M4M NETWORK ANALYZERS

PEP ecopassport®

Product Environmental Profile

Product Environmental Profile - PEP Ecopassport.
Document in compliance with ISO 14025: 2006 "Environmental labels and declarations. Type III environmental declarations"

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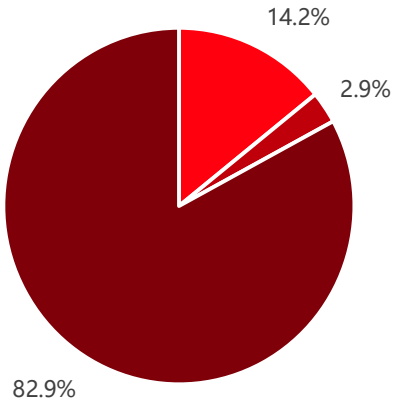
ABB Purpose & Embedding Sustainability

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.

General Information

Reference product	ABB M4M 20 MODBUS Network analyzer - Code 2CSG251141R4051
Description of the product	The M4M Network Analyzers are stand-alone network analyzers that guarantee all power monitoring needs in the energy distribution system: from high-accuracy energy efficiency monitoring of electrical parameters to complete power quality analysis. Thanks to its connectivity capabilities, M4M can get leverage on the integration in ABB scalable energy and asset management solutions. Thanks to MID certification, M4M allow to fulfil all legal requirements for accounting and energy acquisition.
Functional unit	The functional unit for the M4M 20 MODBUS is to ensure all power monitoring needs in the energy distribution system with rated voltage 230V, rated current 5A, current type AC and Ingress Protection IP2X, in the Industrial application area, according to the appropriate use scenario, and during the 10-year reference service life of the product.
Other products covered	M4M Model 20 family M4M Model 30 family M4M Model 20-M family M4M Model 30-M family M4M Model 2X family

Constituent Materials



Total weight of Reference product and packaging	1074.5	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%
PC	13.0	Copper	2.4	Wood	46.3
PE	0.5	Ferrite	0.2	Cardboard & paper	20.6
PA	0.4	Bronze	0.2	PCBA	13.2
Silicone	0.2	Steel	0.1	LCD	2.8
Glass fibre	0.1	–	–	–	–

Additional Environmental Information

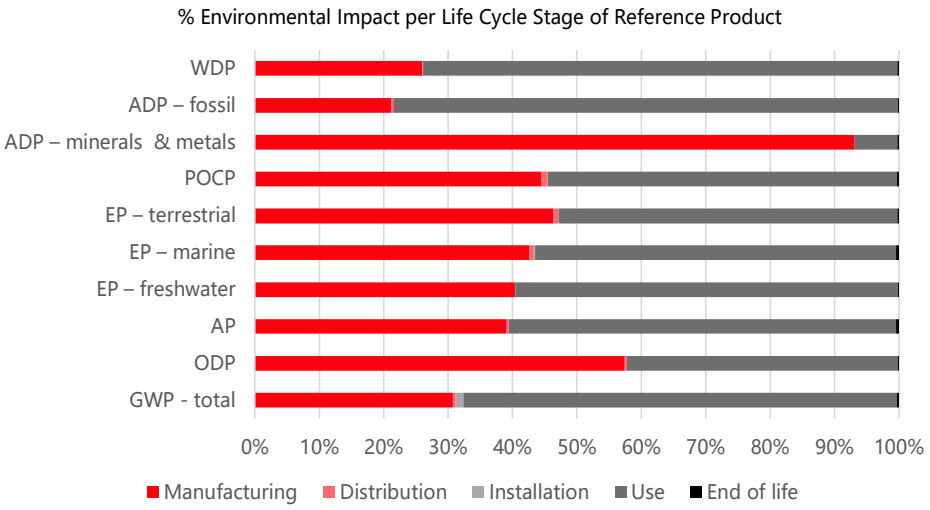
Manufacturing	The manufacturing stage includes the production and transportation to the manufacturer's last logistic platform of M4M Network analyzer and its packaging. The production occurs at the ABB factory located in Santa Palomba (RM).
Distribution	The transport from ABB Santa Palomba factory to Vignate, Milan 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, considering the European macro-area.
Installation	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.
Use	During the use phase, M4M 20 MODBUS consume energy as an active product. The energy consumption has been calculated as follow: - Direct energy consumption (Industrial application); - RSL of 10 years; - Functioning time of 100% of the RSL (α). No maintenance is planned for the product.
End of life	The default end of life scenario provided by the IEC/TR 62635 document has been adopted, considering the product transport by lorry over 1000 km and its disposal.
Benefits and loads beyond the system boundaries	Benefits and loads beyond the system boundaries has been considered according to PCR-ed4-EN-2021 09 06 & UNI EN 15804:2012+A2:2019.

Environmental Impacts

Reference lifetime	10 years
Product category	Other Equipment
Installation elements	No installation materials are required in the life cycle of the product.
Use scenario	The formula for the calculation of the use stage electricity consumption is: E_use [kWh] = (P_use*8760*RSL*α)/1000
Geographical representativeness	Europe
Technological representativeness	Technological representativeness refers to the specific production process for primary data.
Software and database used	SimaPro 9.5 and ecoinvent 3.9.1

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 {RER}| market group for electricity, low voltage | Cut-off, S
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 indicators

Indicator	Unit	Total (no Benefits	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
GWP-total	kg CO_2 eq.	9.74E+01	2.99E+01	4.69E-01	1.13E+00	6.56E+01	3.13E-01	-2.21E+00
GWP-fossil	kg CO_2 eq.	9.68E+01	3.07E+01	4.68E-01	4.04E-02	6.54E+01	2.72E-01	-2.41E+00
GWP-biogenic	kg CO_2 eq.	3.55E-01	-8.06E-01	3.63E-04	1.09E+00	3.20E-02	4.06E-02	2.00E-01
GWP-luluc	kg CO_2 eq.	2.24E-01	5.99E-02	2.22E-04	1.75E-05	1.63E-01	2.46E-04	-5.56E-03
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.	2.97E-06	1.70E-06	1.03E-08	7.92E-10	1.25E-06	5.73E-09	-1.06E-07
ODP = Depletion potential of the stratospheric ozone layer								
AP	H+ eq.	6.24E-01	2.44E-01	1.95E-03	2.04E-04	3.75E-01	2.79E-03	-2.48E-02
AP = Acidification potential, Accumulated Exceedance								
EP-freshwater	kg P eq.	1.04E-01	4.21E-02	3.36E-05	5.43E-06	6.19E-02	1.71E-04	-3.47E-03
EP-marine	kg N eq.	1.08E-01	4.61E-02	7.38E-04	1.89E-04	6.06E-02	4.93E-04	-3.35E-03
EP-terrestrial	mol N eq.	1.04E+00	4.84E-01	7.87E-03	8.75E-04	5.49E-01	2.62E-03	-3.62E-02
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.	3.25E-01	1.45E-01	2.95E-03	3.05E-04	1.76E-01	8.86E-04	-1.11E-02
POCP = Formation potential of tropospheric ozone								
ADP-minerals & metals	kg Sb eq.	1.20E-02	1.12E-02	1.27E-06	1.21E-07	7.93E-04	2.95E-05	-6.61E-04
ADP-fossil	MJ	1.90E+03	4.03E+02	6.89E+00	4.65E-01	1.49E+03	2.75E+00	-3.86E+01
ADP-minerals & metals = Abiotic depletion potential for non-fossil resources ADP-fossil = Abiotic depletion for fossil resources potential								
WDP	m^3 eq. depr.	2.27E+01	5.88E+00	3.29E-02	2.68E-03	1.67E+01	6.09E-02	-6.69E-01
WDP = Water Deprivation potential								

Common base of mandatory indicators

Inventory flows indicator – Resource use indicators

Indicator	Unit	Total (no Benefits	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
PERE	MJ	3.88E+02	5.35E+01	1.01E-01	1.94E-02	3.34E+02	4.01E-01	-8.78E+00
PERM	MJ	1.08E+01	1.08E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	3.98E+02	6.43E+01	1.01E-01	1.94E-02	3.34E+02	4.01E-01	-8.78E+00
PENRE	MJ	1.89E+03	3.97E+02	6.89E+00	4.65E-01	1.49E+03	2.75E+00	-3.86E+01
PENRM	MJ	6.46E+00	6.46E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.90E+03	4.03E+02	6.89E+00	4.65E-01	1.49E+03	2.75E+00	-3.86E+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 resources

Inventory flows indicator – Indicators describing the use of secondary materials, water, and energy resources

Indicator	Unit	Total (no Benefits	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
SM	kg	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
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^3	1.46E+00	2.51E-01	1.08E-03	2.44E-04	1.20E+00	2.23E-03	-2.89E-02

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 (no Benefits	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
Hazardous waste disposed	kg	4.51E-03	1.84E-03	4.28E-05	2.64E-06	2.61E-03	7.70E-06	-1.26E-04
Non- hazardous waste disposed	kg	9.94E+00	2.95E+00	6.05E-01	2.30E-01	5.98E+00	1.70E-01	-2.14E-01
Radioactive waste disposed	kg	1.16E-02	8.92E-04	2.10E-06	5.07E-07	1.07E-02	1.04E-05	-1.50E-04

Common base of mandatory indicators

Inventory flows indicator – Output flow indicators

Indicator	Unit	Total (no Benefits	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	5.23E-01	0.00E+00	0.00E+00	3.41E-01	0.00E+00	1.82E-01	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	1.33E+00	0.00E+00	0.00E+00	9.04E-01	0.00E+00	4.26E-01	0.00E+00

Inventory flow indicator – other indicators

Indicator	**Unit**	Total (no Benefits	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
Biogenic carbon content of the product	kg of C	1.26E-06	1.26E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon content of the associated packaging	kg of C	3.45E-01	3.45E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Optional indicators

Environmental indicators

Indicator	Unit	Total (no Benefits	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
Total use of primary energy during the life cycle	MJ	2.30E+03	4.67E+02	6.99E+00	4.85E-01	1.82E+03	3.15E+00	-4.73E+01
Emissions of fine particles	incidence of diseases	3.21E-06	1.77E-06	4.84E-08	3.37E-09	1.38E-06	1.13E-08	-1.26E-07
Ionizing radiation, human health	kBq U235 eq.	4.56E+01	3.61E+00	8.70E-03	2.02E-03	4.19E+01	4.04E-02	-5.91E-01
Ecotoxicity (fresh water)	CTUe	1.17E+03	9.13E+02	3.32E+00	3.70E-01	2.50E+02	3.44E+00	-6.19E+01
Human toxicity, car-cinogenic effects	CTUh	6.45E-08	3.18E-08	2.04E-10	7.14E-11	3.07E-08	1.73E-09	-3.15E-09
Human toxicity, non-carcinogenic effects	incidence of diseases	3.15E-06	1.81E-06	4.95E-09	5.05E-10	1.22E-06	1.18E-07	-1.97E-07
Impact related to land use/soil quality		5.53E+02	2.54E+02	7.01E+00	3.22E-01	2.90E+02	1.76E+00	-2.99E+01

Other indicators

Indicator	Unit	Total (no Benefits	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
No Other indicators used								

Environmental Impact Indicator Glossary

Impact indicators

Indicator	Description	Distri-bution
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_2 eq.
Ozone depletion (ODP)	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^3 eq. depr.

Resource use indicators

Indicator	Description	Distri-bution
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)

Extrapolation rules

The PEP can cover products different from the reference product if they belong to a homogeneous environmental family. This means that the group of products must satisfy the following characteristics:

- same function;
- same product standard;
- same manufacturing technology: the same type of materials and same manufacturing processes.

The M4M network analyzers family satisfy these conditions, so extrapolation rules were applied to assess the environmental impact of the products belonging to the family, following the PCR indication. No extrapolation rules are set in the PSR; thus, the next steps have been followed to define the extrapolation rule:

- Analyse the products covered by the PEP belonging to the same homogenous family;
- Perform the LCA of a representative product of the homogeneous family;
- Identify and quantify the product parameters that vary between the various products of the homogeneous environmental family (i.e. dimensions, the weight of parts, materials, energy consumption. etc.).

Lastly, a sensitivity analysis was performed for each life cycle stage to identify which parameters of the ones selected are sensitive to environmental impacts to create extrapolation rules.

The parameters identified are listed below and differ between the different stages of the life cycle:

- for the manufacturing, distribution, installation and end-of-life stages:
  - weight of the product;
  - weight of the packaging.
- for manufacturing only:
  - assembly energy consumption.
- for the use stage:
  - energy consumption.

The only parameter identified as sensitive by the analysis is the weight of the product. The energy consumption parameter during the use phase is not a sensitive parameter as energy consumption is the same for all variants of the reference product.

The representative product considered for the calculation of the extrapolation rules is the one analysed in this LCA report, code 2CSG251141R4051.

ABB Code of the specific product	Name	Model	Protocol	Rated voltage (V)	Rated current in continuous operation (A)	Np	IP	Weight of the product (g)
2CSG202451R4051	M4M 30 BACNET	30	BACNET	230	5	3 phases	20	333
2CSG202461R4051	M4M 30 ROGOWSKI	30	ROGOWSKI	230	5	3 phases	20	348
2CSG202471R4051	M4M 30 I/O	30	I/O	230	5	3 phases	20	400
2CSG204471R4051	M4M 20 ETHERNET	20	ETHERNET	230	5	3 phases	20	355
2CSG207081R4051	M4M 20 ROGOWSKI	20	ROGOWSKI	230	5	3 phases	20	348
2CSG236791R4051	M4M 30 PROFIBUS	30	PROFIBUS	230	5	3 phases	20	383
2CSG236831R4051	M4M 20 BACNET	20	BACNET	230	5	3 phases	20	355
2CSG239035R4051	M4M 30-M MODBUS	30-M	MODBUS	230	5	3 phases	20	374
2CSG239045R4051	M4M 30-M ETHERNET	30-M	ETHERNET	230	5	3 phases	20	383
2CSG239055R4051	M4M 20-M MODBUS	20-M	MODBUS	230	5	3 phases	20	348
2CSG239065R4051	M4M 20-M ETHERNET	20-M	ETHERNET	230	5	3 phases	20	355
2CSG239075R4051	M4M 2X Modbus PQ1	2X	Modbus PQ1	230	5	3 phases	20	323
2CSG239085R4051	M4M 2X Modbus PQ2	2X	Modbus PQ2	230	5	3 phases	20	323
2CSG239095R4051	M4M 2X Modbus RTS	2X	Modbus RTS	230	5	3 phases	20	323
2CSG239105R4051	M4M 2X Modbus PQ1+RTS	2X	Modbus PQ1+RTS	230	5	3 phases	20	323
2CSG239115R4051	M4M 2X Modbus PQ2+RTS	2X	Modbus PQ2+RTS	230	5	3 phases	20	323
2CSG239125R4051	M4M 2X Ethernet PQ1	2X	Ethernet PQ1	230	5	3 phases	20	333
2CSG239135R4051	M4M 2X Ethernet PQ2	2X	Ethernet PQ2	230	5	3 phases	20	333
2CSG239145R4051	M4M 2X Ethernet RTS	2X	Ethernet RTS	230	5	3 phases	20	333
2CSG239155R4051	M4M 2X Ethernet PQ1+RTS	2X	Ethernet PQ1+RTS	230	5	3 phases	20	333
2CSG239165R4051	M4M 2X Ethernet PQ2+RTS	2X	Ethernet PQ2+RTS	230	5	3 phases	20	333
2CSG251131R4051	M4M 20 PROFIBUS	20	PROFIBUS	230	5	3 phases	20	355
2CSG251141R4051	M4M 20 MODBUS	20	MODBUS	230	5	3 phases	20	348
2CSG251151R4051	M4M 20	20	-	230	5	3 phases	20	348
2CSG251161R4051	M4M 20 I/O	20	I/O	230	5	3 phases	20	371
2CSG260061R4051	M4M 2X Ethernet	2X	Ethernet	230	5	3 phases	20	333
2CSG260111R4051	M4M 2X Modbus	2X	Modbus	230	5	3 phases	20	333
2CSG274681R4051	M4M 30 ETHERNET	30	ETHERNET	230	5	3 phases	20	383
2CSG274761R4051	M4M 30 MODBUS	30	MODBUS	230	5	3 phases	20	374

The extrapolation rules have been calculated based on the environmental impact assessment results of the reference product M4M 20 MODBUS, code 2CSG251141R4051, and the sensitivity analysis carried out.

For the manufacturing stage, distribution stage and end-of-life stage, the parameter considered for the calculation of the LCIA impacts of the variants is the weight of the product. The calculation of the LCIA impacts of the variants through this parameter indicated that the correlation between the impacts of the representative product and the variants is linear. For the creation of the extrapolation rules, the extrapolation principle applied is a linear correlation concerning weight for the production, distribution and end-of-life phase. Each environmental indicator value shall be calculated using the following formula:

- For the manufacturing stage, distribution stage, installation stage, use stage, and end-of-life stage:

$$y = a_n x_1 + b_n$$

where x_1 is the weight of the product.

For the weight data of the variants, please refer to the table above.

The following table reports the linear coefficients a_n & b_n for each life cycle stage.

IMPACT CATEGORY	MANUFACTURING		DISTRIBUTION		INSTALLATION		USE		END OF LIFE	
	a_1	b_1	a_2	b_2	a_3	b_3	a_4	b_4	a_5	b_5
GWP-total	8.70E-02	-3.76E-01	4.25E-04	3.21E-01	0.00E+00	1.13E+00	0.00E+00	6.56E+01	9.00E-04	-1.61E-15
GWP-fossil	8.64E-02	5.91E-01	4.24E-04	3.21E-01	0.00E+00	4.04E-02	1.22E-32	6.54E+01	7.83E-04	3.77E-15
GWP-biogenic	4.72E-04	-9.70E-01	3.28E-07	2.48E-04	0.00E+00	1.09E+00	0.00E+00	3.20E-02	1.17E-04	1.80E-16
GWP-luluc	1.64E-04	2.91E-03	2.01E-07	1.52E-04	0.00E+00	1.75E-05	2.38E-35	1.63E-01	7.07E-07	-5.42E-19
ODP	4.85E-09	1.61E-08	9.34E-12	7.06E-09	8.88E-44	7.92E-10	1.82E-40	1.25E-06	1.65E-11	6.62E-24
AP	6.88E-04	4.68E-03	1.76E-06	1.33E-03	2.33E-38	2.04E-04	0.00E+00	3.75E-01	8.03E-06	8.67E-19
EP-freshwater	1.20E-04	3.27E-04	3.04E-08	2.30E-05	0.00E+00	5.43E-06	0.00E+00	6.19E-02	4.91E-07	-1.41E-18
EP-marine	1.29E-04	1.22E-03	6.68E-07	5.05E-04	2.33E-38	1.89E-04	0.00E+00	6.06E-02	1.42E-06	2.71E-18
EP-terrestrial	1.36E-03	1.18E-02	7.13E-06	5.39E-03	0.00E+00	8.75E-04	0.00E+00	5.49E-01	7.54E-06	3.04E-18
POCP	4.04E-04	4.02E-03	2.68E-06	2.02E-03	0.00E+00	3.05E-04	-2.38E-35	1.76E-01	2.55E-06	1.08E-18
ADPE	3.21E-05	1.98E-05	1.15E-09	8.71E-07	-2.27E-41	1.21E-07	0.00E+00	7.93E-04	8.46E-08	4.00E-19
ADPF	1.13E+00	9.01E+00	6.24E-03	4.72E+00	0.00E+00	4.65E-01	0.00E+00	1.49E+03	7.90E-03	-4.88E-15
WDP	1.62E-02	2.30E-01	2.98E-05	2.25E-02	0.00E+00	2.68E-03	0.00E+00	1.67E+01	1.75E-04	3.33E-16
PE	1.26E+00	2.97E+01	6.33E-03	4.79E+00	0.00E+00	4.85E-01	-3.91E-31	1.82E+03	9.05E-03	2.66E-14
PERE	1.25E-01	9.96E+00	9.14E-05	6.91E-02	0.00E+00	1.94E-02	0.00E+00	3.34E+02	1.15E-03	-1.61E-15
PERM	2.43E-05	1.08E+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	1.25E-01	2.07E+01	9.14E-05	6.91E-02	0.00E+00	1.94E-02	0.00E+00	3.34E+02	1.15E-03	-1.61E-15
PENRE	1.11E+00	8.60E+00	6.24E-03	4.72E+00	-4.77E-35	4.65E-01	0.00E+00	1.49E+03	7.90E-03	-1.91E-14
PENRM	1.75E-02	3.66E-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
PENRT	1.13E+00	8.96E+00	6.24E-03	4.72E+00	-4.77E-35	4.65E-01	0.00E+00	1.49E+03	7.90E-03	-1.91E-14
SM	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
RSF	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	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	6.89E-04	1.14E-02	9.80E-07	7.41E-04	2.33E-38	2.44E-04	-1.91E-34	1.20E+00	6.42E-06	1.82E-17
HWD	5.10E-06	6.39E-05	3.88E-08	2.93E-05	3.64E-40	2.64E-06	0.00E+00	2.61E-03	2.21E-08	3.39E-20
NHWD	7.80E-03	2.37E-01	5.48E-04	4.14E-01	-2.38E-35	2.30E-01	0.00E+00	5.98E+00	4.90E-04	8.88E-16
RWD	2.52E-06	1.48E-05	1.90E-09	1.44E-06	0.00E+00	5.07E-07	-1.49E-36	1.07E-02	2.98E-08	-4.74E-20
CRU	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	2.13E-04	5.51E-02	0.00E+00	0.00E+00	0.00E+00	3.41E-01	0.00E+00	0.00E+00	5.22E-04	-2.22E-16
MER	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.54E-35	9.04E-01	0.00E+00	0.00E+00	1.23E-03	5.00E-16
PM	4.92E-09	6.00E-08	4.38E-11	3.32E-08	3.55E-43	3.37E-09	1.82E-40	1.38E-06	3.24E-11	-1.52E-22
IRP	1.02E-02	5.79E-02	7.88E-06	5.96E-03	0.00E+00	2.02E-03	-6.10E-33	4.19E+01	1.16E-04	4.02E-16
ETP-fw	2.61E+00	4.73E+00	3.00E-03	2.27E+00	-4.77E-35	3.70E-01	2.44E-32	2.50E+02	9.88E-03	1.47E-14
HTP-c	8.60E-11	1.82E-09	1.85E-13	1.40E-10	0.00E+00	7.14E-11	0.00E+00	3.07E-08	4.96E-12	2.05E-23
HTP-nc	5.10E-09	2.85E-08	4.49E-12	3.39E-09	0.00E+00	5.05E-10	0.00E+00	1.22E-06	3.40E-10	2.96E-21
SQP	4.32E-01	1.03E+02	6.34E-03	4.80E+00	0.00E+00	3.22E-01	0.00E+00	2.90E+02	5.05E-03	6.44E-15
Biogenic C product	3.61E-09	-1.29E-20	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 packaging	4.02E-07	3.45E-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

GWP-total: Global warming potential - total; **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**: Depletion potential of the stratospheric ozone layer; **AP**: Acidification potential, accumulated exceedance; **EP-freshwater**: Eutrophication potential - freshwater; **EP-marine**: Eutrophication potential - marine; **EP-terrestrial**: Eutrophication potential - terrestrial; **POCP**: Photochemical ozone creation potential; **ADPE**: Abiotic depletion potential - non-fossil resources; **ADPF**: Abiotic depletion potential - fossil resources; **WDP**: Water deprivation potential; **PE**: Total use of primary energy during the life cycle; **PERE**: Use of renewable primary energy as energy carrier; **PERM**: Use of renewable primary energy resources used as raw materials; **PERT**: Total use of renewable primary energy; **PENRE**: Use of non-renewable primary energy as energy carrier; **PENRM**: Use of non-renewable primary energy resources used as raw materials; **PENRT**: Total use of non-renewable primary energy resource; **SM**: Use of secondary material; **RSF**: Use of renewable secondary fuels; **NRSF**: Use of non-renewable secondary fuels; **FW**: Net use of fresh water; **HWD**: Hazardous waste disposed; **NHWD**: Non-hazardous waste disposed; **RWD**: Radioactive waste disposed; **CRU**: Components for re-use; **MFR**: Materials for recycling; **MER**: Materials for energy recovery; **EE**: Exported energy – total; **PM**: Particulate matter emissions; **IRP**: Ionizing radiation, human health; **ETP-fw**: Eco-toxicity – freshwater; **HTP-c**: Human toxicity, cancer effect; **HTP-nc**: Human toxicity, non-cancer effects; **SQP**: Land use related impacts/Soil quality.

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Independent verification of the declaration and data, in compliance with ISO 14025: 2006

Internal: ○ **External:** ◉

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 any other program.

Document in compliance with ISO 14025: 2006 "Environmental labels and declarations. Type III environmental declarations"