



# PRODUCT ENVIRONMENTAL PROFILE

## Environmental Product Declaration

### OT30-160G3\_ Switch Disconnectors



|  |   |
|--|---|
| REGISTRATION NUMBER<br>ABBG-00361-V01.01-EN  | DRAFTING RULES: PCR-ED4-EN-2021 09 06<br>SUPPLEMENTED BY PSR-0005-ED3-EN-2016 03 29                         |
| VERIFIER ACCREDITATION NUMBER<br>VH50  | INFORMATION AND REFERENCE DOCUMENTS<br><a href="http://www.pep-ecopassport.org">www.pep-ecopassport.org</a> |
| DATE OF ISSUE<br>03-2024   | VALIDITY PERIOD<br>5 years  |
| INDEPENDENT VERIFICATION OF THE DECLARATION AND DATA, IN COMPLIANCE WITH ISO 14025: 2006                                   |   |
| INTERNAL <input type="checkbox"/>  | EXTERNAL <input checked="" type="checkbox"/>  |
| THE PCR REVIEW WAS CONDUCTED BY A PANEL OF EXPERTS CHAIRED BY JULIE ORGELET (DDEMAIN)                                      |   |
| PEP ARE COMPLIANT WITH XP C08-100-1 :2016 OR EN 50693:2019   |   |
| THE COMPONENTS OF THE PRESENT PEP MAY NOT BE COMPARED WITH COMPONENTS FROM ANOTHER PROGRAM.                                |   |
| DOCUMENT IN COMPLIANCE WITH ISO 14025: 2006 « ENVIRONMENTAL LABELS AND DECLARATIONS. TYPE III ENVIRONMENTAL DECLARATIONS » |   |
| © Copyright 2023 ABB. All rights reserved.   |   |





|   |  |
|---|--|
| <b>EPD Owner</b>                        | ABB Oy, Muottitie 2A, 65101 Vaasa, Finland<br>www.abb.com  |
| <b>Manufacturer name and address</b>    | ABB Oy, Muottitie 2A, 65101 Vaasa, Finland   |
| <b>Company contact</b>                  | EPD_ELSP@in.abb.com  |
| <b>Reference product</b>                | OT125G3-3BS Switch Disconnectors   |
| <b>Description of the product</b>       | OT125G3-3BS is a robust AC Switch Disconnecter for up to 800 VAC application. It provides reliable switching and isolation in a wide variety of applications. Its efficient design makes your operations smoother and more sustainable.  |
| <b>Functional unit</b>                  | <p>The functional unit is to turn off all or part of an installation by separating the installation or part of the installation of all electrical energy, for safety reasons with a rated voltage U and rated current I<sub>n</sub> ensuring isolation characterized by rated voltage U<sub>i</sub> for a reference lifetime of 20 years.</p> <p>Rated voltage U[V]: 800V<br/>Rated current I<sub>n</sub> [A]: 25-160A<br/>Rated Insulation Voltage U<sub>i</sub> [V]:800 V<br/>Number of poles: 3/4</p> |
| <b>Other products covered</b>           | OT30-160G3_ Switch Disconnectors having 3/4 poles and current ratings from 25A to 160A   |
| <b>Reference lifetime</b>               | 20 years   |
| <b>Product category</b>                 | Electrical, Electronic and HVAC-R Products   |
| <b>Use Scenario</b>                     | The use phase has been modeled based on the sales mix data (2022), and the corresponding low voltage electricity countries mix   |
| <b>Geographical representativeness</b>  | Raw materials & Manufacturing: [Europe / Global]<br>Assembly: [Finland]<br>Distribution / Use: [Global] specific sales mix<br>EoL: [Global]  |
| <b>Technological representativeness</b> | Materials and processes data are specific for the production of OT125G3-3BS Switch Disconnectors   |
| <b>LCA Study</b>                        | This study is based on the LCA study described in the LCA report 1SCC301330D0201   |
| <b>EPD type</b>                         | Products family declaration  |
| <b>EPD scope</b>                        | “Cradle to grave”  |
| <b>Year of reported primary data</b>    | 2022   |
| <b>LCA software</b>                     | SimaPro 9.5.0.1 (2023)   |
| <b>LCI database</b>                     | ecoinvent v3.9 (2023)  |
| <b>LCIA methodology</b>                 | EN 50693:2019  |

|          |                |                            |                 |       |       |      |
|----------|----------------|----------------------------|-----------------|-------|-------|------|
| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE |
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 2/18 |



# Contents

|   |           |
|---|-----------|
| <b>ABB Purpose &amp; Embedding Sustainability</b> ..... | <b>4</b>  |
| <b>General Information</b> .....                        | <b>4</b>  |
| <b>OT30-160G3_ Product Cluster</b> .....                | <b>5</b>  |
| <b>Constituent Materials</b> .....                      | <b>5</b>  |
| <b>Functional unit and Reference Flow</b> .....         | <b>6</b>  |
| <b>System boundaries and life cycle stages</b> .....    | <b>7</b>  |
| <b>Temporal and geographical boundaries</b> .....       | <b>7</b>  |
| <b>Boundaries in the life cycle</b> .....               | <b>7</b>  |
| <b>Data quality</b> .....                               | <b>8</b>  |
| <b>Environmental impact indicators</b> .....            | <b>8</b>  |
| <b>Allocation Rules</b> .....                           | <b>8</b>  |
| <b>Limitations and simplifications</b> .....            | <b>8</b>  |
| <b>Energy Models</b> .....                              | <b>9</b>  |
| <b>Inventory Analysis</b> .....                         | <b>9</b>  |
| <b>Manufacturing stage</b> .....                        | <b>10</b> |
| <b>Environmental impacts</b> .....                      | <b>13</b> |
| <b>References</b> .....                                 | <b>18</b> |

| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE |
|----------|----------------|----------------------------|-----------------|-------|-------|------|
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 3/18 |



## ABB Purpose & Embedding Sustainability

ABB is a leading global technology company that energizes the transformation of society and industry to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation and motion portfolio, ABB pushes the boundaries of technology to drive performance to new levels. With a history of excellence stretching back more than 130 years, ABB's success is driven by about 110 thousand talented employees in over 100 countries.

ABB's Electrification business offers a wide-ranging portfolio of products, digital solutions and services, from substation to socket, enabling safe, smart and sustainable electrification. Offerings encompass digital and connected innovations for low voltage and medium voltage, including EV infrastructure, solar inverters, modular substations, distribution automation, power protection, wiring accessories, switchgear, enclosures, cabling, sensing and control.

ABB is committed to continually promoting and embedding sustainability across its operations and value chain, aspiring to become a role model for others to follow. With its ABB Purpose, ABB is focusing on reducing harmful emissions, preserving natural resources and championing ethical and humane behavior.



## General Information

ABB Oy, Smart Power located in Vaasa / Finland, develops, manufactures and markets a comprehensive range of low voltage products and the market's most extensive assortment of low voltage systems. Our customers include industry, panel builders, machine and equipment manufacturers, electrical contractors and electrical power plants.

ABB Oy Smart Power adopts and implements for its own activities an integrated Quality/Environmental/Health Management System in compliance with the following standards:

- ISO 9001/2015 -Quality Management Systems
- ISO 14001/2015 -Environmental Management Systems
- ISO 45001:2018 -Occupational Health and Safety Management Systems

ABB offers a wide range of low voltage switch disconnectors for various applications and distribution. In the factory, the different components and subassemblies are assembled on the manufacturing line. All components and subassemblies are produced by ABB's suppliers and are only assembled in the factory.

The OT30-160G3\_ products comprise the sizes from 25 to 160A. Switches comply with the latest specification of modern low voltage installations.

| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE |
|----------|----------------|----------------------------|-----------------|-------|-------|------|
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 4/18 |

## OT30-160G3\_ Product Cluster

Product cluster declared in this PEP includes the following OT30-160G3\_ Switch Disconnectors and covers both IEC & UL Variants of each of the following product ranges:

| Base Product | IEC Variants         | UL Variants          | Number of poles | Rated voltage, U [V] | Rated current, In [A] | Rated insulation voltage, Ui [V] |
|--------------|----------------------|----------------------|-----------------|----------------------|-----------------------|----------------------------------|
| OT30-160G3_  | OT30-160G3-3BS       | OT30-100G3-3BS       | 3               | 415-800              | 25-160                | 800                              |
|              | OT30-160G3-3DS       | OT30-100G3-3DS       | 3               | 415-800              | 25-160                | 800                              |
|              | OT30-160G3-4DSN2     | OT30-100G3-4DSN2     | 4               | 415-800              | 25-160                | 800                              |
|              | OT30-160G3-4BS_N1,N2 | OT30-100G3-4BS_N1,N2 | 4               | 415-800              | 25-160                | 800                              |

Table 1: Technical characteristics of OT30-160G3\_ Switch Disconnectors

The accessories associated with these products are also included in the study.

### Reference Product:

The reference product for the LCA of the complete range of OT30-160G3\_ is OT125G3-3BS.



## Constituent Materials

The OT125G3-3BS. weights about 0.46 kg including its installed accessories, packaging, and paper documentation.

| OT125G3-3BS  |                  |              |               |             |
|--------------|------------------|--------------|---------------|-------------|
| Materials    | Name             | IEC 62474 MC | [g]           | %           |
| Metals       | Steel            | M-119        | 129.11        | 28.1%       |
|              | Cu and Cu Alloys | M-121        | 63.65         | 13.9%       |
|              | Stainless Steel  | M-100        | 4.60          | 1.0%        |
| Plastics     | Polyamide        | M-258        | 181.01        | 39.4%       |
|              | Polyarylamide    | M-272        | 21.31         | 4.6%        |
|              | Polyoxymethylene | M-255        | 5.21          | 1.1%        |
| Other        | Paper/Cardboard  | M-341        | 54.45         | 11.9%       |
| <b>Total</b> |                  |              | <b>459.34</b> | <b>100%</b> |

Table 2: Weight of materials OT125G3-3BS

| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE |
|----------|----------------|----------------------------|-----------------|-------|-------|------|
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 5/18 |

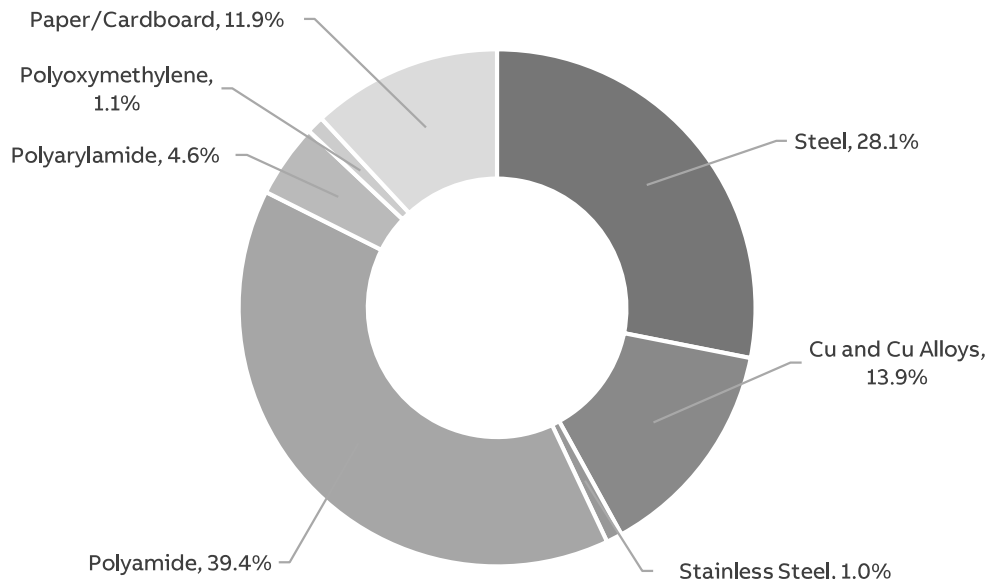


Figure 1: Composition of OT125G3-3BS

Packaging weighs 54.4g, with the following substance composition:

| Material             | Unit | Total | %     |
|----------------------|------|-------|-------|
| Corrugated Cardboard | g    | 54.4  | 11.9% |

Table 3: Weight of Packaging for OT125G3-3BS

Official declarations 1SCC011020D0201 [11] and 1SCC011021D0201 [12] states compliance of ABB Switch Disconnectors respectively to RoHS and REACH regulations; 1SCC011020D0201 [11] provides exemptions considered for RoHS while 1SCC011021D0201 [12] lists REACH substances present in a concentration above 0.1% adding reference to products where involved parts are mounted.

## Functional unit and Reference Flow

The Functional unit is to turn off all or part of an installation by separating the installation or part of the installation of all electrical energy, for safety reasons with a rated voltage  $U$  and rated current  $I_n$  ensuring isolation characterized by rated voltage  $U_i$  for a reference lifetime of 20 years for Low Voltage applications. (table 1)

The Reference Flow of the study is a single Switch Disconnectors (including its packaging and accessories) with mass described, table 2.

| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE |
|----------|----------------|----------------------------|-----------------|-------|-------|------|
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 6/18 |

## System boundaries and life cycle stages

The life cycle of the Switch Disconnectors, an EEPS (Electronic and Electrical Products and Systems), is a “from cradle to grave” analysis and covers the following main life cycle stages: manufacturing, including the relevant acquisition of raw material, preparation of semi-finished goods, etc. and processing steps; distribution; installation, including the relevant steps for the preparation of the product for use; use including the required maintenance steps within the RSL (reference service life of the product) associated to the reference product; end-of-life stage, including the necessary steps until final disposal or recovery of the product system.

The following table shows the stages of the product life cycle and the information stages according to EN 50693:2019 [3] for the evaluation of electronic and electrical products and systems.

| Manufacturing                    | Distribution                                 | Installation   | Use         | End-of-Life (EoL)           |
|----------------------------------|--|--|-------------|-----------------------------|
| Acquisition of raw materials     |  | Installation   |             |                             |
| Transport to manufacturing site  |  |  |             | Deinstallation              |
| Components/parts manufacturing   | Transport to distributor/<br>logistic center | EoL<br>treatment of<br>generated<br>waste<br>(packaging) | Usage       | Collection and<br>transport |
| Assembly                         | Transport to place of use                    |  | Maintenance |                             |
| Packaging                        |  |  |             | EoL treatment               |
| EoL treatment of generated waste |  |  |             |                             |

Table 4: Phases for the evaluation of construction products according to EN50693:2019 [3].

## Temporal and geographical boundaries

The ABB component suppliers are sourced all over the world. All primary data collected are from 2022, which is a representative production year. Secondary data are also representative for this year, as provided by ecoinvent [6].

The selected ecoinvent [6] processes in the LCA model have a global representativeness, due to the unclear origin of each component. In this way, a conservative approach has been adopted.

## Boundaries in the life cycle

As indicated in the PCR capital goods such as buildings, machinery, tools and infrastructure, the packaging for internal transport which cannot be allocated directly to the production of the reference product, may be excluded from the system boundary.

Infrastructures, when present, such as processes deriving from the ecoinvent [6] database have not been excluded.

| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE |
|----------|----------------|----------------------------|-----------------|-------|-------|------|
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 7/18 |

## Data quality

In this PEP, both primary and secondary data are used. Site specific foreground data have been provided by ABB. Main data sources are the bill of materials & drawings which are available on the ERP (SAP) & Windchill. For all processes for which primary are not available, generic data originating from the ecoinvent database [6], allocation cut-off by classification, are used. The ecoinvent database available in the SimaPro software [7] is used for the calculations.

The data quality characterized by quantitative and qualitative aspects, is presented in Appendix 1. Each data quality parameter has been rated according to DQR tables from Chapter 7.19.2.2 of the Product Environmental Footprint Guide v.6.3 to give an indication of geography, technology and temporal representativeness.

## Environmental impact indicators

The information obtained from the inventory analysis is aggregated according to the effects related to the various environmental issues. According to “PCR-ed4-EN-2021 09 06” and EN 50693 [3] the environmental impact indicators must be determined using the characterization factors and impact assessment methods specified in EN 15804:2012+A2:2019 [8].

PCR-ed4-EN-2021 09 06 and the EN 50693:2019 [3] standard establish four indicators for GWP: GWP (total) which includes all greenhouse gases; GWP (fossil fuels); GWP (biogenic) which includes the emissions and absorption of biogenic carbon dioxide and biogenic carbon stored in the product; GWP (land use) - land use and land use transformation. Other indicators as per the PCR[1].

## Allocation Rules

Allocation coefficients are based on the OT30-160G3\_ line’s occupancy area for electricity consumption since, apart from assembly processes, the whole production line is temperature-regulated throughout the year. The allocation of the total amount of waste generated by the production line and water consumption, has been based on this criterion.

## Limitations and simplifications

Raw materials life cycle stage includes the extraction of raw materials as well as the transport distances to the manufacturing suppliers. These distances are assumed to be 1000 km as per PCR. This distance has been added to the one already included in the market processes used for the model, as a result of a conservative choice made by the LCA operators.

Application of grease lubricant on the Switch Disconnectors operating mechanism has been excluded since it is negligible.

|          |                |                            |                 |       |       |      |
|----------|----------------|----------------------------|-----------------|-------|-------|------|
| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE |
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 8/18 |

Surface treatments like galvanizing, tin and silver plating as well as their related transport processes (back and forth from the finishing suppliers) have been considered in the LCA model.

Scraps for metal working and plastic processes are included when already defined in ecoinvent[6].

## Energy Models

| LCA Stage                              | EN 15804:2012 +A2:2019 module | Energy model   | Notes   |
|--|-------------------------------|--|---|
| Raw material extraction and processing | A1-A2                         | Electricity, {RER}  market group for   Cut-off<br>Electricity, {GLO}  market group for   Cut-off | Based on materials and supplier locations                               |
| Manufacturing                          | A3                            | Electricity, {FI}  market for   Cut-off  | Specific Energy model for ABB Vaasa manufacturing plant, 100% renewable |
| Installation (Packaging EoL)           | A5                            | Electricity, {GLO}  market group for   Cut-off   |   |
| Use Stage                              | B1                            | Electricity, [country]x   market for   Cut-off, S **   | Low voltage, based on 2022 country sales mix                            |
| EoL                                    | C1-C4                         | Electricity, {GLO}  market group for   Cut-off   |   |

Table 5: Energy models used in each LCA stage.

\*\* Please refer the use phase page 11 for further description



## Inventory Analysis

In this PEP, both primary and secondary data are used. Site specific foreground data have been provided by ABB. For data collection, Bills of Material (BOM) extracted from ABB's internal SAP software were used. They are a list of all the components and assemblies that constitute the finished product, organized by level. Each item is matched with its code, quantity, weight and supplier. The BOMs were then processed, adding material, surface area and other weight data, taken from technical drawings. Finally, the manufacturing process and surface treatment were assigned, according to information provided by R&D personnel. Road distances between the suppliers and ABB were calculated using Google Maps, and marine distances using Distances & Time (Searates).

All primary data collected from ABB are from 2022, which was a representative production year. The ecoinvent v3.9 cut-off by classification system processes [6] are used to model the background system of the processes.

| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE |
|----------|----------------|----------------------------|-----------------|-------|-------|------|
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 9/18 |



Due to the large amounts of components in the Switch Disconnectors, raw material inputs have been modelled with data fromecoinvent[6] representing either a European [RER] or Global [RoW] market coverage based on the supplier's location. These datasets are assumed to be representative.

## Manufacturing stage

The Switch Disconnectors are composed of a multitude of components, all of which are made from numerous materials. Most of the inputs to the products' manufacturing stage are already produced component parts.

The single use packaging as well as paper documentation are also included in the analysis in the manufacturing stage. ABB receives packaging components from outside suppliers and packages the Switch Disconnectors before shipping them.

Most of the inputs to the products' manufacturing stage are already produced component parts from the supply chain. In the ABB manufacturing plant, the different components and subassemblies are assembled into the Switch Disconnectors. All the semi-finished and ancillary products are produced by ABB's suppliers.

The entire Switch Disconnectors suppliers' network has been modelled with the calculation of each transportation stage: from the first manufacturing supplier to the next. All the distances from the last subassembly suppliers' factories to the ABB manufacturing facility have been calculated. All the distances from the last subassembly suppliers' factories to the ABB manufacturing facility have been calculated.

In the ABB factory, the different components and subassemblies are assembled into the Switch Disconnectors. All the semi-finished and ancillary products are produced by ABB's suppliers.

The energy mix used for the production phase is representative for ABB Vaasa production site and includes renewable energy only (Hydroelectric + Wind).

The complete energy mix has been modeled considering the certificate on Guarantee of origins provided to ABB for the year 2022.

## Distribution

The transport distances from ABB manufacturing plant to the distribution centers (regional distribution centers / local sales organizations) have been calculated considering the specific 2022 sales mix data for this product cluster (SAP ERP sales data as a source).

Since no specific data is available for the transport distances from the Distribution Centre to place of actual use (Customer site), distances of 1000 km are assumed (local/domestic transport by lorry, according to PCR [1]).

| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE  |
|----------|----------------|----------------------------|-----------------|-------|-------|-------|
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 10/18 |

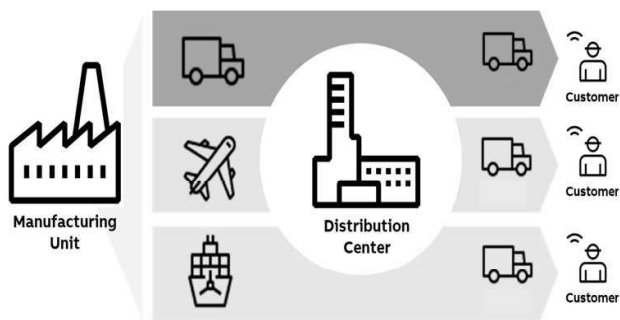


Figure 2: Distribution methodology.

## Installation

The installation phase only implies manual activities, and no energy is consumed. This phase also includes the disposal of the packaging of the Switch Disconnectors.

For the disposal of the packaging after installation of the Switch Disconnectors at the end of its life, a transport distance of 1000 km (according to PCR[1]) was assumed. The chosen transportation datasets are from Ecoinvent [6].

The actual disposal site is unknown and is managed by the customer.

## Use

Use and maintenance are modelled according to the PCR [1].

During the use phase, Switch Disconnectors, dissipates some electricity due to power losses. They are calculated according to the data provided in the catalogue of the Switch Disconnectors and following the PCR [1] & PSR [2] rules:

| Parameters                 |         |        |
|----------------------------|---------|--------|
| I <sub>u</sub>             | [A]     | 30-160 |
| Load Rate                  | [%]     | 50     |
| h/year                     | [h]     | 8760   |
| RSL                        | [years] | 20     |
| Time operating coefficient | [%]     | 30     |

Table 6: Use phase parameters

The formula for the calculation of the electricity consumed is shown below and it is described as follows, where P<sub>Use</sub> is the power consumed by the switch at a given value of current:

$$E_{\text{Use}} [\text{kWh}] = \frac{P_{\text{Use}} * 8760 * \text{RSL} * \alpha}{1000}$$

The above calculations have been performed according to the number of poles on which relevant current flows during use phase.

The Energy model used for this phase has been modelled based on the 2022 actual sales mix data (SAP

|          |                |                            |                 |       |       |       |
|----------|----------------|----------------------------|-----------------|-------|-------|-------|
| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE  |
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 11/18 |



ERP sales data as a source). From the Ecoinvent [6] database, the low voltage electricity country mix for each country(x) has been selected with its respective percentage on the total sales mix (Electricity, low voltage [country]x | market for | Cut-off, S).

Since no maintenance happens during the use phase, the environmental impacts linked to this procedure have been considered as null in the analysis.

## End of life

The end-of-life stage is modelled according to PCR [1] and IEC/TR 62635 [9]. The percentages for end-of-life treatments of materials are taken from IEC/TR 62635 [9]. Since no specific data is available, the transport distances from the place of use to the place of disposal are assumed to be 1000 km (local/domestic transport by lorry, according to PCR [1]). Disassembly manuals can be provided to the customer to support product disposal.

| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE  |
|----------|----------------|----------------------------|-----------------|-------|-------|-------|
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 12/18 |



## Environmental impacts

The following tables show the environmental impact indicators of the life cycle of a single switch, as indicated by PEP Ecopassport PCR and EN 50693:2019 [3]. The indicators are divided into the contribution of the processes to the different modules (upstream, core and downstream) and stages (manufacturing, distribution, installation, use and end-of-life).

### OT125G3-3BS

| Impact category | Unit                  | Total    | Manufacturing | Distribution | Installation | Use      | End of Life |
|-----------------|-----------------------|----------|---------------|--------------|--------------|----------|-------------|
| GWP-total       | kg CO2 eq             | 1.10E+02 | 2.87E+00      | 1.22E-01     | 4.73E-02     | 1.06E+02 | 9.69E-02    |
| GWP-fossil      | kg CO2 eq             | 1.08E+02 | 2.86E+00      | 1.22E-01     | 8.78E-03     | 1.05E+02 | 9.57E-02    |
| GWP-biogenic    | kg CO2 eq             | 1.85E+00 | 1.02E-02      | 8.45E-05     | 3.85E-02     | 1.80E+00 | 1.08E-03    |
| GWP-luluc       | kg CO2 eq             | 1.69E-01 | 4.42E-03      | 6.27E-05     | 4.10E-06     | 1.64E-01 | 7.94E-05    |
| ODP             | kg CFC11-eq           | 1.06E-06 | 3.23E-08      | 2.49E-09     | 1.89E-10     | 1.02E-06 | 1.14E-09    |
| AP              | mol H+ eq             | 5.33E-01 | 4.26E-02      | 9.81E-04     | 3.81E-05     | 4.89E-01 | 4.80E-04    |
| EP-freshwater   | kg P eq               | 5.59E-02 | 2.97E-03      | 7.82E-06     | 7.00E-07     | 5.29E-02 | 2.02E-05    |
| EP-marine       | kg N eq               | 9.51E-02 | 4.96E-03      | 2.99E-04     | 2.67E-05     | 8.96E-02 | 1.38E-04    |
| EP-terrestrial  | mol N eq              | 9.47E-01 | 4.41E-02      | 3.25E-03     | 1.53E-04     | 8.98E-01 | 1.22E-03    |
| POCP            | kg NMVOC eq           | 2.98E-01 | 1.37E-02      | 1.05E-03     | 5.90E-05     | 2.83E-01 | 4.17E-04    |
| ADP-m&m         | kg Sb eq              | 1.21E-03 | 4.54E-04      | 2.91E-07     | 2.28E-08     | 7.53E-04 | 1.28E-07    |
| ADP-fossil      | MJ                    | 1.51E+03 | 4.06E+01      | 1.71E+00     | 1.23E-01     | 1.46E+03 | 1.12E+00    |
| WDP             | m3 world eq. deprive. | 2.29E+01 | 2.19E+00      | 7.57E-03     | 7.68E-04     | 2.07E+01 | 8.34E-03    |
| PENRE           | MJ                    | 1.50E+03 | 3.60E+01      | 1.71E+00     | 1.23E-01     | 1.46E+03 | 1.12E+00    |
| PENRM           | MJ                    | 4.64E+00 | 4.64E+00      | 0.00E+00     | 0.00E+00     | 0.00E+00 | 0.00E+00    |
| PENRT           | MJ                    | 1.51E+03 | 4.06E+01      | 1.71E+00     | 1.23E-01     | 1.46E+03 | 1.12E+00    |
| PERE            | MJ                    | 2.79E+02 | 4.19E+00      | 2.33E-02     | 1.95E-03     | 2.74E+02 | 7.65E-02    |
| PERM            | MJ                    | 9.36E-01 | 9.36E-01      | 0.00E+00     | 0.00E+00     | 0.00E+00 | 0.00E+00    |
| PERT            | MJ                    | 2.80E+02 | 5.13E+00      | 2.33E-02     | 1.95E-03     | 2.74E+02 | 7.65E-02    |
| SM              | kg                    | 1.04E-01 | 1.04E-01      | 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    |
| PET             | MJ                    | 1.79E+03 | 4.57E+01      | 1.73E+00     | 1.25E-01     | 1.74E+03 | 1.19E+00    |
| FW              | m3                    | 1.06E+00 | 5.83E-02      | 2.51E-04     | 2.65E-05     | 1.01E+00 | 3.16E-04    |
| HWD             | kg                    | 3.40E-03 | 2.55E-04      | 1.03E-05     | 7.53E-07     | 3.13E-03 | 4.56E-06    |
| N-HWD           | kg                    | 8.40E+00 | 4.78E-01      | 1.30E-01     | 1.82E-02     | 7.70E+00 | 7.63E-02    |
| RWD             | kg                    | 5.10E-03 | 5.45E-05      | 4.76E-07     | 3.96E-08     | 5.04E-03 | 1.11E-06    |
| CfR             | kg                    | 0.00E+00 | 0.00E+00      | 0.00E+00     | 0.00E+00     | 0.00E+00 | 0.00E+00    |
| MfR             | kg                    | 4.96E-01 | 5.92E-02      | 0.00E+00     | 5.42E-02     | 0.00E+00 | 3.83E-01    |
| MfER            | kg                    | 1.95E-02 | 1.85E-03      | 0.00E+00     | 1.56E-02     | 0.00E+00 | 2.08E-03    |
| EN              | MJ by energy vector   | 0.00E+00 | 0.00E+00      | 0.00E+00     | 0.00E+00     | 0.00E+00 | 0.00E+00    |
| Efp             | disease inc.          | 4.01E-06 | 1.86E-07      | 1.09E-08     | 8.73E-10     | 3.80E-06 | 8.82E-09    |
| IrHH            | kBq U-235 eq          | 2.13E+01 | 2.15E-01      | 1.98E-03     | 1.64E-04     | 2.11E+01 | 4.50E-03    |
| ETX FW          | CTUe                  | 2.49E+02 | 4.11E+01      | 8.94E-01     | 1.02E-01     | 2.07E+02 | 4.23E-01    |
| HTX CE          | CTUh                  | 4.42E-08 | 7.40E-09      | 5.19E-11     | 4.55E-12     | 3.67E-08 | 1.05E-10    |
| HTX N-CE        | CTUh                  | 1.98E-06 | 4.61E-07      | 1.49E-09     | 1.77E-10     | 1.51E-06 | 6.09E-09    |
| IrLS            | Pt                    | 3.57E+02 | 2.00E+01      | 1.52E+00     | 1.25E-01     | 3.34E+02 | 8.42E-01    |

Table 7: Impact indicators for OT125G3-3BS

|          |                |                            |                 |       |       |       |
|----------|----------------|----------------------------|-----------------|-------|-------|-------|
| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE  |
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 13/18 |

| Impact category                                     | Unit | Total    |
|---|------|----------|
| Biogenic Carbon content of the product              | kg   | 2.52E-05 |
| Biogenic Carbon content of the associated packaging | kg   | 1.08E-02 |

Table 8: Inventory Flow indicators of OT125G3-3BS

### Environmental impact indicators

|                |  |
|----------------|--|
| GWP-total      | Global Warming Potential total (Climate change)                                  |
| GWP-fossil     | Global Warming Potential fossil  |
| GWP-biogenic   | Global Warming Potential biogenic  |
| GWP-luluc      | Global Warming Potential land use and land use change                            |
| ODP            | Depletion potential of the stratospheric ozone layer                             |
| AP             | Acidification potential  |
| EP-freshwater  | Eutrophication potential - freshwater compartment                                |
| EP-marine      | Eutrophication potential - fraction of nutrients reaching marine end compartment |
| EP-terrestrial | Eutrophication potential -Accumulated Exceedance                                 |
| POCP           | Formation potential of tropospheric ozone  |
| ADP-m&m        | Abiotic Depletion for non-fossil resources potential                             |
| ADP-fossil     | Abiotic Depletion for fossil resources potential, WDP                            |
| WDP            | Water deprivation potential.   |

### Resource use indicators

|       |   |
|-------|---|
| PERE  | Use of renewable primary energy excluding renewable primary energy resources used as raw material                       |
| PERM  | Use of re-newable primary energy resources used as raw material   |
| 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 material               |
| PENRM | Use of non-renewable primary energy resources used as raw material  |
| PENRT | Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) |
| PET   | Total use of primary energy in the lifecycle  |

### Secondary materials, water and energy resources

|      |                                      |
|------|--------------------------------------|
| SM   | Use of secondary materials           |
| RSF  | Use of renewable secondary fuels     |
| NRSF | Use of non-renewable secondary fuels |
| FW   | FW: Net use of fresh water           |

| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE  |
|----------|----------------|----------------------------|-----------------|-------|-------|-------|
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 14/18 |



### Waste category indicators

|       |                              |
|-------|------------------------------|
| HWD   | Hazardous waste disposed     |
| N-HWD | Non-hazardous waste disposed |
| RWD   | Radioactive waste disposed   |

### Output flow indicators

|      |                               |
|------|-------------------------------|
| CfR  | Component for reuse           |
| MfR  | Materials for recycling       |
| MfER | Materials for energy recovery |
| EN   | Exported energy               |

### Others indicators

|          |   |
|----------|---|
| Efp      | Emissions of Fine particles               |
| IrHH     | Ionizing radiation, human health          |
| ETX FW   | Ecotoxicity, freshwater                   |
| HTX CE   | Human toxicity, carcinogenic effects      |
| HTX N-CE | Human toxicity, non-carcinogenic effects  |
| IrLS     | Impact related to Land use / soil quality |

|          |                |                            |                 |       |       |       |
|----------|----------------|----------------------------|-----------------|-------|-------|-------|
| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE  |
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 15/18 |

## Extrapolation for Homogeneous environmental family

This PEP covers different build configurations than the representative product from the IEC and UL types. All the analyzed configurations have the same main functionality, product standards and manufacturing technology. The different life cycle stages can be extrapolated to other products of the same homogeneous environmental family by applying a rule of proportionality to the parameters in the following tables, divided by different life cycle stages.

| Product              | GWP-total | GWP-fossil | GWP-biogenic | GWP-luluc | ODP  | AP   | EP-freshwater | EP-marine | EP-terrestrial | POCP | ADP-minerals & metals | ADP-fossil | WDP  |
|----------------------|-----------|------------|--------------|-----------|------|------|---------------|-----------|----------------|------|-----------------------|------------|------|
| OT30-160G3-3BS       | 1.00      | 1.00       | 1.00         | 1.00      | 1.00 | 1.00 | 1.00          | 1.00      | 1.00           | 1.00 | 1.00                  | 1.00       | 1.00 |
| OT30-160G3-3DS       | 1.06      | 1.06       | 0.98         | 0.99      | 1.02 | 1.02 | 1.01          | 1.05      | 1.03           | 1.03 | 1.00                  | 1.07       | 1.08 |
| OT30-160G3-4DSN2     | 1.36      | 1.36       | 1.80         | 1.17      | 1.31 | 1.34 | 1.33          | 1.36      | 1.34           | 1.34 | 1.33                  | 1.37       | 1.39 |
| OT30-160G3-4BS_N1,N2 | 1.32      | 1.32       | 1.67         | 1.19      | 1.30 | 1.33 | 1.33          | 1.32      | 1.32           | 1.32 | 1.33                  | 1.32       | 1.33 |

Table 9: Extrapolation factors for OT30-160G3\_ - Manufacturing

| Product              | Factor |
|----------------------|--------|
| OT30-160G3-3BS       | 1.00   |
| OT30-160G3-3DS       | 1.04   |
| OT30-160G3-4DSN2     | 1.34   |
| OT30-160G3-4BS_N1,N2 | 1.32   |

Table 10: Extrapolation factors for OT30-160G3\_ -Distribution

| Product    | Pole | LCA Stage | Factor |
|------------|------|-----------|--------|
| OT30G3-3_  | 3    | Use Stage | 0.33   |
| OT30G3-4_  | 4    |           | 0.43   |
| OT60G3-3_  | 3    |           | 0.33   |
| OT60G3-4_  | 4    |           | 0.43   |
| OT63G3-3_  | 3    |           | 0.33   |
| OT63G3-4_  | 4    |           | 0.43   |
| OT80G3-3_  | 3    |           | 0.54   |
| OT80G3-4_  | 4    |           | 0.72   |
| OT100G3-3_ | 3    |           | 0.80   |
| OT100G3-4_ | 4    |           | 1.07   |
| OT125G3-3_ | 3    |           | 1.00   |
| OT125G3-4_ | 4    |           | 1.33   |
| OT160G3-3_ | 3    |           | 1.59   |
| OT160G3-4_ | 4    |           | 2.12   |

Table 11: Extrapolation factors for OT30-160G3\_ -Use Phase

| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE  |
|----------|----------------|----------------------------|-----------------|-------|-------|-------|
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 16/18 |

| Product              | GWP-total | GWP-fossil | GWP-biogenic | GWP-luluc | ODP  | AP   | EP-freshwater | EP-marine | EP-terrestrial | POCP | ADP-minerals & metals | ADP-fossil | WDP  |
|----------------------|-----------|------------|--------------|-----------|------|------|---------------|-----------|----------------|------|-----------------------|------------|------|
| OT30-160G3-3BS       | 1.00      | 1.00       | 1.00         | 1.00      | 1.00 | 1.00 | 1.00          | 1.00      | 1.00           | 1.00 | 1.00                  | 1.00       | 1.00 |
| OT30-160G3-3DS       | 1.14      | 1.05       | 9.04         | 1.03      | 1.09 | 1.04 | 1.02          | 1.10      | 1.06           | 1.07 | 1.10                  | 1.06       | 1.05 |
| OT30-160G3-4DSN2     | 1.49      | 1.38       | 10.82        | 1.36      | 1.42 | 1.37 | 1.35          | 1.43      | 1.39           | 1.40 | 1.42                  | 1.39       | 1.39 |
| OT30-160G3-4BS_N1,N2 | 1.50      | 1.37       | 12.64        | 1.35      | 1.40 | 1.36 | 1.35          | 1.42      | 1.38           | 1.39 | 1.41                  | 1.38       | 1.38 |

Table 12: Extrapolation factors for OT30-160G3\_ -EoL

## Additional environmental information



According to the waste treatment scenario calculation in Simapro, based on the recycling rate in the technical report IEC/TR 62635 Edition 1.0 [9] Table D.6, the following recyclability potentials were calculated. The recyclability potential is calculated based on the product weight (excluding packaging).

| Switch Type | Recyclability potential |
|-------------|-------------------------|
| OT125G3-3BS | 94.49%                  |

Table 13: Recyclability potential of OT125G3-3BS

|                    |                          |  |                                 |               |             |               |
|--------------------|--------------------------|--|---------------------------------|---------------|-------------|---------------|
| STATUS<br>Approved | SECURITY LEVEL<br>Public | PEP Ecopasspor reg. number<br>ABBG-00361-V01.01-EN | DOCUMENT ID.<br>1SCC301334D0201 | REV.<br>A.001 | LANG.<br>en | PAGE<br>17/18 |
|--------------------|--------------------------|--|---------------------------------|---------------|-------------|---------------|



## References

- [1] PEP Ecopassport PCR-ed4-EN-2021 09 06 “Product Category Rules for Electrical, Electronic and HVAC-R Products”  
(published: 6th September 2021)
- [2] PEP Ecopassport PSR-0005-ed3-EN-2016 03 29 “Product Specific Rules for Electrical Switchgear and Control gear Solutions” (published: May 2016)
- [3] EN 50693:2019 - Product category rules for life cycle assessments of electronic and electrical products and systems
- [4] ISO 14040:2006/ Amd 1:2020 - Environmental management -Life cycle assessment - Principles and framework
- [5] ISO 14044:2006/Amd 1:2020 - Environmental management - Life cycle assessment - Requirements and guidelines
- [6] ecoinvent v3.9 (2023). ecoinvent version 3.9. Swiss, Centre for Life Cycle Inventories, Dübendorf, Switzerland
- [7] PRé Consultants, 2023. Software SimaPro versione 9.5.0.1 ([www.pre.nl](http://www.pre.nl)).
- [8] UNI EN 15804:2012+A2:2019: Sustainability of constructions - Environmental product declarations (September 2019).
- [9] IEC/TR 62635 - Guidelines for end-of-life information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment - Edition 1.0 2012-10
- [10] 1SCC301330D0201 -LCA Report
- [11] 1SCC011020D0201 - RoHS
- [12] 1SCC011021D0201 - REACH

| STATUS   | SECURITY LEVEL | PEP Ecopasspor reg. number | DOCUMENT ID.    | REV.  | LANG. | PAGE  |
|----------|----------------|----------------------------|-----------------|-------|-------|-------|
| Approved | Public         | ABBG-00361-V01.01-EN       | 1SCC301334D0201 | A.001 | en    | 18/18 |