

AEG EN6x, EN 10x series MCB, 6 & 10 KA, 0.5 TO 63A, B, C & D CURVE, 1 - 4POLES, 1P+N & 3P+N

# Product Environmental Profile

## Environmental Product Declaration



Document in compliance with ISO 14025: 2010 "Environmental labels and declarations. Type III environmental declarations"

#### ORGANIZATION

ABB STOTZ-KONTAKT GmbH

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#### STATUS

Approved

#### SECURITY LEVEL

Public

#### REGISTRATION NUMBER

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## Purpose & Embedding Sustainability

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

This study is related to ABB STOTZ-KONTAKT GmbH, Heidelberg plant that produces MCBs in different ranges. The plant already has the following certifications besides product standard certifications:

DIN EN ISO 9001,  
DIN EN ISO 14001,  
DIN ISO 45001,  
DIN EN ISO 50001 and  
ISO/TS 22163



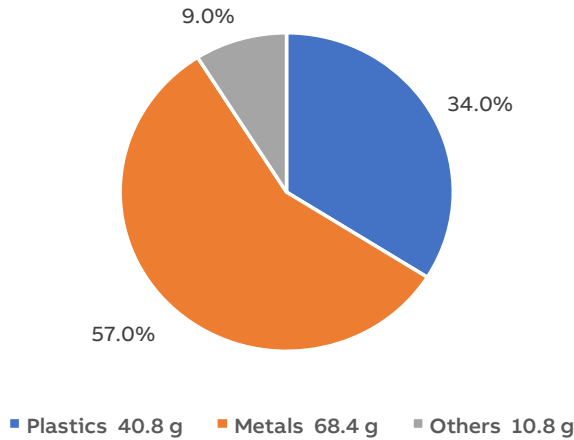
## General Information

<b>Reference product</b>	EN61C16 - Miniature Circuit Breaker - 1P - C - 16 A
<b>Description of the product</b>	EN61C16 Miniature Circuit Breaker (MCB), 1Pole, 16A, 230/400 V AC, C Curve, 6kA
<b>Functional unit</b>	Protect the Household/ commercial installation from overloads and short circuits in a circuit with rated voltage 230/400 V AC, rated current 16A with 1 Pole (1P), a rated Breaking capacity 6kA and tripping curve C, according to the appropriate use scenario, and during the reference service life of the product of 20 years
<b>Other products covered</b>	It is a "Product family declaration" which covers Miniature Circuit Breaker (MCB) EN60 and EN100 of AEG Elfaplus range with Standard Product Characteristics Rated current (In): 0.5, 1, 2, 3, 4, 6, 10, 13, 16, 20, 25, 32, 40, 50 & 63A Rated Voltage (Ue): 230/400 V AC Number of Poles (Np): 1 to 4 Poles, 1Poles+N & 3Pole +N Rated Breaking Capacity(Icn): 6 kA & 10 kA Tripping Curve (Cd): B, C & D

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## Constituent Materials



Total weight of Reference product	119.97	g
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Total weight of reference product also included product packaging

Plastics as % of weight		Metals as % of weight		Others as % of weight	
Name and CAS number	Weight%	Name and CAS number	Weight%	Name and CAS number	Weight%
PA Glass Reinforced	31.2	Steel,	50.4	Carton,	8.9
Miscellaneous Plastics	2.1	Copper, 7440-50-8	4.2	Miscellaneous Other material	0.1
POM, 9002-81-7	0.7	Aluminum, 7429-90-5	2.3	–	–
–	–	Miscellaneous Metals	0.1	–	–

These products comply with actual requirements of EU Directives 2011/65/EU of 8 June 2011 (ROHS) materials and do not contain or only contain in the authorised proportions lead, mercury, cadmium, hexavalent chromium or flame retardants (polybrominated biphenyls - PBB, polybrominated diphenyl ethers - PBDE) as mentioned in the Directive.

**Manufacturing, distribution, installation, use, and end-of-life (EOL) stages are taken into account in the environmental impact analysis of this study.**

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## Additional Environmental Information

<b>Manufacturing</b>	Includes the environmental impacts associated with extraction and processing of the raw materials used to produce the product and its packaging, transport to the manufacturing site and assembly.
<b>Distribution</b>	Is modelled by considering the average distances from manufacturing site to distance at delivery point.
<b>Installation</b>	Does not required any special process, installation of product is manual. Packaging waste generated as output in installation.
<b>Use</b>	Energy is calculated by following the PSR. The energy models based on product distribution. No maintenance is necessary. Reference product consumption over 20 years is 2.21 kWh.
<b>End of life</b>	Includes its transportation from the installation site to the end-of-life treatment site, and end of life treatment processes. A value of 1000 km transport by lorry is used for the transportation as PCR default scenario.



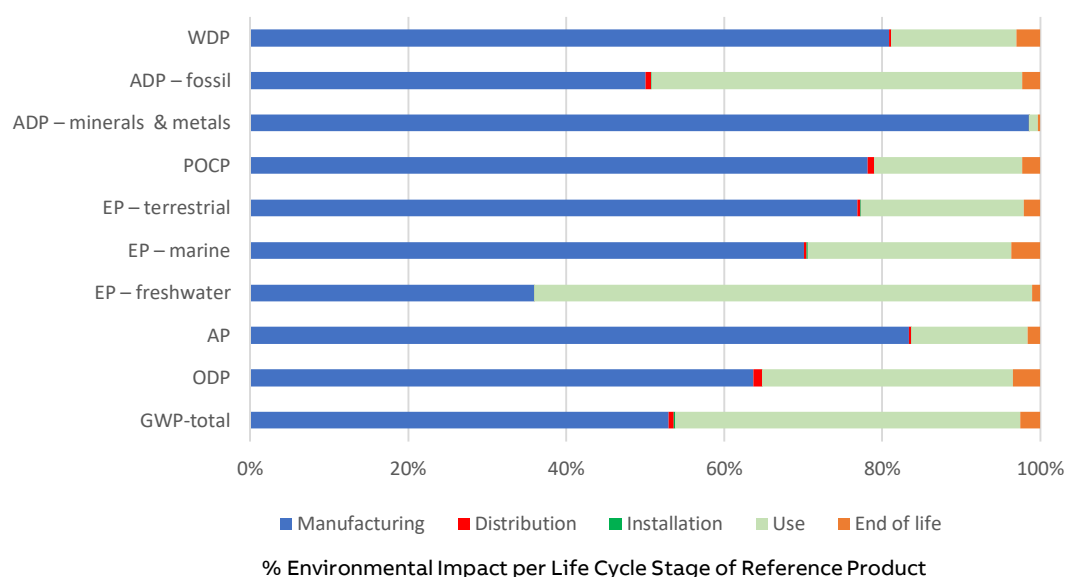
## Environmental impacts

<b>Reference lifetime</b>	20 Years
<b>Product category</b>	Circuit Breakers
<b>Installation elements</b>	End of life of MCB packaging considered in Installation phase.
<b>Use scenario</b>	At loading rate 15% of rated current (In) in continuous operation. And use time rate 30% of reference lifetime (RLT).
<b>Geographical representativeness</b>	Global
<b>Technological representativeness</b>	Technology is specific to ABB MCBs which is common for all ABB manufacturing factories at global level
<b>Software, database and EF Footprint version used</b>	SimaPro 9.5.0.1, Data base Ecoinvent 3.9.1, and EF3.0

### Energy model used

<b>Manufacturing</b>	Electricity Medium Voltage, Global
<b>Installation</b>	Electricity Low Voltage, Medium & High Voltage, Global
<b>Use</b>	Electricity Medium Voltage, Europe
<b>End of life</b>	Electricity Low Voltage, Medium & High Voltage, Global

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## Environmental impact indicators

Indicator	Unit	Total	Manu- facturing	Distri- bution	Instal- lation	Use	End of life
GWP-total	kg CO <sub>2</sub> eq.	2.39E+00	1.27E+00	1.60E-02	4.75E-03	1.04E+00	6.02E-02
GWP-fossil	kg CO <sub>2</sub> eq.	2.28E+00	1.26E+00	1.60E-02	7.52E-04	9.52E-01	5.56E-02
GWP-biogenic	kg CO <sub>2</sub> eq.	1.03E-01	4.60E-03	1.40E-05	4.00E-03	9.01E-02	4.59E-03
GWP-luluc	kg CO <sub>2</sub> eq.	4.23E-03	2.22E-03	7.65E-06	2.68E-07	1.93E-03	7.22E-05
GWP-fossil = Global Warming Potential fossil fuels GWP-biogenic = Global Warming Potential biogenic GWP-luluc = Global Warming Potential land use and land use change							
ODP	kg CFC-11 eq.	3.28E-08	2.09E-08	3.53E-10	1.05E-11	1.04E-08	1.13E-09
ODP = Depletion potential of the stratospheric ozone layer							
AP	H+ eq.	1.59E-02	1.32E-02	3.85E-05	3.36E-06	2.33E-03	2.59E-04
AP = Acidification potential, Accumulated Exceedance							
EP-freshwater	kg P eq.	1.98E-03	7.12E-04	1.15E-06	8.65E-08	1.25E-03	2.03E-05
EP-marine	kg N eq.	2.69E-03	1.89E-03	1.05E-05	3.44E-06	6.94E-04	9.86E-05
EP-terrestrial	mol N eq.	2.58E-02	1.98E-02	1.08E-04	1.28E-05	5.31E-03	5.42E-04
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment EP-terrestrial = Eutrophication potential, Accumulated Exceedance							
POCP	kg NMVOC eq.	8.34E-03	6.52E-03	6.29E-05	5.32E-06	1.56E-03	1.93E-04
POCP = Formation potential of tropo-spheric ozone							
ADP-minerals & metals	kg Sb eq.	1.44E-04	1.42E-04	4.35E-08	2.68E-09	1.68E-06	4.27E-07
ADP-fossil	MJ	3.21E+01	1.61E+01	2.36E-01	8.01E-03	1.50E+01	7.45E-01
ADP-minerals & metals = Abiotic depletion potential for non-fossil resources ADP-fossil = Abiotic depletion for fossil resources potential							
WDP	m <sup>3</sup> e depr.	5.37E-01	4.35E-01	1.14E-03	9.31E-05	8.54E-02	1.62E-02
WDP = Water Deprivation potential							
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## Common base of mandatory indicators

### Inventory flows indicator – Resource use indicators

Indicator	Unit	Total	Manu- facturing	Distri- bution	Instal- lation	Use	End of life
PERE	MJ	5.27E+00	1.78E+00	3.46E-03	2.67E-04	3.41E+00	7.60E-02
PERM	MJ	1.59E-01	1.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	5.42E+00	1.94E+00	3.46E-03	2.67E-04	3.41E+00	7.60E-02
PENRE	MJ	3.09E+01	1.48E+01	2.36E-01	8.01E-03	1.50E+01	7.45E-01
PENRM	MJ	1.23E+00	1.23E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	3.21E+01	1.61E+01	2.36E-01	8.01E-03	1.50E+01	7.45E-01
PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials							
PERM = Use of renewable primary energy resources used as raw materials							
PERT = Total Use of renewable primary energy resources							
PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials							
PENRM = Use of non-renewable primary energy resources used as raw materials							
PENRT = Total Use of non-renewable primary energy re-sources)							

### Inventory flows indicator – Indicators describing the use of secondary materials, water, and energy re-sources

Indicator	Unit	Total	Manu- facturing	Distri- bution	Instal- lation	Use	End of life
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m <sup>3</sup>	2.06E-02	1.32E-02	3.71E-05	3.22E-06	6.89E-03	5.15E-04
SM = Use of secondary material							
RSF = Use of renewable secondary fuels							
NRSF = Use of non-renewable secondary fuels							
FW = Use of net fresh water							

### Inventory flows indicator – Waste category indicators

Indicator	Unit	Total	Manu- facturing	Distri- bution	Instal- lation	Use	End of life
Hazardous waste disposed	kg	2.86E-04	2.62E-04	1.47E-06	4.88E-08	1.74E-05	4.92E-06
Non- hazardous waste disposed	kg	3.90E-01	2.46E-01	2.07E-02	1.43E-03	5.76E-02	6.47E-02
Radioactive waste disposed	kg	1.06E-04	2.89E-05	7.20E-08	6.62E-09	7.56E-05	1.77E-06

## Common base of mandatory indicators

### Inventory flows indicator – Output flow indicators

Indicator	Unit	Total	Manu- facturing	Distri- bution	Instal- lation	Use	End of life
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	1.19E-02	3.14E-03	0.00E+00	8.73E-03	0.00E+00	0.00E+00
Materials for energy recovery	kg	2.33E-03	1.37E-03	0.00E+00	9.58E-04	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

### Inventory flow indicator – other indicators

Indicator	Unit	Total
Biogenic carbon content of the product	kg of C	0.00E+00
Biogenic carbon content of the associated packaging	kg of C	5.32E-03

## Optional indicators

### Environmental indicators

Indicator	Unit	Total	Manu- facturing	Distri- bution	Instal- lation	Use	End of life
Total use of primary energy during the life cycle	MJ	3.75E+01	1.80E+01	2.40E-01	8.28E-03	1.85E+01	8.21E-01
Emissions of fine particles	incidence of diseases	8.75E-08	6.99E-08	1.54E-09	6.97E-11	1.04E-08	5.60E-09
Ionizing radiation, human health	kBq U235 eq.	3.87E-01	1.11E-01	2.98E-04	2.62E-05	2.69E-01	7.05E-03
Ecotoxicity (fresh water)	CTUe	1.64E+01	1.47E+01	1.24E-01	1.02E-02	1.30E+00	2.78E-01
Human toxicity, carcinogenic effects	CTUh	4.12E-09	2.99E-09	6.92E-12	5.49E-13	2.30E-10	8.95E-10
Human toxicity, non-carcinogenic effects	CTUh	1.31E-07	1.07E-07	2.13E-10	1.57E-11	7.70E-09	1.57E-08
Impact related to land use/soil quality	kg	1.96E+00	1.44E+00	4.48E-02	1.19E-03	3.76E-01	1.01E-01

### Extrapolation of Coefficients

Extrapolation rules are established according to EN 50693. Results of LCA performed for a reference product extrapolated to other products, these products are belonged to a same homogeneous product family as the reference product. The group of products have the following same characteristics:

- Same main function, Same product standards,

- Similar manufacturing technology: same type of materials and manufacturing processes

Coefficients factors have been extrapolated with division of environment indicators value of homogeneous product by reference product environment indicator value.

For other products than the Reference product covered by this PEP, the environmental impacts for each phase of the lifecycle are obtained by multiplying the values of the Reference product by the following coefficients:

**Note:** If the coefficient is "1", the impacts of the phase of the life cycle are assimilated to the Reference product, meaning that the impacts are unchanged in comparison to the Reference product.

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**Manufacturing phase:** To calculate environmental impact of covered product nominal value of reference product environment category to be multiplied with corresponding rating Impact category's coefficient, then value to be multiplied by the number of poles.

i.e.  $y = a \times x \times n$

Where a= Coefficient of corresponding rating impact category

y= Homogeneous product environmental category

x=Nominal value of reference product environmental category

n=Number of poles including neutral poles

Manufacturing Phase Coefficient		Rated Current			
Impact category	0.5A, 1A, 2A, 3A & 4A	6A & 10A	13A & 16A	20A, 25A, 32A, 40A	50A, 63A
GWP-total	1.081	1.040	1.000	1.104	1.528
GWP-fossil	1.080	1.039	1.000	1.102	1.522
GWP-biogenic	1.445	1.270	1.000	1.811	3.028
GWP-luluc	1.107	1.039	1.000	1.185	1.573
ODP	1.062	1.035	1.000	1.082	1.481
AP	1.516	1.207	1.000	2.118	3.008
EP-freshwater	1.475	1.192	1.000	2.085	4.118
EP-marine	1.164	1.069	1.000	1.432	2.323
EP-terrestrial	1.204	1.085	1.000	1.394	2.450
POCP	1.191	1.082	1.000	1.343	2.155
ADP-minerals & metals	1.666	1.259	1.000	2.475	7.937
ADP-fossil	1.083	1.040	1.000	1.180	1.607
WDP	1.246	1.102	1.000	2.123	2.640
<b>Inventory flows indicator – Resource use indicators</b>					
PERE	1.168	1.073	1.000	1.333	1.801
PERM	1.000	1.000	1.000	1.000	1.000
PERT	1.154	1.067	1.000	1.306	1.735

Impact category	0.5A, 1A, 2A, 3A & 4A	6A & 10A	13A & 16A	20A, 25A, 32A, 40A	50A, 63A
PENRE	1.090	1.043	1.000	1.197	1.657
PENRM	1.000	1.000	1.000	0.975	0.999
PENRT	1.083	1.040	1.000	1.180	1.607
<b>Inventory flows indicator – Indicators describing the use of secondary materials, water, and energy re-sources</b>					
FW	1.202	1.085	1.000	1.882	2.372
<b>Inventory flows indicator – Waste category indicators</b>					
Hazardous waste disposed	1.523	1.208	1.000	1.795	3.291
Non- hazardous waste disposed	1.168	1.073	1.000	1.266	1.561
Radioactive waste disposed	1.135	1.063	1.000	1.232	1.777
<b>Inventory flows indicator – Output flow indicators</b>					
Materials for recycling & Material for energy recovery	1.000	1.000	1.000	1.000	1.000
<b>Inventory flows indicator – Other indicators</b>					
Biogenic carbon content of the associated packaging	1.000	1.000	1.000	1.000	1.000

**Note:**

In above table coefficients are excluded when impact indicators value is zero for reference products. And for Optional Environmental indicators.

**Distribution, Installation & EOL Phase:** To calculate the environmental impact of covered product nominal value of reference product environment category is to be multiplied with corresponding rating's coefficient, and then value to be multiplied by the number of poles. i.e.  $y=a*x*n$

Where a= Coefficient of corresponding rating

y= Homogeneous product environmental category

x=Nominal value of reference product environmental category,

n=Number of poles including neutral poles

#### Coefficient of Distribution, Installation & EOL Phase

Rated Current	0.5A, 1A, 2A, 3A & 4A	6A & 10A	13A & 16A	20A, 25A, 32A, 40A	50A, 63A
Distribution Phase	1.071	1.031	1.000	1.056	1.116
Installation Phase	1.000	1.000	1.000	1.000	1.000
EOL Phase	1.077	1.034	1.000	1.061	1.127

**Use phase:** To calculate the environmental impact of covered product nominal value of reference product environment category to be multiplied with corresponding rating w.r.t tripping curve's coefficient, and then value to be multiplied by the number of poles. i.e.  $y=a*x*n$

Where a= Coefficient of corresponding rating w.r.t tripping curve

y= Homogeneous product environmental category

x=Nominal value of reference product environmental category.

n=Number of poles including neutral poles

#### Use Phase Coefficient

Tripping curve	Rated Current									
	0.5A	1A	2A	3A	4A	6A	10A	13A	16A	20A
B, C & D	0.690	0.690	0.690	0.690	0.690	0.476	0.762	0.914	1.000	1.143
Tripping curve	25A	32A	40A	50A	63A					
	25A	32A	40A	50A	63A					
B, C & D	1.333	1.643	2.000	2.429	3.000					

Coefficients listed in Manufacturing phase, Distribution phase, Installation phase, Use phase, and End of Life phase (EOL) applicable for entire " EN60 and EN100 of AEG Elfaplus MCB Series" correspond to ratings.

## Environmental Impact Indicator Glossary

### Impact indicators

Indicator	Description	Unit
Global warming potential (GWP) - total	Indicator of potential global warming caused by emissions to air contributing to the greenhouse effect. The total global warming potential (GWP-total) is the sum of three sub-categories of climate change. GWP-total = GWP-fossil + GWP-biogenic + GWP- land use and land use change	kg CO <sub>2</sub> eq.
Ozone depletion (OD)	Emissions to air that contribute to the destruction of the stratospheric ozone layer	kg CFC-11 eq.
Acidification of soil and water (A)	Acidification of soils and water caused by the release of certain gases to the atmosphere, such as nitrogen oxides and sulphur oxides	H+ eq.
Eutrophication (E)	Indicator of the contribution to eutrophication of water by the enrichment of the aquatic ecosystem with nutritional elements, e.g. industrial or domestic effluents, agriculture, etc. This indicator is divided to three: freshwater, marine and terrestrial.	kg P eq., kg N eq., mole N eq.
Photochemical ozone creation (POCP)	Indicator of emissions of gases that affect the creation of photochemical ozone in the lower atmosphere (smog) because of the rays of the sun.	kg NMVOC eq.
Depletion of abiotic resources – elements (ADPe)	Indicator of the depletion of natural non-fossil resources	kg Sb eq.
Depletion of abiotic resources – fossil fuels (ADPf)	The use of non-renewable fossil resources in an unsustainable way (e.g. from material to waste)	MJ (lower heating value)
Water Deprivation potential (WDP)	Deprivation-weighted water consumption. Assesses the potential of water deprivation, to either humans or ecosystems, building on the assumption that the less water remaining available per area, the more likely another user will be deprived.	m <sup>3</sup> e depr.

### Resource use indicators

Indicator	Description	Unit
Total use of primary energy	Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) + Total use of renewable primary energy re-sources (primary energy and primary energy resources used as raw materials)	MJ (lower heating value)

## Environmental Impact Indicator Glossary

### Inventory flows indicator -Indicators describing the use of secondary materials, water, and

Indicator	Description	Unit
SM = Use of secondary material	Material recovered from previous use by recycling or from waste which substitutes primary materials and use in product.	kg
RSF = Use of renewable secondary fuels	Fuel recovered after a first use or retrieved from waste of renewable fuel, that replaces primary fuels.	MJ
NRSF = Use of non-renewable secondary fuels	Fuel recovered after a first use or retrieved from waste of non-renewable fuel, that replaces primary fuels.	MJ
FW = Use of net fresh water	Freshwater use in absolute values	m <sup>3</sup>

### Inventory flows indicator – Waste category indicators

Indicator	Description	Unit
Hazardous waste disposed	A hazardous waste is a special type of waste because it cannot be disposed of by common means like other by-products of our everyday lives.	Kg
Non- hazardous waste disposed	Non-hazardous waste is any waste that does not cause harm to people or the environment.	Kg
Radioactive waste disposed	Radioactive waste is a type of hazardous waste that contains radioactive material.	Kg

### Inventory flows indicator – Output flow indicators

Indicator	Description	Unit
Components for reuse	Material or components leaving the modelled system boundary which is destined for reuse	Kg
Materials for recycling	Material leaving the modelled system boundary which is destined for recycling	Kg
Materials for energy recovery	Material leaving the modelled system boundary which is destined for use in power stations using secondary fuels.	Kg
Exported energy	Energy exported from waste incineration and landfill	MJ

### Inventory flow indicator – other indicators

Indicator	Description	Unit
Biogenic carbon content of the product, and Biogenic carbon content of the associated packaging	Biogenic carbon is the carbon that is stored in biological materials, such as plants or soil.	kg of C

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## Environmental Impact Indicator Glossary

### Inventory flow indicator – other indicators

Indicator	Description	Unit
Total use of primary energy during the life cycle	Sum of the primary renewable and non-renewable energy	MJ
Emissions of fine particles	Indicator of the potential incidence of disease due to particulate matter emissions.	incidence of diseases
Ionizing radiation, human health	Damage to human health and ecosystems linked to the emissions of radionuclides.	kBq U235 eq.
Ecotoxicity (fresh water)	Impact on freshwater organisms of toxic substances emitted to the environment.	CTUe
Human toxicity, carcinogenic effects and non-carcinogenic effects	Impact on humans of toxic substances emitted to the environment. Divided into non-cancer and cancer related toxic substances.	CTUh
Impact related to land use/soil quality	Measure of the changes in soil quality (Biotic production, Erosion resistance, Mechanical filtration).	kg

## References

- Product Category Rules for Electrical, Electronic and HVAC-R Products - PEP-PCR-ed4-EN-2021 09 06
- SPECIFIC RULES FOR Electrical switchgear and control gear Solutions - PSR-0005-ed3-EN-2023 06 06
- IEC 60947-1 - Low-voltage switchgear and controlgear - Part 1: General rules
- IEC 60947-2 - Low-voltage switchgear and controlgear - Part 2: Circuit-breakers
- ISO 14067:2018 Greenhouse gases — Carbon footprint of products — requirements and guidelines for quantification
- ISO 14044 Environmental management — Life cycle assessment — Requirements and guidelines
- ISO14040 Environmental management — Life cycle assessment — Principles and framework
- ISO 14025 - Environmental management — Life cycle assessment — Principles and framework
- IEC/TR 62635 Guidelines for end-of-life information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment
- IEC 62474 Material declaration for products of and for the electrotechnical industry
- EN 50693:2019 – Product category rules for life cycle assessments of electronic and electrical products and systems
- Data base Ecoinvent 3.9.1
- Life cycle assessment report - DESB-00475-V01-01-EN

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Independent verification of the declaration and data, in compliance with ISO 14025: 2010

Internal	<input type="radio"/>	External	<input checked="" type="radio"/>
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The PCR review was conducted by a panel of experts chaired by Julie Orgelet (DDemain)

PEP are compliant with EN 50693:2019  
The components of the present PEP cannot be compared with components from another program

Document in compliance with ISO 14025: 2010 "Environmental labels and declarations. Type III environmental declarations"

