



ENVIRONMENTAL PRODUCT DECLARATION

EFACEC Swithgear QBN7

In accordance with ISO 14025 and EN 50693:2019

Program Operator	EPDItaly
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Efacec Energia – Máquinas e Equipamentos Eléctricos S.A. located at Parque Empresarial Arroiteia , S, Mamede Infesta 4465-591, Portugal

Efacec India Private Limited located at Plot nº H-155, MIDC Industrial Area, Ambad, Nashik, Maharashtra 422010, Índia

www.epditaly.it

GENERAL INFORMATION

EPD OWNER

Name of the company	Efacec Energia – Máquinas e Equipamentos Eléctricos S.A. – Switchgear www.efacec.com
Registered office	Parque empresarial Arroiteia , S, Mamede Infesta 4465-591
Contacts for information on the EPD	hercilio.santos@efacec.com / josefaria@efacec.com

PROGRAM OPERATOR

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

Product name (s)	QBN7
Site (s)	Efacec Energia – Máquinas e Equipamentos Eléctricos S.A. located at Parque Empresarial Arroiteia , S, Mamede Infesta 4465-591, Portugal Efacec India Private Limited located at Plot n° H-155, MIDC Industrial Area, Ambad, Nashik, Maharashtra 422010, Índia
Other information	Reference period for data collected: March 2022-February 2023
Short description and technical information of the product (s)	Switchgear for primary distribution. Modular and metal-clad cubicles for indoor installation, with main circuit (medium voltage) insulated in air suitable for medium voltage networks up to 36kV
Field of application of the product (s)	Medium voltage networks up to 36kV
CPC Code (number) https://unstats.un.org/unsd/classifications/Econ	46214

VERIFICATION INFORMATION

PCR (title, version, date of publication or update)	PCR EPDIItaly007 - Electronic and Electrical Products and Systems, revision 3, 13/01/2023 PCR EPDIItaly015 – Switchboards, revision 1.5, 23/02/2022
EPDIItaly Regulation (version, date of publication or update)	Regulations of the EPDIItaly Programme, revision 6.0, 30/10/2023
Independent Verification Statement	The PCR review was performed by PCR review panel - info@epditaly.it . Independent verification of the declaration and data, carried out according to ISO 14025: 2010. <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External Third party verification carried out by: ICMQ S.p.A., via Gaetano De Castilla 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 EPDIItaly 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

This is a product specific declaration.

Geographic locations: The product is produced in India and in Portugal. The use and the end of life phase occur in Colombia.

The database used was the Ecoinvent EN 15804 add-on, version 3.10. The database was used to determine the life cycle inventory and impact assessment of upstream and downstream stages and to determine the impact assessment of the core stage.

SCOPE OF THE STUDY

All the stages of the life cycle are included (cradle to grave).

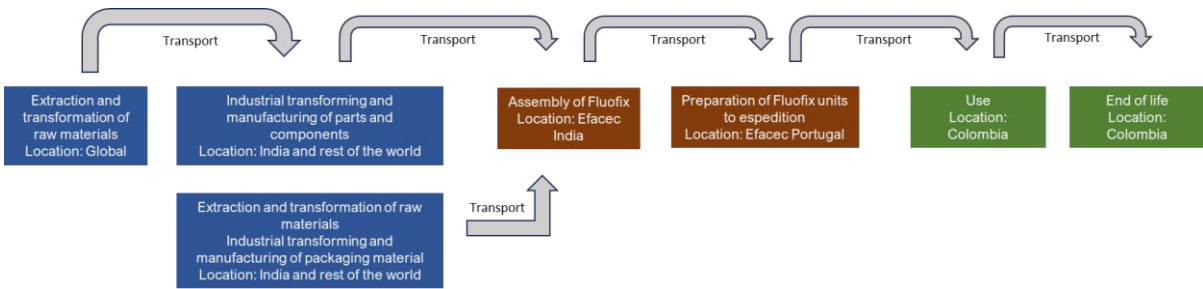


Figure 1 – Schematic representation of the life cycle of the products under study

ORGANIZATION DESCRIPTION

Efacec develops and provides integrated solutions in the fields of energy, mobility and the environment.

Efacec Power Solutions constitutes a group of companies that brings together all the means of production, technologies and technical and human competences for the development of activities in the fields of Energy, Engineering, Environment, Transport and Electric Mobility solutions, as well as a vast network of subsidiaries, branches and agents spread across four continents.

The organization is audited and certified by the most demanding quality and management standards: ISO 9001, ISO 14001, ISO 45001 and also certified according to the research, development and innovation standard NP 4457. These certifications are an integral part of a policy of continuous, transversal improvement, aimed at customer satisfaction and recognition as preferred partners.

PRODUCT DESCRIPTION

The QBN7 is a Medium Voltage Air Insulated Switchgear destined for Primary Distribution networks up to 36 kV, constructed on a modular Metal-clad design, making it easy to extend with more feeders.

The installation area required is quite small, but without compromising the operational safety and easy access for maintenance.

The standard operation of the equipment is exclusively carried-out from the front and the need to access it from the rear is limited to the connection of the MV cables.

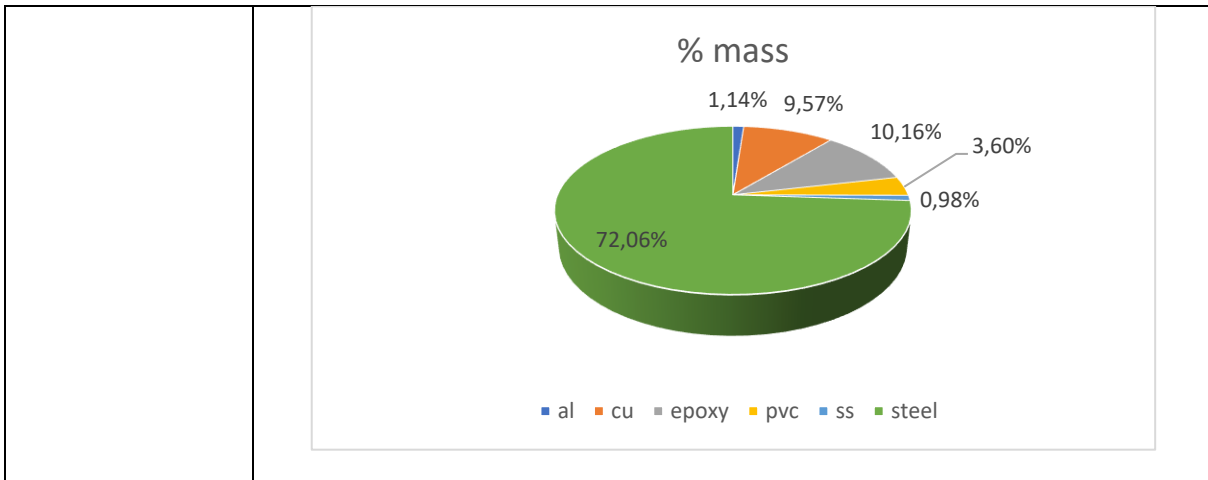
The construction of QBN7 switchgear is internal arc resistant, in accordance with IEC 62271-200, PM type, A-FLR accessibility, for the protection of personnel and other equipment.

The cubicles are fitted by DIVAC withdrawable vacuum circuit breakers, with high electrical and mechanical performance in accordance with IEC 62271-100, E3 and M2 classes.

Always in the forefront of the most demanding performances, the QBN7 range has already reached 3150 A and 31.5 kA.

Product/ Characteristic	314230122-01
Ir - Rated Current	1250A
IAC - Internal Arc Classification	A-FLR
Icc - Short circuit withstand	25kA/1s
Ur - Rated Voltage	36kV
Ud - Power Frequency	70kV
Up - BIL	170kV

Product QBN7 Material Composition			
	Material	Mass (kg)	%
Mass composition of the main materials	ABS (acrylonitrile-butadiene-styrene)	2,1559	0,14%
	Acrylic	0,9598	0,06%
	Al (aluminium)	17,8707	1,14%
	Aluminiumbronze	0,0582	0,00%
	Bakelite	2,0725	0,13%
	Brass	6,1817	0,40%
	Bronze	0,0976	0,01%
	Bronzoptfe	0,0062	0,00%
	Ceramic	5,3184	0,34%
	Cu (copper)	149,4886	9,57%
	Epoxy (epoxy resin)	158,6135	10,16%
	Nylonglassfiber	0,9753	0,06%
	PCB (printed circuit board)	0,1560	0,01%
	Polycarbonate	1,1086	0,07%
	Pom (poliamide)	1,2931	0,08%
	Pporesin	0,0120	0,00%
	PVC (polyvinylchloride)	56,1912	3,60%
	Rubber	10,2947	0,66%
	Silicone	8,0762	0,52%
	Stainless steel	15,3647	0,98%
Steel	1125,2870	72,06%	
Total	1561,582	100,00%	
	Packaging (wood)	102,5984	
Graphic representation (main materials)			



Declared/ Functional Unit: A unit of final product.

Reference Service Life (RSL): Twenty years.

Presence of dangerous substances: No substances of concern or very high concern are present in the final product nor are expected to be released during use phase.

The core module consists of assembling the components and manufacturing the final product.

The QBN7 is a Medium Voltage Air Insulated Switchgear destined for Primary Distribution networks up to 36 kV, constructed on a modular Metal-clad design, making it easy to extend with more feeders.

The QBN7 production process (core module - gate to gate) consists of assembling the final components/sub-assemblies, carrying out quality/ functional tests and packaging/preparing for dispatch.

Assembly involves several stages using hand tools and electrical equipment. Electrical devices and equipment are also used for testing, so only electrical energy is consumed in the core module. There is also no consumption or use of raw materials (other than those included in the BOM (bill of materials), whose production is included in the upstream module) or auxiliaries in the production process in relevant quantities to impact the LCA results.

At Efacec India is assembled DIVAC (circuit breaker) and QBN7 SAK (the initial steps of the switchboard (final product)) assembly. At Efacec Portugal are executed the final assembly operations, customization operations and final functional and quality tests.

The next figures represent the flowcharts of these assembly processes.

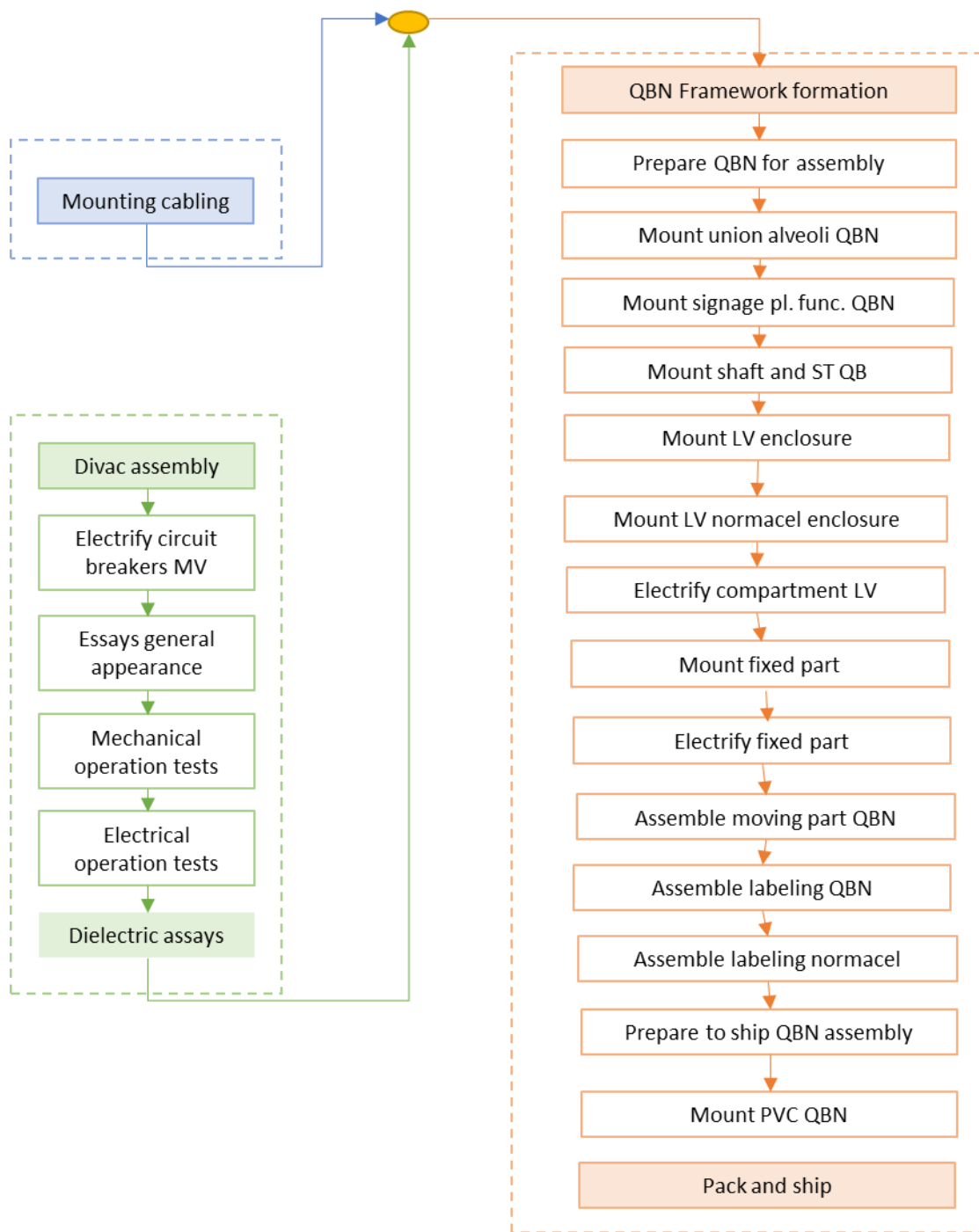


Figure 2 – QBN7 - Assembly at Efacec India - Flowchart

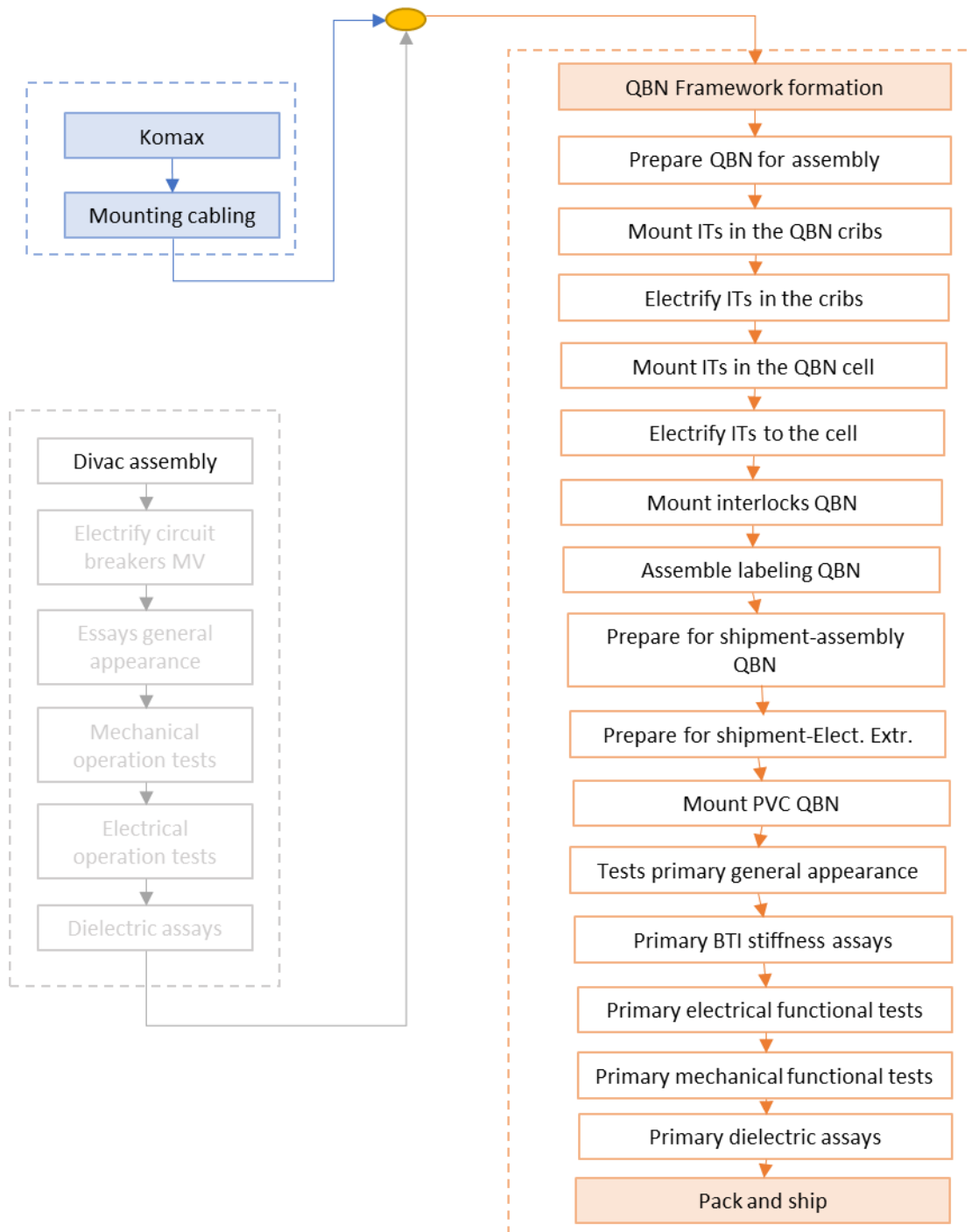


Figure 3 - Normacel - Assembly at Efacec Portugal – Flowchart

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LCA RESULTS - ENVIRONMENTAL IMPACT DESCRIPTIVE PARAMETERS

Environmental impact indicators	Unit	Manufacturing	Distribution	Installation	Use and maintenance	EoL
Global Warming Potential total (GWPtotal)	kg CO2e	7,449E+03	3,768E+02	4,664E+00	1,877E+04	4,049E+02
Global Warming Potential total (GWPfossil)	kg CO2e	7,454E+03	3,763E+02	6,238E+00	1,562E+04	4,051E+02
Global Warming Potential total (GWPbiogenic)	kg CO2e	-1,095E+01	-3,407E-02	1,501E+02	1,767E+03	-2,699E-01
Global Warming Potential total (GWPluluc)	kg CO2e	6,367E+00	1,688E-01	2,296E-03	1,370E+03	7,061E-02
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11ee	2,541E+00	5,596E-06	8,803E-08	9,453E-05	1,626E-06
Acidification potential, Accumulated Exceedance (AP)	moles of H+ equivalents	1,166E+02	4,729E+00	3,576E-02	1,473E+02	6,957E-01
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)	kg P eq.	9,038E+00	2,411E-02	1,063E-03	4,706E+00	2,211E-02
Eutrophication potential, fraction of nutrients reaching marine end compartment (EPmarine)	kg N eq.	1,125E+01	1,294E+00	1,574E-02	1,534E+01	4,748E-01
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	mol N eq.	1,309E+02	1,431E+01	1,604E-01	1,658E+02	2,385E+00
Formation potential of tropospheric ozone (POCP)	Kg NMVOC eq	4,130E+01	4,563E+00	4,829E-02	5,199E+01	7,710E-01
Abiotic Depletion for non-fossil resources potential (ADP-minerals&metals)	Kg Sb eq	1,179E+00	9,224E-04	1,807E-05	3,418E-02	1,823E-03
Abiotic Depletion for non-fossil resources potential (ADP-fossil)	MJ, net calorif value	5,571E+04	5,121E+03	8,049E+01	1,884E+05	1,526E+03
Water deprivation potential, deprivationweighted water consumption (WDP)	m3 eq	2,679E+03	2,092E+01	3,654E+00	9,385E+03	2,941E+01

LCA RESULTS - PARAMETERS DESCRIBING RESOURCE USE

Parameters describing the resource use	Unit	Manufacturing	Distribution	Installation	Use and maintenance	EoL
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	8,950E+04	5,121E+03	8,049E+01	1,884E+05	-7,264E+03
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	1,183E+04	5,978E+01	1,264E+00	2,028E+05	6,585E+01
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	2,712E+03	0,000E+00	0,000E+00	0,000E+00	8,781E+03
Use of renewable primary energy resources used as raw materials (PERM)	MJ	1,464E+03	0,000E+00	6,050E-02	0,000E+00	0,000E+00

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Parameters describing the resource use	Unit	Manufacturing	Distribution	Installation	Use and maintenance	EoL
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials (PENRT))	MJ	9,230E+04	5,129E+03	8,064E+01	1,884E+05	1,533E+03
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials (PERT))	MJ	1,349E+04	5,978E+01	1,325E+00	2,028E+05	6,584E+01
Net use of fresh water (FW)	m3	5,998E+01	6,015E-01	2,975E-02	2,213E+02	1,401E-01
Use of secondary materials (MS)	kg	5,946E+02	2,326E+00	6,252E-02	3,213E+01	9,122E+01
Use of renewable secondary fuels (RSF)	MJ	4,139E+01	2,188E-02	4,537E-04	1,199E-01	2,469E-02
Use of non-renewable secondary fuels (NRSF)	MJ	ND	ND	0,000E+00	ND	ND

LCA RESULTS - WASTE PRODUCTION DESCRIPTIVE PARAMETERS

Parameters describing the waste production	Unit	Manufacturing	Distribution	Installation	Use and maintenance	EoL
Hazardous landfill waste (HWD)	kg	1,837E+03	8,308E+00	7,799E-01	1,651E+03	9,678E+00
Non-hazardous waste disposed (NHWD)	kg	5,407E+04	1,454E+02	1,079E+02	2,322E+04	1,062E+03
Radioactive waste disposed (RWD)	kg	8,213E-02	6,525E-04	1,390E-05	5,939E-03	3,905E-04
Materials for energy recovery (MER)	kg	3,016E-02	2,447E-04	5,858E-06	2,576E-03	1,354E-04
Material for recycling (MFR)	kg	2,659E+02	2,110E-01	6,494E-04	3,089E+01	9,464E+02
Components for reuse (CRU)	kg	ND	ND	ND	ND	ND
Exported thermal energy (ETE)	MJ	5,779E+01	4,815E-01	1,312E-02	5,282E+00	7,102E+00
Exported electricity energy (EEE)	MJ	4,393E+01	3,473E-01	6,802E-03	3,740E+00	1,908E+01

CALCULATION RULES

Relevant aspect for the study	Description
LCI and LCIA	From the Ecoinvent database (add-on EN 15804) we obtained the LCI (life cycle inventory) and the LCA (life cycle assessment) results (indicators and parameters)
System model	Allocation, cut-off, EN15804
LCA assessment method	EN15804 EF 3.1. EN15804
Cut-off and exclusions	Were followed the PCRs indications
Transportation and end of life scenarios	Were followed the PCRs indications For the end-of-life, table G.4 of EN50693:2019 was used as reference
Waste management	Applied the polluters pays principle, adopting the end of waste state based on the definition of EN 15804 and EU's Waste Framework Directive (European Commission)

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

All life cycle stages were included, is a cradle to cradle study.

Geographic boundaries:

The manufacture of raw materials and components is carried out globally, with special emphasis on India.

Product assembly starts at Efacec India and ends at Efacec Portugal, where at least customization and final tests are carried out.

The distribution, installation, use and end of life stages are: Colombia.

Processes/Stages	Description	Additional information
Production (extraction, treatment, transformation, etc.) of raw materials needed to manufacture the components	This process takes place globally	<p>The composition of each component and constituent part of the product derives from the list of materials prepared in the design/development phase of the product.</p> <p>From there, given the diversity and quantity of raw materials needed to manufacture the components and constituent parts and consequently of the respective suppliers along the upstream chain, we resorted to the use of commercial database.</p> <p>The main material used was classified “low alloyed steel”, “market for, GLO” which we found to be the most representative and approximate, taking into account the data availability at Ecoinvent data base.</p>
Industrial processes of transformation and manufacture of the various parts, components and semi-finished products	This process takes place specially in India and Portugal, but also in the rest of the world, depending on the market availabilities and conditions	<p>As mentioned, the composition of each component and constituent part of the product derives from the list of materials prepared in the design/development phase of the product.</p> <p>From there, given the diversity and quantity of raw materials needed to manufacture the components and constituent parts and consequently of the respective suppliers along the upstream chain, we resorted to the use of software and commercial database.</p>
Production of finished product packaging, including packaging for distribution in the reference market segment	Similar to what was described in the previous point	<p>Similar to what was described in the previous point</p> <p>It should be noted that the components, parts and semi-finished products are packaged in India, unpacked in Portugal (with non-reusable packaging waste sent for recycling).</p> <p>The product is subject to customization operations, depending on the customer's requirements, and to final tests that ensure the quality control of the finished product, which is then repackaged for distribution to customers.</p>

Processes/Stages	Description	Additional information
Transport of raw materials and semi-finished products along the entire supply chain	The environmental impact indicators associated with the transport of raw materials for the manufacture of components and integral parts to direct suppliers (tier 1) are included in their manufacturing process.	Ecoinvent's market activities
Transport of materials, components and sub-assemblies from the supplier's production site to the assembly site(s) and/or packaging site(s)	The average distance between direct suppliers and Efacec India was estimated taking into account the applicable PCRs.	PCRs indications were followed Assumptions
If assembly is to be carried out at several locations in series, consideration should be given to transport between each location	The distance between Efacec India and Efacec Portugal was calculated and the type of transport carried out (maritime and land) was determined	PCRs indications were followed Informatic applications for distance between ports were used
Assembly of components	This stage takes place at Efacec Portugal and Efacec India	The activity data is primary data In this process, is mainly consumed electricity Electricity, low voltage, residual mix, Portugal was used for Portugal (GWP total: 6,23E-1 kgCO ₂ e/kWh; GWP fossil: 6,22E-1 kgCO ₂ e/kWh) Market for electricity, low voltage, western India was used for India (GWP total: 1,59 kgCO ₂ e/kWh; GWP fossil: 1,58 kgCO ₂ e/kWh)
Distribution	The distance between Efacec Portugal and the installation site was calculated and the type of transport carried out (maritime and land) was determined	PCRs indications were followed Informatic applications for distance between ports were used
Installation	This stage takes place in Colombia	It is made mainly manually The packaging waste was considered PCR indications were used

Processes/Stages	Description	Additional information
Use and maintenance	This stage takes place in Colombia	PCR indications were used Market for electricity, medium voltage, Colombia was used.
De-Installation	This stage takes place in Colombia	It is made mainly manually PCR indications were used
End of life (EoL)	This stage takes place in Colombia	Table G.4 of EN50693:2019 was used as reference PCR indications were used

REFERENCES

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- ISO 14025:2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures
- ISO 14026:2017 Environmental labels and declarations — Principles, requirements and guidelines for communication of footprint information
- ISO 14040:2006 Environmental management — Life cycle assessment — Principles and framework
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- ISO 14044:2006 Environmental management — Life cycle assessment — Requirements and guidelines
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- ISO 14044:2006/Amd 2:2020 Environmental management — Life cycle assessment — Requirements and guidelines — Amendment 2
- PCR EPDIItaly007 - Electronic and electrical products and systems, revision 3, 2023/01/13
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GLOSSARY

- DIVAC – Vacuum Circuit Breaker
- EI – Efacec India
- KOMAX – Cabling preparation equipment

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SAK – Standard Assembly Kit