Life Cycle Assessment (LCA)

Based on DIN EN ISO 14040/44

Easyfit Single Rocker Wall Switch

EWSSA – PTM 215x

GENERAL INFORMATION

MANUFACTURER

Manufacturer	EnOcean GmbH
Address	Kolpingring 18a, 82041 Oberhaching, Germany
Contact details	info@enocean.com
Website	https://www.enocean.com

LCA STANDARDS, SCOPE AND VERIFICATION

Program operator	Internal
Reference standard	DIN EN ISO 14040/44
PCR	-
Sector	Electrical product
Category of LCA	Pre-verified
Scope of the LCA	Cradle to gate with options, A4-B7, and modules C1-C4, D
LCA author	EnOcean GmbH
LCA verification	Independent verification of this LCA and data, according to ISO 14025: Internal certification

The manufacturer has the sole ownership, liability, and responsibility for the LCA. LCAs within the same product category but from different programs may not be comparable.

PRODUCT

Product name	Easyfit – EWSSA – PTM 215x
Additional labels	Easyfit by EnOcean
Product reference	E8001-A270 See annex in case other products are covered under this LCA.
Place of production	Hungary / Germany
Period for data	2022
Averaging in LCA	No averaging
Variation in GWP-fossil for A1-A3	Not applicable

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 Unit
Declared unit mass	0.057 kg
GWP-fossil, A1-A3 (kgCO2e) Global Warming Potential	1.18E+00
GWP-total, A1-A3 (kgCO2e)	1.17E+00
Secondary material, inputs (%)	15.2
Secondary material, outputs (%)	8.31
Total energy use, A1-A3 (kWh)	5.51

(Carbon Dioxide Equivalent (CO2e) is the unit of measurement for the warming effect of greenhouse gases.)

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

EnOcean – the pioneer of energy harvesting wireless technology. Headquartered in Oberhaching, near Munich, EnOcean provides valuable data for the Internet of Things (IoT) with its resource-saving energy harvesting technology. For more than 20 years, EnOcean produces maintenance-free wireless switches and sensors, which gain their energy from the surrounding – from movement, light or temperature.
For more information, please visit:

https://www.enocean.com/en/about-us/about-enocean/

PRODUCT DESCRIPTION

Single Rocker (EWSSZ) / Double Rocker (EWSDZ) Wall Switches. EWSSx use the PTM 215x pushbutton transmitter module from EnOcean and therefore they are fully self-powered and never require batteries. The simple act of pressing the rocker generates enough energy to send wireless telegrams to other devices. EWSSx and EWSDx wall switches therefore provide convenient control of lighting, temperature and miscellaneous electric loads.
For more information, please visit:

https://www.enocean.com/en/product-category/kinetic-switches-finished-products/

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	11.21	EU
Minerals	0	Not applicable
Fossil materials	87.04	EU
Bio-based materials	0	Not applicable

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	0

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 Unit
Mass per declared unit	0.057 kg
Functional unit	Accessory – no power consumption
Reference service life	Not applicable

SUBSTANCES, REACH - VERY HIGH CONCERN

For information about REACH SVHC substances please visit the website:

https://www.enocean.com/en/support/quality-and-reliability/

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This LCA covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
x	x	x	x	x	MNR	MNR	MNR	MNR	MNR	x	MNR	MNR	x	x	x	x
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demol.	Transport	Waste processing	Disposal	Reuse / Recovery / Recycling

Modules not relevant = MNR.

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials also, electricity, and waste formed in the production processes at the manufacturing facilities are included.

The product is made of metals, plastics, and electronic components. All components are transported to the production facility, where the main manufacturing processes primarily are associated with assembly. The finished product can be packaged with polyethylene, cardboard, and/or paper as packaging material before shipment to customers. Manufacturing loss, ancillaries and wastes are calculated according to the data that each manufacturing site is sharing with EnOcean. The total annual amount of waste in kg is allocated to the total annual production in kg at the specific manufacturing site responsible to produce the studied product. Thus, it is possible to allocate it according to the weight of the product analysed in this study. Some of the wastes are due to ancillary materials used during manufacturing while the rest is due to material losses.

TRANSPORT AND ASSEMBLY (A4-A5)

Transport distances were calculated on the base of the supplier location and manufacturing location and then made a cumulative group choosing the conservative scenario. Environmental impacts from installation include waste packaging materials (A5). The impacts of energy consumption and the used ancillary materials during installation are considered negligible.
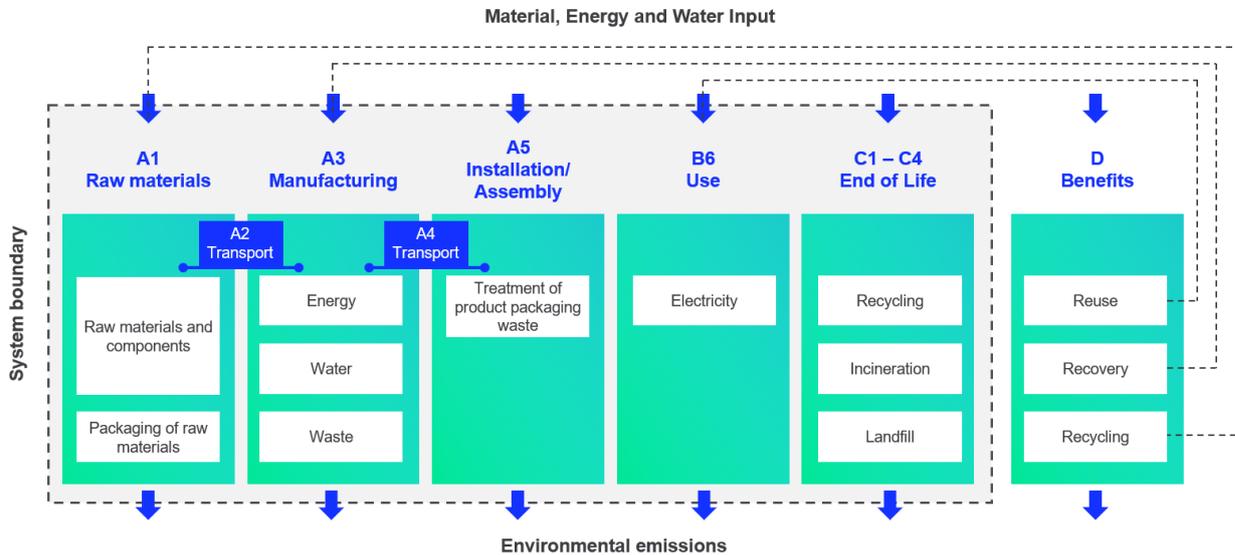
PRODUCT USE AND MAINTENANCE (B1-B7)

During the use phase, the product consumes electricity from Europe's or the rest of the world's electricity grid mix (B6). The total power consumption of the reference product is calculated as follows: Wattage x Reference lifetime = kWh consumed throughout the entire use phase B6.

PRODUCT END OF LIFE (C1-C4, D) VP-049-C

Consumption of energy and natural resources in demolition process is assumed to be negligible. It is assumed that the waste is collected separately and transported to the waste treatment centre. Transportation distance to treatment is assumed as 150 km and the transportation method is assumed to be lorry (C2). According to EN 50693:2019, the sequence of treatment operations occurring to the product shall include de-pollution, fractions separation and preparation (dismantling, crushing, shredding, sorting), recycling, other material recovery, energy recovery and disposal. In this study, the default values from table G.4 of EN 50693 is used for treating materials in different waste treatment methods. Due to the material and energy recovery potential of parts in the lighting system, the end-of-life product is converted into recycled raw materials, while the energy recovered from incineration displaces electricity and heat production (D). The benefits and loads of incineration and recycling are included in Module D.

SYSTEM BOUNDARY VP

Material, Energy and Water Input

A1 Raw materials	A3 Manufacturing	A5 Installation/ Assembly	B6 Use	C1 – C4 End of Life	D Benefits
A2 Transport	A4 Transport				
Raw materials and components	Energy	Treatment of product packaging waste	Electricity	Recycling	Reuse
	Water			Incineration	Recovery
Packaging of raw materials	Waste			Landfill	Recycling

System boundary

Environmental emissions

LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, ancillary materials, energy & water consumption, material loss and waste generation at the manufacturing site are attributed to the bill of materials of the products, therefore, they are allocated by partitioning the quantities on the base of the total production in kg throughout the year. Thus, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging materials	No allocation
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

This LCA is created with a most conservative scenario in A1-A3 in terms of material composition.

AVERAGES AND VARIABILITY

Type of average	No averaging
Averaging method	Not applicable
Variation in GWP-fossil for A1-A3	Not applicable

This LCA is product and factory specific and does not contain average calculations. It is created with a most conservative scenario in A1-A3 in terms of material composition.

LCA AND BIBLIOGRAPHY

The LCA has been prepared according to the reference standards and ISO 14040/14044. EcoInvent 3.8 database was used as the source of environmental data.

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ENVIRONMENTAL IMPACT DATA

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1]	kg CO$_2$e	6.45E-01	1.09E-02	5.15E-01	1.17E+00	1.10E-02	1.44E-03	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	8.24E-04	5.79E-02	3.05E-02	-3.79E-02
GWP – fossil	kg CO$_2$e	6.49E-01	1.09E-02	5.16E-01	1.18E+00	1.10E-02	4.62E-05	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	8.23E-04	5.79E-02	3.05E-02	-3.71E-02
GWP – biogenic	kg CO$_2$e	-4.54E-03	0.00E+00	-1.40E-03	-5.93E-03	0.00E+00	1.40E-03	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	0.00E+00	0.00E+00	0.00E+00	-7.67E-04
GWP – LULUC	kg CO$_2$e	8.71E-04	4.04E-06	5.62E-04	1.44E-03	8.01E-06	1.64E-08	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	3.04E-07	7.53E-07	4.57E-07	-1.80E-05
Ozone depletion pot.	kg CFC-$_{11}$e	4.89E-08	2.52E-09	4.29E-08	9.43E-08	2.18E-09	3.73E-12	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.89E-10	1.42E-10	1.14E-10	-8.28E-10
Acidification potential	mol H$^+$e	6.09E-03	4.63E-05	1.57E-03	7.71E-03	3.57E-04	3.43E-07	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	3.49E-06	1.51E-05	8.39E-06	-6.97E-04
EP-freshwater[2]	kg Pe	1.20E-04	8.96E-08	2.36E-05	1.43E-04	3.91E-08	4.21E-10	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	6.74E-09	2.35E-08	1.09E-08	-2.53E-06
EP-marine	kg Ne	7.29E-04	1.38E-05	2.30E-04	9.72E-04	8.77E-05	1.56E-07	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.04E-06	6.57E-06	5.36E-06	-4.58E-05
EP-terrestrial	mol Ne	8.18E-03	1.52E-04	2.55E-03	1.09E-02	9.75E-04	1.59E-06	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.14E-05	6.80E-05	3.85E-05	-5.75E-04
POCP ("smog")[3]	kg NMVOCe	2.85E-03	4.86E-05	8.42E-04	3.74E-03	2.52E-04	3.94E-07	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	3.66E-06	1.66E-05	9.93E-06	-1.68E-04
ADP-minerals & metals[4]	kg Sbe	1.02E-04	2.57E-08	2.37E-06	1.04E-04	1.52E-08	1.15E-10	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.93E-09	2.03E-08	3.28E-09	-1.31E-05
ADP-fossil resources	MJ	1.02E+01	1.64E-01	9.06E+00	1.94E+01	1.38E-01	3.34E-04	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.24E-02	1.29E-02	9.36E-03	-3.51E-01
Water use[5]	m^{3}e depr.	3.23E-01	7.35E-04	1.32E-01	4.56E-01	4.08E-04	6.80E-05	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	5.53E-05	2.32E-03	1.26E-03	-5.42E-03

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	3.73E-08	1.26E-09	6.06E-09	4.46E-08	3.41E-10	3.04E-12	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	9.49E-11	8.76E-11	6.28E-11	-4.97E-09
Ionizing radiation[6]	kBq U235e	6.04E-02	7.83E-04	1.26E-01	1.87E-01	6.33E-04	1.05E-06	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	5.89E-05	4.95E-05	3.55E-05	-1.83E-03
Ecotoxicity (freshwater)	CTUe	5.65E+01	1.48E-01	5.16E+00	6.18E+01	8.72E-02	1.44E-03	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.11E-02	1.30E-01	7.29E-02	-4.13E+00
Human toxicity, cancer	CTUh	1.08E-09	3.63E-12	1.64E-10	1.25E-09	6.58E-12	1.33E-13	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	2.73E-13	5.38E-12	9.69E-12	-8.68E-11
Human tox. non-cancer	CTUh	3.99E-08	1.46E-10	4.16E-08	4.42E-08	5.58E-11	5.15E-12	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.10E-11	2.07E-10	5.77E-10	-8.23E-09
SQP[7]	-	3.81E+00	1.89E-01	1.17E+00	5.17E+00	1.89E-02	2.17E-04	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.43E-02	6.80E-03	1.07E-02	-3.98E-01

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy[8]	MJ	7.66E-01	1.85E-03	9.81E-01	1.75E+00	9.45E-04	7.99E-06	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.39E-04	7.38E-04	2.93E-04	-5.12E-02
Renew. PER as material	MJ	7.72E-02	0.00E+00	1.38E-02	9.09E-02	0.00E+00	-1.38E-02	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	0.00E+00	0.00E+00	0.00E+00	1.99E-02
Total use of renew. PER	MJ	8.43E-01	1.85E-03	9.95E-01	1.84E+00	9.45E-04	-1.37E-02	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.39E-04	7.38E-04	2.93E-04	-3.13E-02
Non-re. PER as energy	MJ	8.89E+00	1.64E-01	9.03E+00	1.81E+01	1.38E-01	3.34E-04	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.24E-02	1.29E-02	9.36E-03	-3.51E-01
Non-re. PER as material	MJ	1.34E+00	0.00E+00	3.56E-04	1.34E+00	0.00E+00	-3.56E-04	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	0.00E+00	-6.55E-01	-6.55E-01	1.04E-03
Total use of non-re. PER	MJ	1.02E+01	1.64E-01	9.03E+00	1.94E+01	1.38E-01	-2.21E-05	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.24E-02	-6.42E-01	-6.45E-01	-3.50E-01
Secondary materials	kg	8.83E-03	4.56E-05	9.62E-04	9.84E-03	6.30E-05	3.63E-07	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	3.43E-06	1.14E-05	8.96E-06	9.98E-04
Renew. secondary fuels	MJ	9.06E-04	4.60E-07	1.26E-05	9.19E-04	1.69E-07	3.20E-09	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	3.47E-08	4.49E-07	2.23E-07	-2.10E-05
Non-ren. secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m³	7.59E-03	2.13E-05	4.12E-03	1.17E-02	8.78E-06	2.71E-07	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.60E-06	8.64E-05	4.65E-05	-2.49E-04

8) PER = Primary energy resources.

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END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	5.95E-02	2.18E-04	1.82E-02	7.79E-02	1.88E-04	3.53E-05	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.64E-05	1.64E-05	3.00E-04	-3.18E-03
Non-hazardous waste	kg	1.03E+00	3.58E-03	1.07E+00	2.10E+00	1.53E-03	1.16E-04	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	2.69E-04	2.47E-02	2.80E-02	-2.06E-01
Radioactive waste	kg	1.62E-05	1.10E-06	3.46E-05	5.19E-05	9.75E-07	1.10E-09	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	8.27E-08	8.73E-09	0.00E+00	-7.13E-07

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	0.00E+00	4.82E-03	0.00E+00	0.00E+00
Materials for energy rec	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	9.97E-03	9.97E-03	0.00E+00	0.00E+00	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	0.00E+00	5.32E-01	0.00E+00	0.00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO_2e	6.31E-01	1.08E-02	5.03E-01	1.14E+00	1.09E-02	4.37E-05	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	8.15E-04	5.78E-02	3.01E-02	-3.62E-02
Ozone depletion Pot.	kg CFC_{-11}e	4.79E-08	1.99E-09	3.61E-08	8.60E-08	1.72E-09	3.17E-12	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.50E-10	1.26E-10	9.75E-11	-6.81E-10
Acidification	kg SO_2e	5.20E-03	3.60E-05	1.33E-03	6.57E-03	2.85E-04	2.47E-07	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	2.71E-06	1.09E-05	6.04E-06	-6.11E-04
Eutrophication	kg PO_4^3e	2.43E-03	8.20E-06	8.57E-04	3.30E-03	3.18E-05	1.95E-07	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	6.17E-07	7.35E-06	9.16E-05	-1.24E-04
POCP ("smog")	kg C_2H_4e	3.64E-04	1.41E-06	8.12E-05	4.46E-04	7.33E-06	6.64E-09	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.06E-07	2.60E-07	3.54E-07	-2.52E-05
ADP-elements	kg Sbe	1.01E-04	2.48E-08	2.36E-06	1.04E-04	1.49E-08	9.20E-11	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.87E-09	1.91E-08	2.66E-09	-1.31E-05
ADP-fossil	MJ	9.92E+00	1.64E-01	9.05E+00	1.91E+01	1.38E-01	3.34E-04	MNR	MNR	MNR	MNR	MNR	MND	MNR	MNR	1.24E-02	1.29E-02	9.36E-03	-3.51E-01

ANNEX

MATERIAL COMPOSITION

The product's base materials and components are shown in the table below. The selected material groups in the table consist of materials with similar percentage of material or energy recovery in the disposal operation.

Material	Weight (g)	Weight-%
Copper	0.81	1.41
Plastics	48.31	84.27
Printing Paper	1.0	1.74
PCB Copper	0.33	0.58
PCB Iron	0.2	0.35
PCB Support	1.5	2.62
PCB Tin	0.02	0.03
PP / PS-High Impact PS / ABS	0.09	0.15
Steel	5.07	8.84

The products are compliant to the substance restrictions in the EU RoHS directive (2011/65/EU).

PRODUCTS COVERED UNDER THIS LCA

EWSSA
EWSSZ
EWSSB
Including the following sub-products (modules):
PTM 215
PTM 216B
PTM 216Z
PTM 215ZE
PTM 215Zx