PRODUCT ENVIRONMENTAL PROFILE

Environmental Product Declaration

ABB Cable Distribution Cabinet CDC 640

REGISTRATION NUMBER ABBG-00189-V01.01-EN	IN COMPLIANCE WITH PCR-ED4-EN-2021 09 06 SUPPLEMENTED BY PSR-0005-ED2-EN-2016 03 29
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DOCUMENT IN COMPLIANCE WITH ISO 14025: 2006 « ENVIRONMENTAL LABELS AND DECLARATIONS. TYPE III ENVIRONMENTAL DECLARATIONS »	

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EPD Owner	ABB Electrification Sweden AB, Kabeldon BOX 531, SE-441 15 Alingsås, Sweden www.abb.com
Manufacturer name and address	ABB Electrification Sweden AB, Kabeldon BOX 531, SE-441 15 Alingsås, Sweden
Company contacts	EPD_ELSP@in.abb.com
Reference product	CDC 640 Cable distribution cabinet
Description of the product	CDC 640 range of Cable distribution cabinets provide a robust and safe solution with uncompromised lifetime. The cabinet provides a number of significant benefits such as continuous operation, space saving and fast installation. The entire system, including busbars, connectors and switches are IP2X classified
Functional unit	The functional unit to this study is a single Cable distribution cabinet (including its packaging and accessories), to establish, support and interrupt for 20 years against direct contact with live parts and allow grouping monitoring, control and protection devices in a single enclosure or a cabinet having the following dimensions H x L x P or an assembly of X enclosures or cabinets having the following dimensions H x L x P, while protecting against mechanical impacts (IK) and the penetration of solid objects and liquids (IP). This product is not governed by IEC 62262, therefore we have not mentioned IK (Degree of protection against external mechanical impacts) in the functional Unit. However, it fulfills IEC 61439-5 mechanical impact protection criteria which is equivalent to IK 10 from IEC 62262. H = Height (mm) = 1200 L = Width (mm) = 600 P = Depth (mm) = 220 X = Total number of Cabinets = 1 Pw = Maximum permissible power = 252kW IP = Degree of Ingress protection = 2X
Other products covered	ABB Cable Distribution Cabinet CDC 660
Reference lifetime	20 years
Product category	Electrical, Electronic and LVAC-R Products
Use Scenario	The use phase has been modeled based on the sales mix data (2022), and the corresponding low voltage electricity countries mix
Geographical representativeness	Raw materials & Manufacturing: [Europe / Global] Assembly: [Sweden] Distribution / Use: [Global] specific sales mix EoL: [Global]
Technological representativeness	Materials and processes data are specific to the production of CDC 640 Cable distribution cabinet
LCA Study	This study is based on the LCA study described in the LCA report 2CGD001189S1000
EPD type	Product family declaration
EPD scope	“Cradle to grave”
Year of reported primary data	2022
LCA software	SimaPro 9.3.0.3 (2022)
LCI database	Ecoinvent v3.8 (2021)
LCIA methodology	EN 15804:2012+A2:2019

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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

ABB Switches and fusegears operates in Alingsas in Sweden. ABB Provides a complete low voltage distribution system consisting of cabinets, busbars, switching devices, connectors and wide range of accessories that support a great variety of customer applications.

- ABB products comply with following EC directive: "Low-Voltage Directives" (LVD) no. 2014/35/EU
- ISO 9001 for quality management
- ISO 14001 for environmental management
- OHSAS 18001 for the management of the health and safety of employees in the workplace
- ISO 150001 for energy management

Different products produced in ABB Switches an Fusegears are

- SLD & SLE Fuse Switch Disconnectors
- CDC Cabinets
- CMS Cabinets
- Connectors
- Switches and Moulded Case Circuit breakers

Each brand are specific systems which is developed according to standards for different country distribution systems. The primary scope is to deliver a system with high level of safety, simplicity and reliability. Every installer and surrounding environments should be safe during the 40 years of the products lifetime. The products are critical parts of public infrastructure, and continuous operation needs to be secured.

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CDC 640 Cable distribution cabinet product cluster

CDC 640 range of Cable distribution cabinets provide a robust and safe solution with uncompromised lifetime. The cabinet provides a number of significant benefits such as continuous operation, space saving and fast installation. These benefits are important for achieving low operating cost and high reliability in low voltage distribution systems.
The entire system, including busbars, connectors and switches are IP2X classified.

- **CDC 640 Cable distribution cabinet product rating**

Cable Distribution Cabinet	CDC 640
Rated voltage [V]	400
Rated current [A]	630
Number of poles	4

Table 1: Technical characteristics of Cable distribution cabinets
(Refer Technical catalogue for complete details).

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Constituent Materials

CDC 640 Cable distribution cabinet

CDC 640 Cable distribution cabinets weighs 1883g including its installed accessories, paper documentation and packaging.

Materials	Name	IEC 62474 MC	[g]	Weight %
Metals	Steel	M-119	43206.0	82.4%
	Aluminium and its alloys	M-120	2047.4	3.9%
	Stainless Steel	M-100	71.6	0.1%
	Zinc and its alloys	M-124	15.8	<0.1%
	PolyButyleneTerephthalate (PBT)	M-261	326.8	0.6%
	Polyethylene (PE)	M-251	440.0	0.8%
	Other Polymers	N/A	53.1	0.1%
Others	Wood	M-340	6250.0	11.9%
	Paper	M-341	7.0	<0.1%
			52417.7	100.0%

Table 2: Weight of materials CDC 640 Cable distribution cabinet

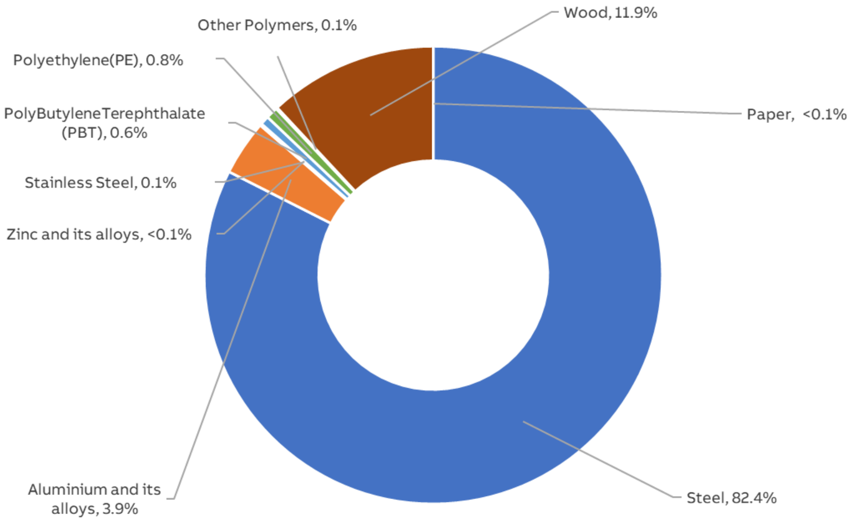

Figure 1: Composition of CDC 640 Cable distribution cabinet

The following tables shows the packaging weights for different types of the Cable Distribution Cabinets

Material weight (g)	CDC 640
Wood	6250
Polyethylene	440

Table 3: Weight of materials CDC 640 – Packaging

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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.

Protect persons during 20 years against direct contact with live parts and allow grouping monitoring, control and protection devices in a single enclosure or a cabinet having the following dimensions H x L x P or an assembly of X enclosures or cabinets having the following dimensions H x L x P, while protecting against mechanical impacts (IK) and the penetration of solid objects and liquids (IP):

Cable distribution cabinets	CDC 440
H = Height (mm)	1200
L = Width (mm)	600
P = Depth (mm)	220
X = Total number of Cabinets	1
Pw = Maximum permissible power	252kW
IP = Degree of Ingress protection	2X

Table 4: Functional unit of Cable distribution cabinet

The Reference Flow of the study is a single Cable distribution cabinet (including its packaging and accessories) with mass described in chapter 1.3, table 2 & 3.

System boundaries and life cycle stages

The life cycle of the Cable distribution cabinet, 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.

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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 2022, which is a representative production year. Secondary data are also representative for this year, as provided by ecoinvent [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.

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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 the CDC line’s occupancy area for electricity and the total amount of waste generated by the production line.

The total number of operators was considered for water consumption. All these flows have been allocated and divided by the total number of CDC 640 Cable distribution cabinet produced in 2022.

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 the Cable distribution cabinet 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. Specific phosphate surface treatment, Stearate coating have been excluded by operational choice. Scraps for metal working and plastic processes are included when already defined in ecoinvent[6].

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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 Green Mix	Specific Energy model for ABB Sweden 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 2022 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

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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 2022, 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

The Cable distribution cabinets are composed of a multitude of components, all of which are made from of numerous materials. Most of the inputs to the products' manufacturing stage are already produced component parts.
All the Cable distribution cabinet'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 packaged product from supplier, sorts, repacks and delivers to the customer according to the orders.

In the ABB manufacturing plant, surface treatment, sheet metal pressing, the different components and subassemblies are assembled into the Cable distribution cabinets. 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.

The energy mix used for the production phase is representative for ABB production site and includes renewable energy only (Wind).

The complete energy mix has been modeled considering the Energy Certificate from the supplier.

Distribution

The transport distances from ABB manufacturing plant to the distribution centers (regional distribution centers / local sales organizations) have been calculated considering the specific 2022 sales mix data for SLE product cluster (SAP ERP sales data as a source). The Distribution

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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.

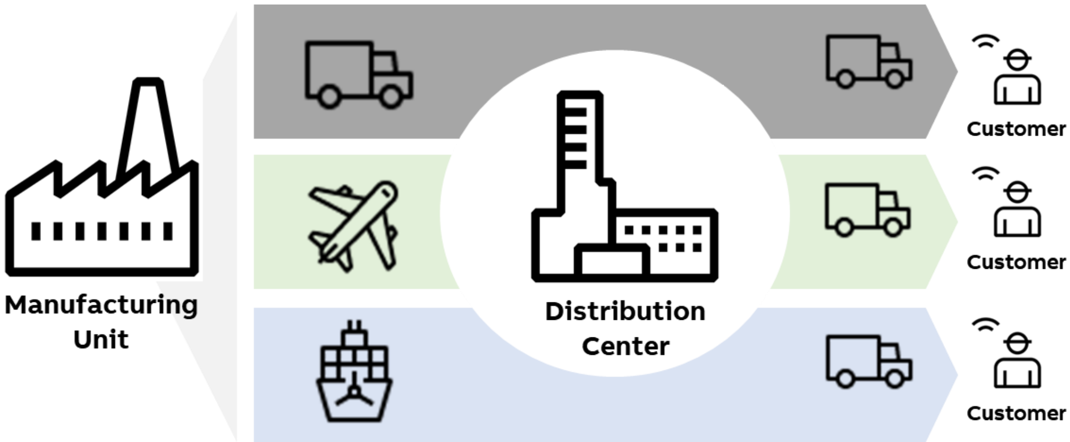

Figure 2: Distribution methodology.

Installation

The installation phase only implies manual activities, and no energy is consumed. This phase also includes the disposal of the packaging of the Cable distribution cabinet.

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

CDC Cabinets have no power loss during use phase.

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]).

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Environmental impacts

The following table show the environmental impact indicators of the life cycle of a single CDC 640 Cable distribution cabinet, 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	Manuf	Distr	Install	Use	EoL
GWP-total	kg CO2 eq	2.01E+02	1.82E+02	5.60E+00	8.19E+00	0.00E+00	4.63E+00
GWP-fossil	kg CO2 eq	1.94E+02	1.83E+02	5.59E+00	8.14E-01	0.00E+00	4.62E+00
GWP-biogenic	kg CO2 eq	6.85E+00	-5.41E-01	5.61E-03	7.38E+00	0.00E+00	7.49E-03
GWP-luluc	kg CO2 eq	2.42E-01	2.38E-01	2.07E-03	2.55E-04	0.00E+00	1.85E-03
ODP	kg CFC11 eq	2.01E-05	1.75E-05	1.34E-06	1.54E-07	0.00E+00	1.05E-06
AP	mol H+ eq	1.00E+00	9.45E-01	3.14E-02	3.98E-03	0.00E+00	2.44E-02
EP-freshwater	kg P eq	9.34E-02	9.26E-02	3.48E-04	7.38E-05	0.00E+00	3.48E-04
EP-marine	kg N eq	2.31E-01	2.09E-01	1.04E-02	1.92E-03	0.00E+00	9.13E-03
EP-terrestrial	mol N eq	2.31E+00	2.09E+00	1.14E-01	1.60E-02	0.00E+00	9.24E-02
POCP	kg NMVOC eq	7.63E-01	6.97E-01	3.37E-02	4.59E-03	0.00E+00	2.73E-02
ADP-m&m	kg Sb eq	1.02E-02	1.02E-02	1.28E-05	1.62E-06	0.00E+00	9.91E-06
ADP-fossil	MJ	2.49E+03	2.32E+03	8.75E+01	1.04E+01	0.00E+00	7.05E+01
WDP	m3	6.11E+01	6.06E+01	3.01E-01	-1.17E-02	0.00E+00	2.77E-01
PENRE	MJ	2.46E+03	2.30E+03	8.75E+01	1.04E+01	0.00E+00	7.05E+01
PENRM	MJ	2.79E+01	2.79E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	2.49E+03	2.32E+03	8.75E+01	1.04E+01	0.00E+00	7.05E+01
PERE	MJ	3.46E+02	3.43E+02	1.11E+00	1.41E-01	0.00E+00	1.10E+00
PERM	MJ	1.08E+02	1.08E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	4.53E+02	4.51E+02	1.11E+00	1.41E-01	0.00E+00	1.10E+00
SM	kg	2.38E+01	2.38E+01	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
FW	m3	2.02E+00	2.00E+00	1.03E-02	3.68E-04	0.00E+00	9.53E-03
HWD	kg	6.50E-02	6.46E-02	2.10E-04	2.49E-05	0.00E+00	1.66E-04
N-HWD	kg	6.79E+01	4.92E+01	8.06E+00	1.99E+00	0.00E+00	8.65E+00
RWD	kg	1.01E-02	8.94E-03	5.92E-04	6.68E-05	0.00E+00	4.68E-04
MfR	kg	5.64E+01	1.26E+01	0.00E+00	6.25E-01	0.00E+00	4.31E+01
MfER	kg	5.04E+00	0.00E+00	0.00E+00	5.02E+00	0.00E+00	1.78E-02
Efp	disease inc.	1.42E-05	1.28E-05	6.63E-07	8.32E-08	0.00E+00	5.69E-07
IrHH	kBq U-235 eq	2.35E+01	2.26E+01	4.42E-01	5.05E-02	0.00E+00	3.65E-01
ETX FW	CTUe	8.18E+03	7.98E+03	6.81E+01	8.85E+00	0.00E+00	1.20E+02
HTX CE	CTUh	7.09E-07	7.05E-07	1.93E-09	4.34E-10	0.00E+00	1.52E-09
HTX N-CE	CTUh	6.43E-06	6.28E-06	7.41E-08	1.89E-08	0.00E+00	5.86E-08
IrLS	Pt	1.89E+03	1.70E+03	9.87E+01	1.17E+01	0.00E+00	7.57E+01

Table 7: Impact indicators for CDC 640 Cable distribution cabinets

Impact category	Unit	CDC 640
Biogenic Carbon content of the product	kg	4.00E-03
Biogenic Carbon content of the associated packaging	kg	3.19E+00

Table 8: Inventory flow other indicators

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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)

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

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Waste category indicators

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

Output flow indicators

MfR	Materials for recycling
MfER	Materials for energy recovery

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 LCA covers different build configurations other 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.

LCA Phase: Manufacturing

Impact category	GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater	EP-marine	EP-terrestrial	POCP	ADP-minerals & metals	ADP-fossil	WDP
CDC640	1	1	1	1	1	1	1	1	1	1	1	1	1
CDC660	1.29	1.27	-1.96	1.26	1.22	1.27	1.29	1.35	1.28	1.27	1.28	1.27	0.81

Table 9: Extrapolation factors for Manufacturing stage
Reference product: CDC 640

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LCA Phase: Distribution

Distribution	Factor
CDC640	1
CDC660	1.29

Table 10: Extrapolation factors for Distribution stage
Reference product: CDC 640

LCA Phase: Installation

Installation	Factor
CDC640	1
CDC660	1

Table 11: Extrapolation factors for Cable distribution cabinet-Distribution Phase

LCA Phase: Use

As per PSR no power loss for Unequipped Cabinets and Enclosures.

LCA Phase: End of Life

Impact category	GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater	EP-marine	EP-terrestrial	POCP	ADP-minerals & metals	ADP-fossil	WDP
CDC640	1	1	1	1	1	1	1	1	1	1	1	1	1
CDC660	1.10	1.23	1.00	1.24	1.24	1.24	1.23	1.21	1.24	1.24	1.24	1.24	1.29

Table 12: Extrapolation factors for CDC 640 Cable distribution cabinets - EOL Phase

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).

	CDC 640
Recyclability potential	93.3%

Table 13: Recyclability potential of CDC 640

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References

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

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