



ENVIRONMENTAL PRODUCT DECLARATION

Product names:

Low voltage, multi-core cables of the N1VV-K family:

- N1VV-K 7X1,5 0,6/1KV CPR EN50575
- N1VV-K 7X2,5 0,6/1KV CPR EN50575
- N1VV-K 12X2,5 0,6/1KV CPR EN50575
- N1VV-K 16X2,5 0,6/1KV CPR EN50575

Manufacturing site:

Via Francesca, 8 – 24060 BOLGARE (BG)
Italy




Compliant with ISO 14025 and EN 50693:2019

Program Operator	EPDItaly
Publisher	EPDItaly
Declaration Number	ICC Cavi N1VV-K 01
Registration Number	EPDITALY0609
Issue Date	06/02/2024
Valid to	06/02/2029

Rev. 01

1. General information

EPD Owner Information	
EPD Owner	Italian Cable Company S.p.A.
Address	Via Francesca, 8, 24060 Bolgare (BG), Italy
Website	https://icc.it/
Contact	Gian Carlo Garbo, R&D Manager, GianCarlo.Garbo@icc.it Pietro De Mattia, Marketing Manager, Pietro.DeMattia@icc.it
Program Information	
Program Operator	EPDItaly 
Address	EPDItaly Via Gaetano De Castillia, 10 20124 – Milano Italy
Website	https://www.epditaly.it/
Contact	info@epditaly.it (+39) 02 701 5081
EPD Information	
Product names	<ul style="list-style-type: none"> - N1VC7V-K 4X25 0,6/1KV CPR EN50575 - N1VC7V-K 7X1,5 0,6/1KV CPR EN50575 - N1VC7V-K 7X2,5 0,6/1KV CPR EN50575 - N1VC7V-K 12X2,5 0,6/1KV CPR EN50575 - N1VC7V-K 16X2,5 0,6/1KV CPR EN50575 - X1151/1 3X1,5+12X0,5 - X1151/2 6X1,5+19X0,5 - X1151/3 6X1,5+25X0,5
CPC Code	463 family “Insulated wire and cable; optical fibre cables” and sub-subsequent clusters
Functional Unit	1 km of electrical cable, for all life cycle stages, besides use phase.
Applied Standards	ISO 14040:2006/Amd 1:2020 “Environmental management. Life cycle assessment. Principles and framework”. ISO 14044:2006/Amd 2:2020 “Environmental management. Life cycle assessment. Requirements and guidelines”. EN 56093:2019 “Product category rules for life cycle assessments of electronic and electrical products and systems”
Product Category Rules	Core PCR EPDItaly007 rev. 3 2023/01/13 “Electronic and Electrical Products and Systems”. Sub-PCR EPDItaly016 rev. 02 2020/09/25 “Electronic and Electrical Products and Systems – Cables and Wires”.
Comparability	Italian Cable Company, the EPD Owner, is responsible for the statements regarding this Environmental Product Declaration. This EPD is compliant with the Product Category Rules applicable for the certified product(s) and with the EN 50693:2019 standard. EPDs of similar products but from different program operators may not be comparable with this one.
Verification statement / Independent verification	The review of the PCR was conducted by ICMQ S.p.A. – Via G. De Castillia, 10 Eng. Elena Neri, Indaco2 – info@epditaly.it . Independent verification of this declaration and of related data was conducted according to ISO 14025:2010. <input type="checkbox"/> Internal verification <input checked="" type="checkbox"/> External verification. Third-party independent verification conducted by IMQ S.p.A - Via Quintiliano 43, 20138 Milano Italia - Tel. 02 50731 - PEC: direzione.img@legalmail.it , accredited by <i>Accredia</i> .
Responsibility Statement	The EPD owner releases EPDItaly from any non-compliance with environmental legislation. The holder of the declaration will be responsible for the information and the related supporting evidence.

	EPDItaly declines any responsibility regarding the information, data and results provided by the EPD Owner for the life cycle assessment.
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2. Company profile

Italian Cable Company (ICC) was initially established as Rota Cavi in 1961. It became Italian Cable Company (ICC) in 2001, after a series of acquisitions and integrations of new production processes. ICC is a flagship Italian producer of cables for energy, industrial, signaling and control applications.

The name desired by the Owner after the first 40 years of history combines the international vocation and the guarantee of Made in Italy quality. The growth strategy of the 2000s was also achieved thanks to joint ventures with companies across the border, followed in 2004 by the integration of Siltek, an Italian company specialized in the production of cables for high-temperature applications.

The growing complexity of the markets led ICC to increasingly establish its strategy on innovation, integration, and internationalization, recognizing the changes as important opportunities for growth and reinvention. ICC aims at continuous improvement and excellence, investing in Research and Development, cutting-edge technologies, organizational flexibility, as well as attention to the individual and the environment.

Currently, the ICC Group is composed of four companies: ICC and C.M.R in Italy, E-Cablaje in Romania and Techno Indusil in Argentina.

In over 60 years of history, Italian Cable Company has consolidated itself as an international group, known in over 70 countries for the quality of its products and services, with over 600 factory employees, both in Italy and abroad.

3. Scope and type of the EPD

Type of EPD

Product-Specific EPD; this declaration pertains to a group of specific products by a specific manufacturer.

Geographical scope

Cable manufacturing occurs in the Italian geographical scope, whilst distribution occurs within the European geographical scope.

Functional Unit

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

System boundaries

This EPD entails the entire life cycle of the cables manufactured by ICC, from “Cradle to Grave”. Consistently with the indications of PCR 007 – Electronics and Electrical Products and Systems” and sub-PCR 016 – “Cables and Wires”, the system boundaries include the contributions reported in Table 1.

TABLE 1 SYSTEM BOUNDARIES

Manufacturing Stage		Distribution Stage	Installation Stage	USE & Maintenance Stage	End-of-Life Stage, De-installation
Upstream Module	Core Module	Downstream Module			
Extraction of raw materials and production of semi-finished products (copper rods, PVC granulate etc).	Production of the packaging for product shipment	Transport of finished product to the client’s warehouse	Transport finished product to the installation site	Energy loss as heat during the lifetime of the cable	Cable recovery from site and its End-of-Life
Upstream transport of raw materials and packaging to ICC plant for cable production	Cable production, including relevant energy consumption		Transport and recycling of installation waste (trimmed cable)		
	Core waste treatment		Transport and recycling/disposal of cable packaging		

Description of the life cycle stages in the different modules:

Upstream Module

Manufacturing Stage

- Extraction of the copper from the raw ore and subsequent processes of electrowinning to purify the copper to a “Grade-A cathode”, suitable for electrical wire applications. Up to 2,5% of the copper content in the cables produced by ICC is recycled from existing electrical cable scraps and as such it does not require further electrochemical purification. Cooper is provided to ICC in the form of spooled rods, suitable for further wiring process.
- Preparation of the PVC granulate and masterbatch, suitable for the extrusion of the insulation.
- Upstream transport of raw materials and packaging to ICC plant for cable production.

Core Module

Manufacturing Stage

- Production of the packaging for product shipment. Primary packaging consists of a LDPE film wrapping. Packaged cables are then delivered on wooden Euro-pallets;
- Wiring of the copper rods into thin copper wires, to be subsequently twisted to form the conductor core;
- Extrusion of the PVC granulate to form the single-core conductor insulation;
- Assembly individual single-core conductors into a multi-core cable;
- Application of the flame-retardant PVC filler to the multi-core;
- Application of cable sheath in PVC;
- Extrusion of external PVC insulation;
- Packaging of the finished cables.

Operations in the Core Module entail:

- Consumption of material, accounting for scraps to be recovered.
- Consumption of electricity, thermal energy, water.
- Waste from production operations, its transportation to recycling/disposal site and waste treatment.

Downstream Module

Distribution Stage

- Cable transportation to ICC's client warehouse.

Installation Stage

- Cable transportation to installation sites.
- During installation, a loss of 5% of cable is accounted for. Cable trimmings are then recovered, and the material recycled. End-of-Life of the packaging of the cable is also accounted for in this phase.

Use & Maintenance Stage

This phase comprises, as sole contribution, the energy dissipated as heat, due to the Joule's effect, during the reference service life (RSL) of the cable. As indicated in sub-PCR 016, the formula employed to calculate the energy loss is the following:

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

Where:

- E_{use} is the energy dissipated by the cable during its operating time;
- R_{linear} is the linear resistivity of the cable, expressed as $\Omega \cdot km$;
- I is the electrical current. $I = 1$ A is set as a reference current for comparison of the environmental performances with other EPDs of similar cables using the same PCR employed herein.
- RSL is the Reference Service Life of the cable. For comparison with other similar cables, RSL is set to 40 years, expressed in seconds in the formula.

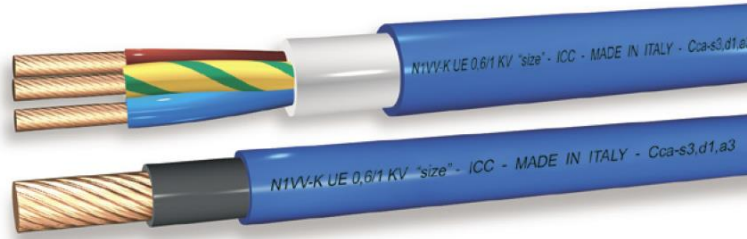
End-of-Life Stage, Deinstallation

In the End-of-Life of the cable, it was assumed a 100% recovery of the cable from the installation site. Subsequent operations were taken into account:

- Transport of the cable to recycling. A distance of 50 km to recycling site was considered;
- Dismantling of the cable to recover the different materials, including the energy consumption associated to this operation;
- Recycling of 100% of copper and 70% recycling of the plastic materials.
- Disposal processes of the plastic material that was not recycled.

4. Description of the products

Product identification



The products in this EPD are the following electrical cables of the N1VC7V-K family, produced by ICC:

- N1VV-K 7X1,5 0,6/1KV CPR EN50575
- N1VV-K 7X2,5 0,6/1KV CPR EN50575
- N1VV-K 12X2,5 0,6/1KV CPR EN50575
- N1VV-K 16X2,5 0,6/1KV CPR EN50575

Electrical cables of the N1VV-K family are multi-core, i.e. the cable is composed of multiple copper conductors (wires). A PVC sheath is applied, then an external PVC insulation.

Function and application

Power cables, indoor use also in wet environments, outdoor installation, fixed laying on bare walls or steel structures, in pipes or in underground. UV resistant, suitable for permanent external use.

Cables suitable for electrical power systems in constructions and other civil engineering buildings, in order to limit fire and smoke production and spread, in accordance with the European Construction Product Regulation (CPR) Class Cca-s3, d1, a3.

Cable composition

The following table lists the unitary mass of 1 km of cable and the composition and quantity of the different materials.

TABLE 2 CABLE UNITARY MASS AND COMPOSITION

	Cable unitary mass kg	Copper (energy transmission and shielding) kg	PVC (insulation) kg
N1VV-K 7X1,5 0,6/1KV CPR EN50575	305,3	88,5	216,8
N1VV-K 7X2,5 0,6/1KV CPR EN50575	415,9	145,1	270,8
N1VV-K 12X2,5 0,6/1KV CPR EN50575	623,9	249,2	374,7
N1VV-K 16X2,5 0,6/1KV CPR EN50575	801,5	332,8	468,7

The cables studied in the context of this EPD and their packaging do not contain any Substance of Very High Concern (SHVC), as defined by ECHA and in the ECHA substance candidate list.

5. Environmental performances

The environmental performances of the different cables in this EPD are listed in the following tables. In addition to reporting the total impact for each cable in each impact category, results are also reported individually for each stage in the life cycle of each cable. In agreement with EN 50693:2019, separate tables are reported, quantifying the impacts in the following indicators:

- Environmental impact indicators.
- Resource use indicators.
- Waste production indicators.
- Output flows indicators.

TABLE 3 ENVIRONMENTAL PERFORMANCES OF 1 KM OF CABLE N1VV-K 7X1,5 0,6/1KV CPR EN50575

Environmental Impact Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
Climate change - Total	kg CO ₂ eq	1,14E+03	5,54E+01	1,34E+01	2,36E+01	1,60E+03	1,57E+02	2,99E+03
Climate change - Fossil	kg CO ₂ eq	1,13E+03	1,24E+02	1,34E+01	2,10E+01	1,54E+03	1,56E+02	2,98E+03
Climate change - Biogenic	kg CO ₂ eq	1,17E+01	-6,89E+01	4,03E-03	2,58E+00	5,92E+01	3,99E-01	4,97E+00
Climate change - Land use and LU change	kg CO ₂ eq	1,60E+00	7,39E-02	2,61E-04	4,11E-04	3,90E+00	6,63E-03	5,58E+00
Acidification	mol H ⁺ eq	5,40E+01	3,68E-01	3,37E-02	5,32E-02	7,57E+00	8,33E-02	6,21E+01
Eutrophication, freshwater	kg P eq	4,22E+00	1,60E-02	9,09E-05	1,57E-04	1,42E+00	3,93E-03	5,67E+00
Eutrophication, marine	kg N eq	2,92E+00	8,19E-02	1,31E-02	2,57E-02	1,34E+00	2,64E-02	4,40E+00
Eutrophication, terrestrial	mol N eq	3,93E+01	8,28E-01	1,38E-01	2,19E-01	1,15E+01	2,47E-01	5,22E+01
Photochemical ozone formation	kg NMVOC eq	1,15E+01	3,92E-01	5,46E-02	8,64E-02	3,70E+00	9,04E-02	1,58E+01
Ozone depletion	kg CFC11 eq	2,42E-04	3,00E-06	2,88E-07	4,50E-07	2,52E-05	2,08E-06	2,73E-04
Resource use, minerals and metals	kg Sb eq	6,69E-01	7,74E-06	4,58E-07	7,17E-07	9,60E-05	9,74E-06	6,69E-01
Non renewable, fossil	MJ	1,74E+04	1,71E+03	1,76E+02	2,75E+02	1,78E+04	2,66E+02	3,77E+04
Water use	m ³ depriv.	5,78E+02	2,80E+01	1,62E-01	2,56E-01	3,62E+02	1,04E+01	9,78E+02
Resource Use Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
PENRE	MJ	1,91E+04	1,80E+03	1,77E+02	2,77E+02	3,62E+04	2,93E+02	5,79E+04
PERE	MJ	2,35E+03	1,25E+03	4,66E-01	8,18E-01	8,19E+03	1,87E+01	1,18E+04
PENRM	MJ	8,89E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,89E+03
PERM	MJ	8,69E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,69E+02
PENRT	MJ	2,80E+04	1,80E+03	1,77E+02	2,77E+02	3,62E+04	2,93E+02	6,68E+04
PERT	MJ	3,22E+03	1,25E+03	4,66E-01	8,18E-01	8,19E+03	1,87E+01	1,27E+04
FW	m ³	1,27E+01	6,95E-01	7,41E-03	1,20E-02	2,84E+01	2,69E+00	4,45E+01
SM	kg	2,21E+00	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	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Waste Production Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
HWD	kg	1,44E+00	7,03E-03	1,17E-03	1,83E-03	4,06E-02	1,39E-03	1,50E+00
NHWD	kg	2,21E+02	2,38E+00	8,64E-03	1,46E+01	4,20E+01	1,97E+01	3,00E+02
RWD	kg	2,55E-02	1,29E-03	1,52E-05	2,48E-05	2,69E-01	4,19E-04	2,96E-01
Output Flows Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	1,14E+01	0,00E+00	4,34E+01	0,00E+00	2,40E+02	2,95E+02
CRU	kg	0,00E+00	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	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Acronyms in the table: PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; PERT = Total use of renewable primary energy resources; FW = Use of net fresh water; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; MER = Materials for energy recovery; MFR = Materials for recycling; CRU = Components for reuse; ETE= Exported thermal energy; EEE= Exported electricity energy.

TABLE 4 ENVIRONMENTAL PERFORMANCES OF 1 KM OF CABLE N1VV-K 7X2,5 0,6/1KV CPR EN50575

Environmental Impact Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
Climate change - Total	kg CO ₂ eq	1,67E+03	7,05E+01	1,77E+01	3,02E+01	9,61E+02	2,00E+02	2,95E+03
Climate change - Fossil	kg CO ₂ eq	1,65E+03	1,40E+02	1,77E+01	2,76E+01	9,24E+02	1,99E+02	2,96E+03
Climate change - Biogenic	kg CO ₂ eq	1,77E+01	-6,99E+01	5,31E-03	2,63E+00	3,55E+01	5,62E-01	-1,35E+01
Climate change - Land use and LU change	kg CO ₂ eq	2,45E+00	7,58E-02	3,44E-04	5,39E-04	2,34E+00	8,46E-03	4,87E+00
Acidification	mol H ⁺ eq	8,77E+01	4,05E-01	4,45E-02	6,97E-02	4,54E+00	1,15E-01	9,29E+01
Eutrophication, freshwater	kg P eq	6,88E+00	1,76E-02	1,20E-04	2,02E-04	8,53E-01	5,42E-03	7,76E+00
Eutrophication, marine	kg N eq	4,62E+00	9,09E-02	1,72E-02	3,22E-02	8,02E-01	3,53E-02	5,60E+00
Eutrophication, terrestrial	mol N eq	6,26E+01	9,05E-01	1,82E-01	2,86E-01	6,91E+00	3,34E-01	7,13E+01
Photochemical ozone formation	kg NMVOC eq	1,83E+01	4,31E-01	7,20E-02	1,13E-01	2,22E+00	1,24E-01	2,12E+01
Ozone depletion	kg CFC11 eq	3,05E-04	3,46E-06	3,80E-07	5,90E-07	1,51E-05	2,69E-06	3,27E-04
Resource use, minerals and metals	kg Sb eq	1,10E+00	8,08E-06	6,04E-07	9,41E-07	5,76E-05	1,22E-05	1,10E+00
Non renewable, fossil	MJ	2,43E+04	1,93E+03	2,32E+02	3,61E+02	1,07E+04	3,87E+02	3,79E+04
Water use	m ³ depriv.	1,01E+03	3,01E+01	2,14E-01	3,35E-01	2,17E+02	1,40E+01	1,27E+03
Resource Use Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
PENRE	MJ	2,68E+04	2,02E+03	2,34E+02	3,63E+02	2,17E+04	4,27E+02	5,16E+04
PERE	MJ	3,72E+03	1,28E+03	6,14E-01	1,05E+00	4,92E+03	2,52E+01	9,95E+03
PENRM	MJ	1,11E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,11E+04
PERM	MJ	8,91E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,91E+02
PENRT	MJ	3,79E+04	2,02E+03	2,34E+02	3,63E+02	2,17E+04	4,27E+02	6,27E+04
PERT	MJ	4,61E+03	1,28E+03	6,14E-01	1,05E+00	4,92E+03	2,52E+01	1,08E+04
FW	m ³	2,29E+01	7,43E-01	9,77E-03	1,56E-02	1,70E+01	3,39E+00	4,41E+01
SM	kg	3,63E+00	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	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Waste Production Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
HWD	kg	2,36E+00	8,02E-03	1,54E-03	2,40E-03	2,44E-02	1,95E-03	2,40E+00
NHWD	kg	3,55E+02	2,93E+00	1,14E-02	1,48E+01	2,52E+01	2,47E+01	4,23E+02
RWD	kg	3,87E-02	1,41E-03	2,00E-05	3,23E-05	1,61E-01	6,12E-04	2,02E-01
Output Flows Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	1,53E+01	0,00E+00	4,96E+01	0,00E+00	3,35E+02	4,00E+02
CRU	kg	0,00E+00	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	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Acronyms in the table: PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; PERT = Total use of renewable primary energy resources; FW = Use of net fresh water; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; MER = Materials for energy recovery; MFR = Materials for recycling; CRU = Components for reuse; ETE= Exported thermal energy; EEE= Exported electricity energy.

TABLE 5 ENVIRONMENTAL PERFORMANCES OF 1 KM OF CABLE N1VV-K 12X2,5 0,6/1KV CPR EN50575

Environmental Impact Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module					
Climate change - Total	kg CO ₂ eq	2,64E+03	6,29E+01	2,74E+01	4,79E+01	9,61E+02	2,82E+02	4,03E+03
Climate change - Fossil	kg CO ₂ eq	2,61E+03	2,00E+02	2,74E+01	4,28E+01	9,24E+02	2,81E+02	4,09E+03
Climate change - Biogenic	kg CO ₂ eq	2,87E+01	-1,38E+02	8,20E-03	5,13E+00	3,55E+01	8,68E-01	-6,74E+01
Climate change - Land use and LU change	kg CO ₂ eq	4,02E+00	1,45E-01	5,31E-04	8,37E-04	2,34E+00	1,20E-02	6,52E+00
Acidification	mol H ⁺ eq	1,50E+02	5,90E-01	6,86E-02	1,08E-01	4,54E+00	1,75E-01	1,55E+02
Eutrophication, freshwater	kg P eq	1,18E+01	2,63E-02	1,85E-04	3,19E-04	8,53E-01	8,21E-03	1,27E+01
Eutrophication, marine	kg N eq	7,75E+00	1,38E-01	2,66E-02	5,21E-02	8,02E-01	5,21E-02	8,82E+00
Eutrophication, terrestrial	mol N eq	1,06E+02	1,37E+00	2,81E-01	4,45E-01	6,91E+00	4,96E-01	1,15E+02
Photochemical ozone formation	kg NMVOC eq	3,07E+01	6,49E-01	1,11E-01	1,76E-01	2,22E+00	1,87E-01	3,40E+01
Ozone depletion	kg CFC11 eq	4,25E-04	5,00E-06	5,86E-07	9,15E-07	1,51E-05	3,86E-06	4,51E-04
Resource use, minerals and metals	kg Sb eq	1,88E+00	1,50E-05	9,33E-07	1,46E-06	5,76E-05	1,70E-05	1,88E+00
Non renewable, fossil	MJ	3,72E+04	2,76E+03	3,59E+02	5,60E+02	1,07E+04	6,12E+02	5,22E+04
Water use	m ³ depriv.	1,79E+03	4,41E+01	3,30E-01	5,20E-01	2,17E+02	2,08E+01	2,07E+03
Resource Use Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module					
PENRE	MJ	4,12E+04	2,91E+03	3,61E+02	5,64E+02	2,17E+04	6,76E+02	6,74E+04
PERE	MJ	6,24E+03	2,44E+03	9,48E-01	1,66E+00	4,92E+03	3,74E+01	1,36E+04
PENRM	MJ	1,54E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,54E+04
PERM	MJ	1,74E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,74E+03
PENRT	MJ	5,66E+04	2,91E+03	3,61E+02	5,64E+02	2,17E+04	6,76E+02	8,28E+04
PERT	MJ	7,98E+03	2,44E+03	9,48E-01	1,66E+00	4,92E+03	3,74E+01	1,54E+04
FW	m ³	4,15E+01	1,11E+00	1,51E-02	2,44E-02	1,70E+01	4,74E+00	6,44E+01
SM	kg	6,23E+00	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	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Waste Production Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module					
HWD	kg	4,05E+00	1,16E-02	2,38E-03	3,72E-03	2,44E-02	2,99E-03	4,10E+00
NHWD	kg	6,02E+02	4,55E+00	1,76E-02	2,89E+01	2,52E+01	3,41E+01	6,95E+02
RWD	kg	6,32E-02	2,12E-03	3,09E-05	5,05E-05	1,61E-01	9,71E-04	2,28E-01
Output Flows Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module					
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	2,26E+01	0,00E+00	8,75E+01	0,00E+00	5,11E+02	6,22E+02
CRU	kg	0,00E+00	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	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Acronyms in the table: PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; PERT = Total use of renewable primary energy resources; FW = Use of net fresh water; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; MER = Materials for energy recovery; MFR = Materials for recycling; CRU = Components for reuse; ETE= Exported thermal energy; EEE= Exported electricity energy.

TABLE 6 ENVIRONMENTAL PERFORMANCES OF 1 KM OF CABLE N1VV-K 16X2,5 0,6/1KV CPR EN50575

Environmental Impact Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
Climate change - Total	kg CO ₂ eq	3,44E+03	1,00E+02	3,43E+01	5,86E+01	9,61E+02	3,56E+02	4,95E+03
Climate change - Fossil	kg CO ₂ eq	3,40E+03	2,40E+02	3,43E+01	5,34E+01	9,24E+02	3,55E+02	5,00E+03
Climate change - Biogenic	kg CO ₂ eq	3,77E+01	-1,40E+02	1,03E-02	5,24E+00	3,55E+01	1,12E+00	-6,04E+01
Climate change - Land use and LU change	kg CO ₂ eq	5,29E+00	1,50E-01	6,66E-04	1,04E-03	2,34E+00	1,51E-02	7,79E+00
Acidification	mol H ⁺ eq	2,00E+02	6,91E-01	8,60E-02	1,35E-01	4,54E+00	2,26E-01	2,05E+02
Eutrophication, freshwater	kg P eq	1,57E+01	3,05E-02	2,32E-04	3,91E-04	8,53E-01	1,06E-02	1,66E+01
Eutrophication, marine	kg N eq	1,03E+01	1,60E-01	3,33E-02	6,26E-02	8,02E-01	6,66E-02	1,14E+01
Eutrophication, terrestrial	mol N eq	1,40E+02	1,58E+00	3,52E-01	5,54E-01	6,91E+00	6,36E-01	1,50E+02
Photochemical ozone formation	kg NMVOC eq	4,07E+01	7,51E-01	1,39E-01	2,19E-01	2,22E+00	2,41E-01	4,43E+01
Ozone depletion	kg CFC11 eq	5,26E-04	6,03E-06	7,34E-07	1,14E-06	1,51E-05	4,88E-06	5,54E-04
Resource use, minerals and metals	kg Sb eq	2,52E+00	1,57E-05	1,17E-06	1,82E-06	5,76E-05	2,13E-05	2,52E+00
Non renewable, fossil	MJ	4,78E+04	3,30E+03	4,49E+02	6,99E+02	1,07E+04	7,99E+02	6,37E+04
Water use	m ³ depriv.	2,41E+03	5,10E+01	4,14E-01	6,48E-01	2,17E+02	2,67E+01	2,71E+03
Resource Use Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
PENRE	MJ	5,30E+04	3,47E+03	4,52E+02	7,03E+02	2,17E+04	8,83E+02	8,02E+04
PERE	MJ	8,27E+03	2,52E+03	1,19E+00	2,03E+00	4,92E+03	4,79E+01	1,58E+04
PENRM	MJ	1,92E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,92E+04
PERM	MJ	1,78E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,78E+03
PENRT	MJ	7,22E+04	3,47E+03	4,52E+02	7,03E+02	2,17E+04	8,83E+02	9,94E+04
PERT	MJ	1,00E+04	2,52E+03	1,19E+00	2,03E+00	4,92E+03	4,79E+01	1,75E+04
FW	m ³	5,63E+01	1,27E+00	1,89E-02	3,03E-02	1,70E+01	5,94E+00	8,06E+01
SM	kg	8,32E+00	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	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Waste Production Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
HWD	kg	5,41E+00	1,39E-02	2,98E-03	4,64E-03	2,44E-02	3,87E-03	5,46E+00
NHWD	kg	8,01E+02	5,52E+00	2,20E-02	2,95E+01	2,52E+01	4,27E+01	9,04E+02
RWD	kg	8,30E-02	2,45E-03	3,88E-05	6,25E-05	1,61E-01	1,27E-03	2,48E-01
Output Flows Indicators	Unit	Manufacturing		Distribution	Installation	Use	End-of-Life	Total
		Upstream module	Core Module	Downstream module				
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	2,89E+01	0,00E+00	9,75E+01	0,00E+00	6,61E+02	7,87E+02
CRU	kg	0,00E+00	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	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Acronyms in the table: PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; PERT = Total use of renewable primary energy resources; FW = Use of net fresh water; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; MER = Materials for energy recovery; MFR = Materials for recycling; CRU = Components for reuse; ETE= Exported thermal energy; EEE= Exported electricity energy.

6. Additional information on the LCA study

Cut-off criteria and Exclusions from system boundaries

All input flows to the system studied were considered.

In the present study, the following contributions were not considered:

- Production of packaging for transportation of raw materials to the assembly site.
- Airborne emissions in the manufacturing – core phase, excluded through a sensitivity analysis.
- Construction, maintenance and decommissioning of infrastructures (machinery and buildings).
- Administrative and marketing activities, such as business travels, that are not directly related to the production of the product.

Data sources

Primary data were collected by ICC, related to the following activities:

- quantity of raw materials used for the cable assembly.
- Electrical and Thermal Energy consumption for the assembly.
- Quantity and type of packaging used for distribution.
- Information about the supplier of raw materials and packaging, including the supply distance, type and quantity of materials and packaging supplied.
- Distances to the client's warehouses and mode of transportation.

Secondary data, from the Ecoinvent 3.9.1 database were used to model the production of the raw materials in the upstream phase, including energy consumption.

Distance from the client's warehouse to installation sites was conservatively assumed to be 300 km (truck), in absence of primary data.

Distance to disposal site of waste produced in the different stages was conservatively assumed to be 50 km (truck) in absence of primary data.

Data quality

Based on the in-depth analysis on the data used, the following can be stated:

- **Temporal representativeness:** data collected by ICC relates to the year 2022, as they were collected specifically for the preparation of this study; as regards to data sourced from the literature, all the studies used are the most recent available and the database used (Ecoinvent 3.9.1, the latest update). No data is older than 10 years.
- **Geographical representativeness:** the processes used in this study reflect the geography of the system boundaries (e.g. the energy mix used reflects the country of production, i.e. Italy); the choices are consistent with the field of application of the study.
- **Technological representativeness:** both in the choice of data and in the modeling of the different phases of the life cycle, it was considered that the technology described in the database was representative of the system analyzed.
- **Precision:** the data were collected precisely and validated through comparisons and checks of mass and energy balances; furthermore, the estimate of the uncertainty through the Monte Carlo analysis is reported below (referring to the secondary data of the Ecoinvent DB since on the primary data the uncertainty is considered considerably lower and therefore not comparable).
- **Reproducibility:** the processes used for modeling and the data described in this report allow the results of the study to be reproducible, using the same database, the same methods and characterization factors.

Allocation criteria

A mass allocation was used, for the following contributions in the Core phase:

- consumption of thermal energy and water at assembly plant.
- Waste production a plant, except for scrap plastic and copper material from cable production, for which quantities are known for each cable.

Allocation was based on the total production of year 2022 and the known unitary mass of individual cables (Table 2).

Electricity consumption was known for each production stage and machinery used. Therefore, an allocation was not necessary in this case.

Calculation tools

LCA calculations were performed with Sima Pro 9.5.0.1, using Ecoinvent 3.9.1 database (most recent versions of the software and of the database).

7. References

1. EPDItaly - Program Regulation version 6.0 2023/10/30.
2. Product Category Rules (PCR) EPDItaly007 - CORE PCR EN 50693 BASE rev.3, 2023/01/13 - Electronic and electrical products and systems.
3. Product Category Rules (PCR) EPDItaly016 - SUB PCR EN 50693 cables rev.2, 2020/09/25 - Electronic and electrical products and systems - Cable and wires.
4. EN 15804:2012+A2:2019 – Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
5. BS EN 50693:2019 - Product category rules for life cycle assessments of electronic and electrical products and systems.
6. ISO 14020:2023 Environmental labels and declarations-General principles.
7. ISO 14025:2010 Environmental labels and declarations-Type III Environmental Declarations-Principles and procedures.
8. ISO 14040:2006/AMD 1:2020 Environmental Management-Life Cycle Assessment-Principles and framework.
9. ISO 14044:2006/AMD 2:2020 Environmental Management-Life Cycle Assessment Requirements and Guidelines.
10. Norma CEI 64-8 2007 – Per impianti elettrici utilizzatori.
11. Rapporto LCA “Cavi elettrici delle famiglie FS17, N1VC7V-K, N1VV-K, TELECONTROLLO prodotti presso lo stabilimento di Bolgare (BG) – anno 2022 Rev.03 del 30/01/2024”.