Product ID: 3BSE076939R1 (PM866AK01)

Environmental Product Declaration for AC 800M Controllers

EPD type III in accordance with ISO 14025:2006 and EN 50693:2020

Program	The International EPD® System, www.environdec.com
Program operator	EPD International AB
EPD registration number	EPD-IES-0016118
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Valid until	2030-03-24
Product Category Rules (PCR)	Electronic and electrical equipment, and electronic components (non-construction), 2024:06, version 1.0.0
The EPD covers multiple products	PM866A, PM867, PM862, PM863, PM860A, PM858, PM856A, PM851A, PM857

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication on www.environdec.com.

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START

Company information

ABB is a global technology leader in electrification and automation, enabling a more sustainable and resource-efficient future. By connecting its engineering and digitalization expertise, ABB helps industries run at high performance, while becoming more efficient, productive and sustainable so they outperform. At ABB, we call this ‘Engineered to Outrun’. The company has over 140 years of history and around 110,000 employees worldwide.

Our Process Automation business offers a range of solutions for process and hybrid industries, including control technologies. Based on its deep domain knowledge, experience and expertise in delivering world-class automation products, systems and solutions, a wide area of complimenting digital and collaborative solutions across applications and sectors, the Process Automation business helps customers remain competitive, improving their ROI and running safe and productive operations.

Owner of the EPD	ABB Process Automation
Name and location of production site	Vaesteras, Sweden

ABB Sustainability

ABB is at the core of accelerating the energy transition. Every day, we empower customers across the globe to optimize, electrify and decarbonize their operations.

Our Sustainability Agenda is fully in line with this mission. Guided by recognized best-practice standards and guidance, and embedded across our business, it aims to enable a low-carbon society, preserve resources and promote social progress for a net-zero future. Our actions are underpinned by our culture of integrity and transparency, extending across our value chain.

We believe in an inclusive energy transition to a net-zero future, with lifted-up communities, workers and societies. We respect and promote human rights and dignity, and strive to create safe, fair, and inclusive working environments where our people can thrive.

To preserve the earth's resources for future generations, we are moving to circular business models that eliminate waste and keep products and materials in use. Our Circularity Approach covers all stages of the product life cycle, from design and sourcing, through production and use, all the way to responsible end-of-life services.

To enable a low-carbon society, we are taking action across our value chain. With our technologies, we empower customers to avoid emissions and ramp up renewables. To cut our own greenhouse gas emissions, we follow targets that are aligned with the Net-Zero Standard of the Science Based Targets initiative (SBTi).

Product information

AC 800M Controllers

AC 800M controllers are a family of scalable process controllers with choice of speed, safety, memory and availability. This EPD focuses on the processor modules, also called controllers. Each processor module is equipped with two Ethernet ports for communication with other controllers and for interaction with operators, engineers, managers, and higher-level applications.

Key features

- Reliability and simple fault diagnosis procedures
- Modularity, allowing for step-by-step expansion
- IP20 Class protection without the requirement for enclosures
- Built-in redundant Ethernet Communication ports
- Robust design and redundancy options

Product identification:	PM866A
Other products covered in this EPD	PM867, PM863, PM862, PM860A, PM858, PM857, PM856A, PM851A
UN CPC code	UN CPC 482
Geographical cope	Europe is considered for the downstream phase
Energy mix	Low voltage electricity mix for Europe (from ecoinvent 3.9.1; emission factor is 0.367 kg CO_2-eq/kWh.)
Standards	G3 compliant to ISA 71.04, IP20 according to IEC/EN 61131-2, EMC, Marine certified, RoHS, REACH and WEEE compliant.

LCA information

Grouping of products, data quality, allocation rules and cut-off criteria

Grouping of products

This EPD includes nine products from the AC 800M family, from ABB PA. The grouping complies with the PCR for Electronic and Electrical Equipment, and Electronic Components (Non-Construction), 2024:06, version 1.0.0, as well as EN 50693.A representative product with the highest sales figures in the group has been selected to present the results, while the results for the remaining products in the group are derived using extrapolation factors.

Data quality, allocation rules and cut-off criteria

The data used comprises both primary and secondary sources. Primary data related to the production of AC 800M controllers are obtained from EMS facilities, reflecting production conditions and practices in Vaesteras, Sweden, in 2023.

Secondary data for manufacturing component processes represent regional and global averages from the Ecoinvent v3.9.1 database, available in the Simapro 9.5.0.0 software. Background data for product components is sourced from the bill of materials and data sheets for AC 800M controllers available in ABB's data management system in 2024. Special attention is given to accurately modeling processes such as electronic component manufacturing and printed circuit board (PCB) assembly to reflect current industrial practices.

An allocation method is used to determine the resource/ material consumption and waste management associated with manufacturing stage at the production site. Since the EMS facilities produce a range of different electronic products, only a proportional share of the environmental impact is assigned to the specific production line under consideration. In this study, the allocation of resources, materials, as well as waste, is based on a quantitative calculation using the physical mass of the products.

Allocation rules have been applied to calculate the share of resources and waste attributed to the ABB warehouse based on the quantity of products.

A 1% cut-off threshold has been applied in this study. This means that the included inventory data collectively account for at least 99% of the results across all environmental impact categories, 99% of the total product mass, and 99% of the energy use throughout the product life cycle. Additionally, as mandated by the PCR, certain materials, electronic components, and processes such as PCBA (Printed Circuit Board Assembly) are excluded from any cut-off criteria, regardless of their contribution.

LCA information

Functional unit, Use stage and System boundaries

Functional unit

The functional unit of this study is defined as the provision of industrial process control and automation functions by one AC 800M controller over its 25-year product lifespan. This functional unit serves as a standardized measure for assessing the environmental impacts of the product. Since no complementary PCR (c-PCR), or Product Specific Rule (PSR) exists for industrial process controllers, a Reference Service Life (RSL) could not be established from standardized guidelines. Instead, the product lifespan has been used to define the functional unit, ensuring consistency with the goal and scope of the study.

Use stage

AC 800M controllers are employed across a wide range of facilities and industries, with their power consumption varying based on the specific applications they support. These controllers are designed for continuous operation, running 24 hours a day. For this study, the power consumption is based on data provided in ABB’s product manuals available on ABB's website, as well as verified test results conducted in the ABB Process Automation R&D lab. The average electricity consumption of PM866A, the representative product of the group, is 6.85 W.

System boundaries

This EPD adopts a cradle-to-grave approach, covering the following life cycle stages:

Manufacturing - This stage includes the extraction and processing of raw materials such as metals and plastics, as well as manufacturing PCBs and all the components mounted on them. It covers the energy and resources consumed in raw material extraction, intermediate product production, and transportation to the assembly facilities. Specific data covers the assembly, testing, and packaging of controllers, including energy and material consumption per unit and waste generation. The electricity mix for production processes is based on Sweden's residual mix, as documented in ecoinvent library.

Distribution - This stage addresses the environmental impacts associated with transporting the final product from manufacturing facilities to distributors and end users. This includes fuel consumption, emissions, and packaging waste during transit. The products are transported within Europe using generic data from EN50693, which assumes an average intracontinental transport distance of 3,500 km by a EURO6 diesel lorry with a 16–32 metric ton capacity.

Use and Maintenance - This stage focuses on the electricity consumption of a process controller during its operational life and any maintenance requirements. Low voltage electricity mix for Europe as an ecoinvent process is chosen for this stage.

End-of-Life - The end-of-life scenario follows IEC/TR 62635 recyclability rates for electronics. Non-recyclable materials are assumed to be incinerated.

LCA information

Manufacturing

Raw materials extraction
- Metals, Polymers, etc.

Processing of materials
- Producing components
- Transportation to the EMS

Manufacturing and Assembly
- Component soldering
- PCB mounting
- Module integration
- Testing
- Packaging

Distribution

Warehousing
- Storage of finished product

Transportation
- Transportation from EMS to customers

Use and Maintenance

Operation
- Energy consumption during use

Maintenance
- Battery replacement

End-of-Life

Recycling
- Disassembly and material recovery

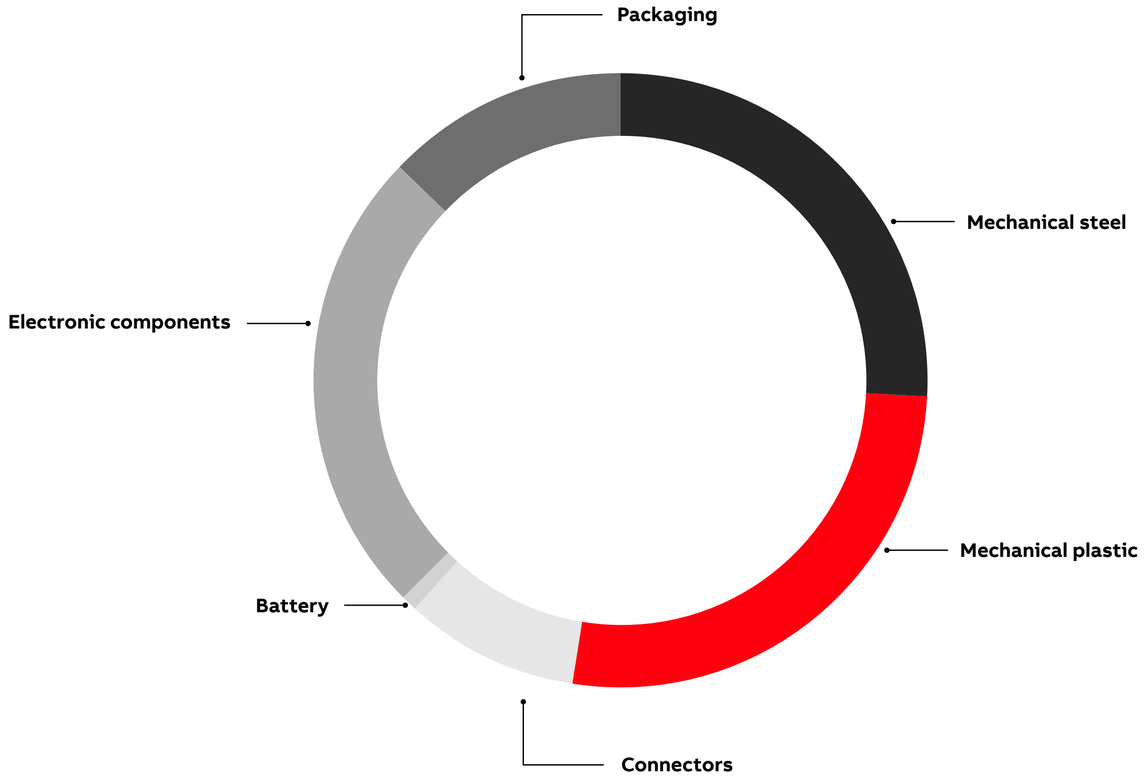
Disposal
- Landfill
- Incineration

Content declaration

Product with packaging

Based on content of the representative product in this EPD

Materials	PM866A	Percentage (%)
Mechanical steel	283.08 g	26.00%
Mechanical plastic	290 g	26.64%
Connectors	100.3 g	9.21%
Battery	8.9 g	0.82%
Electronic components	268.4 g	24.65%
Corrugated board box*	138 g	12.68%
Total weight	**1088 g**	



The products contain substances from the SVHC list. For the latest updated details please check the SCIP database.

PM866A Id: e3df1f09-59e7-4c09-8da5-7b965f37c50e.

* ≈99% biogenic content

Environmental performance

Potential environmental impact

The environmental performance indicators follow Version 3.0, based on EN 15804:2012+A2:2019/AC:2021, including mandatory indicators and GWP-GHG. The assessment method used is EN 15804+A2.

Parameter		Unit	Manufacturing	Distribution	Use and Maintenance	End of Life	Total
Global Warming Potential (GWP)	**Biogenic**	kg CO2 eq	2.03E-01	6.13E-02	1.85E+01	2.84E-03	**1.88E+01**
	Fossil	kg CO2 eq	4.86E+01	8.16E-01	5.31E+02	2.77E+00	**5.84E+02**
	Land use and land transformation	kg CO2 eq	9.57E-02	3.69E-04	1.33E+00	8.20E-04	**1.42E+00**
	TOTAL	kg CO2 eq	**4.89E+01**	**8.78E-01**	**5.51E+02**	**2.78E+00**	**6.04E+02**
Acidification potential (AP)		mol H+ eq	3.99E-01	2.19E-03	3.06E+00	4.12E-03	**3.47E+00**
Eutrophication potential (EP)	**Aquatic marine**	kg N eq	7.70E-02	4.95E-04	4.94E-01	1.03E-03	**5.72E-01**
	Aquatic freshwater	kg P eq	8.23E-02	8.46E-05	5.03E-01	7.55E-04	**5.86E-01**
	Aquatic terrestrial	mol N eq	8.43E-01	4.95E-03	4.50E+00	1.01E-02	**5.36E+00**
Ozone layer depletion (ODP)		kg CFC11 eq	2.00E-06	1.68E-08	1.01E-05	1.78E-07	**1.23E-05**
Photochemical oxidant creation potential (POCP)		kg NMVOC eq	2.41E-01	2.70E-03	1.43E+00	3.56E-03	**1.68E+00**
Abiotic depletion potential (ADP)	**Fossil resources**	MJ	8.15E+02	1.46E+01	1.21E+04	1.35E+01	**1.29E+04**
	Metals and minerals	kg Sb eq	2.50E-02	2.49E-06	6.52E-03	3.68E-06	**3.15E-02**
Water deprivation potential (WDP)		m3 depriv.	1.27E+01	1.30E-01	1.36E+02	3.44E-01	**1.49E+02**

Environmental performance

GWP-GHG

Indicator	Unit	Manufacturing	Distribution	Use an Maintenance	End of Life	TOTAL
GWP - GHG	kg CO2 eq	4.89E+01	8.18E-01	5.36E+02	2.78E+00	**5.88E+02**
Share of specific data		15.75%				

- The GWP-GHG indicator accounts for all greenhouse gases included in GWP-total, except for biogenic carbon dioxide uptake, biogenic CO_2 emissions, and biogenic carbon stored in the product.
- The share of specific data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more specific data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories

Environmental performance

Use of resources in functional unit [MJ, net calorific value]

Parameter		Manufacturing	Distribution	Use and Maintenance	End of Life	Total
Primary energy resources – Renewable	Use as energy carrier	6.72E+01	2.86E-01	2.71E+03	5.53E-01	**2.78E+03**
	Used as raw materials	1.89E+00	0.00E+00	0.00E+00	0.00E+00	**1.89E+00**
	TOTAL	**6.91E+01**	**2.86E-01**	**2.71E+03**	**5.53E-01**	**2.78E+03**
Primary energy resources – Non-renewable	Use as energy carrier	8.48E+02	1.52E+01	1.27E+04	1.44E+01	**1.35E+04**
	Used as raw materials	8.99E+00	0.00E+00	0.00E+00	0.00E+00	**8.99E+00**
	TOTAL	**8.57E+02**	**1.52E+01**	**1.27E+04**	**1.44E+01**	**1.36E+04**

Environmental performance

Extrapolation factors for other controllers in the groups

Since all the products covered in this LCA belong to the same homogeneous product family, and according to the PCR for electronics and EN 50693, an extrapolation method has been applied to extend the results to the entire group.

To ensure the validity of this approach, a sensitivity analysis is performed for each life cycle stage of the representative product (PM866A). This analysis identified the most influential parameters impacting the environmental categories.

Using these parameters, extrapolation factors have been defined, with the PM866A serving as the reference product.

For information regarding SVHCs please check the product entry in the SCIP database.

PM866A Id: e3df1f09-59e7-4c09-8da5-7b965f37c50e
PM867 Id: b1bea740-81ac-4a9b-90ef-44216b1e5bca
PM862 Id: fec5c94d-1555-43e1-8f80-a37697096e0d
PM863 Id: 7cc2f8a3-3b37-4b05-bf7d-b949d49bfa85
PM860A Id: cfb99e66-8d2c-40f2-8d42-dc77d6c53125
PM858 Id: b4123f3b-fb1f-42ef-96d3-d876ae0dfd56
PM856A Id: ab16e437-acb8-454f-a9e5-3f7c21e47215
PM851A Id: aff407d1-a6b4-4c40-9b1d-a8b195f42491
PM857K01 Id: 024cbe7a-6413-4ef8-a68a-96998beebdb6

LCA stages	Manufacturing (Producing Components)	Manufacturing (Final Assembling)	Distribution	Use and Maintenance	End of Life
Influential parameters	Total PCB weight	Production process electricity consumption	Average Inventory Holding Period	Power consumption	Total PCB weight

Controller	Manufacturing (Producing Components)	Manufacturing (Final Assembling)	Distribution	Use and Maintenance	End of Life
PM862 **PM858**	1	1	1	1	1
PM867 **PM863** **PM857**	1	1	2.73	1	1
PM860A **PM856A** **PM851A**	0.89	0.54	5.42	0.84	0.89

Environmental performance

Variation of indicator results for PM860A, PM856A, PM851A

Potential environmental impact

Impact Category		Unit	Total	Variation comparing to PM866A
Global Warming Potential (GWP)	Biogenic	kg CO2 eq	5.05E+02	-16.32%
	Fossil	kg CO2 eq	1.60E+01	-14.64%
	Land use and land transformation	kg CO2 eq	4.88E+02	-16.38%
	TOTAL	kg CO2 eq	1.18E+00	**-16.72%**
Acidification potential (AP)		mol H+ eq	2.87E+00	-17.14%
Eutrophication potential (EP)	Aquatic marine	kg N eq	4.73E-01	-17.28%
	Aquatic freshwater	kg P eq	4.83E-01	-17.68%
	Aquatic terrestrial	mol N eq	4.42E+00	-17.54%
Ozone layer depletion (ODP)		kg CFC11 eq	1.02E-05	-17.33%
Photochemical oxidant creation potential (POCP)		kg NMVOC eq	1.39E+00	-17.04%
Abiotic depletion potential (ADP)	Fossil resources	MJ	1.08E+04	-16.27%
	Metals and minerals	kg Sb eq	2.34E-02	-25.87%
Water deprivation potential (WDP)		m3 depriv.	1.25E+02	-16.65%

Use of resources in functional unit [MJ, net calorific value]

Parameter		Total	Variation comparing to PM866A
Primary energy resources – Renewable	Use as energy carrier	2.32E+03	-16.25%
	Used as raw materials	1.35E+00	-28.50%
	TOTAL	2.33E+03	**-16.26%**
Primary energy resources – Non-renewable	Use as energy carrier	1.13E+04	-16.26%
	Used as raw materials	6.43E+00	-28.50%
	TOTAL	1.14E+04	**-16.27%**

Indicator describing GWP- GHG per functional unit

Indicator	Unit	TOTAL	Variation comparing to PM866A
GWP - GHG	kg CO2 eq	4.92E+02	-16.38%

Program information and references

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Accountabilities for PCR, LCA and independent, third-party verification

Product Category Rules (PCR)

- PCR: Electronic and electrical equipment, and electronic components (non-construction), 2024:06, version 1.0.0
- PCR review was conducted by The technical committee of the International EPD® System. A full list of members available on www.environdec.com. The review panel may be contacted via support@environdec.com.
- The product category corresponds to UN CPC divisions 43-48 and 84, and HS code 85 Electrical machinery and equipment and parts thereof.

Third-party verification

- External and independent ('third-party') verification of the declaration and data, according to ISO 14025:2006, via:

  ☑ EPD verification through an individual EPD verification

- Third-party verifier: Pär Lindman, Miljögiraff.
- Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third-party verifier:

☑ No

Life Cycle Assessment (LCA)

- LCA accountability: R&D department, ABB Process Automation.

References

- General Programme Instructions of the International EPD System, version 4.0
- General Programme Instructions of the International EPD System, version 5.0
- Electronic and electrical equipment, and electronic components (non-construction), 2024:06, version 1.0.0
- ISO 14040:2006 Environmental management – Life cycle assessment - Principles and Framework
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and Guidelines
- EN 50693:2020 Product category rules for life cycle assessments of electronic and electrical products and systems
- Ecoinvent version 3.9.1
- Simapro 9.5.0.0
- LCA Internal Report AC 800M Group 1 carried out by ABB Process Automation (PCP), Sweden, 2024

Notes

- An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication on www.environdec.com.
- EPDs within the same product category but from different programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison.
- Further information regarding products or EPD to be addressed to EPD owner:
  - ABB Process Automation
  - ch-papcp.communications@abb.com
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