





# ABB Purpose & Embedding Sustainability

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.

The content of this PEP cannot be compared with the content based on another program/database.

Scan QR code for more information

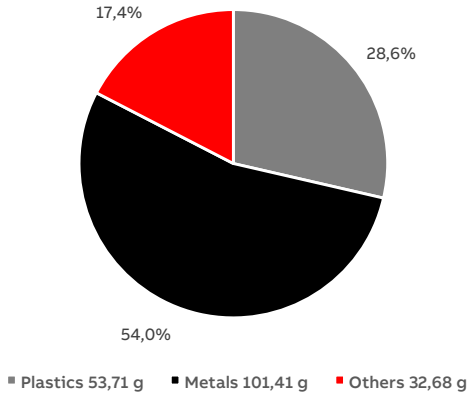


## General information

Reference product	The scope of this LCA study is the evaluation of the environmental impacts of the life cycle of ABB DSE201 product family produced by ABB SpA. The ABB DSE201 products are Electronic Residual Current Breakers with overcurrent protection (eRCBO). The specific type of ABB DSE201 C16 AC30 analyzed in this LCA project is the article code 2CSR255051R1164.
Description of the product	The ABB DSE201 products are electronic Residual Current Circuit Breaker with Overcurrent Protection; the devices are designed for the protection of end user single-phase circuits against overload and short-circuit currents; it also provides protection against the effects of sinusoidal alternating earth fault currents and against indirect contacts and additional protection against direct contacts.
Functional unit	The functional unit is designed to protect the installation against overloads and short circuits and protect people and premises at risk of fire or explosion against insulation defects in a circuit with rated voltage 230-240V rated current 16A, with 1P+N poles, a rated breaking capacity 6kA, the tripping curve type C, the sensitivity 30mA, and the differential protection type AC, according to the appropriate use scenario, and in the Household/Commercial and during the reference service life of the product of 20 years
Other products covered	ABB DSE201 eRCBOs family technical characteristics: Rated voltage [V]: 230-240 Rated current [A]: 6/10/16/20/25/32/40 Rated breaking capacity [A]: 6 kA Type of differential protection: A/AC Tripping Curve: C/B
Manufacturing address	ABB S.p.A. – ELSB Viale dell'Industria, 18 20009 Vittuone (MI) - Italy <a href="http://www.new.abb.com">www.new.abb.com</a>



# Constituent Materials



Total weight of reference product and packaging

187,8

g

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	19,1	Steel	26,8	Cadboard	11,3
Glass fiber	6,9	Copper	25,8	Other	4,5
PC	1,7	Other Metal	1,3	Paper	1,2
PTFE / PPS / PE	0,9			Wood	0,4

Total weight of the reference product 163,3 g plus packaging 24,5g



## Additional Information

<b>Manufacturing</b>	The manufacturing stage includes the production and transportation to the manufacturer's last logistic platform of DSE201 and its packaging. The production occurs at the ABB factory located in Santa Palomba (RM).
<b>Distribution</b>	The transport from ABB Santa Palomba factory to Vignate (MI) and other locations, was taken into account. For the distribution of the product from Vignate to the final customer, the intracontinental transport scenario provided by PCR-ed4-EN-2021 09 06 standard was adopted.
<b>Installation</b>	The installation phase only implies manual activities and no energy is consumed. This phase also includes the disposal of the packaging of the product. Statistical average data from Eurostat databases were considered for the disposal of the product and its packaging.
<b>Use</b>	During the use phase, the DSE201 dissipates some electricity due to power losses. The average power loss of the switch has been calculated by ABB following the assumption indicated in the PSR-0005-ed3.1-EN-2023 12 08 : <ul style="list-style-type: none"><li>- Nominal current load rate as 15% (Household / Commercial);</li><li>- RSL of 20 years;</li><li>- Functioning time of 30% of the RSL (<math>\alpha</math>).</li></ul> No maintenance is planned for the product.
<b>End of life</b>	The default end-of-life scenario provided by the IEC/TR 62635 document have been adopted, considering the product transport by lorry over 1000 km.
<b>Benefits and loads beyond the system boundaries</b>	The potential benefits derives from the impacts prevented by recycling and waste to energy recovery of the packaging in the installation phase



# Environmental Impacts

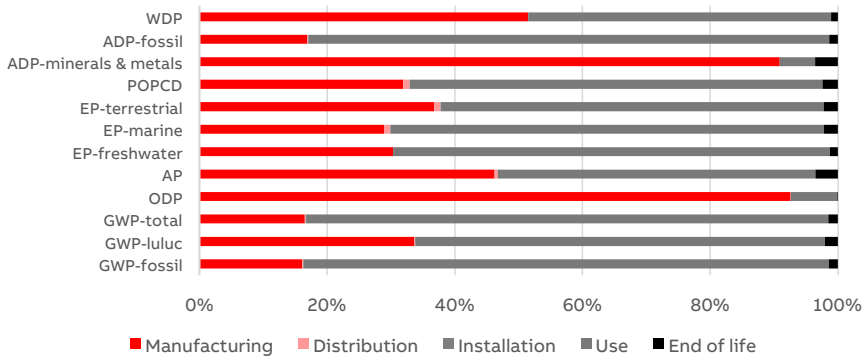
Reference lifetime	20 years
Product category	electronic Residual Current Circuit Breaker with Overcurrent Protection
Installation elements	No installation materials are required in the life cycle of the product.
Use scenario	The calculation of the use stage electricity consumption from the average power consider the following assumptions: nominal current load rate as 15% (Household /Commercial)
Geographical representativeness	For the use and end-of-life stages of the product, the geographical boundaries of Europe have been considered
Technological representativeness	Technological representativeness refers to the specific production process for primary data.
Software and database used	SimaPro 9.5.0.0 - Ecoinvent 3.9,- Industry Data 2.0

## Energy model used

Manufacturing	ABB GO energy mix 2022. The energy-related processes used for the remaining inputs are those included in the ecoinvent v3.9.1 datasets.
Installation	No energy consumption occur during the installation stage
Use	Electricity, low voltage (Various regionalities according to product distribution data)
End of life	The energy-related processes used for the inputs of the end-of-life stage are those included in the ecoinvent datasets selected for the analysis.

# Common base of mandatory indicators

% Environmental Impact per Life Cycle Stage of Reference Product



## Environmental impact indicators

Indicator	Unit	Total	Manufacturing	Distribution	Installation	Use	End of life	Benefits
GWP	Total	kg CO2 eq. 1,93E+01	3,17E+00	3,49E-02	3,68E-02	1,57E+01	2,89E-01	-5,16E-01
	Fossil	kg CO2 eq. 1,91E+01	3,08E+00	3,49E-02	1,62E-03	1,57E+01	2,70E-01	-5,25E-01
	Biogenic	kg CO2 eq. 1,92E-01	8,36E-02	-1,38E-06	3,52E-02	5,40E-02	1,91E-02	9,58E-03
	Luluc	kg CO2 eq. 1,69E-02	5,67E-03	2,44E-05	1,52E-06	1,08E-02	3,39E-04	-7,20E-04
ODP	kg CFC-11 eq.	3,11E-06	2,88E-06	5,41E-10	2,92E-11	2,26E-07	3,36E-09	-7,41E-02
AP	H+ eq.	1,48E-01	6,82E-02	7,91E-04	1,03E-05	7,34E-02	5,15E-03	-2,05E-02
EP	Freshwater	kg P eq. 2,09E-02	6,34E-03	1,63E-06	2,12E-07	1,43E-02	2,60E-04	-1,76E-03
	Marine	kg N eq. 2,11E-02	6,09E-03	2,03E-04	2,24E-05	1,43E-02	4,52E-04	-1,25E-03
	Terrestrial	mol N eq. 2,15E-01	7,90E-02	2,24E-03	3,68E-05	1,29E-01	4,74E-03	-1,66E-02
POPCD	kg NMVOC eq.	6,45E-02	2,06E-02	6,17E-04	1,72E-05	4,17E-02	1,55E-03	-4,91E-03
ADP	Minerals & metals	kg SB eq. 1,52E-03	1,38E-03	5,49E-08	5,23E-09	8,43E-05	5,40E-05	-2,69E-04
	Fossil	MJ 2,33E+02	3,93E+01	4,48E-01	2,00E-02	1,90E+02	3,09E+00	-6,32E+07
WDP	m³ eq. depr.	2,95E+00	1,52E+00	1,33E-03	3,97E-04	1,40E+00	3,20E-02	-3,49E-01

## Resource use indicators

Indicator	Unit	Total	Manufacturing	Distribution	Installation	Use	End of life	Benefits
PERE	MJ	2,39E+01	7,70E+00	3,98E-03	5,93E-04	1,58E+01	3,44E-01	-9,84E-01
PERM	MJ	6,09E-01	6,09E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	2,45E+01	8,31E+00	3,98E-03	5,93E-04	1,58E+01	3,44E-01	-9,84E-01
PENRE	MJ	2,31E+02	3,78E+01	4,48E-01	2,00E-02	1,90E+02	3,09E+00	-6,32E+07
PENRM	MJ	1,50E+00	1,50E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	2,33E+02	3,93E+01	4,48E-01	2,00E-02	1,90E+02	3,09E+00	-6,32E+07

# Common base of mandatory indicators

## Use of secondary materials, water, and energy resources

Indicator	Unit	Total	Manufacturing	Distribution	Installation	Use	End of life	Benefits
SM	kg	1,77E-02	1,77E-02	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	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m <sup>3</sup>	9,16E-02	4,69E-02	4,52E-05	1,29E-05	4,34E-02	1,22E-03	-8,79E-03

## Waste category indicators

Indicator	Unit	Total	Manufacturing	Distribution	Installation	Use	End of life	Benefits
HWD	kg	1,76E-03	1,21E-03	2,43E-06	1,15E-07	5,37E-04	1,01E-05	-2,69E+01
N-HWD	kg	1,68E+00	6,24E-01	8,71E-03	1,16E-02	9,33E-01	1,07E-01	-1,25E-01
RWD	kg	1,71E-04	7,94E-05	6,36E-08	9,88E-09	8,76E-05	3,71E-06	-8,75E+01

## Output flow indicators

Indicator	Unit	Total	Manufacturing	Distribution	Installation	Use	End of life	Benefits
CfRu	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	2,49E-01	1,03E-01	0,00E+00	7,17E-03	0,00E+00	1,39E-01	0,00E+00
MFER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EE	MJ	5,94E-02	0,00E+00	0,00E+00	3,35E-02	0,00E+00	2,59E-02	0,00E+00

## Other indicators

Indicator		Unit	Total
Biogenic Carbon	Product	kg of C	1,31E-04
	Packaging	kg of C	1,85E-02

## Optional indicators

Indicator	Unit	Total	Manufacturing	Distribution	Installation	Use	End of life	Benefits
Tot PE	MJ	2,57E+02	4,76E+01	4,52E-01	2,06E-02	2,06E+02	3,43E+00	-7,31E+06
Efp	Dise inc	5,27E-07	2,70E-07	1,58E-09	1,95E-10	2,24E-07	3,19E-08	-5,96E-01
IrHH	kBq U-235 eq	7,25E-01	3,16E-01	2,73E-04	4,05E-05	3,94E-01	1,47E-02	-3,41E-02
ETX FW	CTUe	1,61E+02	1,11E+02	2,28E-01	6,35E-02	4,53E+01	4,80E+00	-2,52E+07
HTX CE	CTUh	1,86E-08	1,24E-08	1,53E-11	1,75E-12	4,03E-09	2,13E-09	-2,57E-02
HTX N-CE	CTUh	1,01E-06	7,46E-07	1,90E-10	6,55E-11	1,74E-07	8,66E-08	-2,43E+00
IrLS	Pt	5,68E+01	3,63E+01	1,18E-01	1,44E-02	1,80E+01	2,38E+00	-6,31E+07

# Extrapolation Factors

For other products than the Reference product covered by this PEP, the environmental impacts for each phase of the lifecycle are obtained by a linear correlation with respect to weight for the production, distribution, and end-of-life phase and with respect to average power loss for the use phase. Each environmental indicator value shall be calculated using the following formulas:  $y = a_n x + b_n$

\* 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

Impact category	Unit of measure	Manufacturing		Distribution		Installation		Use		End of life	
		a1	b1	a2	b2	a3	b3	a4	b4	a5	b5
GWP-total	kg CO2 eq	0,00E+00	3,17E+00	0,00E+00	3,49E-02	0,00E+00	3,68E-02	4,31E+01	-4,95E-02	0,00E+00	2,89E-01
GWP-fossil	kg CO2 eq	0,00E+00	3,08E+00	0,00E+00	3,49E-02	0,00E+00	1,62E-03	4,29E+01	-4,93E-02	0,00E+00	2,70E-01
GWP-biogenic	kg CO2 eq	0,00E+00	8,36E-02	0,00E+00	-1,38E-06	0,00E+00	3,52E-02	1,48E-01	-1,70E-04	0,00E+00	1,91E-02
GWP-luluc	kg CO2 eq	0,00E+00	5,67E-03	0,00E+00	2,44E-05	0,00E+00	1,52E-06	2,97E-02	-3,41E-05	0,00E+00	3,39E-04
ODP	kg CFC11 eq	0,00E+00	2,88E-06	0,00E+00	5,41E-10	0,00E+00	2,92E-11	6,19E-07	-7,11E-10	0,00E+00	3,36E-09
AP	mol H+ eq	0,00E+00	6,82E-02	0,00E+00	7,91E-04	0,00E+00	1,03E-05	2,01E-01	-2,31E-04	0,00E+00	5,15E-03
EP-freshwater	kg P eq	0,00E+00	6,34E-03	0,00E+00	1,63E-06	0,00E+00	2,12E-07	3,92E-02	-4,51E-05	0,00E+00	2,69E-04
EP-marine	kg N eq	0,00E+00	6,09E-03	0,00E+00	2,03E-04	0,00E+00	2,24E-05	3,93E-02	-4,51E-05	0,00E+00	4,52E-04
EP-terrestrial	mol N eq	0,00E+00	7,90E-02	0,00E+00	2,24E-03	0,00E+00	3,68E-05	3,53E-01	-4,05E-04	0,00E+00	4,74E-03
POCP	kg NMVOC eq	0,00E+00	2,06E-02	0,00E+00	6,17E-04	0,00E+00	1,72E-05	1,14E-01	-1,31E-04	0,00E+00	1,55E-03
ADPE	kg Sb eq	0,00E+00	1,38E-03	0,00E+00	5,49E-08	0,00E+00	5,23E-09	2,31E-04	-2,65E-07	0,00E+00	5,40E-05
ADPF	MJ	0,00E+00	3,93E+01	0,00E+00	4,48E-01	0,00E+00	2,00E-02	5,20E+02	-5,97E-01	0,00E+00	3,09E+00
WDP	m3	0,00E+00	1,52E+00	0,00E+00	1,33E-03	0,00E+00	3,97E-04	3,83E+00	-4,40E-03	0,00E+00	3,20E-02
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	1,03E-01	0,00E+00	0,00E+00	0,00E+00	7,17E-03	0,00E+00	0,00E+00	0,00E+00	1,39E-01
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,35E-02	0,00E+00	0,00E+00	0,00E+00	2,59E-02
PM	disease inc,	0,00E+00	2,70E-07	0,00E+00	1,58E-09	0,00E+00	1,95E-10	6,13E-07	-7,04E-10	0,00E+00	3,19E-08
IRP	kBq U-235 eq	0,00E+00	3,16E-01	0,00E+00	2,73E-04	0,00E+00	4,05E-05	1,08E+00	-1,24E-03	0,00E+00	1,47E-02
PENRE	MJ	0,00E+00	3,78E+01	0,00E+00	4,48E-01	0,00E+00	2,00E-02	5,20E+02	-5,97E-01	0,00E+00	3,09E+00
PENRM	MJ	0,00E+00	1,50E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	0,00E+00	3,93E+01	0,00E+00	4,48E-01	0,00E+00	2,00E-02	5,20E+02	-5,97E-01	0,00E+00	3,09E+00
PERE	MJ	0,00E+00	7,70E+00	0,00E+00	3,98E-03	0,00E+00	5,93E-04	4,33E+01	-4,98E-02	0,00E+00	3,44E-01
PERM	MJ	0,00E+00	6,09E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	0,00E+00	8,31E+00	0,00E+00	3,98E-03	0,00E+00	5,93E-04	4,33E+01	-4,98E-02	0,00E+00	3,44E-01
PE	MJ	0,00E+00	4,76E+01	0,00E+00	4,52E-01	0,00E+00	2,06E-02	5,63E+02	-6,47E-01	0,00E+00	3,43E+00
SM	kg	0,00E+00	1,77E-02	0,00E+00	0,00E+00	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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	0,00E+00	4,69E-02	0,00E+00	4,52E-05	0,00E+00	1,29E-05	1,19E-01	-1,37E-04	0,00E+00	1,22E-03
HWD	kg	0,00E+00	1,21E-03	0,00E+00	2,43E-06	0,00E+00	1,15E-07	1,47E-03	-1,69E-06	0,00E+00	1,01E-05
NHWD	kg	0,00E+00	6,24E-01	0,00E+00	8,71E-03	0,00E+00	1,16E-02	2,56E+00	-2,94E-03	0,00E+00	1,07E-01
RWD	kg	0,00E+00	7,94E-05	0,00E+00	6,36E-08	0,00E+00	9,88E-09	2,40E-04	-2,76E-07	0,00E+00	3,71E-06
ETP-fw	CTUe	0,00E+00	1,11E+02	0,00E+00	2,28E-01	0,00E+00	6,35E-02	1,24E+02	-1,43E-01	0,00E+00	4,80E+00
HTP-c	CTUh	0,00E+00	1,24E-08	0,00E+00	1,53E-11	0,00E+00	1,75E-12	1,10E-08	-1,27E-11	0,00E+00	2,13E-09
HTP-nc	CTUh	0,00E+00	7,46E-07	0,00E+00	1,90E-10	0,00E+00	6,55E-11	4,76E-07	-5,47E-10	0,00E+00	8,66E-08
SQP	Pt	0,00E+00	3,63E+01	0,00E+00	1,18E-01	0,00E+00	1,44E-02	4,93E+01	-5,67E-02	0,00E+00	2,38E+00
Biogenic C content_product	kg C	0,00E+00	1,31E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Biogenic C content_packaging	kg C	0,00E+00	1,85E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00



## Extrapolation Factors

Product name	Average power loss (Wloss)@15%In (Included electronic consumption) [W]	Weight of the product [g]
2CSR255151R1065	2,34E-01	165,00
2CSR255151R1105	2,34E-01	165,00
2CSR255151R1165	2,54E-01	165,00
2CSR255151R1205	2,81E-01	165,00
2CSR255151R1255	2,54E-01	165,00
2CSR255151R1325	2,76E-01	165,00
2CSR255151R1405	2,81E-01	165,00
2CSR255151R1064	2,34E-01	165,00
2CSR255151R1104	2,34E-01	165,00
2CSR255151R1164	2,54E-01	165,00
2CSR255151R1204	2,81E-01	165,00
2CSR255151R1254	2,54E-01	165,00
2CSR255151R1324	2,76E-01	165,00
2CSR255151R1404	2,81E-01	165,00
2CSR255051R1065	2,34E-01	165,00
2CSR255051R1105	2,34E-01	165,00
2CSR255051R1165	2,54E-01	165,00
2CSR255051R1205	2,81E-01	165,00
2CSR255051R1255	2,54E-01	165,00
2CSR255051R1325	2,76E-01	165,00
2CSR255051R1405	2,81E-01	165,00
2CSR255051R1064	2,34E-01	165,00
2CSR255051R1104	2,34E-01	165,00
2CSR255051R1164	2,54E-01	165,00
2CSR255051R1204	2,81E-01	165,00
2CSR255051R1254	2,54E-01	165,00
2CSR255051R1324	2,76E-01	165,00
2CSR255051R1404	2,81E-01	165,00
2CSR255153R1065	2,34E-01	165,00
2CSR255153R1105	2,34E-01	165,00
2CSR255153R1165	2,54E-01	165,00
2CSR255153R1205	2,81E-01	165,00
2CSR255153R1255	2,54E-01	165,00
2CSR255153R1325	2,76E-01	165,00
2CSR255153R1405	2,81E-01	165,00
2CSR255153R1064	2,34E-01	165,00
2CSR255153R1104	2,34E-01	165,00

## Extrapolation Factors

Product name	Average power loss (Wloss)@15%In (Included electronic consumption) [W]	Weight of the product [g]
2CSR255153R1164	2,54E-01	165,00
2CSR255153R1204	2,81E-01	165,00
2CSR255153R1254	2,54E-01	165,00
2CSR255153R1324	2,76E-01	165,00
2CSR255153R1404	2,81E-01	165,00
2CSR255053R1064	2,34E-01	165,00
2CSR255053R1104	2,34E-01	165,00
2CSR255053R1164	2,54E-01	165,00
2CSR255053R1204	2,81E-01	165,00
2CSR255053R1254	2,54E-01	165,00
2CSR255053R1324	2,76E-01	165,00
2CSR255053R1404	2,81E-01	165,00
2CSR255053R1065	2,34E-01	165,00
2CSR255053R1105	2,34E-01	165,00
2CSR255053R1165	2,54E-01	165,00
2CSR255053R1205	2,81E-01	165,00
2CSR255053R1255	2,54E-01	165,00
2CSR255053R1325	2,76E-01	165,00
2CSR255053R1405	2,81E-01	165,00
2CSR255053R2064	2,34E-01	165,00
2CSR255053R2104	2,34E-01	165,00
2CSR255053R2164	2,54E-01	165,00
2CSR255053R2204	2,81E-01	165,00
2CSR255053R2254	2,54E-01	165,00
2CSR255053R2324	2,76E-01	165,00
2CSR255053R2404	2,81E-01	165,00

# Glossary

## Environmental impact Indicators

GWP-total	Global Warming Potential total (Climate hange)
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 reachin 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 indicators

PENRE	Use of non-renewable primary energy excluding 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)
PERE	Use of renewable primary energy excluding non-renewable primary energy resources used as raw material.
PERM	Use of renewable 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)

Secondary materials, water and energy resources		Waste category indicators	
SM	Use of secondary materials	HWD	Hazardous waste disposed
RSF	Use of renewable secondary fuels	N-HWD	Non-hazardous waste disposed
NRSF	Use of non-renewable secondary fuels	RWD	Radioactive waste disposed
FW	Net use of fresh water		

Output flow indicators		Optional indicators	
CfRu	Components for re-use	Tot PE	Total use of primary energy during the life cycle
MfR	Materials for recycling		
MfER	Materials for energy recovery	Efp	Emissions of Fine particles
EE	Exported Energy	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

## References

---

- [1] PEP ecopassport® PROGRAM. PCR-ed4-EN-2021 09 06. Product Category Rules for Electrical, Electronic and HVAC-R Products.
- [2] PEP ecopassport® PROGRAMME. PSR-0005-ed3.1-EN-2023 12 08. Specific rules for Electrical switchgear and control gear Solutions
- [3] PRÉ Consultants. Software Simapro 9.5.0.0 2022 ([www.simapro.com](http://www.simapro.com)).
- [4] ISO 14040:2006/Amd 1:2020. Life cycle assessment. Environmental management. Principles and Framework. International Organization for Standardization. 2020.
- [5] ISO 14044:2006/Amd 1:2017/Amd 2:2020. Life cycle assessment. Environmental management. Requirements and guidelines. International Organization for Standardization. 2020.
- [6] ABB website. (<https://global.abb/group/en/about>) [accessed 12-01-2023].
- [7] ABB website (<https://global.abb/group/en/sustainability/sustainability-strategy-2030>) [accessed 12-01-2023].
- [8] ABB website. (<https://new.abb.com/low-voltage/products/system-pro-m/residual-current-devices/dda200>) [accessed 15-12-2023].
- [9] Ecoinvent. 2022. Swiss Centre for Life Cycle Assessment. v3.9.1 ([www.ecoinvent.ch](http://www.ecoinvent.ch)).
- [10] EN 15804:2012+A2:2019: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
- [11] Google Maps. (<https://www.google.it/maps/preview>).
- [12] Sea Rates. (<https://www.searates.com/>).
- [13] VAC – Advanced Magnetic Solutions, VITROPERM® 800 / 500 (VITROPERM 500 - 800.pdf ([vacuumschmelze.com](http://vacuumschmelze.com))).
- [14] Wikipedia, Alnico (Alnico - Wikipedia).
- [15] Kruzhanov, Vladislav & Arnhold, Volker. (2012). Energy consumption in powder metallurgical manufacturing. Powder Metallurgy. 55. 14-21. 10.1179/174329012X13318077875722 ((PDF) Energy consumption in powder metallurgical manufacturing ([researchgate.net](http://researchgate.net))).
- [16] GO CERTIFICATES ABB SPA 2022.
- [17] Eurostat. ([https://ec.europa.eu/eurostat/web/products-datasets/-/ENV\\_WASPAC](https://ec.europa.eu/eurostat/web/products-datasets/-/ENV_WASPAC)).
- [18] ITSB-00640-V01,01-EN- LCA Report to support PEP Ecopassport for ABB DSE201 C16 AC30