LV insulated control cables

CONTENTS

1. DOCUMENT AIMS AND APPLICATION AREA 3

1.1. RELATED DOCUMENTS TO BE IMPLEMENTED 3

2. DOCUMENT VERSION MANAGEMENT 3

4. REFERENCES 3

5. ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY 4

6. DEFINITIONS AND ACRONYMS 5

7. DESCRIPTION 6

7.1 LIST OF COMPONENTS 6
7.1.1. STANDARD CABLE 6
7.2. SERVICE CONDITIONS 9
7.2.1. General service conditions 9
7.2.2. Specific service conditions 9
7.3. TECHNICAL CHARACTERISTICS 9
7.3.1. Type of cables 9
7.4. CONSTRUCTION CHARACTERISTICS 14
7.4.1. CONDUCTOR 14
7.4.3. FILLER 15
7.4.4. OUTER SHEATH 16
7.6. TESTING 16

8. LOCAL SECTION 17

1. DOCUMENT AIMS AND APPLICATION AREA

The aim of this document is to provide technical requirements for the supply of LV insulated non-fire propagating cables, single and multi-core, used for energy or signal in control systems of the distributions networks.

This document shall be implemented and applied to the extent possible within the RETELE ELECTRICE and in compliance with any applicable laws, regulations, and governance rules, including any stock exchange and unbundling-relevant provisions, which in any case prevail over the provisions contained in this document.

1.1. RELATED DOCUMENTS TO BE IMPLEMENTED

This document does not require implementation of further documents.

2. DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
00	29/12/2022	First emission.
01	23.09.2024	Changes according to the new organizational structure.

Table 2 Version management

3.UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

- Engineering and Standardization unit

Responsible for authorizing the document:

- Head of Network Operation
- Head of HSEQ

4. REFERENCES

- Code of Ethics ;
- Human Right Policy;
- Zero Tolerance of Corruption (ZTC) Plan;
- Stop Work Policy;
- Integrated Policy for Quality, Health and Safety, Environment, anti-Bribery and Information security;
- ISO 9001:2015 - Quality Management System – Requirements;
- ISO 14001:2015 - Environmental Management System - Requirements with guidance for use;
- ISO 45001:2018 - Occupational Health and Safety Management System - Requirements with guidance for use;
- ISO 37001:2016 - Anti-bribery Management System - Requirements with guidance for use;
- ISO 27001:2017 - Information Security Management System – Requirements;
- IL RE097 Technical Conformity Assessment";
- "Barcode specification –

LAWS

- NTE007/08/00 Normative for the design and execution of electrical cable networks

EUROPEAN & INTERNATIONAL STANDARDS

- EN13501-6 "Fire classification of construction products and building elements - Part 6: Classification using data from reaction to fire tests on electric cables."
- EN 50575 "Power, control and communication cables - Cables for general applications in construction works subject to reaction to fire requirements."
- HD 603 "Distribution cables of rated voltage 0,6/1 kV"
- HD 605 "Electric cables - Additional test methods"
- IEC 60228: "Conductors of insulated cables"
- IEC 60410: Sampling plans and procedures for inspection by attributes.

- IEC 60502-1:" Power cables with extruded insulation and their accessories for rated voltages from 1 kV up to 30 kV – Part 1: cables for rated voltages of 1 kV and 3 kV"
- IEC 60332-Saries: "Tests on electric and optical fiber cables under fire conditions"
- EN 50362 Series: "Insulating, sheathing and covering materials for low voltage energy cables."
- EN 50395 "Electrical test methods for low-voltage energy cables"
- IEC 60754-1 "Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content."
- IEC 60754-2 "Test on gases evolved during combustion of materials from cables - Part 2: Determination of acidity (by pH measurement) and conductivity."
- IEC 60811 Series: "Electric and optical fiber cables – Test methods for non- metallic materials"
- IEC 61034-2 "Measurement of smoke density of cables burning under defined conditions - Part 2: Test procedure and requirements."
- IEC 62230 "Electric cables - Spark-test method"
- ISO 2859-0 "Sampling procedures for inspection by attributes -- Part 0: Introduction to the ISO 2859 attribute sampling system"
- ISO 2859-1 "Sampling procedures for inspection by attributes -- Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection."
- Regulation AEA 95101 Version 2015 Exterior Underground Energy and Telecommunications Lines
- ASTM B 3 "Standard Specification for Soft or Annealed Copper Wire"
- EN 50525-1: "Low voltage energy cables of rated voltages up to and including 450/750 V (U0/U) - Part 1: General requirements'
- EN 50525-2: "Low voltage energy cables of rated voltages up to and including 450/750 V (U_0/U) – Part 2: Cables for general applications"
- EN 50525-3: "Low voltage energy cables of rated voltages up to and including 450/750 V (U_0/U) – Part 3: Cables with special fire performance"
- EN 50525-4: "Low voltage energy cables of rated voltages up to and including 450/750 V (U_0/U) – Part 4: Flexible cables with cross-linked elastomer insulation"

LOCAL STANDARDS

See local section.

REPLACED LOCAL STANDARDS

- Romania

  FT-153_MAT
  FT-091_MAT
  FT-094_MAT
  FT-126_MAT
  FT-027_TLT Ed. 01
  FT-160_MAT Ed. 01
  DV201
  DV202
  DV203
  DV204 ED. 6
  DV205
  DV206
  DV207
  DV208
  DV209

5. ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

Value Chain/Process Area: Engineering and Standardization

Macro Process: Materials management

Process: Standard Catalog Management.

6. DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
Acceptable Quality Level (AQL)	The maximum percentage of malfunctions that can be detected during a sample inspection and can still be considered satisfactory
Low Voltage (LV)	Any set of nominal voltage levels in the range 0,5 to 1 kV AC or 120 to 1500 V DC
Technical Conformity Assessment (TCA)	A “conformity assessment” with respect to “specified requirements”[1] consists in functional, dimensional, constructional and test characteristics required for a product (or a series of products) and quoted in technical specifications and quality requirements issued distribution company. This also includes the verification of conformity with respect to local applicable regulation and laws and possession of relevant requested certifications

Table 3 – Definitions and acronyms

7. DESCRIPTION
7.1 LIST OF COMPONENTS
7.1.1. STANDARD CABLE

GS Type Code	Distribution Company	Material code	Type	Voltage	Conductor material	Conductor class (Acc to IEC 60228)	Number of conductors per section [n° mm2]	Conductor wire diameter (MAX) [mm]	Maximum diameters of circular copper conductors [mm]	Average insulation thickness (MIN) [mm]	Insulation material	Screen thickness(MIN) [mm]	Screen type	Const. Charact.	Outer sheath color	Conductors' identification
GSCC028/1	RO	349022	I	450/750 V	COPPER	5	1 x 1,5	0,26	1,8	0,8	PVC	.		Unipolar	light blue	Color
GSCC028/2	RO	349023	I	450/750 V	COPPER	5	1 x 2,5	0,26	2,4	0,8	PVC	.		Unipolar	light blue	Color
GSCC028/3	RO	349024	I	450/750 V	COPPER	5	1 x 4	0,31	3	1	PVC	.		Unipolar	light blue	Color
GSCC028/4	RO	349025	I	450/750 V	COPPER	5	1 x 6	0,31	3,9	1	PVC	.		Unipolar	light blue	Color
GSCC028/5	RO	349026	I	450/750 V	COPPER	5	1 x 10	0,41	5,1	1	PVC	.		Unipolar	light blue	Color
GSCC028/6	RO	349027	I	450/750 V	COPPER	5	1 x 16	0,41	6,3	1	PVC	.		Unipolar	light blue	Color
GSCC028/7	RO	349028	I	450/750 V	COPPER	5	1 x 25	0,41	7,8	1,2	PVC	.		Unipolar	light blue	Color
GSCC028/8	RO	349030	I	450/750 V	COPPER	5	1 x 50	0,41	11	1,4	PVC	.		Unipolar	light blue	Color
GSCC028/9	RO	349032	I	450/750 V	COPPER	5	1 x 95	0,51	15,1	1,6	PVC	.		Unipolar	light blue	Color
GSCC028/10	RO	349033	I	450/750 V	COPPER	5	1 x 120	0,51	17	1,6	PVC	.		Unipolar	light blue	Color
GSCC028/11	RO	349034	I	450/750 V	COPPER	5	1 x 150	0,51	19	1,8	PVC	.		Unipolar	light blue	Color
GSCC028/12	RO	349036	I	450/750 V	COPPER	5	1 x 185	0,51	21	2	PVC	.		Unipolar	light blue	Color
GSCC028/13	RO	349038	I	450/750 V	COPPER	5	1 x 240	0,51	24	2,2	PVC	.		Unipolar	light blue	Color

GS Type Code	Distribution Company	Material code	Type	Voltage	Conductor material	Conductor class (Acc to IEC 60228)	Number of conductors per section [n° mm2]	Conductor wire diameter (MAX) [mm]	Maximum diameters of circular copper conductors [mm]	Average insulation thickness (MIN) [mm]	Insulation material	Screen thickness(MIN) [mm]	Screen type	Const Charact	Outer sheath color	Conductors' identification
GSCC028/19	RO	633105	I	450/750 V	COPPER	5	1 x 70	0,51	13,1	1,4	PVC	.		Unipolar		
GSCC028/20	RO	631101	I	450/750 V	COPPER	5	1 x 1,5	0,26	3,4	0,7	PVC	.		Unipolar		Color
GSCC028/21	RO	631102	I	450/750 V	COPPER	5	1 x 2,5	0,26	4,1	0,8	PVC	.		Unipolar		Color
GSCC028/22	RO	631103	I	450/750 V	COPPER	5	1 x 4	0,31	4,8	0,8	PVC	.		Unipolar		Color
GSCC028/23	RO	631104	I	450/750 V	COPPER	5	1 x 6	0,31	5,3	0,8	PVC	.		Unipolar		Color
GSCC028/24	RO	631105	I	450/750 V	COPPER	5	1 x 10	0,41	6,8	1	PVC	.		Unipolar		Color
GSCC028/25	RO	631106	I	450/750 V	COPPER	5	1 x 16	0,41	8,1	1	PVC	.		Unipolar		Color
GSCC028/26	RO	631107	I	450/750 V	COPPER	5	1 x 25	0,41	10,2	1,2	PVC	.		Unipolar		Color
GSCC028/27	RO	633140	II	450/750 V	ALUMINUM	2	1 x 2,5	0,26		0,8	PVC	.		Unipolar		
GSCC028/28	RO	633141	II	450/750 V	ALUMINUM	2	1 x 4	0,31		1	PVC	.		Unipolar		
GSCC028/29	RO	633143	II	450/750 V	ALUMINUM	2	1 x 6	0,31		1	PVC	.		Unipolar		

GS Type Code	Distribution Company	Material code	Type	Voltage	Conductor material	Conductor class (Acc to IEC 60228)	Number of conductors per section [n° mm2]	Conductor wire diameter (MAX) [mm]	Maximum diameters of circular copper conductors [mm]	Average insulation thickness (MIN) [mm]	Insulation material	Screen thickness(MIN) [mm]	Screen type	Const Charact	Outer sheath color	Conductors' identification
GSCC028/42	RO	349152	IV	0,6/1 kV	COPPER	5	2 x 2,5	0.26	2,4	0,8	PVC/HEPR	0,1	Two helically wound copper tapes	Bipolar	light blue	Color
GSCC028/43	RO	633214	III	0,6/1 kV	COPPER	5	2 x 2,5	0.26	2,4	0,8	PVC/HEPR	.		Bipolar		
GSCC028/44	RO	349153	IV	0,6/1 kV	COPPER	5	2 x 4	0.31	3	1	PVC/HEPR	0,1	Two helically wound copper tapes	Bipolar	light blue	Color
GSCC028/45	RO	633213	III	0,6/1 kV	COPPER	5	2 x 4	0.31	3	1	PVC/HEPR	.		Bipolar		
GSCC028/46	RO	349154	IV	0,6/1 kV	COPPER	5	2 x 6	0.31	3,9	1	PVC/HEPR	0,1	Two helically wound copper tapes	Bipolar	light blue	Color
GSCC028/47	RO	349155	IV	0,6/1 kV	COPPER	5	2 x 10	0.41	5,1	1	PVC/HEPR	0,1	Two helically wound copper tapes	Bipolar	light blue	Color
GSCC028/48	RO	349156	IV	0,6/1 kV	COPPER	5	2 x 16	0.41	6,3	1	PVC/HEPR	0,1	Two helically wound copper tapes	Bipolar	light blue	Color

GSCC028/49	RO	349157	IV	0,6/1 kV	COPPER	5	2 x 25	0.41	7,8	1,2	PVC/HEPR	0,1	Two helically wound copper tapes	Bipolar	light blue	Color
GSCC028/61	RO	349166	IV	0,6/1 kV	COPPER	5	3 x 1,5	0,26	1,8	0,8	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/62	RO	349167	IV	0,6/1 kV	COPPER	5	3 x 2,5	0,26	2,4	0,8	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/63	RO	633174	III	0,6/1 kV	COPPER	5	3 x 2,5	0,26	2,4	0,8	PVC/HEPR	-		Multipolar		

GS Type Code	Distribution Company	Material code	Type	Voltage	Conductor material	Conductor class (Acc to IEC 60228)	Number of conductors per section [n° mm2]	Conductor wire diameter (MAX) [mm]	Maximum diameters of circular copper conductors [mm]	Average insulation thickness (MIN) [mm]	Insulation material	Screen thickness(MIN) [mm]	Screen type	Const Charact	Outer sheath color	Conductors' identification
GSCC028/64	RO	349168	IV	0,6/1 kV	COPPER	5	3 x 4	0,31	3	1	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/65	RO	633124	III	0,6/1 kV	COPPER	5	3 x 4	0,31	3	1	PVC/HEPR	-		Multipolar		
GSCC028/66	RO	349169	IV	0,6/1 kV	COPPER	5	3 x 6	0,31	3,9	1	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/67	RO	349171	IV	0,6/1 kV	COPPER	5	3 x 16	0,41	6,3	1	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/68	RO	349181	IV	0,6/1 kV	COPPER	5	4 x 1,5	0,26	1,8	0,8	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/69	RO	349182	IV	0,6/1 kV	COPPER	5	4 x 2,5	0,26	2,4	0,8	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/70	RO	633127	III	0,6/1 kV	COPPER	5	4 x 2,5	0,26	2,4	0,8	PVC/HEPR	-		Multipolar		
GSCC028/71	RO	349183	IV	0,6/1 kV	COPPER	5	4 x 4	0,31	3	1	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/72	RO	633128	III	0,6/1 kV	COPPER	5	4 x 4	0,31	3	1	PVC/HEPR	-		Multipolar		
GSCC028/73	RO	349184	IV	0,6/1 kV	COPPER	5	4 x 6	0,31	3,9	1	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/74	RO	633129	III	0,6/1 kV	COPPER	5	4 x 6	0,31	3,9	1	PVC/HEPR	-		Multipolar		
GSCC028/75	RO	349185	IV	0,6/1 kV	COPPER	5	4 x 10	0,41	5,1	1	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/76	RO	349186	IV	0,6/1 kV	COPPER	5	4 x 16	0,41	6,3	1	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/77	RO	349187	IV	0,6/1 kV	COPPER	5	4 x 25	0,41	7,8	1,2	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/78	RO	351052	IV	0,6/1 kV	COPPER	5	7 x 1,5	0,26	1,8	0,8	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/79	RO	351053	IV	0,6/1 kV	COPPER	5	7 x 2,5	0,26	2,4	0,8	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color

GS Type Code	Distribution Company	Material code	Type	Voltage	Conductor material	Conductor class (Acc to IEC 60228)	Number of conductors per section [n° mm2]	Conductor wire diameter (MAX) [mm]	Maximum diameters of circular copper conductors [mm]	Average insulation thickness (MIN) [mm]	Insulation material	Screen thickness(MIN) [mm]	Screen type	Const Charact	Outer sheath color	Conductors' identification
GSCC028/80	RO	351057	IV	0,6/1 kV	COPPER	5	12 x 2,5	0,26	2,4	0,8	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/81	RO	351073	IV	0,6/1 kV	COPPER	5	16 x 2,5	0,26	2,4	0,8	PVC/HEPR	0,1	Two helically wound copper tapes	Multipolar	light blue	Color
GSCC028/82	RO	351000	III	0,6/1 kV	COPPER	5	5 x 1,5	0,26	1,8	0,8	PVC/HEPR	-		Multipolar	light blue	Color
GSCC028/83	RO	351002	III	0,6/1 kV	COPPER	5	7 x 1,5	0,26	1,8	0,8	PVC/HEPR	-		Multipolar	light blue	Color
GSCC028/84	RO	351003	III	0,6/1 kV	COPPER	5	7 x 2,5	0,26	2,4	0,8	PVC/HEPR	-		Multipolar	light blue	Color
GSCC028/85	RO	351007	III	0,6/1 kV	COPPER	5	12 x 2,5	0,26	2,4	0,8	PVC/HEPR	-		Multipolar	light blue	Color
GSCC028/86	RO	351023	III	0,6/1 kV	COPPER	5	16 x 2,5	0,26	2,4	0,8	PVC/HEPR	-		Multipolar	light blue	Color
GSCC028/126	RO	633163	I	450/750 V	COPPER	5	1 x 10	0,41	5,1	1	PVC	-		Unipolar		
GSCC028/128	RO	633164	I	450/750 V	COPPER	5	1 x 6	0,31	3,9	1	PVC	-		Unipolar		
GSCC028/137	RO	633199	I	450/750 V	COPPER	5	1 x 16	0,41	6,3	1	PVC	-		Unipolar		
GSCC028/144	RO	633165	I	450/750 V	COPPER	5	1 x 2,5	0,26	2,4	0,8	PVC	-		Unipolar		
GSCC028/146	RO	633166	I	450/750 V	COPPER	5	1 x 4	0,31	3	1	PVC	-		Unipolar		

GS Type Code	Distribution Company	Material code	Type	Voltage	Conductor material	Conductor class (Acc to IEC 60228)	Number of conductors per section [n° mm2]	Conductor wire diameter (MAX) [mm]	Maximum diameters of circular copper conductors [mm]	Average insulation thickness (MIN) [mm]	Insulation material	Screen thickness(MIN) [mm]	Screen type	Const Charact	Outer sheath color	Conductors' identification
GSCC028/151	RO	633102	VI	450/750 V	COPPER	5	3 x 2,5	0,26	2,4	0,8	XLPE	.		Multipolar		Color
GSCC028/152	RO	633131	VI	450/750 V	COPPER	5	3 x 25 + 16	0,41	7,8	1,2	XLPE	.		Multipolar		Color
GSCC028/153	RO	633103	VI	450/750 V	COPPER	5	5 x 2,5	0,26	2,4	0,8	XLPE	.		Multipolar		Color
GSCC028/154	RO	633122	VI	450/750 V	COPPER	5	4 x 1,5	0,26	1,8	0,8	XLPE	.		Multipolar		Color
GSCC028/155	RO	633123	VI	450/750 V	COPPER	5	4 x 4	0,31	3	1	XLPE	.		Multipolar		Color
GSCC028/156	RO	633104	VI	450/750 V	COPPER	5	4 x 10	0,41	5,1	1	XLPE	.		Multipolar		Color
GSCC028/157	RO	631158	III	300/500 V	COPPER	5	2 x 1	0,21	1,5	\	PVC	.		Multipolar		Color
GSCC028/158	RO	631159	III	300/500 V	COPPER	5	3 x 1	0,21	1,5	\	PVC	.		Multipolar		Color
GSCC028/159	RO	631160	III	300/500 V	COPPER	5	4 x 1	0,21	1,5	\	PVC	.		Multipolar		Color
GSCC028/160	RO	631161	III	300/500 V	COPPER	5	5 x 1	0,21	1,5	\	PVC	.		Multipolar		Color
GSCC028/161	RO	631162	III	300/500 V	COPPER	5	2 x 1,5	0,26	1,8	0,8	PVC	.		Multipolar		Color
GSCC028/162	RO	631163	III	300/500 V	COPPER	5	3 x 1,5	0,26	1,8	0,8	PVC	.		Multipolar		Color
GSCC028/163	RO	631164	III	300/500 V	COPPER	5	4 x 1,5	0,26	1,8	0,8	PVC	.		Multipolar		Color

GS Type Code	Distribution Company	Material code	Type	Voltage	Conductor material	Conductor class (Acc to IEC 60228)	Number of conductors per section [n° mm2]	Conductor wire diameter (MAX) [mm]	Maximum diameters of circular copper conductors [mm]	Average insulation thickness (MIN) [mm]	Insulation material	Screen thickness(MIN) [mm]	Screen type	Const Charact	Outer sheath color	Conductors' identification
GSCC028/164	RO	631165	III	300/500 V	COPPER	5	5 x 1,5	0,26	1,8	0,8	PVC	.		Multipolar		Color
GSCC028/165	RO	631166	III	300/500 V	COPPER	5	2 x 2,5	0,26	2,4	0,8	PVC	.		Multipolar		Color
GSCC028/166	RO	631167	III	300/500 V	COPPER	5	3 x 2,5	0,26	2,4	0,8	PVC	.		Multipolar		Color
GSCC028/167	RO	631168	III	300/500 V	COPPER	5	4 x 2,5	0,26	2,4	0,8	PVC	.		Multipolar		Color
GSCC028/168	RO	631169	III	300/500 V	COPPER	5	5 x 2,5	0,26	2,4	0,8	PVC	.		Multipolar		Color
GSCC028/169	RO	631170	III	300/500 V	COPPER	5	2 x 4	0,31	3	1	PVC	.		Multipolar		Color
GSCC028/170	RO	631171	III	300/500 V	COPPER	5	3 x 4	0,31	3	1	PVC	.		Multipolar		Color
GSCC028/171	RO	631172	III	300/500 V	COPPER	5	4 x 4	0,31	3	1	PVC	.		Multipolar		Color
GSCC028/172	RO	631173	III	300/500 V	COPPER	5	5 x 4	0,31	3	1	PVC	.		Multipolar		Color
GSCC028/173	RO	633132	III	450/750 V	COPPER	5	3 x 25 + 16	0,41	7,8	1,2	PVC/HEPR	.		Multipolar		Color
GSCC028/174	RO	633133	III	450/750 V	COPPER	5	3 x 35 + 16	0,41		1,2	PVC/HEPR	.		Multipolar		Color
GSCC028/175	RO	633125	III	0,6/1 kV	COPPER	5	12 x 1,5	0,26	1,8	0,8	PVC	.		Multipolar		Color
GSCC028/176	RO	633126	III	0,6/1 kV	COPPER	5	19 x 1,5	0,26	1,8	0,8	PVC	.		Multipolar		Color
GSCC028/209	RO	351041	V	0,6/1 kV	COPPER	5	7 x 1,5	0,26	1,8	0,8	PVC/HEPR	0,1	Copper wires	Multipolar		Color
GSCC028/210	RO	351044	V	0,6/1 kV	COPPER	5	7 x 2,5	0,26	2,4	0,8	PVC/HEPR	0,1	Copper wires	Multipolar		Color
GSCC028/211	RO	351045	V	0,6/1 kV	COPPER	5	12 x 2,5	0,26	2,4	0,8	PVC/HEPR	0,1	Copper wires	Multipolar		Color
GSCC028/212	RO	351046	V	0,6/1 kV	COPPER	5	16 x 2,5	0,26	2,4	0,8	PVC/HEPR	0,1	Copper wires	Multipolar		Color
GSCC028/213	RO	351042	V	0,6/1 kV	COPPER	5	12 x 1,5	0,26	1,8	0,8	PVC/HEPR	0,1	Copper wires	Multipolar		Color
GSCC028/214	RO	351043	IV	0,6/1 kV	COPPER	5	16 x 1,5	0,26	1,8	0,8	PVC/HEPR	0,1	Copper wires	Multipolar		Color

Table 4 List of components, main characteristics

7.2. SERVICE CONDITIONS

7.2.1. General service conditions

No special service conditions apply.

7.2.2. Specific service conditions

No specific service conditions apply.

7.3. TECHNICAL CHARACTERISTICS

7.3.1. Type of cables

TYPE	DESCRIPTION
I	Single core cables, flexible copper conductor, PVC/HEPR insulated, fire retardant.
II	Single core cables, flexible aluminum conductor, PVC/HEPR insulated, fire retardant.
III	Multicore cables, flexible copper conductors, PVC/HEPR insulated, fire retardant.
IV	Multicore cables with copper conductor, shielded copper (wires or tapes), PVC/HEPR insulated, PVC outer sheath.
V	Multicore control cables with flexible copper conductor XLPE insulation, PE (ST8) outer sheath without halogens
VI	Multicore shielded control armored cables with flexible copper conductors under XLPE insulation, PVC outer sheath
VII	Multipolar cables with flexible copper conductors bundled on three (2 phases, 1 neutral), aluminum foil screen, XLPE insulation PE (ST8) outer sheath without halogens
VIII	Industrial cables of rated voltage 0,6/1kV. Part 4: XLPE insulated and polyolefin sheathed cables. (
IX	Multi-core XLPE-insulated and polyolefin-sheathed cables of rated voltage 0.6/1 kV, resistant to flame propagation, for fixed wiring in control circuits.

Table 5 - The following table briefly describes the different types of cables specified in this document.

The typical layout of cables is shown in Figure 1 to 7.

The different parts of the cables are depicted in section 7.4.

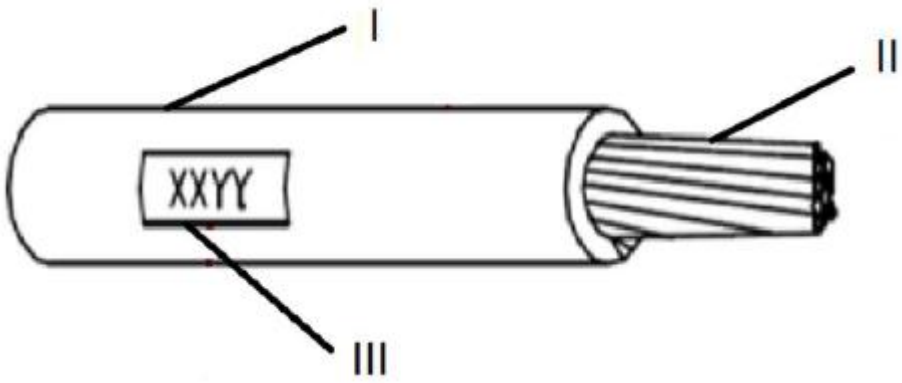


Figure 1 Schematic drawing of Type I cables

I – PVC or HEPR Insulation
II – Cu Conductor
III -Marking

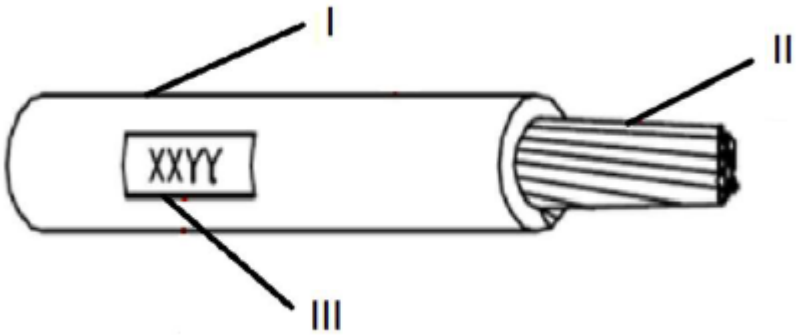


Figure 2 Schematic drawing of Type II cables

I – PVC or HEPR Insulation
II – Al Conductor
III -Marking

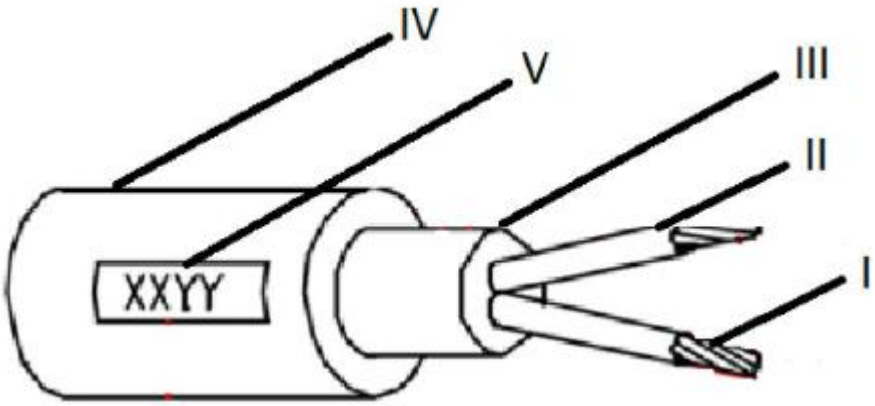


Figure 3 Schematic drawing of Type III cable

I – Cu Conductor
II – PVC or HEPR Insulation
III – Filler
IV – Outer Sheath
V – Marking

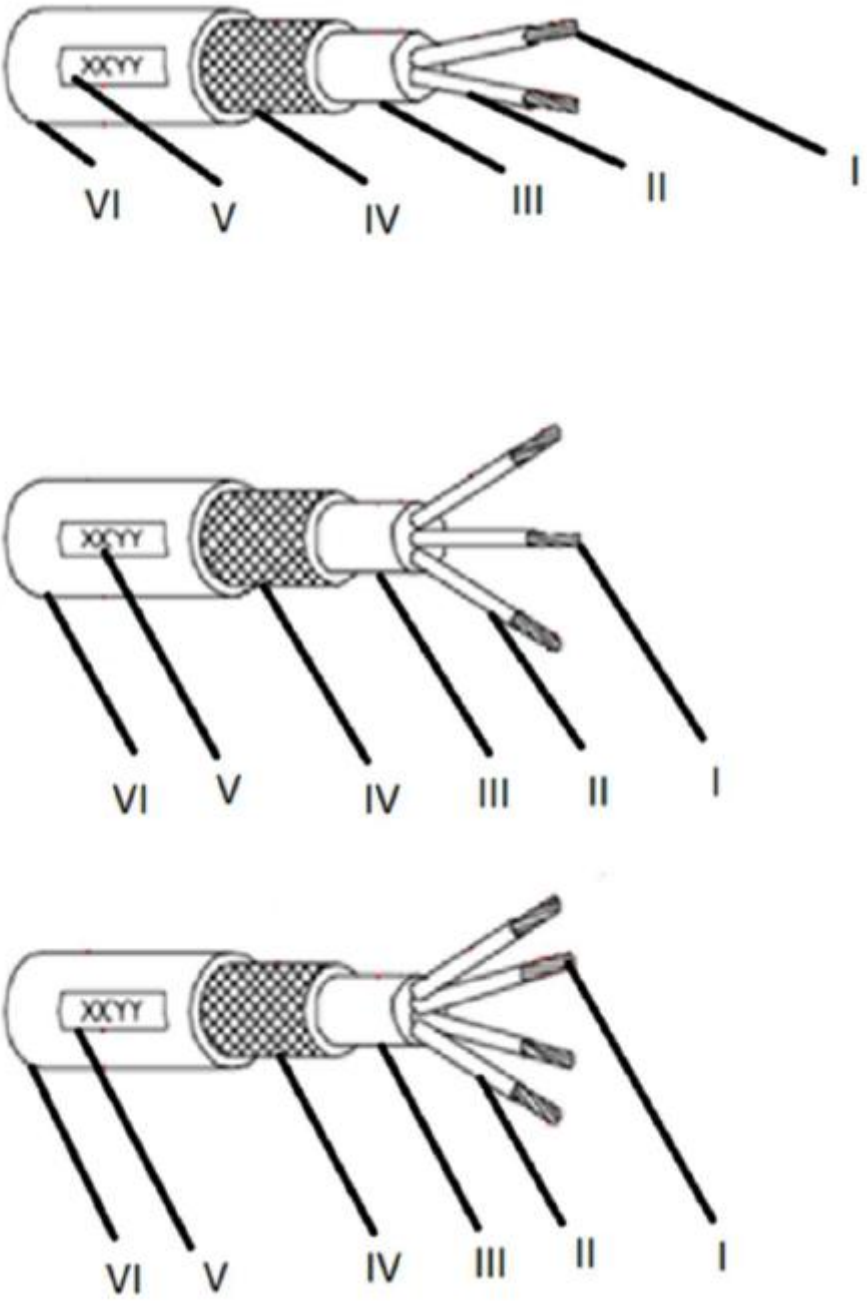


Figure 4 Schematic drawing of Type IV cable

I – Cu Conductor
II – PVC or HEPR Insulation
III – Filler
IV –Screen
V – Marking
VI - Outer Sheath

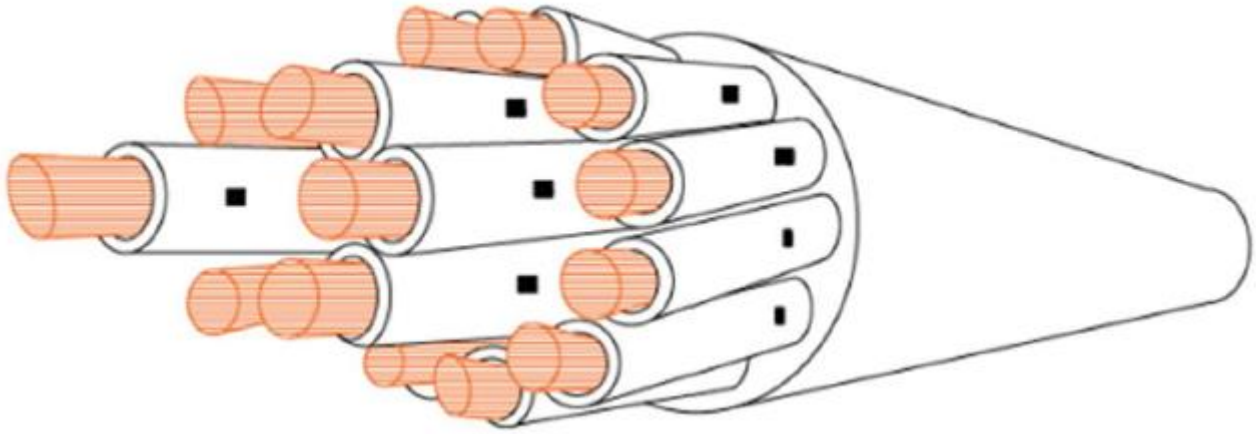


Figure 5 Schematic drawing of Type V cable

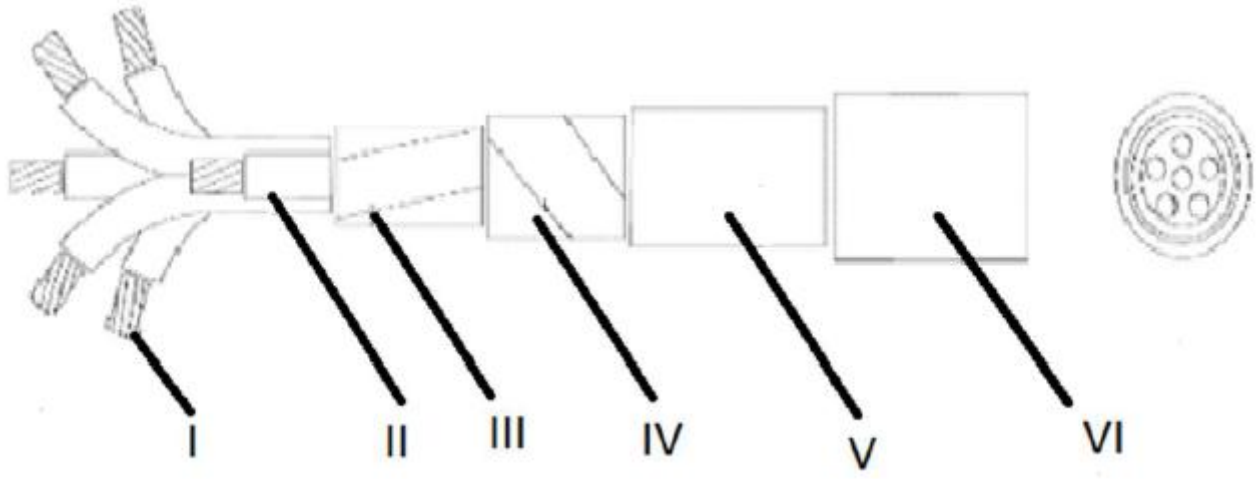


Figure 6 Schematic drawing of Type VI cable

I – Cu Conductor
II – Insulation
III – Filler
IV– Separator tape
V – Armoring
VI – Outer Sheath

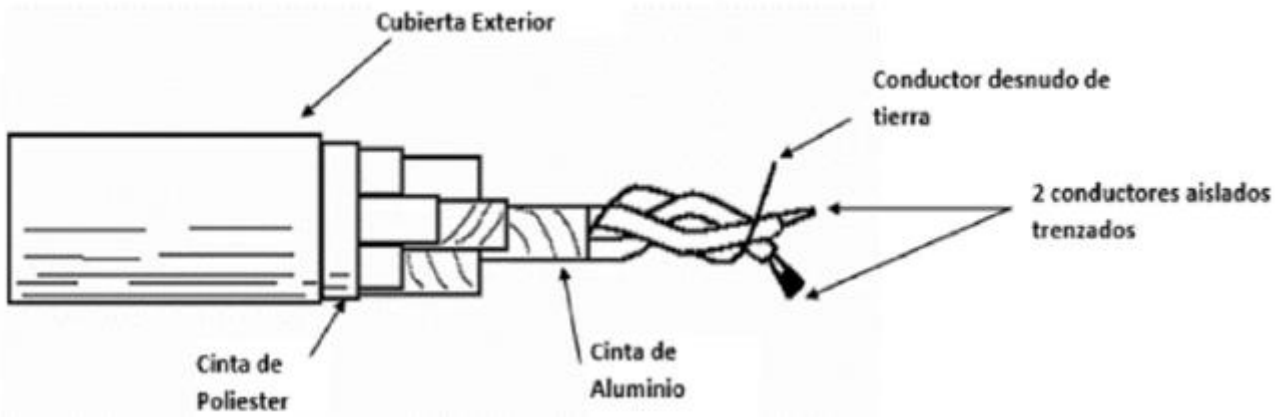


Figure 7 Schematic drawing of Type VII cable



Figure 8 Schematic drawing of type VIII cable.



Figure 9 Schematic drawing of type IX cable.

Note: Figures are for illustrative purposes only.
Client could request for each type of cables a sustainable solution based among others upon:

- Cable whose outer sheath is made of polyolefin of vegetable origin;
- Cables with a percentage of recycled material (in the conductor and/or sheathing)

7.4. CONSTRUCTION CHARACTERISTICS
7.4.1. CONDUCTOR

For all types, the conductor class is defined in table 4 according to IEC60228.

In Table 6 and 7, aluminum and copper conductors' main features are depicted.

Nominal cross-section [mm^2]	Minimum number of wires	Diameter of conductors [mm]		Maximum resistance of conductor at 20°C [Ω/km]
		Minimum	Maximum	
2,5	\	\	\	\
4	\	\	\	\
6	\	\	\	\
10	7	3,4	3,7	3,08
16	7	4,1	4,6	1,91
25	7	5,2	5,7	1,2
35	7	6,1	6,7	0,668
50	19	7,2	7,8	0,641
70	19	8,7	9,4	0,443
95	19	1,3	11,0	0,32
120	37	1,6	12,4	0,253
150	37	12,9	13,8	0,206
185	37	14,5	15,4	0,164
240	37	16,7	17,6	0,125
300	61	18,8	19,8	0,1

Table 6 Aluminum conductors characteristics according to IEC 60228 (Class 2).

Nominal cross-section [mm^2]	Minimum number of wires	Diameter of conductors [mm]		Maximum resistance of conductor at 20°C [Ω/km]
		Minimum	Maximum	
0,75	7	\	1,3	26,7
1	7	\	1,5	20,0
1,5	7	\	1,8	13,7
2,5	7	\	2,4	8,21
4	7	\	3,0	5,09
6	7	\	3,9	3,39
10	7	\	5,1	1,95
16	7	\	6,3	1,24
25	7	\	7,8	0,795
35	7	\	9,2	0,565
50	19	\	11,0	0,393
95	19	\	15,1	0,210
120	37	\	17,0	0,164
150	37	\	19,0	0,132
185	37	\	21,0	0,108

Table 7 Copper conductors characteristics according to IEC 60228 (Class 5).

Copper purity shall not be less than 99,9 %.

For cable classified as "sustainable solution" the conductor material (Copper or Aluminum) shall contain more than 10% of recycled material.

This case, the conductor material shall be compliant with the characteristics required in this Global Standard.

7.4.2.INSULATION

The insulation shall be applied by a suitable extrusion process and shall form a compact and homogenous body. In addition, it shall be possible to remove without creating any damage to the conductor.

The insulating material shall be PVC, HEPR cross-linked polyethylene (XLPE) as defined as per table 4.

The PVC insulation must allow maximum conductor temperatures of 70 °C in normal operation and 160 °C under short circuit condition by at least 5 seconds.

The HEPR insulation must allow maximum conductor temperatures of 90 °C in normal operation and 250 °C under short circuit condition by at least 5 seconds.

The XLPE insulation must allow maximum conductor temperatures of 90 °C in normal operation and 250 °C under short circuit condition by at least 5 seconds.

The minimum thickness of insulation measured and accepted at any point of the cable shall not be less than 90% of the nominal value minus 0,1 mm. In addition, the average of all these measures should not be less than the nominal thickness.

$t_{min} \geq 0{,}9\ t_n - 0{,}1$

Where:

t_{min}: minimum insulation thickness in millimeters

t_n : nominal thickness in millimeters

In Table 8 nominal and minimum thickness for XLPE insulated cables are shown:

Cross-section [mm²]	PVC		XLPE - HEPR		EPR	
	Insulation nominal thickness [mm]	Insulation minimum thickness [mm]	Insulation nominal thickness [mm]	Insulation minimum thickness [mm]	Insulation nominal thickness [mm]	Insulation minimum thickness [mm]
0,75	\	\	\	\	\	\
1	\	\	\	\	\	\
1,5	0,8	0,62	0,7	0,53	1,0	0,8
2,5	0,8	0,62	0,7	0,53	1,0	0,8
4	1,0	0,8	0,7	0,53	1,0	0,8
6	1,0	0,8	0,7	0,53	1,0	0,8
10	1,0	0,8	0,7	0,53	1,0	0,8
16	1,0	0,8	0,7	0,53	1,0	0,8
25	1,2	0,98	0,9	0,71	1,2	0,98
35	1,2	0,98	0,9	0,71	1,2	0,98
50	1,4	1,16	1,0	0,8	1,4	1,16
70	1,4	1,16	1,1	0,89	1,4	1,16
95	1,6	1,34	1,1	0,89	1,6	1,34
120	1,6	1,34	1,2	0,98	1,6	1,34
150	1,8	1,52	1,4	1,16	1,8	1,52
185	2,0	1,7	1,6	1,34	2,0	1,7
240	2,2	1,88	1,7	1,43	2,2	1,88
300	2,4	2,06	1,8	1,52	2,4	2,06

Table 8 Insulation thickness

7.4.3. FILLER

7.4.3.1. Central Fillers

It shall consist of non-hygroscopic textile yarn or by a combination of an extruded compound based on non-vulcanized elastomeric material with textile yarn and that not contaminating insulation and easy to be removed from the cores. The central filler is mandatory for conductor cross-section greater than 25 mm².

7.4.3.2. Overall, Fillers

It shall consist of an extruded compound based on non-vulcanized elastomeric material non-hygroscopic and that not contaminating insulation and easy to be removed from the cores. It shall be drilled between the cores and must allow easy separation of the concentric conductor wires and cover the laid-up cores without gaps. It could be replaced by the inner covering.

7.4.3.3. Inner covering

Over the cores assembly shall be applied an inner covering consisting of a cylindrical layer of extruded compound. It shall be based on a non-vulcanized non-hygroscopic elastomeric material and may be extruded or lapped. Optionally, a synthetic tape may be applied helically over the laid up of cores.

7.4.4. OUTER SHEATH

For those type of cables including an outer sheath, it shall be resistant to moisture and abrasion. In addition, it shall be free from heavy metals or volatile hydrocarbons.

The outer sheath material shall be PVC RZ/PE (ST8)/PO as described in each type (see table 5).

The outer sheath shall be adhered to the insulation.

The nominal outer sheath thickness is given by:

Tnom= 0,035xD +1

Where:

D: diameter in millimeters

tnom : nominal thickness in millimeters

The minimum thickness of the outer sheath measured and accepted at any point of the cable shall not be less than 85% of the nominal value minus 0,1 mm. In addition, the average of all these measures should not be less than the nominal thickness.

tmin≥0,85 tn-0,1

Where:

tmin: minimum thickness in millimeters

tn : nominal thickness in millimeters

7.5.DESIGNATION OF THE CABLE AND FIRE REACTION CLASS

7.5.1. Cable designation

For UE, conforming to RPC UE N. 305/2011.

For European cables, the fire reaction class must be, according to EN 50575, (Cca-s3;d1;a3

7.6. TESTING

EN 50395 Electrical test methods for low-voltage energy cables

IEC 60332 Series “Tests on electric and optical fiber cables under fire conditions”

EN 60754-1 Testing of gases emitted during combustion of materials taken from cables.

EN 50363-0 Insulating, sheathing and covering materials for low-voltage energy cables.

IEC 60811 Electric and fiber optic cables - Test methods for non-metallic materials

EN 50525 series 1-4: “Low voltage energy cables of rated voltages up to and including 450/750 V (U0/U)

8. LOCAL SECTION

If the insulation is black, all conductors must be clearly identified by sequential numbering indicated on the insulation, which differs from country to country.

Material code	Cross-section [mm^2]	Color
631101	1.5	Black, Brown, Grey, Light-blue, Yellow-Green
631102	2.5	Black, Brown, Grey, Light-blue, Yellow-Green
631103	4	Black, Brown, Grey, Light-blue, Yellow-Green
631104	6	Black, Brown, Grey, Light-blue, Yellow-Green
631105	10	Black, Brown, Grey, Light-blue, Yellow-Green
631106	16	Black, Brown, Grey, Light-blue, Yellow-Green
631107	25	Black, Brown, Grey, Light-blue, Yellow-Green

ERRATA

CONDUCTOR IDENTIFICATION

For multipolar cables with a conductor number greater than 5, conductor identification must be using numbers, no color.

INSULATION TICKNESS FOR HEPR

In the common list (table 4) for type III and IV cable that can be produced with PVC and HEPR insulation, the insulation thickness value is referred only to PVC.

For HEPR insulation thickness value, please consult table 8.

COPPER CONDUCTORS' CHARACTERISTICS ACCORDING TO IEC 60228 (CLASS 2)

For copper conductor Plain wires (table 7) it shall be considered these values

Nominal cross-section [mm^2]	Minimum number of wires	Diameter of conductors [mm] Maximum	Maximum resistance of conductor at 20°C [Ω/km]
0.75	7	1.3	26
1	7	1.5	19,5
1.5	7	1.8	13,3
2.5	7	2.4	7,98
4	7	3.0	4,95
6	7	3.9	3,3
10	7	5.1	1,91
16	7	6.3	1.21
25	7	7.8	0,78
35	7	9.2	0,554
50	19	11.0	0,386
95	19	15.1	0,206
120	37	17.0	0.161
150	37	19.0	0.129
185	37	21.0	0.106
240	37	24.0	0.0801

COPPER CONDUCTORS' CHARACTERISTICS ACCORDING TO IEC 60228 (CLASS 5)

Nominal cross-section [mm2]	Maximum diameter of wires in conductor	Maximum resistance of Nominal conductor at 20 °C
0,5	0,21	39
0.75	0,21	26
1	0,21	19,5
1.5	0,26	13,3
2.5	0,26	7,98
4	0,31	4,95
6	0,31	3,3
10	0,41	1,91
16	0,41	1,21
25	0,41	0,78
35	0,41	0,554
50	0,41	0,386
70	0,51	0,272
95	0,51	0,206
120	0,51	0,161
150	0,51	0,129
185	0,51	0,106
240	0,51	0,0801
300	0,51	0,0641
400	0,51	0,0486
500	0,61	0,0384
630	0,61	0,0287