

Henan Huaxing Cables co., LTD



## ENVIRONMENTAL PRODUCT DECLARATION

### ABC (Aerial Bundled Cable)

1X10+10 MM<sup>2</sup>; 2X16+25 MM<sup>2</sup>; 2X16MM<sup>2</sup>;  
3X25+54.6 MM<sup>2</sup>; 3X35+2X16+54.6 MM<sup>2</sup>;  
3X95+54.6 MM<sup>2</sup>; 4X16MM<sup>2</sup>

### PLANT LOCATION:

No. 12 Dingxiang Road , Yong'an industry zone ,  
Gongyi city , Henan province, China

in accordance with ISO 14025 and EN 50693

Program Operator	EPDIItaly
Publisher	EPDIItaly

Declaration Number	HX-ABC-2023
Registration Number	EPDITALY0444

Issue Date	14.06.2024
Valid to	14.06.2029



## 1. General information

### DECLARATION OWNER:

Henan Huaxing Cables Co., Ltd

Production site location: No. 12 Dingxiang Road, Yong'an industry zone, Gongyi city, Henan province, China

Company contact person: Novira Cheng (Sales manager), noviracheng@huaxingcable.com

### PROGRAM OPERATOR:

EPDItaly (www.epditaly.it) Via Gaetano De Castillia N° 10 - 20124 Milano (MI), Italia

### IDENTIFICATION OF THE PRODUCTS:

ABC electric cables: **1x10+10 MM2; 2x16+25 MM2; 2x16MM2; 3x25+54.6 MM2; 3x35+2x16+54.6 MM2; 3x95+54.6 MM2; 4x16MM2**

Cables included in the category of "Electronic and electrical products and systems- Cables and wires" according to Sub-PCR EPDItaly016

CPC CODE: 463

### REFERENCE DOCUMENTS AND RULES (PCR):

- Sub-PCR EPD Italy 016: "Electronic and Electrical Product and System – Cables and Wires", Rev.2, issue date 25/09/2020, valid until 25/09/2025, CPC 463 family "insulated wire and cable; optical fibre cables" and subsequent clusters, in conformity with:
- PCR EPDItaly007, Rev. 3 (13.01.2023): "Electronic and electrical product and systems"
- EN 50693:2020 Product category rules for life cycle assessments of electronic and electrical products and systems
- EN 15804:2012 +A2:2019 Sustainability of construction works- Environmental product declarations- Core rules for the product category of construction products.

LCA STUDY realized by ANTHESIS

This declaration has been developed referring to the EPDItaly, following the "Regolamento di EPDItaly Rev.5.2, emission date: 16/02/2022"; further information and the document itself are available at: [www.epditaly.it](http://www.epditaly.it)

Independent verification of the declaration and data carried out according to ISO 14025: 2010

INTERNAL  EXTERNAL

Third party verification carried out by:

ICMQ Spa (www.icmq.it) Via Gaetano De Castillia N° 10 - 20124 Milano (MI), Italia. Accredited by: Accredia.

EPDs relating to the same category of products but belonging to different programs may not be comparable.

Disclaimer: Henan Huaxing Cable Co.,Ltd relieves EPDItaly from any non-compliance with the environmental legislation self-declared by the manufacturer himself. The declaration Owner will be responsible for the information and supporting evidence; EPDItaly declines all responsibility regarding the manufacturer's information, data and results of the life cycle assessment.

## 2. The company

Henan Huaxing Cables Co., Ltd is one of the leading cable and wire manufacturers in China. It is located in Yongan industrial zone, Gongyi city. The company was built in Jan. 1984, expanded in 2005, covering a total area of 67,000 square meters; the building area is 28,000 square meters.

The total investment is 260 million Yuan. The company has 180 employees, including five senior technical engineers; about one hundred are middle and junior technicians. The company integrates research, development, and production together.

The main products are AAC/AAAC/ACSR/ACAR conductors, Aerial Bundled Cable (ABC Cable), Control cable, Concentric Cable, Power Cable LV and MV voltage, plastic electric wire, solar cable, protect cable and so on. They also produce wire and cable products according to the standards of IEC, ASTM, BS, DIN, AS, CSA, JIS, KS etc to meet specific needs of customers.

These products have sold in more than 60 countries and regions, most are in the Middle East, Africa, South American and Southeast Asia. Besides, also set up many sales distributors in large and medium cities for domestic market.

Henan Huaxing Cables Co., Ltd also certificated by ISO9001 quality system, ISO14001 environmental system, OHSAS18001 occupational health system and CCC national product certifications.

### 3. Scope and type of EPD

This is a product EPD and applies to 7 cables of the Aerial Bundled Cable (ABC) family of wires and cables. The cables are manufactured in China, distributed and installed in different world geographical areas, where they are used, treated and/or disposed at the end of life.

EPD document valid within the following geographical area: China and worldwide according to sales market conditions.

Life Cycle Assessment (LCA) supporting this EPD was performed over 7 references of cables, using the software Simapro 9.5.0.1 (PRé Consultants), based on activity data for the year 2020 and database Ecoinvent 3.9.1. The product and life cycle stages are described in the following sections.

#### 3.1 Functional Unit

According to PCR EPDItaly016 – “Electronic and electrical product and systems – cables and wires”, the following functional unit was considered:

1 km of cable for all the life cycle stages besides use phase.

As the cable may operate at variable loads during its lifetime, the use phase shall be modelled using a declared unit of 1 km of cable with a load of 1 A. This allows to fairly compare EPDs based on this PCR even if the actual load of the cable is not known.

#### 3.2 System boundaries

LCA had a “cradle to grave” scope and considered the following life cycle modules:

**Tabla 1. Lifecycle stages**

Life cycle stage	Module	Processes	
Manufacturing	Upstream module	A1. Raw Materials	X
		A2. Raw materials transport	X
	Core module	A3. Manufacturing	X
Distribution	Downstream Module	A4. Distribution	X
Installation		A5. Installation	X
Use & Maintainance		B1-7. Use and Maintenance	X
End-of-life		C1. Deinstallation	MND
		C2. Waste transport	X
		C3. Waste treatment	X
		C4. Waste Disposal	X

MND: Modules not declared

#### Manufacturing

A1- Raw materials: it considers the extraction and production of raw materials for semifinished products received by external supplier and used to produce and assembly the cable components. Packaging materials are not included. Datasets representing this stage consider the materials processing operations, the energy, the waste treatments, and the emissions arising from these procedures, which are included in background Simapro processes.

A2 - Raw materials transport: it considers the transportation of the raw materials from supplier to the manufacturing plant. Different suppliers of the raw materials are involved in the system.

A3. Cable Manufacturing: it contemplates the manufacture of the final product, including drawing, stranding and extrusion, product assembly and packaging operations. In this stage, the production of the auxiliary materials and the

packaging materials (wooden drum), water, and electricity consumptions as well as waste and wastewater generation are considered.

**Distribution**

A4. Cable distribution: includes the impacts related to the distribution to the installation site. In order to model the distribution pattern for the cables, average data for costumers located in different geographical regions were considered, requiring ship and truck transport. For truck transportation from port to the final destination, the distance to capital towns were considered (Callao(Lima) in Perú, Valparaiso in Chile, Sao Paulo in Brasil), in lack of further indications.

**Installation**

A5. Installation: Considering that the cable’s installation does not require any relevant inputs in terms of materials and energy, a cut-off on the impacts included in this module was applied (according to EPDItaly 016). Only packaging material waste is considered in this stage.

**Use and Maintenance**

B1-7. Use: include the energy dissipates with the use energy due to the Joule effect, during the lifetime. Maintenance operations are included and declared in the cut-off criteria (according to EPDItaly 016).

**End-of-life**

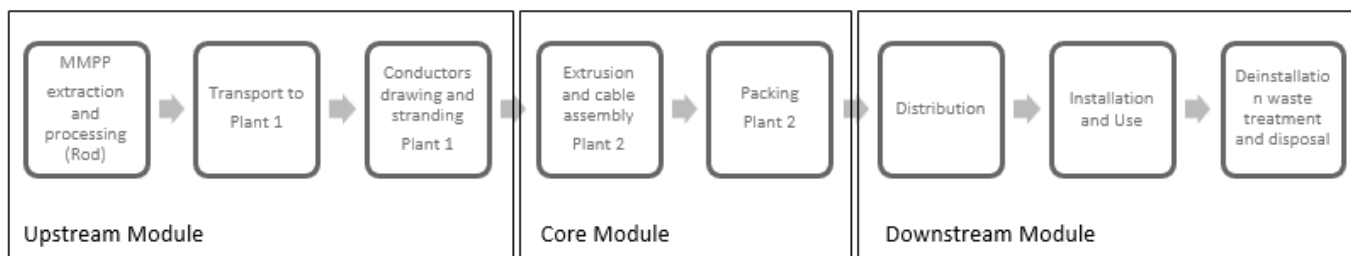
C1. Dismantling: Considering that the cable’s dismantling does not require any relevant inputs in terms of materials and energy, a cut-off on the impacts included in this module was applied (according to EPDItaly 016).

C2. Waste transport: the transportation of the cables from the point of waste generation to the treatment platform. For recovery and recycling processes, which take place outside the boundaries of the product system, only impacts related to the transport of the waste to the treatment platform are considered, according to EPDItaly 007 (6.3).

C3. Waste treatment includes collection of waste fractions from the dismantling and waste processing of material flows intended for reuse, recycling, and energy recovery. A shredding process requiring electricity is considered within this study. Further operations starting from the recycled are out of the system boundaries.

C4. Cable Waste disposal: At the end of life (after dismantling), it is assumed 50% of the cables are recycled (based on statistics in 2019, the collection rate of WEEE was 48,5% in the European Union). Therefore, the 50% are disposed to landfill or incinerated. The environmental impact derived from final waste treatment processes (landfill or incineration) are considered in this module.

**Figure 1. Henan Huaxing Cables Co., Ltd cables manufacturing flow chart**



#### 4. Product description

The 7 cables in the ABC family (Aerial Bundled Cable) have many options in terms of the number of phase conductors used, the type of neutral conductor and either it is bare or insulated. The conductors shall be of aluminium 1350 wires for phases and aluminium alloy 6201 for neutral conductor. The conductors shall be extruded with XLPE as insulation. The neutral core carries equally space ribs right round the circumference.

The function is to transport low voltage electricity, with main application in industrial installations.

Standard packaging materials for distribution consist in 85kg wooden drums, although other packaging solution are available for clients on demand.

**Table 2. Technical characteristics**

LCA Study code	Cable Reference	Max. Voltage (kV)	Electrical resistance indirect current at 20°C (Ω/km)
5	1x10+10 mm <sup>2</sup>	1	3,08
6	2x16+25 mm <sup>2</sup>	1	1,91
7	2x16mm <sup>2</sup>	1	1,91
8	3x25+54.6 mm <sup>2</sup>	1	1,2
9	3x35+2x16+54.6 mm <sup>2</sup>	1	0,868
10	3x95+54.6 mm <sup>2</sup>	1	0,32
11	4x16mm <sup>2</sup>	1	1,91

The product does not contain dangerous substances (according to Regulations (EU) 1907/2006 (REACH) and (EU) 1272/2008) and do not release the same in water, air or soil, in all phases of the life cycle.

**Table 3. Material composition**

Study code	5	6	7	8	9	10	11
Family	ABC Cables	ABC Cables	ABC Cables	ABC Cables	ABC Cables	ABC Cables	ABC Cables
Cable reference	1x10+10 mm <sup>2</sup>	2x16+25 mm <sup>2</sup>	2x16mm <sup>2</sup>	3x25+54.6 mm <sup>2</sup>	3x35+2x16+54.6 mm <sup>2</sup>	3x95+54.6 mm <sup>2</sup>	4x16mm <sup>2</sup>
Aluminum	37%	37%	65%	41%	48%	64%	65%
Aluminum alloy	38%	31%	0%	30%	22%	13%	0%
XLPE	25%	31%	35%	29%	29%	23%	35%
Total weight (kg/km)	73	218	125	493	663	1161	249

## 5. LCA results and interpretations

The results of the underlying LCA are provided in this section as for environmental impacts, resource use and waste categories. All parameters required by the sub-PCR EPDIItaly016 are included and reported in the following tables.

The main general conclusions of the LCA are:

Raw material production (A1) in first place and cable manufacturing (A3) are the stages that most contribute to the overall environmental burden. Cable distribution results with a minor contribution. The end-of-life stage does not result in any relevant environmental impact. Thus, the overall environmental impacts of 1 km of cable are largely dependent on cable weight.

Within the ABC cable family, the 7 cables under study are all made of 65 to 77% of aluminum or aluminum alloy and 23 to 35% of XLPE used as insulation material. The aluminum is the main material and its contribution to environmental impacts is much higher than other materials. Thus, the environmental impact of the life cycle of the cable is mainly due to the extraction and processing of the materials in the stage (A1), with the production of primary aluminum ingot being the main hotspot.

The manufacturing process (A3) has a notable impact in GWP luluc metals and contributes to a lesser extent to other categories. Depending on the impact category considered, the wire drawing and electrical consumption for the product assembly are the main contributing processes in A3.

**ABC: 1x10+10mm<sup>2</sup>**
**Table 4.** Environmental impacts of the life cycle of the ABC cables. Result values in absolute (A) and relative terms (B). Resource use per unit of product during the life cycle of the cable. Waste production per unit of product during the life cycle of the ABC cables.

ENVIRONMENTAL IMPACTS (A)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	kg CO2 eq	9,59E+02	2,39E+01	2,20E-01	1,05E+01	1,45E+01	<b>1,01E+03</b>
GWP-fossil	kg CO2 eq	9,57E+02	2,39E+01	2,20E-01	1,05E+01	1,45E+01	<b>1,01E+03</b>
GWP-biogenic	kg CO2 eq	9,32E-01	1,24E-03	1,24E-05	1,77E-02	4,24E-03	<b>9,55E-01</b>
GWP-luluc	kg CO2 eq	1,18E+00	8,43E-04	8,38E-06	4,84E-04	4,06E-03	<b>1,19E+00</b>
ODP	kg CFC11 eq	8,00E-06	3,53E-07	3,22E-09	3,99E-07	4,38E-08	<b>8,80E-06</b>
POFP	kg NMVOC eq	3,60E+00	3,70E-01	1,16E-03	2,80E-02	1,71E-02	<b>4,01E+00</b>
AP	mol H+ eq	7,79E+00	4,69E-01	8,34E-04	1,67E-02	1,70E-02	<b>8,29E+00</b>
EP-freshwater	kg P eq	5,09E-02	3,33E-05	5,10E-07	1,32E-05	9,01E-05	<b>5,10E-02</b>
EP-marine	kg N eq	1,03E+00	1,23E-01	3,37E-04	5,63E-03	5,87E-03	<b>1,17E+00</b>
EP-terrestrial	mol N eq	1,14E+01	1,36E+00	3,62E-03	6,19E-02	5,71E-02	<b>1,29E+01</b>
ADP-fossil	MJ	1,07E+04	3,03E+02	2,94E+00	1,60E+02	4,48E+01	<b>1,12E+04</b>
ADP-minerals&metals	kg Sb eq	2,29E-03	7,45E-07	1,30E-08	1,02E-07	2,94E-07	<b>2,29E-03</b>
WDP	m3 depriv.	6,93E+01	3,37E-01	4,10E-03	1,16E+02	2,95E-01	<b>1,86E+02</b>

ENVIRONMENTAL IMPACTS (B)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	%	95,13%	2,37%	0,02%	1,04%	1,44%	<b>100,00%</b>
GWP-fossil	%	95,13%	2,37%	0,02%	1,04%	1,44%	<b>100,00%</b>
GWP-biogenic	%	97,57%	0,13%	0,00%	1,86%	0,44%	<b>100,00%</b>
GWP-luluc	%	99,55%	0,07%	0,00%	0,04%	0,34%	<b>100,00%</b>
ODP	%	90,91%	4,01%	0,04%	4,54%	0,50%	<b>100,00%</b>
POFP	%	89,63%	9,21%	0,03%	0,70%	0,43%	<b>100,00%</b>
AP	%	93,93%	5,65%	0,01%	0,20%	0,21%	<b>100,00%</b>
EP-freshwater	%	99,73%	0,07%	0,00%	0,03%	0,18%	<b>100,00%</b>
EP-marine	%	88,45%	10,54%	0,03%	0,48%	0,50%	<b>100,00%</b>
EP-terrestrial	%	88,48%	10,57%	0,03%	0,48%	0,44%	<b>100,00%</b>
ADP-fossil	%	95,44%	2,71%	0,03%	1,43%	0,40%	<b>100,00%</b>
ADP-minerals&metals	%	99,95%	0,03%	0,00%	0,00%	0,01%	<b>100,00%</b>
WDP	%	37,26%	0,18%	0,00%	62,40%	0,16%	<b>100,00%</b>



RESOURCES USE		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
PERE	MJ	6,84E+02	4,80E-01	4,33E-03	1,29E+02	2,66E+00	8,16E+02
PERM	MJ	1,56E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,56E+02
PERT	MJ	8,40E+02	4,80E-01	4,33E-03	1,29E+02	2,66E+00	9,72E+02
PENRE	MJ	1,06E+04	3,22E+02	3,12E+00	1,77E+02	4,76E+01	1,11E+04
PENRM	MJ	7,80E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,80E+02
PENRT	MJ	1,13E+04	3,22E+02	3,12E+00	1,77E+02	4,76E+01	1,19E+04
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	7,67E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,67E+00
FW	m3	2,47E+00	1,38E-02	1,62E-04	4,64E+00	1,64E-02	7,15E+00

WASTE PRODUCTION PARAMETERS		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
HWD	kg	3,55E-01	1,71E-03	1,98E-05	7,33E-04	1,84E-04	3,57E-01
NHWD	kg	1,42E+02	4,46E-02	7,50E-04	3,93E-02	2,78E+01	1,70E+02
RWD	kg	1,09E-02	1,18E-05	1,03E-07	5,13E-06	6,08E-05	1,10E-02
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	1,91E+00	0,00E+00	0,00E+00	0,00E+00	2,74E+01	2,93E+01
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

**ENVIRONMENTAL IMPACTS:** Ozone depletion (ODP), Photochemical ozone formation potential (POFP), Acidification (AP), Eutrophication, freshwater (EP-freshwater), Resource use, fossils (ADP-fossil), Resource use, minerals and metals (ADP-minerals&metals), Water use (WDP).

**RESOURCES USE PARAMETERS:** Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE), Use of renewable primary energy excluding renewable primary energy resources used as raw material (PERE), Use of non-renewable primary energy resources used as raw material (PENRM), Use of renewable primary energy resources used as raw material (PERM), Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT), Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT), Net use of fresh water (FW), Use of secondary materials (MS), Use of renewable secondary fuels (RSF), Use of non-renewable secondary fuels (NRSF).

**WASTE PRODUCTION PARAMETERS:** Hazardous waste disposed (HWD), Non-hazardous waste disposed (NHWD), Radioactive waste disposed (RWD), Materials for energy recovery (MER), Material for recycling (MFR), Components for reuse (CRU), Exported thermal energy (ETE), Exported electricity energy (EEE).

**ABC: 2x16+25mm<sup>2</sup>**
**Table 5.** Environmental impacts of the life cycle of the ABC cables. Result values in absolute (A) and relative terms (B). Resource use per unit of product during the life cycle of the cable. Waste production per unit of product during the life cycle of the ABC cables.

ENVIRONMENTAL IMPACTS (A)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	kg CO2 eq	2,79E+03	7,10E+01	7,17E-01	6,49E+00	5,15E+01	<b>2,92E+03</b>
GWP-fossil	kg CO2 eq	2,79E+03	7,10E+01	7,17E-01	6,48E+00	5,15E+01	<b>2,91E+03</b>
GWP-biogenic	kg CO2 eq	2,57E+00	3,68E-03	4,06E-05	1,10E-02	1,30E-02	<b>2,60E+00</b>
GWP-luluc	kg CO2 eq	3,14E+00	2,51E-03	2,73E-05	3,00E-04	1,20E-02	<b>3,15E+00</b>
ODP	kg CFC11 eq	2,27E-05	1,05E-06	1,05E-08	2,48E-07	1,38E-07	<b>2,42E-05</b>
POFP	kg NMVOC eq	1,05E+01	1,10E+00	3,78E-03	1,74E-02	5,31E-02	<b>1,17E+01</b>
AP	mol H+ eq	2,28E+01	1,40E+00	2,72E-03	1,03E-02	5,24E-02	<b>2,43E+01</b>
EP-freshwater	kg P eq	1,48E-01	9,92E-05	1,66E-06	8,21E-06	2,70E-04	<b>1,48E-01</b>
EP-marine	kg N eq	3,01E+00	3,67E-01	1,10E-03	3,49E-03	1,87E-02	<b>3,40E+00</b>
EP-terrestrial	mol N eq	3,32E+01	4,05E+00	1,18E-02	3,84E-02	1,78E-01	<b>3,74E+01</b>
ADP-fossil	MJ	3,19E+04	9,03E+02	9,57E+00	9,91E+01	1,34E+02	<b>3,30E+04</b>
ADP-minerals&metals	kg Sb eq	5,69E-03	2,22E-06	4,23E-08	6,33E-08	9,85E-07	<b>5,70E-03</b>
WDP	m3 depriv.	2,02E+02	1,00E+00	1,34E-02	7,20E+01	1,36E+00	<b>2,77E+02</b>

ENVIRONMENTAL IMPACTS (B)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	%	95,56%	2,43%	0,02%	0,22%	1,76%	<b>100,00%</b>
GWP-fossil	%	95,55%	2,44%	0,02%	0,22%	1,77%	<b>100,00%</b>
GWP-biogenic	%	98,93%	0,14%	0,00%	0,42%	0,50%	<b>100,00%</b>
GWP-luluc	%	99,53%	0,08%	0,00%	0,01%	0,38%	<b>100,00%</b>
ODP	%	94,02%	4,35%	0,04%	1,02%	0,57%	<b>100,00%</b>
POFP	%	89,92%	9,44%	0,03%	0,15%	0,46%	<b>100,00%</b>
AP	%	93,99%	5,74%	0,01%	0,04%	0,22%	<b>100,00%</b>
EP-freshwater	%	99,74%	0,07%	0,00%	0,01%	0,18%	<b>100,00%</b>
EP-marine	%	88,53%	10,78%	0,03%	0,10%	0,55%	<b>100,00%</b>
EP-terrestrial	%	88,58%	10,81%	0,03%	0,10%	0,48%	<b>100,00%</b>
ADP-fossil	%	96,53%	2,73%	0,03%	0,30%	0,41%	<b>100,00%</b>
ADP-minerals&metals	%	99,94%	0,04%	0,00%	0,00%	0,02%	<b>100,00%</b>
WDP	%	73,09%	0,36%	0,00%	26,05%	0,49%	<b>100,00%</b>

RESOURCES USE		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
PERE	MJ	2,01E+03	1,43E+00	1,41E-02	7,97E+01	7,98E+00	2,10E+03
PERM	MJ	5,10E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,10E+02
PERT	MJ	2,52E+03	1,43E+00	1,41E-02	7,97E+01	7,98E+00	2,61E+03
PENRE	MJ	3,09E+04	9,60E+02	1,02E+01	1,10E+02	1,43E+02	3,22E+04
PENRM	MJ	2,90E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,90E+03
PENRT	MJ	3,38E+04	9,60E+02	1,02E+01	1,10E+02	1,43E+02	3,51E+04
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	2,28E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,28E+01
FW	m3	7,00E+00	4,11E-02	5,28E-04	2,88E+00	6,29E-02	9,99E+00

WASTE PRODUCTION PARAMETERS		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
HWD	kg	9,51E-01	5,08E-03	6,44E-05	4,55E-04	5,53E-04	9,57E-01
NHWD	kg	4,11E+02	1,33E-01	2,44E-03	2,44E-02	8,06E+01	4,92E+02
RWD	kg	3,18E-02	3,51E-05	3,36E-07	3,18E-06	1,82E-04	3,20E-02
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	5,69E+00	0,00E+00	0,00E+00	0,00E+00	7,49E+01	8,06E+01
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

**ENVIRONMENTAL IMPACTS:** Ozone depletion (ODP), Photochemical ozone formation (POFP), Acidification (AP), Eutrophication, freshwater (EP-freshwater), Resource use, fossils (ADP-fossil), Resource use, minerals and metals (ADP-minerals&metals), Water use (WDP).

**RESOURCES USE PARAMETERS:** Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE), Use of renewable primary energy excluding renewable primary energy resources used as raw material (PERE), Use of non-renewable primary energy resources used as raw material (PENRM), Use of renewable primary energy resources used as raw material (PERM), Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT), Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT), Net use of fresh water (FW), Use of secondary materials (MS), Use of renewable secondary fuels (RSF), Use of non-renewable secondary fuels (NRSF).

**WASTE PRODUCTION PARAMETERS:** Hazardous waste disposed (HWD), Non-hazardous waste disposed (NHWD), Radioactive waste disposed (RWD), Materials for energy recovery (MER), Material for recycling (MFR), Components for reuse (CRU), Exported thermal energy (ETE), Exported electricity energy (EEE).

**ABC: 2x16mm<sup>2</sup>**
**Table 6.** Environmental impacts of the life cycle of the ABC cables. Result values in absolute (A) and relative terms (B). Resource use per unit of product during the life cycle of the cable. Waste production per unit of product during the life cycle of the ABC cables.

ENVIRONMENTAL IMPACTS (A)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	kg CO2 eq	2,07E+03	4,07E+01	4,13E-01	6,49E+00	3,21E+01	<b>2,15E+03</b>
GWP-fossil	kg CO2 eq	2,07E+03	4,07E+01	4,12E-01	6,48E+00	3,21E+01	<b>2,15E+03</b>
GWP-biogenic	kg CO2 eq	1,18E+00	2,11E-03	2,33E-05	1,10E-02	7,57E-03	<b>1,20E+00</b>
GWP-luluc	kg CO2 eq	1,14E+00	1,44E-03	1,57E-05	3,00E-04	6,88E-03	<b>1,14E+00</b>
ODP	kg CFC11 eq	1,52E-05	6,02E-07	6,04E-09	2,48E-07	8,15E-08	<b>1,61E-05</b>
POFP	kg NMVOC eq	7,94E+00	6,31E-01	2,17E-03	1,74E-02	3,11E-02	<b>8,62E+00</b>
AP	mol H+ eq	1,89E+01	8,00E-01	1,56E-03	1,03E-02	3,05E-02	<b>1,97E+01</b>
EP-freshwater	kg P eq	3,33E+00	3,11E+00	4,11E+00	5,11E+00	2,13E+01	<b>1,18E-01</b>
EP-marine	kg N eq	2,32E+00	2,10E-01	6,31E-04	3,49E-03	1,11E-02	<b>2,55E+00</b>
EP-terrestrial	mol N eq	2,56E+01	2,32E+00	6,78E-03	3,84E-02	1,05E-01	<b>2,81E+01</b>
ADP-fossil	MJ	2,32E+04	5,17E+02	5,50E+00	9,91E+01	7,73E+01	<b>2,39E+04</b>
ADP-minerals&metals	kg Sb eq	3,61E-04	1,27E-06	2,43E-08	6,33E-08	5,99E-07	<b>3,63E-04</b>
WDP	m3 depriv.	1,10E+02	5,75E-01	7,69E-03	7,20E+01	9,32E-01	<b>1,83E+02</b>

ENVIRONMENTAL IMPACTS (B)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	%	96,30%	1,89%	0,02%	0,30%	1,49%	<b>100,00%</b>
GWP-fossil	%	96,29%	1,89%	0,02%	0,30%	1,49%	<b>100,00%</b>
GWP-biogenic	%	98,28%	0,18%	0,00%	0,92%	0,63%	<b>100,00%</b>
GWP-luluc	%	99,25%	0,13%	0,00%	0,03%	0,60%	<b>100,00%</b>
ODP	%	94,18%	3,74%	0,04%	1,54%	0,51%	<b>100,00%</b>
POFP	%	92,09%	7,32%	0,03%	0,20%	0,36%	<b>100,00%</b>
AP	%	95,73%	4,06%	0,01%	0,05%	0,15%	<b>100,00%</b>
EP-freshwater	%	8,99%	8,41%	11,11%	13,82%	57,67%	<b>100,00%</b>
EP-marine	%	91,15%	8,25%	0,02%	0,14%	0,43%	<b>100,00%</b>
EP-terrestrial	%	93,40%	1,97%	4,42%	0,01%	0,20%	<b>100,00%</b>
ADP-fossil	%	97,07%	2,17%	0,02%	0,42%	0,32%	<b>100,00%</b>
ADP-minerals&metals	%	99,46%	0,35%	0,01%	0,02%	0,17%	<b>100,00%</b>
WDP	%	59,90%	0,31%	0,00%	39,27%	0,51%	<b>100,00%</b>

RESOURCES USE		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
PERE	MJ	9,24E+02	8,19E-01	8,12E-03	7,97E+01	4,59E+00	1,01E+03
PERM	MJ	2,93E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,93E+02
PERT	MJ	1,22E+03	8,19E-01	8,12E-03	7,97E+01	4,59E+00	1,30E+03
PENRE	MJ	2,27E+04	5,50E+02	5,85E+00	1,10E+02	8,22E+01	2,34E+04
PENRM	MJ	1,85E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,85E+03
PENRT	MJ	2,45E+04	5,50E+02	5,85E+00	1,10E+02	8,22E+01	2,53E+04
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	1,31E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,31E+01
FW	m3	3,47E+00	2,35E-02	3,04E-04	2,88E+00	4,06E-02	6,41E+00

WASTE PRODUCTION PARAMETERS		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
HWD	kg	4,27E-01	2,91E-03	3,71E-05	4,55E-04	5,24E-08	4,31E-01
NHWD	kg	3,21E+02	7,61E-02	1,41E-03	2,44E-02	2,06E+03	3,66E+02
RWD	kg	2,53E-02	2,01E-05	1,93E-07	3,18E-06	1,01E-08	2,54E-02
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	3,26E+00	0,00E+00	0,00E+00	0,00E+00	1,66E+03	4,40E+01
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

**ENVIRONMENTAL IMPACTS:** Ozone depletion (ODP), Photochemical ozone formation (POFP), Acidification (AP), Eutrophication, freshwater (EP-freshwater), Resource use, fossils (ADP-fossil), Resource use, minerals and metals (ADP-minerals&metals), Water use (WDP).

**RESOURCES USE PARAMETERS:** Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE), Use of renewable primary energy excluding renewable primary energy resources used as raw material (PERE), Use of non-renewable primary energy resources used as raw material (PENRM), Use of renewable primary energy resources used as raw material (PERM), Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT), Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT), Net use of fresh water (FW), Use of secondary materials (MS), Use of renewable secondary fuels (RSF), Use of non-renewable secondary fuels (NRSF).

**WASTE PRODUCTION PARAMETERS:** Hazardous waste disposed (HWD), Non-hazardous waste disposed (NHWD), Radioactive waste disposed (RWD), Materials for energy recovery (MER), Material for recycling (MFR), Components for reuse (CRU), Exported thermal energy (ETE), Exported electricity energy (EEE).

**ABC: 3x25+54.6mm<sup>2</sup>**

**Table 7.** Environmental impacts of the life cycle of the ABC cables. Result values in absolute (A) and relative terms (B). Resource use per unit of product during the life cycle of the cable. Waste production per unit of product during the life cycle of the ABC cables.

ENVIRONMENTAL IMPACTS (A)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	kg CO2 eq	6,61E+03	1,61E+02	1,65E+00	4,08E+00	1,11E+02	<b>6,89E+03</b>
GWP-fossil	kg CO2 eq	6,60E+03	1,61E+02	1,65E+00	4,07E+00	1,10E+02	<b>6,88E+03</b>
GWP-biogenic	kg CO2 eq	5,89E+00	8,35E-03	9,33E-05	6,91E-03	2,92E-02	<b>5,93E+00</b>
GWP-luluc	kg CO2 eq	7,15E+00	5,69E-03	6,28E-05	1,88E-04	2,73E-02	<b>7,18E+00</b>
ODP	kg CFC11 eq	5,36E-05	2,38E-06	2,42E-08	1,56E-07	3,07E-07	<b>5,64E-05</b>
POFP	kg NMVOC eq	2,49E+01	2,49E+00	8,68E-03	1,09E-02	1,19E-01	<b>2,75E+01</b>
AP	mol H+ eq	5,48E+01	3,16E+00	6,25E-03	6,50E-03	1,17E-01	<b>5,81E+01</b>
EP-freshwater	kg P eq	3,54E-01	2,25E-04	3,83E-06	5,16E-06	6,11E-04	<b>3,55E-01</b>
EP-marine	kg N eq	7,18E+00	8,32E-01	2,52E-03	2,19E-03	4,14E-02	<b>8,06E+00</b>
EP-terrestrial	mol N eq	7,90E+01	9,18E+00	2,71E-02	2,41E-02	3,98E-01	<b>8,86E+01</b>
ADP-fossil	MJ	7,46E+04	2,05E+03	2,20E+01	6,23E+01	3,04E+02	<b>7,70E+04</b>
ADP-minerals&metals	kg Sb eq	1,25E-02	5,03E-06	9,74E-08	3,98E-08	2,15E-06	<b>1,25E-02</b>
WDP	m3 depriv.	4,60E+02	2,27E+00	3,07E-02	4,53E+01	2,72E+00	<b>5,10E+02</b>

ENVIRONMENTAL IMPACTS (B)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	%	95,98%	2,34%	0,02%	0,06%	1,60%	<b>100,00%</b>
GWP-fossil	%	95,97%	2,34%	0,02%	0,06%	1,61%	<b>100,00%</b>
GWP-biogenic	%	99,25%	0,14%	0,00%	0,12%	0,49%	<b>100,00%</b>
GWP-luluc	%	99,54%	0,08%	0,00%	0,00%	0,38%	<b>100,00%</b>
ODP	%	94,91%	4,22%	0,04%	0,28%	0,54%	<b>100,00%</b>
POFP	%	90,43%	9,06%	0,03%	0,04%	0,43%	<b>100,00%</b>
AP	%	94,33%	5,44%	0,01%	0,01%	0,20%	<b>100,00%</b>
EP-freshwater	%	99,76%	0,06%	0,00%	0,00%	0,17%	<b>100,00%</b>
EP-marine	%	89,10%	10,33%	0,03%	0,03%	0,51%	<b>100,00%</b>
EP-terrestrial	%	89,14%	10,35%	0,03%	0,03%	0,45%	<b>100,00%</b>
ADP-fossil	%	96,84%	2,66%	0,03%	0,08%	0,39%	<b>100,00%</b>
ADP-minerals&metals	%	99,94%	0,04%	0,00%	0,00%	0,02%	<b>100,00%</b>
WDP	%	90,14%	0,45%	0,01%	8,87%	0,53%	<b>100,00%</b>

RESOURCES USE		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
PERE	MJ	4,57E+03	3,24E+00	3,25E-02	5,01E+01	1,80E+01	4,65E+03
PERM	MJ	1,17E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,17E+03
PERT	MJ	5,75E+03	3,24E+00	3,25E-02	5,01E+01	1,80E+01	5,82E+03
PENRE	MJ	7,29E+04	2,18E+03	2,34E+01	6,90E+01	3,23E+02	7,55E+04
PENRM	MJ	6,14E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,14E+03
PENRT	MJ	7,91E+04	2,18E+03	2,34E+01	6,90E+01	3,23E+02	8,17E+04
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	5,18E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,18E+01
FW	m3	1,60E+01	9,31E-02	1,21E-03	1,81E+00	1,32E-01	1,80E+01

WASTE PRODUCTION PARAMETERS		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
HWD	kg	2,19E+00	1,15E-02	1,48E-04	2,86E-04	1,25E-03	2,21E+00
NHWD	kg	9,83E+02	3,01E-01	5,62E-03	1,53E-02	1,84E+02	1,17E+03
RWD	kg	7,60E-02	7,96E-05	7,72E-07	2,00E-06	4,12E-04	7,65E-02
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	1,29E+01	0,00E+00	0,00E+00	0,00E+00	1,75E+02	1,88E+02
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

**ENVIRONMENTAL IMPACTS:** Ozone depletion (ODP), Photochemical ozone formation (POFP), Acidification (AP), Eutrophication, freshwater (EP-freshwater), Resource use, fossils (ADP-fossil), Resource use, minerals and metals (ADP-minerals&metals), Water use (WDP).

**RESOURCES USE PARAMETERS:** Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE), Use of renewable primary energy excluding renewable primary energy resources used as raw material (PERE), Use of non-renewable primary energy resources used as raw material (PENRM), Use of renewable primary energy resources used as raw material (PERM), Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT), Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT), Net use of fresh water (FW), Use of secondary materials (MS), Use of renewable secondary fuels (RSF), Use of non-renewable secondary fuels (NRSF).

**WASTE PRODUCTION PARAMETERS:** Hazardous waste disposed (HWD), Non-hazardous waste disposed (NHWD), Radioactive waste disposed (RWD), Materials for energy recovery (MER), Material for recycling (MFR), Components for reuse (CRU), Exported thermal energy (ETE), Exported electricity energy (EEE).

**ABC: 3x35+2x16+54.6mm<sup>2</sup>**
**Table 8.** Environmental impacts of the life cycle of the ABC cables. Result values in absolute (A) and relative terms (B). Resource use per unit of product during the life cycle of the cable. Waste production per unit of product during the life cycle of the ABC cables

ENVIRONMENTAL IMPACTS (A)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	kg CO2 eq	9,62E+03	2,17E+02	3,30E+00	2,95E+00	1,50E+02	<b>9,99E+03</b>
GWP-fossil	kg CO2 eq	9,60E+03	2,17E+02	3,30E+00	2,95E+00	1,50E+02	<b>9,98E+03</b>
GWP-biogenic	kg CO2 eq	7,70E+00	1,12E-02	1,87E-04	5,00E-03	3,93E-02	<b>7,76E+00</b>
GWP-luluc	kg CO2 eq	8,84E+00	7,66E-03	1,26E-04	1,36E-04	3,68E-02	<b>8,88E+00</b>
ODP	kg CFC11 eq	7,59E-05	3,21E-06	4,83E-08	1,12E-07	4,15E-07	<b>7,96E-05</b>
POFP	kg NMVOC eq	3,65E+01	3,36E+00	1,74E-02	7,90E-03	1,60E-01	<b>4,00E+01</b>
AP	mol H+ eq	8,22E+01	4,26E+00	1,25E-02	4,70E-03	1,58E-01	<b>8,67E+01</b>
EP-freshwater	kg P eq	5,26E-01	3,03E-04	7,65E-06	3,73E-06	8,22E-04	<b>5,27E-01</b>
EP-marine	kg N eq	1,06E+01	1,12E+00	5,05E-03	1,59E-03	5,60E-02	<b>1,18E+01</b>
EP-terrestrial	mol N eq	1,16E+02	1,23E+01	5,43E-02	1,74E-02	5,37E-01	<b>1,29E+02</b>
ADP-fossil	MJ	1,08E+05	2,75E+03	4,40E+01	4,51E+01	4,09E+02	<b>1,11E+05</b>
ADP-minerals&metals	kg Sb eq	1,31E-02	6,77E-06	1,95E-07	2,88E-08	2,91E-06	<b>1,31E-02</b>
WDP	m3 depriv.	6,18E+02	3,06E+00	6,15E-02	3,27E+01	3,75E+00	<b>6,58E+02</b>

ENVIRONMENTAL IMPACTS (B)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	%	96,27%	2,17%	0,03%	0,03%	1,50%	<b>100,00%</b>
GWP-fossil	%	96,26%	2,17%	0,03%	0,03%	1,51%	<b>100,00%</b>
GWP-biogenic	%	99,28%	0,14%	0,00%	0,06%	0,51%	<b>100,00%</b>
GWP-luluc	%	99,50%	0,09%	0,00%	0,00%	0,41%	<b>100,00%</b>
ODP	%	95,25%	4,03%	0,06%	0,14%	0,52%	<b>100,00%</b>
POFP	%	91,15%	8,39%	0,04%	0,02%	0,40%	<b>100,00%</b>
AP	%	94,89%	4,91%	0,01%	0,01%	0,18%	<b>100,00%</b>
EP-freshwater	%	99,78%	0,06%	0,00%	0,00%	0,16%	<b>100,00%</b>
EP-marine	%	89,95%	9,52%	0,04%	0,01%	0,48%	<b>100,00%</b>
EP-terrestrial	%	89,99%	9,54%	0,04%	0,01%	0,42%	<b>100,00%</b>
ADP-fossil	%	97,07%	2,48%	0,04%	0,04%	0,37%	<b>100,00%</b>
ADP-minerals&metals	%	99,92%	0,05%	0,00%	0,00%	0,02%	<b>100,00%</b>
WDP	%	93,98%	0,46%	0,01%	4,98%	0,57%	<b>100,00%</b>



RESOURCES USE		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
PERE	MJ	7,25E+03	4,36E+00	6,49E-02	3,62E+01	2,43E+01	<b>7,32E+03</b>
PERM	MJ	2,35E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	<b>2,35E+03</b>
PERT	MJ	9,60E+03	4,36E+00	6,49E-02	3,62E+01	2,43E+01	<b>9,66E+03</b>
PENRE	MJ	1,06E+05	2,93E+03	4,68E+01	4,99E+01	4,35E+02	<b>1,09E+05</b>
PENRM	MJ	8,38E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	<b>8,38E+03</b>
PENRT	MJ	1,14E+05	2,93E+03	4,68E+01	4,99E+01	4,35E+02	<b>1,18E+05</b>
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	<b>0,00E+00</b>
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	<b>0,00E+00</b>
NRSF	MJ	6,97E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	<b>6,97E+01</b>
FW	m3	2,10E+01	1,25E-01	2,43E-03	1,31E+00	1,80E-01	<b>2,26E+01</b>

WASTE PRODUCTION PARAMETERS		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
HWD	kg	2,82E+00	1,55E-02	2,96E-04	2,07E-04	1,68E-03	<b>2,83E+00</b>
NHWD	kg	1,45E+03	4,05E-01	1,12E-02	1,11E-02	2,48E+02	<b>1,70E+03</b>
RWD	kg	1,13E-01	1,07E-04	1,54E-06	1,45E-06	5,54E-04	<b>1,13E-01</b>
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	<b>0,00E+00</b>
MFR	kg	1,74E+01	0,00E+00	0,00E+00	0,00E+00	2,34E+02	<b>2,51E+02</b>
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	<b>0,00E+00</b>
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	<b>0,00E+00</b>
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	<b>0,00E+00</b>

**ENVIRONMENTAL IMPACTS:** Ozone depletion (ODP), Photochemical ozone formation (POFP), Acidification (AP), Eutrophication, freshwater (EP-freshwater), Resource use, fossils (ADP-fossil), Resource use, minerals and metals (ADP-minerals&metals), Water use (WDP).

**RESOURCES USE PARAMETERS:** Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE), Use of renewable primary energy excluding renewable primary energy resources used as raw material (PERE), Use of non-renewable primary energy resources used as raw material (PENRM), Use of renewable primary energy resources used as raw material (PERM), Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT), Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT), Net use of fresh water (FW), Use of secondary materials (MS), Use of renewable secondary fuels (RSF), Use of non-renewable secondary fuels (NRSF).

**WASTE PRODUCTION PARAMETERS:** Hazardous waste disposed (HWD), Non-hazardous waste disposed (NHWD), Radioactive waste disposed (RWD), Materials for energy recovery (MER), Material for recycling (MFR), Components for reuse (CRU), Exported thermal energy (ETE), Exported electricity energy (EEE).

**ABC: 3x95+54.6mm<sup>2</sup>**
**Table 9.** Environmental impacts of the life cycle of the ABC cables. Result values in absolute (A) and relative terms (B). Resource use per unit of product during the life cycle of the cable. Waste production per unit of product during the life cycle of the ABC cables.

ENVIRONMENTAL IMPACTS (A)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	kg CO2 eq	2,00E+04	3,79E+02	3,30E+00	1,09E+00	2,15E+02	<b>2,06E+04</b>
GWP-fossil	kg CO2 eq	1,99E+04	3,79E+02	3,30E+00	1,09E+00	2,15E+02	<b>2,05E+04</b>
GWP-biogenic	kg CO2 eq	1,31E+01	1,96E-02	1,87E-04	1,84E-03	6,66E-02	<b>1,31E+01</b>
GWP-luluc	kg CO2 eq	1,45E+01	1,34E-02	1,26E-04	5,02E-05	6,47E-02	<b>1,46E+01</b>
ODP	kg CFC11 eq	1,52E-04	5,61E-06	4,83E-08	4,15E-08	6,83E-07	<b>1,58E-04</b>
POFP	kg NMVOC eq	7,61E+01	5,87E+00	1,74E-02	2,91E-03	2,69E-01	<b>8,22E+01</b>
AP	mol H+ eq	1,79E+02	7,45E+00	1,25E-02	1,73E-03	2,68E-01	<b>1,87E+02</b>
EP-freshwater	kg P eq	1,13E+00	5,29E-04	7,65E-06	1,38E-06	1,43E-03	<b>1,14E+00</b>
EP-marine	kg N eq	2,23E+01	1,96E+00	5,05E-03	5,85E-04	9,11E-02	<b>2,44E+01</b>
EP-terrestrial	mol N eq	2,46E+02	2,16E+01	5,43E-02	6,43E-03	8,93E-01	<b>2,68E+02</b>
ADP-fossil	MJ	2,15E+05	4,82E+03	4,40E+01	1,66E+01	7,10E+02	<b>2,20E+05</b>
ADP-minerals&metals	kg Sb eq	1,49E-02	1,18E-05	1,95E-07	1,06E-08	4,47E-06	<b>1,49E-02</b>
WDP	m3 depriv.	1,07E+03	5,35E+00	6,15E-02	1,21E+01	3,80E+00	<b>1,09E+03</b>

ENVIRONMENTAL IMPACTS (B)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	%	97,09%	1,84%	0,02%	0,01%	1,05%	<b>100,00%</b>
GWP-fossil	%	97,09%	1,85%	0,02%	0,01%	1,05%	<b>100,00%</b>
GWP-biogenic	%	99,33%	0,15%	0,00%	0,01%	0,51%	<b>100,00%</b>
GWP-luluc	%	99,46%	0,09%	0,00%	0,00%	0,44%	<b>100,00%</b>
ODP	%	95,97%	3,54%	0,03%	0,03%	0,43%	<b>100,00%</b>
POFP	%	92,51%	7,14%	0,02%	0,00%	0,33%	<b>100,00%</b>
AP	%	95,86%	3,99%	0,01%	0,00%	0,14%	<b>100,00%</b>
EP-freshwater	%	99,83%	0,05%	0,00%	0,00%	0,13%	<b>100,00%</b>
EP-marine	%	91,56%	8,04%	0,02%	0,00%	0,37%	<b>100,00%</b>
EP-terrestrial	%	91,59%	8,06%	0,02%	0,00%	0,33%	<b>100,00%</b>
ADP-fossil	%	97,46%	2,19%	0,02%	0,01%	0,32%	<b>100,00%</b>
ADP-minerals&metals	%	99,89%	0,08%	0,00%	0,00%	0,03%	<b>100,00%</b>
WDP	%	98,05%	0,49%	0,01%	1,11%	0,35%	<b>100,00%</b>

RESOURCES USE		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
PERE	MJ	8,98E+03	7,62E+00	6,49E-02	1,34E+01	4,22E+01	9,04E+03
PERM	MJ	2,35E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,35E+03
PERT	MJ	1,13E+04	7,62E+00	6,49E-02	1,34E+01	4,22E+01	1,14E+04
PENRE	MJ	2,16E+05	5,12E+03	4,68E+01	1,84E+01	7,55E+02	2,22E+05
PENRM	MJ	1,13E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,13E+04
PENRT	MJ	2,27E+05	5,12E+03	4,68E+01	1,84E+01	7,55E+02	2,33E+05
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	1,22E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,22E+02
FW	m3	3,60E+01	2,19E-01	2,43E-03	4,82E-01	2,34E-01	3,70E+01

WASTE PRODUCTION PARAMETERS		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
HWD	kg	5,05E+00	2,71E-02	2,96E-04	7,62E-05	2,92E-03	5,08E+00
NHWD	kg	3,11E+03	7,09E-01	1,12E-02	4,09E-03	4,45E+02	3,56E+03
RWD	kg	2,43E-01	1,88E-04	1,54E-06	5,33E-07	9,65E-04	2,44E-01
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	3,04E+01	0,00E+00	0,00E+00	0,00E+00	4,48E+02	4,78E+02
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

**ENVIRONMENTAL IMPACTS:** Ozone depletion (ODP), Photochemical ozone formation (POFP), Acidification (AP), Eutrophication, freshwater (EP-freshwater), Resource use, fossils (ADP-fossil), Resource use, minerals and metals (ADP-minerals&metals), Water use (WDP).

**RESOURCES USE PARAMETERS:** Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE), Use of renewable primary energy excluding renewable primary energy resources used as raw material (PERE), Use of non-renewable primary energy resources used as raw material (PENRM), Use of renewable primary energy resources used as raw material (PERM), Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT), Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT), Net use of fresh water (FW), Use of secondary materials (MS), Use of renewable secondary fuels (RSF), Use of non-renewable secondary fuels (NRSF).

**WASTE PRODUCTION PARAMETERS:** Hazardous waste disposed (HWD), Non-hazardous waste disposed (NHWD), Radioactive waste disposed (RWD), Materials for energy recovery (MER), Material for recycling (MFR), Components for reuse (CRU), Exported thermal energy (ETE), Exported electricity energy (EEE).

**ABC: 4x16mm<sup>2</sup>**
**Table 10.** Environmental impacts of the life cycle of the ABC cables. Result values in absolute (A) and relative terms (B). Resource use per unit of product during the life cycle of the cable. Waste production per unit of product during the life cycle of the ABC cables.

ENVIRONMENTAL IMPACTS (A)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	kg CO2 eq	4,17E+03	8,14E+01	1,65E+00	6,49E+00	6,43E+01	<b>4,32E+03</b>
GWP-fossil	kg CO2 eq	4,17E+03	8,14E+01	1,65E+00	6,48E+00	6,43E+01	<b>4,32E+03</b>
GWP-biogenic	kg CO2 eq	2,47E+00	4,22E-03	9,33E-05	1,10E-02	1,51E-02	<b>2,50E+00</b>
GWP-luluc	kg CO2 eq	2,31E+00	2,88E-03	6,28E-05	3,00E-04	1,38E-02	<b>2,33E+00</b>
ODP	kg CFC11 eq	3,07E-05	1,20E-06	2,42E-08	2,48E-07	1,63E-07	<b>3,23E-05</b>
POFP	kg NMVOC eq	1,60E+01	1,26E+00	8,68E-03	1,74E-02	6,21E-02	<b>1,74E+01</b>
AP	mol H+ eq	3,79E+01	1,60E+00	6,25E-03	1,03E-02	6,10E-02	<b>3,95E+01</b>
EP-freshwater	kg P eq	2,37E-01	1,14E-04	3,83E-06	8,21E-06	3,10E-04	<b>2,37E-01</b>
EP-marine	kg N eq	4,69E+00	4,21E-01	2,52E-03	3,49E-03	2,22E-02	<b>5,14E+00</b>
EP-terrestrial	mol N eq	5,16E+01	4,64E+00	2,71E-02	3,84E-02	2,10E-01	<b>5,65E+01</b>
ADP-fossil	MJ	4,66E+04	1,03E+03	2,20E+01	9,91E+01	1,55E+02	<b>4,79E+04</b>
ADP-minerals&metals	kg Sb eq	7,32E-04	2,54E-06	9,74E-08	6,33E-08	1,20E-06	<b>7,36E-04</b>
WDP	m3 depriv.	2,25E+02	1,15E+00	3,07E-02	7,20E+01	1,86E+00	<b>3,00E+02</b>

ENVIRONMENTAL IMPACTS (B)		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
GWP-total	%	96,44%	1,88%	0,04%	0,15%	1,49%	<b>100,00%</b>
GWP-fossil	%	96,44%	1,88%	0,04%	0,15%	1,49%	<b>100,00%</b>
GWP-biogenic	%	98,78%	0,17%	0,00%	0,44%	0,61%	<b>100,00%</b>
GWP-luluc	%	99,27%	0,12%	0,00%	0,01%	0,59%	<b>100,00%</b>
ODP	%	94,93%	3,72%	0,07%	0,77%	0,50%	<b>100,00%</b>
POFP	%	92,23%	7,26%	0,05%	0,10%	0,36%	<b>100,00%</b>
AP	%	95,76%	4,05%	0,02%	0,03%	0,15%	<b>100,00%</b>
EP-freshwater	%	99,82%	0,05%	0,00%	0,00%	0,13%	<b>100,00%</b>
EP-marine	%	91,26%	8,19%	0,05%	0,07%	0,43%	<b>100,00%</b>
EP-terrestrial	%	91,31%	8,20%	0,05%	0,07%	0,37%	<b>100,00%</b>
ADP-fossil	%	97,27%	2,16%	0,05%	0,21%	0,32%	<b>100,00%</b>
ADP-minerals&metals	%	99,47%	0,35%	0,01%	0,01%	0,16%	<b>100,00%</b>
WDP	%	74,97%	0,38%	0,01%	24,01%	0,62%	<b>100,00%</b>

RESOURCES USE		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
PERE	MJ	2,91E+03	1,64E+00	3,25E-02	7,97E+01	9,17E+00	3,00E+03
PERM	MJ	1,17E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,17E+03
PERT	MJ	4,08E+03	1,64E+00	3,25E-02	7,97E+01	9,17E+00	4,18E+03
PENRE	MJ	4,57E+04	1,10E+03	2,34E+01	1,10E+02	1,64E+02	4,71E+04
PENRM	MJ	3,69E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,69E+03
PENRT	MJ	4,94E+04	1,10E+03	2,34E+01	1,10E+02	1,64E+02	5,08E+04
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	2,62E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,62E+01
FW	m3	7,08E+00	4,71E-02	1,21E-03	2,88E+00	8,11E-02	1,01E+01

WASTE PRODUCTION PARAMETERS		Manufacturing	Distribution	Installation	Use&Maintenance	End of life	
Parameter	Unit	A1 – A3	A4	A5	B	C2 – C4	Total
HWD	kg	8,56E-01	5,82E-03	1,48E-04	4,55E-04	6,37E-04	8,63E-01
NHWD	kg	6,42E+02	1,52E-01	5,62E-03	2,44E-02	9,11E+01	7,33E+02
RWD	kg	5,08E-02	4,03E-05	7,72E-07	3,18E-06	2,09E-04	5,10E-02
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	6,52E+00	0,00E+00	0,00E+00	0,00E+00	8,15E+01	8,80E+01
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

**ENVIRONMENTAL IMPACTS:** Ozone depletion (ODP), Photochemical ozone formation (POFP), Acidification (AP), Eutrophication, freshwater (EP-freshwater), Resource use, fossils (ADP-fossil), Resource use, minerals and metals (ADP-minerals&metals), Water use (WDP).

**RESOURCES USE PARAMETERS:** Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE), Use of renewable primary energy excluding renewable primary energy resources used as raw material (PERE), Use of non-renewable primary energy resources used as raw material (PENRM), Use of renewable primary energy resources used as raw material (PERM), Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT), Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT), Net use of fresh water (FW), Use of secondary materials (MS), Use of renewable secondary fuels (RSF), Use of non-renewable secondary fuels (NRSF).

**WASTE PRODUCTION PARAMETERS:** Hazardous waste disposed (HWD), Non-hazardous waste disposed (NHWD), Radioactive waste disposed (RWD), Materials for energy recovery (MER), Material for recycling (MFR), Components for reuse (CRU), Exported thermal energy (ETE), Exported electricity energy (EEE).

## 6. LCA Calculation rules

### 6.1 Data source quality and allocation

Primary data was collected from different departments for the manufacturing plant of Henan Huaxing Cables Co., Ltd for the year 2020. Secondary data comes from the Ecoinvent 3.9.1 database set. The main assumptions and considerations are described in the next section.

The allocation for the energy, water and packaging material consumptions and for the waste was done using mass allocation method based on inventory data.

### 6.2 Scenarios, assumptions and considerations

- The electricity consumption for manufacturing is modelled as “medium voltage”, and for China mix provided by Ecoinvent 3.9.1, based on the source mentioned in Ecoinvent process (China Electric Power Yearbook 2015, with data for 2014)
- The PPP (Polluter Pays Principle) is applied to determine the system boundaries for waste: for recovery and recycling processes, which take place outside the boundaries of the product system, only impacts related to the transport of the waste to the treatment platform are included in the system boundaries. Incineration and disposal processes are included in the system boundaries, at stage A5 (installation) and C4 (Cable disposal).
- For the waste generated in the manufacturing stage (A3 process) the following scenario are assumed:
  - Metal scrap is assumed to be 100% recycled in other systems.
  - Plastics Scrap: 25% landfill/25% incineration/50% recycled.
  - Hazardous Waste: 100% Incineration.
- Wooden drums for distribution are acquired as new (not reused), and assumed 100% reused at the end of life in A5
- For distribution, transport was considered EURO IV category vehicle, in absence of primary data on the fleet of vehicle used, as a precautionary approach following PCR 016 (4.2.3.3).
- In the use phase, the cable dissipates energy due to the Joule Effect was calculated according to the formula:

$$E_{use} \left[ \frac{J}{km \cdot A^2} \right] = R_{linear} \cdot I^2 \cdot RSL$$

- A RSL of 40 years was assumed
- For the Use phase the following scenario was considered: 40% Perú, 30% Brasil, 30% Argentina and the country electrical mix provided by Ecoinvent 3.9.1.
- For the cables end of life (after dismantling), it was assumed 50% cables are recycled (based on the statistics in 2019, the collection rate of WEEE was 48.5 % in the European Union), thus the following End-of-life scenarios are assumed for each material:
  - Plastics: 25% landfill/25% incineration/50% recycled.
  - Aluminum: 50% Incineration/ 50% recycled.
- Waste treatment (shredding as a preparation to recycling) of cables is included (C3). Further recycling operations are out of boundary, as PPP principle is applied.
- The distance to waste treatment plant is assumed to be 100 Km.

### 6.3 Cut-off rules

As established in the PCR of construction products, at least 95% of each input and output of the system have been included. For this study, more than 98% of the weight of the declared product was considered in this study and packaging materials for distribution are also included.

According to the EPDItaly Regulations and PCR EPDItaly007, the following flows and operations were cut-off:

- Production, use and disposal of the packaging of components and semi-finished intermediates
- Materials making up the cable itself whose total mass does not exceed 2% of the total weight of the device (i.e. polyester tape eventually used for the cable).
- Material and energy flows related to the installation stage, whenever it is reasonable to assume that installation is performed manually.

- Devices external to the cable itself (e.g. insulators, poles) required for installation.
- Any extraordinary maintenance done on the cables.
- Material and energy flows related to the cables' removal from the installation site, whenever it is reasonable to assume that dismantling is performed by adopting manual tools (e.g. screwdrivers, hammers, etc.).

Moreover, the processes listed below have not been included:

- Manufacturing of production equipment, buildings, and other capital goods.
- Business travel of personnel.
- Travel to and from work by personnel.
- Long term emissions.

## REFERENCES

- ISO 14040:2006 – Environmental management – Life Cycle Assessment – Principles and framework
- ISO 14044:2006 – Environmental management – Life Cycle Assessment – Requirements
- EN ISO 14025:2006- Labels and environmental declarations.
- ISO/TR 14047: 2003 – Gestión Medioambiental – Análisis del ciclo de vida – Ejemplos de aplicación de LCI (Inventario del Ciclo de Vida)
- ISO/TS 14048: 2003 – Environmental management – Life Cycle Assessment – Data inventory
- ISO/TR 14049: 2000 – Environmental management – Life Cycle Assessment – Objectives, scope and inventory interpretation
- PCR EPD Italy 007: “Electronic and electrical product and systems” Rev. 3 (13.01.2023), valid until 19/01/2025, CPC 46, in conformity with EN 50693:2019
- Sub-PCR EPD Italy 016: “Electronic And Electrical Products And Systems –Cables And Wires” Rev.2, issue date 25/09/2020, valid until 25/09/2025, CPC 463 family “Insulated wire and cable; optical fibre cables” and subsequent clusters , in conformity with:
- EN 50693:2020 Product category rules for life cycle assessments of electronic and electrical products and systems
- EN 15804:2012 +A2:2019 Sustainability of construction works -Environmental product declarations -Core rules for the product category of construction products
- REGULATIONS OF THE EPDItaly PROGRAMME rev 5.2, 16/02/2022
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