaling verification, followed by PT4 (Production Test 4) for Wi-Fi calibration, Wi-Fi verification, and writing and saving Wi-Fi bin data, after which the Thermal Gel Process is performed, including thermal gel application and module shielding cover assembly, to produce semi-finished product B; semi-finished product B moves to the ASSY (Assembly) station for DUT assembly, then to FT1 (Function Test 1) for writing setting data, and FT2 (Function Test 2) for Wi-Fi throughput testing to produce semi-finished product C; finally, semi-finished product C undergoes RC (Run Check) to verify setting data and OBA (Outgoing Box Audit) for random inspection before becoming finished goods ready for shipment.

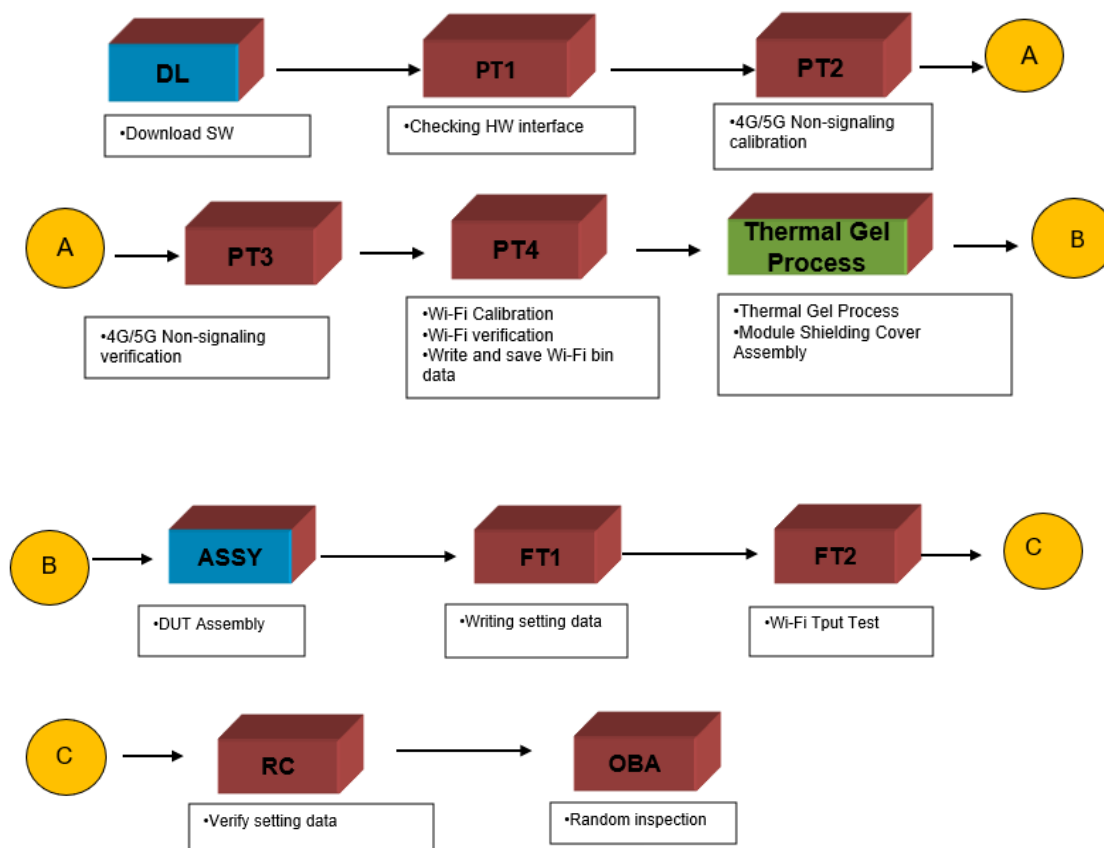


Table 2 Material composition of the product considered in the analysis.

Electronic components	% Mass
Adapter	9.42%
Aluminum Inductor	0.05%
Antenna	1.74%
Cable	2.69%
Chipset	0.17%
Coil Inductor	0.16%
Connector	1.04%
Consumable-glue	0.04%
Consumable-Solder	0.03%
Crystal	0.00%
Diode	0.05%
Ferrite bead	0.00%
heatsink	7.88%
Multilayer Ceramic Capacitor	0.03%
Multilayer Inductor	0.00%
Multilayer Resistor	0.02%
PCB	6.04%
Switch	0.30%
Structural components	% Mass
Rubber	0.04%
Plastic housing	24.19%
Plastic housing-bottom	3.49%
Screw	0.39%
Shield	1.35%
Solder paste	0.00%
sponge	0.04%
Thermal gel	0.08%
Thermal pad	1.38%

Table 3 Packaging composition of the product considered in the analysis.

Packaging components	% Mass
Packing-corrugated board	9.80%
Packing-film	2.10%
Packing-label	0.15%
Packing-paper	27.12%
Packing-pet	0.11%
Packing-pp	0.11%

Table 4 Location of production, application and end-of-life of product

Product	Location of production	Location of application and end-of-life
CPE FWA IDU 5G ID525TM	Vietnam	Italy

3. Life Cycle Assessment Information

A Life Cycle Assessment (LCA) is a methodology for assessing the environmental impacts associated with the life cycle of a particular product or process. LCA consists of 4 stages (Goal and Scope, Inventory Analysis, Impact Assessment, and review/presentation), which must follow similar procedures to a PCR (Product Category Rules) and helps to evaluate the carbon footprint and natural resources of a product or process. The product and life cycle stages are described in the following sections.

3.1 Functional Unit

The functional unit of "A router: to provide the function of receiving and transmitting signals for 5 years RSL, equipped with LTE or 5G network capability, supporting both 2.4GHz and 5GHz Wi-Fi frequency bands" was adopted in this study.

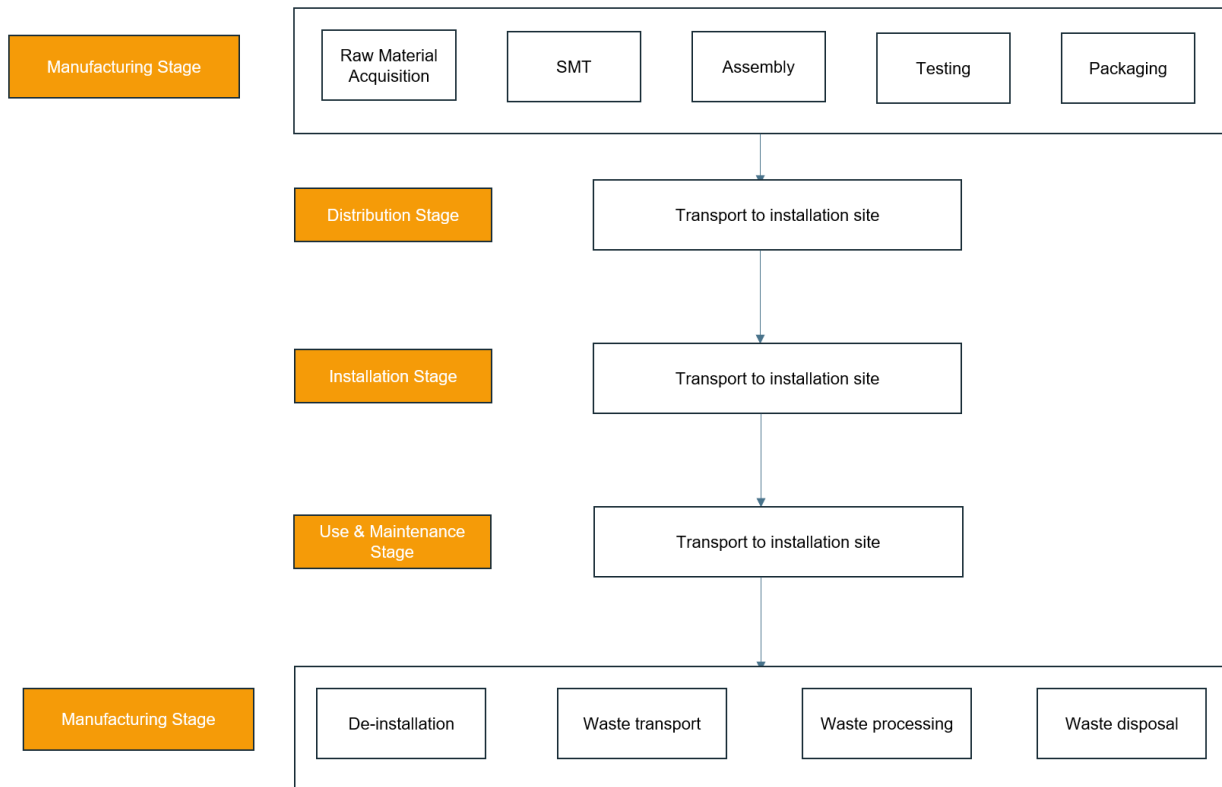
For the router, one pcs router is equal to 0.872 kg. An average RSL of 5 years is used for LCA calculations.

3.2 System boundary

The system boundary of the study shows as below, that is, all the substantial environmental impact generated by product stage (raw material supply, transport and manufacturing), distribution, installation, use&maintenance and end-of-life stage.

Table 4 system boundary of product

MANUFACTURING STAGE		DISTRIBUTION STAGE	INSTALLATION STAGE	USE & Maintenance STAGE	END-OF-LIFE STAGE De-installation
UPSTREAM MODULE	CORE MODULE	DOWNSTREAM MODULE			
extraction of raw materials, including waste recycling processes and the production of semi-finished, packaging and ancillary products	manufacturing of the product constituents, including all the stages	IN ACCORDANCE WITH EN 50693			
transportation of raw materials to the manufacturing company	product assembly				
	packaging				
	waste handling processes				



The system boundary of the research begins with the acquisition of raw materials, which will be processed and transported to the production site of FUYU PRECISION COMPONENT COMPANY LIMITED for production, and finally undergo end-of-life stage.

Life cycle stage	Description
Manufacturing stage (Upstream module)	This stage includes: The processing of all upstream raw materials of the router (including the extraction and processing of natural resources), loss, packaging, and some transportation activities. The process of transporting all upstream raw materials of the router to the production site.
Manufacturing stage (Core module)	It considers the production and assembly of routers, including the production of auxiliary materials , water, and electricity consumption as well as waste generation.
Distribution	It considers the transportation of the router from the assembly plant to the installation site.
Installation	Considering that the router's installation does not require any relevant inputs in terms of materials and energy and is performed manually, the lca result in this process has been reported as zero. Only packaging material waste is considered in this stage.
Use and Maintenance	Use: include energy use due to the operation during the lifetime. Maintenance operations are declared within the cut-off criteria.
End-of-life stage	The end-of-life stage includes:

	Dismantling: Considering that the router's dismantling does not require any relevant input in terms of materials and energy, the lca result in this process has been reported as zero. Transport to waste processing: The transportation of the router from the point of waste generation to the treatment platform. For recovery and recycling processes, which take place outside the boundaries of the product system, only impacts related to the transport of the waste to the treatment platform are considered. Waste processing for reuse, recovery and/or recycling: Includes collection of waste fractions from the dismantling and waste processing of material flows intended for reuse, recycling, and energy recovery. Shredding process requiring electricity is considered within this study. Waste disposal: The environmental impact derived from final waste treatment processes (landfill or incineration) are considered in this module.
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3.3 Impact categories

The methodology chosen to evaluate the potential environmental impacts of the product subject of this study includes all the impact categories required by the EN 50693:2019 as implemented in the SimaPro software. Some indicators have been analyzed in the LCA but are not reported in the EPD, such as Particulate matter, Ionising radiation, Ecotoxicity, freshwater, Human toxicity, cancer, Human toxicity, non-cancer and Land use. The categories analyzed are therefore:

Environment Impact Indicator	Unit
Global Warming Potential total (GWP-total)	kg CO2 eq
Global Warming Potential fossil fuels (GWP-fossil)	kg CO2 eq
Global Warming Potential biogenic (GWP-biogenic)	kg CO2 eq
Global Warming Potential land use and land use change (GWP-luluc)	kg CO2 eq
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq
Acidification potential, Accumulated Exceedance (AP)	mol H+ eq
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP- freshwater)	kg P eq
Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine)	kg N eq
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	mol N eq
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq
Abiotic depletion potential for non-fossil resources (ADP-mineral & metals)	kg Sb eq
Abiotic depletion potential for fossil resources (ADP-fossil)	MJ
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	m3 depriv.
Particulate matter	disease inc.

Ionising radiation	kBq U-235 eq
Ecotoxicity, freshwater	CTUe
Human toxicity, cancer	CTUh
Human toxicity, non-cancer	CTUh
Land use	Pt
PERE	MJ (LHV)
PERM	MJ (LHV)
PERT	MJ (LHV)
PENRE	MJ (LHV)
PENRM	MJ (LHV)
PENRT	MJ (LHV)
Use of secondary material	kg
Use of renewable secondary fuels	MJ (LHV)
Use of non-renewable secondary fuels	MJ (LHV)
Net use of fresh water	m ³
Hazardous waste disposed	kg
Non-hazardous waste disposed	kg
Radioactive waste disposed	kg
Components for re-use	kg
Materials for recycling	kg
Materials for energy recovery	kg
Exported energy- electricity	MJ
Exported energy - heat	MJ

3.4 Cut-off

All relevant input and output flows of matter and energy included within the system boundaries were considered.

According to the EPDItaly Regulations and PCR EPDItaly007, the following flows and operations were cut-off:

- Considering that the router's installation does not require any relevant inputs in terms of materials and energy and is performed manually, a cut-off on the impacts included in installation stage module was applied.
- For the use stage, no ordinary maintenance and routine repairs of the product was considered during its service life.

- For the dismantling phase, the same impacts were considered as for the installation phase. Considering that the router's dismantling is performed manually and does not require any relevant inputs in terms of materials and energy, a cut-off on the impacts included in End-of-life stage module.
- Production, use and disposal of the packaging of raw materials.

3.5 Allocation Principles

The allocation for the energy, water and packaging material consumptions and for the waste was done using mass allocation method based on inventory data.

3.6 Assumption

The following assumptions were adopted in this study:

Life cycle stage	Assumptions
Material transportation	For the material transportation, emission factor is selected Euro 5 standard vehicle, in absence of primary data on the fleet of vehicle used.
Production	The electricity mix used during production stage are selected based on the manufacturing scenario in vietnam according to the power capacity from Ecoinvent 3.11, GWP for used electricity mix used are 0.56 kg CO ₂ e./ kWh for Grid electricity and 0.08 for photovoltaic electricity. The selected datasets are: Electricity, low voltage {VN} market for electricity, low voltage EN15804, U Electricity, low voltage {RoW} electricity production, photovoltaic, 570kWp open ground installation, multi-Si EN15804, U
Distribution	For distribution, transport was considered EURO 5 category vehicle, in absence of primary data on the fleet of vehicle used.
Installation	Label, plastic and paper packaging are assumed to be 100% incinerated at the end of life in this stage.

Use and
Maintenance

In the use phase, the electricity consumption during use is calculated by adding the energy used during operation and the energy used in standby mode.

Different users have varying daily router usage times, so this scenario assumes the router operates for 12 hours and remains in standby mode for 12 hours each day. The energy use during the service time was calculated according to the formula:

The equation is presented below:

$$E_{\text{total}}[\text{kWh}] = E_{\text{output}} + E_{\text{standby}}$$

$$E_{\text{output}}[\text{kWh}] = (P_{\text{output}} \times 8760 \times \text{RSL} \times \alpha) / 1000$$

$$E_{\text{standby}}[\text{kWh}] = (P_{\text{standby}} \times 8760 \times \text{RSL} \times (1 - \alpha)) / 1000$$

Where:

E_{use} is the energy consumed by the router during its service life.

P_{use} is the power consumed by the router at a given value of current during its operating time

P_{standby} is the power consumed by the router remaining in standby mode.

RSL is the reference service life of the product

α is a coefficient describing the amount of time in which the router is requested to operate its function

For the Use phase the following scenario was considered: low voltage level in Italy provided by Ecoinvent 3.11. GWP for used electricity mix used is 0.37 kg CO₂e./ kWh.

The selected dataset is Electricity, low voltage {IT} | market for electricity, low voltage | EN15804, U

Parameter	Unit	Properties	Characterization factor resource	GWP of electricity mix
P_{output}	w	12	Electricity, low voltage {IT}	0.37 kg CO ₂ e / kWh
P_{standby}	w	4.5		

	Reference Service Life	years	5	market for electricity, low voltage EN15804, U	
	α	/	0.5		
	E_{output}	kWh	262.8		
	E_{standby}	kWh	98.55		
	E_{total}	kWh	361.35		
Waste transport	An average distance of 200 km was used to estimate the transport of waste router from installation site to the treatment platform.				
Waste processing for reuse, recovery and/or recycling	Waste treatment (shredding as the preparations to recycle) of router is included. For the router end of life (after dismantling), the primary data of recycling referred to the assessment of WEEE for this product, thus the following End-of-life scenarios are modelled for each material: Hard Plastic: 75%recycled / 25% energy recovery Soft Plastic: 65% recycled / 30% energy recovery / 5% landfill Copper: 95% recycled, 5% landfill PCB: 90% recycled, 10% landfill				
Disposal	It is assumed that the remaining router is disposed of via landfill.				

3.7 Data quality

All the main flows of matter and energy have been fully quantified and included in the study; the flows excluded from the analysis are identified in the Cut-off rules section.

LCI/LCA database: The secondary data are taken from the ecoinvent 3.11 environmental database.

Process	Representativeness		
	Geographical	Technical	Time
Adapter	Good	Fair	Very good
Aluminum Inductor	Good	Very good	Very good
Antenna	Good	Fair	Very good
Cable	Good	Good	Very good
Chipset	Good	Very good	Very good
Coil Inductor	Good	Very good	Very good
Connector	Good	Very good	Very good
Consumable-Solder	Good	Good	Very good
Consumable-Flux	Good	Good	Very good
Crystal	Good	Fair	Very good

Diode	Good	Very good	Very good
Heatsink	Good	Good	Very good
Multilayer Ceramic Capacitor	Good	Good	Very good
Multilayer Resistor	Good	Good	Very good
Ferrite bead	Good	Good	Very good
Packaging-corrugated board	Good	Good	Very good
Packing-Film	Good	Good	Very good
Packing-Label	Good	Good	Very good
Packing-Paper	Good	Good	Very good
Packing-Pet	Good	Good	Very good
Packing-PP	Good	Good	Very good
PCB	Good	Good	Very good
Plastic Housing	Good	Good	Very good
Plastic Housing-bottom	Good	Good	Very good
Rubber	Good	Good	Very good
Screw	Good	Good	Very good
Shield	Good	Good	Very good
Solder paste	Good	Good	Very good
Sponge	Good	Good	Very good
Switch	Good	Good	Very good
Thermal gel	Good	Good	Very good
Thermal pad	Good	Good	Very good
Distribution by lorry	Good	Good	Very good
Distribution by Air	Good	Good	Very good
Distribution by container ship	Good	Good	Very good
Power mix generation in Vietnam	Good	Good	Very good
Power mix generation in Italy	Good	Good	Very good
Low voltage photovoltaic electricity generation in Vietnam	Fair	Good	Very good
Waste processing for router after manual dismantling	Good	Good	Very good
Recycling of copper in Italy	Good	Good	Very good
Recycling of plastic in Italy	Good	Good	Very good
Recycling of PCB in Italy	Good	Good	Very good

Treatment of waste plastic in Italy	Good	Good	Very good
Landfill of waste router in Italy	Good	Good	Very good

Geographic representativeness: primary site-specific data were used for the router assembly processes; for the secondary data, datasets were selected from databases consistent with the geography of the processes.

Technological representativeness: the primary data used represent the specific production technology of the product. For the secondary data taken from the database, reference was made to the most representative technology for the processes.

Time representativeness: the primary data used refers to the year 2025 and 2026.

Completeness: The LCA model included all known mass and energy flows for production of routers. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.

Precision/uncertainty: Data collected for operations were typically averaged for one year, which is expected to reduce the variability of results.

Representativeness analysis: Adapter in manufacturing stage contributes more than 30% to the core indicator.

Use of Fair data with more than 30% of a core impact: No Fair data contributing 30% to the core indicator used.

Use of poor relevant data: No poor data used.

Use of very poor relevant data: No very poor data used.

3.8 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 from 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.

4. Inventory

In the development of this EPD, primary data was preferentially utilized wherever accessible. For the secondary data, datasets were selected from the Ecoinvent v3.11 database. The source and version of characterization factors used in this module are EN 15804 +A2 LCIA & LCI indicators.

The cut-off method used for the datasets in Ecoinvent is EN 15804+A2.

Data collection was implemented through the creation of a specialized sheet that compiled input and output data. This included mass - related data and energy consumption data, all of which were sourced within the production site from 2025/04/01 to 2026/01/31. Following data collection, the sheet underwent rigorous verification. This involved employing mass balance checks to identify any inconsistencies. Once detected, these inconsistencies were promptly clarified and resolved. All the original data and secondary data used have good transparency, completeness, accuracy and consistency, so the data quality is pretty good.

Regarding the study methodology, SimaPro 10.2 software was employed. It was utilized to construct the model for the product life cycle and to calculate the Life Cycle Assessment (LCA) results.

It should be noted that, in accordance with the principles of confidentiality, the complete LCA report (SGS/2026/LCAR/E/0601) and detailed inventory data have not been fully disclosed in this EPD.

The withheld data primarily relates to specific proprietary processes and certain sensitive material compositions within the production phase. This decision was made to protect the company's intellectual property and trade secrets. However, we are committed to transparency and are willing to provide additional details of the inventory data upon request. Interested parties may contact our company directly to obtain further information

5. Environmental Impact Assessment

For Potential Human exposure efficiency relative to U235 (IRP), 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.

While for environmental impact indicator(Abiotic depletion potential for non-fossil resources(ADP-minerals&metals), Abiotic depletion potential for fossil resources(ADP-fossil), Water (user) deprivation potential, deprivation-weighted water consumption (WDP), Potential Comparative Toxic Unit for ecosystems (ETP-fw), Potential Comparative Toxic Unit for humans (HTP-c), Potential Comparative Toxic Unit for humans (HTP-nc), Potential Soil quality index (SQP)), the results of these 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.

5.1 Environmental Impact Descriptive Parameters

5.1.1

Indicator	Unit	Upstream Module	Core Module	Downstream Module			
		Manufacturing Stage		Distribution Stage	Installation stage	Use&Maintenance Stage	End-of-life Stage
Global Warming Potential total (GWP-total)	kg CO2 eq	1.46E+01	1.92E+00	6.89E+00	1.26E+00	1.33E+02	1.96E+00
Global Warming Potential fossil fuels (GWP-fossil)	kg CO2 eq	1.50E+01	1.86E+00	6.89E+00	9.51E-03	1.27E+02	1.90E+00
Global Warming Potential biogenic (GWP-biogenic)	kg CO2 eq	-4.57E-01	6.49E-02	1.13E-03	1.25E+00	6.42E+00	6.00E-02
Global Warming Potential land use and land use change (GWP-luluc)	kg CO2 eq	3.11E-02	3.01E-04	5.45E-04	6.51E-06	2.75E-02	9.99E-04
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	1.54E-06	1.42E-08	1.03E-07	1.44E-10	3.43E-06	4.53E-09
Acidification potential, Accumulated Exceedance (AP)	mol H+ eq	1.28E-01	1.75E-02	3.05E-02	9.43E-05	5.13E-01	3.24E-03
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP- freshwater)	kg P eq	1.45E-02	1.02E-03	1.07E-04	1.13E-06	3.74E-02	2.07E-04
Eutrophication potential, fraction of nutrients reaching marine end compartment (EP- marine)	kg N eq	1.88E-02	2.45E-03	1.20E-02	3.54E-04	8.31E-02	1.26E-03
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	mol N eq	1.99E-01	2.46E-02	1.31E-01	2.05E-04	8.83E-01	9.81E-03

Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	7.13E-02	7.12E-03	4.22E-02	2.77E-04	3.53E-01	3.51E-03
Abiotic depletion potential for non-fossil resources (ADP-mineral & metals)	kg Sb eq	2.63E-03	1.61E-05	1.62E-06	1.23E-08	1.62E-03	4.90E-06
Abiotic depletion potential for fossil resources (ADP-fossil)	MJ	2.10E+02	1.94E+01	9.11E+01	1.36E-01	2.11E+03	3.09E+00
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	m³ depriv.	6.07E+00	0.00E+00	1.74E-01	0.00E+00	6.91E+01	1.17E-01

5.2 Parameters Describing Resource Use

5.2.1

Indicator	Unit	Upstream Module	Core Module	Downstream Module			
		Manufacturing Stage		Distribution Stage	Installation stage	Use&Maintenance Stage	End-of-life Stage
PENRE	MJ (LHV)	2.10E+02	1.94E+01	9.11E+01	1.36E-01	2.11E+03	3.10E+00
PERE	MJ (LHV)	3.33E+01	8.14E+00	3.34E-01	3.67E-03	8.99E+02	3.76E-01
PENRM	MJ (LHV)	1.06E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ (LHV)	6.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ (LHV)	2.21E+02	1.94E+01	9.11E+01	1.36E-01	2.11E+03	3.10E+00
PERT	MJ (LHV)	3.33E+01	8.14E+00	3.34E-01	3.67E-03	8.99E+02	3.76E-01
FW	m ³	1.52E-01	3.59E-03	4.21E-03	0.00E+00	1.84E+00	3.06E-03
MS	kg	2.47E-01	4.35E-03	8.58E-03	4.39E-05	5.11E-01	1.16E-03
RSF	MJ (LHV)	1.81E-02	7.53E-05	4.49E-05	8.28E-07	4.62E-03	4.30E-05
NRSF	MJ (LHV)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; **PERE** = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; **PENRM** = Use of non renewable primary energy resources used as raw materials; **PERM** = Use of renewable primary energy resources used as raw materials; **PENRT** = Total use of non-renewable primary energy resources; **PERT** = Total use of renewable primary energy resources; **FW** = Use of net fresh water; **MS** = Use of secondary material; **RSF** = Use of renewable secondary fuels; **NRSF** = Use of non-renewable secondary fuels

5.3 Waste Production Descriptive Parameters

5.3.1

Indicator	Unit	Upstream Module	Core Module	Downstream Module			
		Manufacturing Stage		Distribution Stage	Installation stage	Use&Maintenance Stage	End-of-life Stage
HWD	kg	1.62E+00	2.54E-01	3.88E-02	3.17E-04	4.46E+00	3.00E-01
NHWD	kg	5.39E+01	7.34E+00	8.07E-01	1.27E+00	1.91E+02	1.63E+00
RWD	kg	3.68E-04	2.76E-06	6.09E-06	6.28E-08	4.64E-03	2.12E-05
MER	kg	4.20E-05	6.99E-07	8.80E-07	9.64E-09	4.54E-05	4.24E-06
MFR	kg	5.88E-02	1.26E-02	1.42E-03	3.06E-06	4.91E-01	7.21E-01
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	MJ	4.39E-02	1.70E-03	1.62E-03	1.43E-05	1.51E-01	5.79E-04
EEE	MJ	1.63E-01	1.07E-03	2.57E-03	2.83E-05	1.10E+01	1.34E-02

HWD = Hazardous waste disposed; **NHWD** = Non-hazardous waste disposed; **RWD** = Radioactive waste disposed; **MER** = Materials for energy recovery; **MFR** = Materials for recycling; **CRU** = Components for reuse; **ETE**= Exported thermal energy; **EEE**= Exported electricity energy;

6. LCA results and interpretations

The results of the underlying LCA are provided in this section as for environmental impacts, resource use and waste categories. All parameters required by the sub-PCR EPD Italy007 are included and reported in the Section 5.

The main general conclusions of the LCA are:

Operational energy use during use stage, are the process with the highest contribution in the lifecycle environmental burden. Material acquisition and distribution results with a minor contribution. The installation and manufacturing stage does not result in any significant environmental impact. Thus, the overall environmental impacts of the router are largely dependent on operating power and duration.

For the upstream module, the biogenic carbon emissions absorbed by packaging materials will be released through incineration during the waste treatment of packaging in installation phase; therefore, the compensation for the GWP-biogenic has been accounted for in the installation stage.

The energy consumed during the lifetime is considered as the hotspot of the life cycle of the router. The routers under study are mainly made of electronic components. In upstream module, the Adapter and chipset are the main contributors to all environmental categories, the impact depending on their content.

The distribution of routers contributes a significant environmental impact in GWP, the shipment from Vietnam port to Italy Genova port and from Vietnam airport to Italy Milano Malpensa airport are considered as the main contributing process.

7. Reference

- ISO 14040:2006 Environmental management — Life cycle assessment — Requirements and guidelines
- ISO 14044:2006 Environmental management — Life cycle assessment — Principles and framework
- EN50693:2019 Product category rules for life cycle assessments of electronic and electrical products and systems
- EPD Italy 007 Rev. 3.2 – 10/12/2025: “Electronic and electrical product and systems”
- SGS/2026/LCAR/E/0601 LCA Report-11/08/2026
- ISO 14025:2026 : Environmental statements and programmes for products — Environmental product declarations (EPDs)
- Regulations of the EPDItaly Programme - Revision 7.1
- Ecoinvent Database. <http://www.Ecoinvent.org>