PRODUCT ENVIRONMENTAL PROFILE
Environmental Product Declaration

ABB CM-UFD Grid Feeding Monitoring Relays
June 2024

CM-UFD.M22M

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PEPS ARE COMPLIANT WITH XP C08-100-1 :2016 AND EN 50693:2019 THE COMPONENTS OF THE PRESENT PEP MAY NOT BE COMPARED WITH COMPONENTS FROM ANY OTHER PROGRAM.	
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EPD Owner	ABB STOTZ-KONTAKT GmbH, 69123 Heidelberg, Germany www.abb.com
Manufacturer name and address	ABB STOTZ-KONTAKT GmbH - Site Hornberg, 78132, Hornberg, Baden-Württemberg Germany
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Reference product	ABB Grid Feeding Monitoring Relay CM-UFD.M22M
Description of the product	The CM-UFD devices are multifunctional grid feeding monitoring relays. They provide different monitoring functions in accordance with CEI 0-21 and other similar standards to detect over- and undervoltage (10-minutes average value, voltage increase and decrease protection) as well as any changes in grid frequency (frequency increase and decrease protection).
Functional unit	The functional unit is to monitor and detect over and under-voltage as well as any changes in the grid frequency with a control supply voltage of 24-240V AC/DC and disconnect the circuit in case of faults or maintenance throughout a reference lifetime of 10 years. This product is considered an 'Active product' with 100% Use Rate in ON, 0% Use Rate in Standby and 0% Use Rate in OFF Mode.
Other products covered	CM-UFD.M22M/M31M/M33M/M34M/M35M CM-FD. M22/M21/M31/M33/M34
Reference lifetime	10 years
Product category	Electrical, Electronic and HVAC-R Products, 3.15 Specific rules for the 'Other Equipment' family of PSR-0005-ed3-EN-2023 06 06
Use Scenario	The use phase has been modeled based on the sales mix data (2023), and the corresponding low voltage electricity countries mix.
Geographical representativeness	Raw materials & Manufacturing: [Europe / Global] Assembly: [Germany] Distribution / Use: [Global] specific sales mix EoL: [Global]
Technological representativeness	Materials and processes data are specific to the production of CM-UFD.M22M Grid Feeding Monitoring Relay
LCA Study	This study is based on the LCA study described in the LCA report 1SAC200393H0001
EPD type	Product family declaration
EPD scope	"Cradle to grave"
Year of reported primary data	2023
LCA software	SimaPro 9.5.0.1 (2023)
LCI database	Ecoinvent v3.9 (2023)
LCIA methodology	EN 15804:2012+A2:2019

Contents

ABB Purpose & Embedding Sustainability

ABB is a leading global technology company that energizes the transformation of society and industry to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation and motion portfolio, ABB pushes the boundaries of technology to drive performance to new levels. With a history of excellence stretching back more than 130 years, ABB's success is driven by about 105 thousand talented employees in over 100 countries.
ABB's Electrification business offers a wide-ranging portfolio of products, digital solutions and services, from substation to socket, enabling safe, smart and sustainable electrification. Offerings encompass digital and connected innovations for low voltage and medium voltage, including EV infrastructure, solar inverters, modular substations, distribution automation, power protection, wiring accessories, switchgear, enclosures, cabling, sensing and control.
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

The ABB STOTZ-KONTAKT GmbH company was founded in 1891 and develops, manufactures, and sells products for the electrical installation and automation of buildings, machines and plants.
For the Smart Power, the company is the competence center for Manual Motor Starters, Overload relays, Mini Contactors, Installation Contactors, Grid Feeding Monitoring Relay, Monitoring Relays, Motor Controller, Power Supplies, Interface Products and Safety Products.

- Heidelberg Workshop Smart Power is about 5000 sq. m.
- Hornberg Workshop is around 6500 sq.m.
- Employees 1000 person.
- Global R&D and product management are located at the factory.

ISO 9001:2015 - Quality Management Systems Heidelberg & Hornberg
ISO 45001:2018- Occupational Health and Safety Assessment Series- Heidelberg
ISO 50001:2018- Energy management systems- Heidelberg & Hornberg
ISO 14001:2015- Environmental management systems - Heidelberg

In the factory, the different components and subassemblies are assembled on the manufacturing line. Most of the components and subassemblies are produced by ABB's suppliers. These are assembled and tested as per the standards within the factory premises.

CM-UFD Grid Feeding Monitoring Relay product cluster

The CM-UFD devices are multifunctional grid feeding monitoring relays. They provide different monitoring functions in accordance with CEI 0-21 and other similar standards to detect over- and undervoltage (10-minutes average value, voltage increase and decrease protection) as well as any changes in grid frequency (frequency increase and decrease protection). The devices are connected between the distributed generation and the public grid in order to disconnect the distributed generation in case of problems (e.g. unstable grid), faults or maintenance on the grid. Additionally, monitoring of ROCOF (rate of change of frequency) can be configured.

Reference Product:

The reference product for the LCA of the complete range of CM-UFD Grid Feeding Monitoring Relay is CM-UFD.M22M.

CM-UFD.M22M product rating:

CM-UFD Grid Feeding Monitoring Relay	Rated operational voltage [U_e]	Rated operational current [I_e]	Number of Output Relays [N_p]	Power Supply Current [I_p]	Rated Control Supply Voltage (U_c)
CM-UFD.M22M/M31M/ M33M/M34M/M35M CM-UFD. M22/M21/M31/M33/M34	24V DC 230V AC	2A-4A	3	60mA (DC) 22mA (AC)	24-240V AC/DC

Table 1: Technical characteristics of CM-UFD Grid Feeding Monitoring Relays (Refer Technical catalogue for complete details).

Constituent Materials

CM-UFD.M22M Grid Feeding Monitoring Relay

CM-UFD.M22M Grid Feeding Monitoring Relay weighs 373g including its installed accessories, paper documentation and packaging.

Materials	Name	IEC 62474 MC	[g]	Weight %
Metals	Steel	M-119	2.3	0.6%
	Cu and Cu Alloys	M-121	0.7	0.2%
Plastics	Polyamide	M-258	92.0	24.6%
	Polycarbonate	M-254	3.5	1.0%
	Unsaturated Polyester	M-301	2.7	0.7%
	Silicon	M-321	1.7	0.5%
	Polyethylene	M-251	0.9	0.2%
Other	Others	N/A	218.5	58.5%
	Paper/Cardboard	M-341	51.1	13.7%
Total			**373.4**	**100.0%**

Table 2: Weight of materials CM-UFD.M22M Grid Feeding Monitoring Relay

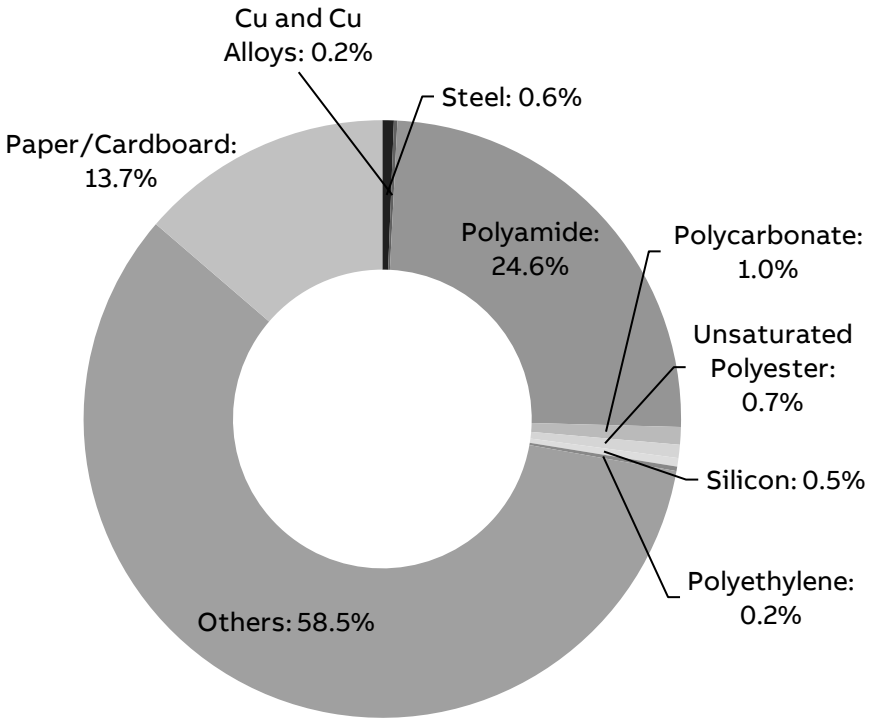

Figure 1: Composition of CM-UFD.M22M Grid Feeding Monitoring Relay

Packaging for reference product CM-UFD.M22M weighs 41g, with the following substance composition:

Material	CM-UFD.M22M	Weight (g)
Corrugated Cardboard	10.7%	40.14
Polyethylene (PE)	0.2%	0.90
Total	**10.9%**	**41.04**

Table 3: Weight of packaging materials CM-UFD.M22M Grid Feeding Monitoring Relay

No cut-off criteria have been applied to the analysis of the product and its packaging. Additional packaging for semifinished products along the supply chain haven't been considered.

LCA background information

Functional unit and Reference Flow

The functional unit is the reference unit used to quantify the performance of the service delivered by a product to the user. The main purpose of the functional unit is to provide a reference to which inputs and outputs are related in the LCA.

The functional unit is to monitor and detect over and under-voltage as well as any changes in the grid frequency with a control supply voltage of 24-240V AC/DC and disconnect the circuit in case of faults or maintenance throughout a reference lifetime of 10 years. This product is considered an 'Active product' with 100% Use Rate in ON, 0% Use Rate in Standby and 0% Use Rate in OFF Mode.

The Reference Flow of the study is a single Grid Feeding Monitoring Relay (including its packaging and accessories) with mass described in chapter 1.3, table 2.

System boundaries and life cycle stages

The life cycle of CM-UFD Grid Feeding Monitoring Relay, an EEPS (Electronic and Electrical Products and Systems), is a "from cradle to grave" analysis and covers the following main life cycle stages: manufacturing, including the relevant acquisition of raw material, preparation of semi-finished goods, etc. and processing steps; distribution; installation, including the relevant steps for the preparation of the product for use; use including the required maintenance steps within the RSL (reference service life of the product) associated to the reference product; end-of-life stage, including the necessary steps until final disposal or recovery of the product system.

The following table shows the stages of the product life cycle and the information stages according to EN 50693:2019 [3] for the evaluation of electronic and electrical products and systems.

Manufacturing	Distribution	Installation	Use	End-of-Life (EoL)
Acquisition of raw materials Transport to manufacturing site Components/parts manufacturing Assembly Packaging EoL treatment of generated waste	Transport to distributor/ logistic center Transport to place of use	Installation EoL treatment of generated waste (packaging)	Usage Maintenance	Deinstallation Collection and transport EoL treatment

Table 5: Phases for the evaluation of construction products according to EN50693:2019 [3].

Temporal and geographical boundaries

The ABB component suppliers are sourced all over the world. All primary data collected are from 2023, which is a representative production year for production technology of CM-UFD Grid Feeding Monitoring Relay at ABB STOTZ-KONTAKT GmbH Manufacturing Plant. The technological representativeness for the Secondary data is Ecoinvent v3.9[6].

The selected ecoinvent [6] processes in the LCA model have a global representativeness, due to the unclear origin of each component. In this way, a conservative approach has been adopted.

Boundaries in the life cycle

As indicated in the PCR capital goods such as buildings, machinery, tools and infrastructure, the packaging for internal transport which cannot be allocated directly to the production of the reference product, may be excluded from the system boundary.

Infrastructures, when present, such as processes deriving from the ecoinvent [6] database have not been excluded.

Data quality

In this LCA, both primary and secondary data are used. Site specific foreground data have been provided by ABB. Main data sources are the bill of materials & drawings which are available on the ERP (SAP) & Windchill. For all processes for which primary are not available, generic data originating from the ecoinvent database [6], allocation cut-off by classification, are used. The ecoinvent database available in the SimaPro software [7] is used for the calculations.

The data quality characterized by quantitative and qualitative aspects, is presented in Appendix 1. Each data quality parameter has been rated according to DQR tables from Chapter 7.19.2.2 of the Product Environmental Footprint Guide v.6.3 to give an indication of geography, technology, and temporal representativeness.

Environmental impact indicators

The information obtained from the inventory analysis is aggregated according to the effects related to the various environmental issues. According to “PCR-ed4-EN-2021 09 06” and EN 50693 [3] the environmental impact indicators must be determined using the characterization factors and impact assessment methods specified in EN 15804:2012+A2:2019 [8].

PCR-ed4-EN-2021 09 06 and the EN 50693:2019 [3] standard establish four indicators for climate change: Climate change (total) which includes all greenhouse gases; Climate change (fossil fuels); Climate change (biogenic) which includes the emissions and absorption of biogenic carbon dioxide and biogenic carbon stored in the product; Climate change (land use) - land use and land use transformation. Other indicators as per the PCR [1].

Allocation rules

Allocation coefficients are based on CM-UFD Grid Feeding Monitoring Relay line’s occupancy area for electricity apart from assembly processes, the whole production line is temperature regulated throughout the year. The allocation of the total amount of waste generated by the production line is also based on the same criterion.

The total number of operators was considered for water consumption. All these flows have been allocated and divided by the total number of CM-UFD.M22M Grid Feeding Monitoring Relay produced in 2023.

Limitations and simplifications

Raw materials life cycle stage includes the extraction of raw materials as well as the transport distances to the manufacturing suppliers. These distances are assumed to be 1000 km as per the PCR. This distance has been added to the one already included in the market processes used for the model, as a result of a conservative choice made by the LCA operators.

Application of grease lubricant on CM-UFD Grid Feeding Monitoring Relay operating mechanism has been excluded since it is negligible. Surface treatments like galvanizing, silver plating as well as their related transport processes (back and forth from the finishing suppliers) have been considered in the LCA model. Scraps for metal working and plastic processes are included when already defined in ecoinvent [6].

Energy Models

LCA Stage	EN 15804:2012 +A2:2019 module	Energy model	Notes
Raw material extraction and processing	A1-A2	Electricity, {RER}| market group for | Cut-off Electricity, {GLO}| market group for | Cut-off	Based on materials and supplier's locations
Manufacturing	A3	ABB Hornberg Electricity Mix	Specific Energy model for ABB Hornberg manufacturing plant, 100% renewable
Installation (Packaging EoL)	A5	Electricity, {GLO}| market group for | Cut-off	
Use Stage	B1	Electricity, [country]x | market for | Cut-off, S **	Low voltage, based on 2023 country sales mix
EoL	C1-C4	Electricity, {GLO}| market group for | Cut-off	

Table 6: Energy models used in each LCA stage.

** Please refer the use phase for further description

Inventory analysis

In this LCA, both primary and secondary data are used. Site specific foreground data have been provided by ABB. For data collection, Bills of Material (BOM) extracted from ABB's internal SAP and Windchill ERP were used. They are a list of all the components and assemblies that constitute the finished product, organized by hierarchy level. Each item is matched with its code, quantity, weight and supplier. The BOMs were then processed, adding material, surface area, volume and weight data, taken from technical drawings/datasheets. Finally, the manufacturing process and surface treatment were assigned, according to information provided by R&D personnel. Road distances between the suppliers and ABB were calculated using Google Maps, and marine distances using Distances & Time (Searates).

All primary data collected from ABB are from 2023, which was a representative production year. The ecoinvent cut-off by classification system processes [6] are used to represent the LCA model.

To improve both the inventory and modelling phase of the product, a specific modular dataset framework has been adopted. Raw materials and Manufacturing processes datasets from Ecoinvent database [6] have been clustered and listed inside two distinct mater data tables ABB Raw Materials and ABB Materials & Processes. Data used in the analysis is not older than 10 years.

Manufacturing stage

CM-UFD Grid Feeding Monitoring Relay are composed of a multitude of components, all of which are made from of numerous materials. All CM-UFD Grid Feeding Monitoring Relay's components have been modelled according to their specific raw materials and manufacturing processes.

The single use packaging as well as paper documentation are also included in the analysis in the manufacturing stage. ABB receives packaging components from outside suppliers and packages the product before shipping them.

Most of the inputs to the products' manufacturing stage are already produced component parts from the supply chain. In the ABB manufacturing plant, the different components and subassemblies are assembled into CM-UFD Grid Feeding Monitoring Relays. All the semi-finished and ancillary products are produced by ABB's suppliers.

The entire supplier's network has been modelled with the calculation of each transportation stage, from the first manufacturing supplier to the next.

All the specific distances from the last subassembly suppliers' factories up to the ABB manufacturing facility have been calculated.

Distribution

The transport distances from ABB manufacturing plant to the distribution centers (regional distribution centers / local sales organizations) have been calculated considering the specific 2023 sales mix data for CM-UFD product cluster (SAP ERP sales data as a source). The Distribution mix is representative of entire product cluster including reference product and products listed in the extrapolation tables.

The other parameter affecting the environmental impact for this LCA stage is total mass of the product (including its packaging). Different mass values for each specific configuration covered by this study have been considered in the model.

As per PSR, additional distance 1000km is considered to account for the last mile delivery distance.

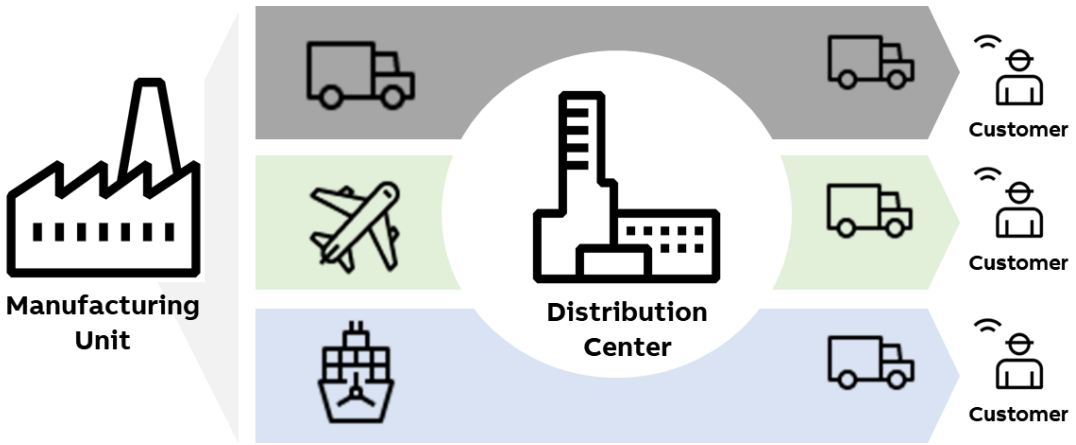

Figure 2: Distribution methodology.

Installation

The installation phase only implies manual activities, and no energy is consumed. This phase also includes the disposal of the packaging of CM-UFD Grid Feeding Monitoring Relay.

For the disposal of the packaging after installation of the product at the end of its life, a transport distance of 1000 km (according to PCR [1]) was assumed.

The actual disposal site is unknown and is managed by the customer. The disposal scenario of the packaging was calculated based on the latest Eurostat data (EU-27) available.

Use

Use and maintenance are modelled according to the PCR [1]. During the use phase, CM-UFD Grid Feeding Monitoring Relay dissipate some electricity due to power losses. They are calculated according to the data provided in the catalogue of CM-UFD Grid Feeding Monitoring Relay and following the PCR [1] & PSR [2] rules:

Parameters		
I_u	[mA]	22-60
Load rate	[%]	100
h/year	[h]	8760
RSL	[years]	10
Time operating coefficient	[%]	100

Table 7: Use phase parameters.

The formula for the calculation of the electricity consumed is shown below and it is described as follows, where P_{use} is the power consumed by the switch at a given value of current:

$$E_{use}\,[kWh] = \frac{P_{use} * 8760 * RSL * \alpha}{1000}$$

The above calculations have been performed according to the number of poles (3) on which relevant current flows during use phase.

The Energy model used for this phase was built based on the 2023 actual sales mix data for the entire CM-UFD product range (SAP ERP sales data as a source). This approach has been taken since this list of countries will be the most representative also for the other products listed in the extrapolation tables.

From Ecoinvent [6] database, the low voltage electricity country mix for each country(x) has been selected with its respective percentage on the total sales mix (Electricity, low voltage [country]x | market for | Cut-off, S).

Since no maintenance happens during the use phase, the environmental impacts linked to this procedure have been considered as null in the analysis.

End of life

The end-of-life stage is modelled according to PCR [1] and IEC/TR 62635 [9]. The percentages for end-of-life treatments of materials are taken from IEC/TR 62635 [9].

Since no specific data is available, the transport distances from the place of use to the place of disposal are assumed to be 1000 km (local/domestic transport by lorry, according to PCR [1]).

Environmental impacts

The following table show the environmental impact indicators of the life cycle of a single CM-UFD.M22M Grid Feeding Monitoring Relay, as indicated by PCR [1] and EN 50693:2019 [3]. The indicators are divided into the contribution of the processes to the different stages (manufacturing, distribution, installation, use and end-of-life).

Impact category	Unit	Total	Manufacturing	Distribution	Installation	Use	End of Life
GWP-total	kg CO2 eq	2.39E+02	1.52E+01	1.98E-01	5.67E-02	2.24E+02	3.28E-01
GWP-fossil	kg CO2 eq	2.25E+02	1.51E+01	1.98E-01	9.19E-03	2.09E+02	3.24E-01
GWP-biogenic	kg CO2 eq	1.38E+01	4.84E-02	7.55E-05	4.75E-02	1.37E+01	3.69E-03
GWP-luluc	kg CO2 eq	6.42E-01	4.22E-02	4.13E-05	3.20E-06	5.99E-01	1.90E-05
ODP	kg CFC11-eq	3.65E-06	4.22E-07	3.35E-09	1.68E-10	3.22E-06	7.38E-09
AP	mol H+ eq	1.17E+00	1.65E-01	8.58E-04	3.34E-05	1.00E+00	2.44E-04
EP-freshwater	kg P eq	2.07E-01	2.30E-02	6.49E-06	5.95E-07	1.84E-01	5.56E-06
EP-marine	kg N eq	2.03E-01	2.44E-02	3.36E-04	1.57E-05	1.78E-01	1.27E-04
EP-terrestrial	mol N eq	1.94E+00	2.59E-01	3.60E-03	1.40E-04	1.67E+00	9.99E-04
POCP	kg NMVOC eq	6.32E-01	7.65E-02	1.19E-03	4.81E-05	5.54E-01	2.79E-04
ADP-m&m	kg Sb eq	8.36E-03	6.29E-03	1.97E-07	1.83E-08	2.07E-03	8.34E-08
ADP-fossil	MJ	3.27E+03	1.91E+02	2.66E+00	9.68E-02	3.07E+03	5.66E-01
WDP	m3 of equiv. depriv.	7.90E+01	5.18E+00	7.39E-03	1.16E-03	7.38E+01	7.14E-03
PENRE	MJ	3.27E+03	1.88E+02	2.66E+00	9.68E-02	3.07E+03	5.66E-01
PENRM	MJ	2.44E+00	2.44E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	3.27E+03	1.91E+02	2.66E+00	9.68E-02	3.07E+03	5.66E-01
PERE	MJ	9.10E+02	2.41E+01	1.87E-02	1.57E-03	8.86E+02	1.20E-02
PERM	MJ	4.74E-01	4.74E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	9.11E+02	2.46E+01	1.87E-02	1.57E-03	8.86E+02	1.20E-02
SM	kg	1.27E-03	1.27E-03	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
PET	MJ	4.18E+03	2.15E+02	2.68E+00	9.84E-02	3.96E+03	5.78E-01
FW	m3	2.63E+00	1.95E-01	2.50E-04	4.06E-05	2.44E+00	2.39E-04
HWD	kg	9.97E-03	1.10E-03	1.75E-05	5.93E-07	8.85E-03	1.57E-06
N-HWD	kg	1.86E+01	1.68E+00	8.18E-02	9.48E-03	1.67E+01	5.98E-02
RWD	kg	1.04E-02	4.20E-04	3.82E-07	3.08E-08	9.93E-03	3.29E-06
CfR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MfR	kg	1.93E-01	2.55E-02	0.00E+00	2.70E-02	0.00E+00	1.41E-01
MfER	kg	1.34E-01	6.14E-03	0.00E+00	3.15E-02	0.00E+00	9.62E-02
EN	MJ by energy vector	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Efp	disease inc.	5.16E-06	9.33E-07	7.71E-09	7.02E-10	4.21E-06	4.12E-09
IrHH	kBq U-235 eq	3.92E+01	1.68E+00	1.63E-03	1.27E-04	3.75E+01	2.83E-03
ETX FW	CTUe	7.06E+02	2.93E+02	1.39E+00	8.98E-02	4.10E+02	1.50E+00
HTX CE	CTUh	9.61E-08	1.83E-08	4.14E-11	5.12E-12	7.76E-08	4.76E-11
HTX N-CE	CTUh	4.72E-06	1.21E-06	2.49E-09	1.92E-10	3.51E-06	7.07E-09
IrLS	Pt	8.10E+02	8.89E+01	1.04E+00	9.41E-02	7.20E+02	5.69E-01

Table 8: Impact indicators for CM-UFD.M22M Grid Feeding Monitoring Relay

Impact category	Unit	CM-UFD.M22M
Biogenic Carbon content of the product	kg	5.54E-03
Biogenic Carbon content of the associated packaging	kg	7.98E-03

Table 9: Inventory flow other indicators

Environmental impact indicators

GWP-total	Global Warming Potential total (Climate change)
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 reaching 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 use indicators

PERE	Use of renewable primary energy excluding 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)
PENRE	Use of non-renewable primary energy excluding non-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)
PET	Total use of primary energy in the lifecycle

Secondary materials, water and energy resources

SM	Use of secondary materials
RSF	Use of renewable secondary fuels
NRSF	Use of non-renewable secondary fuels
FW	FW: Net use of fresh water

Waste category indicators

HWD	Hazardous waste disposed
N-HWD	Non-hazardous waste disposed
RWD	Radioactive waste disposed

Output flow indicators

CfR	Component for reuse
MfR	Materials for recycling
MfER	Materials for energy recovery
EN	Exported energy

Others indicators

Efp	Emissions of Fine particles
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

Extrapolation for Homogeneous environmental family

This PEP covers different build configurations than the representative product. All the analyzed configurations have the same main functionality, product standards and manufacturing technology. The different life cycle stages can be extrapolated to other products of the same homogeneous environmental family by applying a rule of proportionality to the parameters in the following tables, divided by different life cycle stages.

For products other than the reference product, covered in this PEP, the environmental impacts for each phase of the lifecycles are obtained by multiplying the impacts of the reference product by the factors listed in the tables below.

Manufacturing

Product	GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater	EP-marine	EP-terrestrial	POCP	ADP-minerals & metals	ADP-fossil	WDP
CM-UFD.M22M/M31M/M33M/ M34M/M35M	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CM-UFD.M22/M21/M31/M33/M34	0.97	0.97	1.04	0.99	0.98	0.97	0.86	0.93	0.92	0.95	0.81	0.97	0.95

Table 10: Extrapolation factors for CM-UFD Relays -Manufacturing

Distribution

Product	Factor
CM-UFD.M22M/M31M/M33M/M34M/M35M	1.00
CM-UFD.M22/M21/M31/M33/M34	0.97

Table 11: Extrapolation factors for CM-UFD Relays -Distribution

Installation

Product	Factor
CM-UFD.M22M/M31M/M33M/M34M/M35M	1.00
CM-UFD.M22/M21/M31/M33/M34	1.00

Table 12: Extrapolation factors for CM-UFD Relays -Distribution

Use

Product	Factor
CM-UFD.M22M/M31M/M33M/M34M/M35M	1.00
CM-UFD.M22/M21/M31/M33/M34	1.00

Table 13: Extrapolation factors for CM-UFD Relays -Use phase

EoL

Product	GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater	EP-marine	EP-terrestrial	POCP	ADP-minerals & met-als	ADP-fossil	WDP
CM-UFD.M22M/M31M/M33M/ M34M/M35M	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CM-UFD.M22/M21/M31/M33/M34	0.95	0.95	1.00	0.96	0.97	0.96	0.95	0.96	0.96	0.96	0.96	0.96	0.95

Table 14: Extrapolation factors for CM-UFD Relays -EoL

Additional environmental information

According to the waste treatment scenario calculation in Simapro [7], based on the recycling rate in the technical report IEC/TR 62635 Edition 1.0 [9] Table D.6, the following recyclability potentials were calculated. The recyclability potential is calculated based on the product weight (excluding packaging).

Recyclability potential	CM-UFD.M22M
	35.3%

Table 15: Recyclability potential of CM-UFD.M22M

References

[1] PCR “PEP-PCR-ed4-EN-2021_09_06” - Product Category Rules for Electrical, Electronic and HVAC-R Products (published: 6th September 2021)

[2] PSR “PSR-0005-ed3-EN-2023 06 06” - SPECIFIC RULES FOR Electrical switchgear and control gear Solutions

[3] EN 50693:2019 - Product category rules for life cycle assessments of electronic and electrical products and systems

[4] ISO 14040:2006 - Environmental management -Life cycle assessment - Principles and framework

[5] ISO 14044:2006 - Environmental management - Life cycle assessment - Requirements and guidelines

[6] ecoinvent v3.9 (2023). ecoinvent database version 3.9 - (https://ecoinvent.org/)

[7] SimaPro Software version 9.5.0.1 - PRé Sustainability

[8] UNI EN 15804:2012+A2:2019: Sustainability of constructions - Environmental product declarations (September 2019).

[9] IEC/TR 62635 - Guidelines for end-of-life information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment - Edition 1.0 2012-10