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COVERED CONDUCTOR FOR MV LINES

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1 SCOPE

The aim of this document is to provide technical requirements for the supply of covered conductors to be used in the MV lines of the distribution networks of Enel Group Distribution Companies, listed below:

<i>Enel Codensa</i>	<i>Colombia</i>
<i>Edesur</i>	<i>Argentina</i>
<i>Enel distribución Chile</i>	<i>Chile</i>
<i>Enel Distribuição Ceará</i>	<i>Brazil</i>
<i>Enel Distribuição Rio</i>	<i>Brazil</i>
<i>Enel Distribuição Goiás</i>	<i>Brazil</i>
<i>Enel Distribuição Sao Paulo</i>	<i>Brazil</i>

This document specifies the characteristics and tests that shall be accomplished by covered conductor used in the medium voltage distribution network.

Additional prescriptions or integration of the main common part are reported in Local Sections with the same corresponding clause or sub-clause number.

The local standards replaced by this standard appear in the local section.

2 REFERENCE LAWS AND STANDARDS

The list of reference laws and standards are mentioned below in this document.

2.1 Laws

Brazil

- NR-10 - Segurança em Instalações e Serviços em Eletricidade

Chile

- NSEG5. E.n.71 Reglamento de Instalaciones Eléctricas de Corrientes Fuertes.

Colombia

- RETIE, Reglamento Técnico de Instalaciones Eléctricas.

2.2 Standards

The following standards are needful for the application of this Global Standard.

- ASTM E 2009 – Standard Test Method for Oxidation onset temperature of hydrocarbons by differential scanning calorimetry.
- ASTM D 3418 – Standard Test Method for Transition Temperatures of Polymers by Thermal Analysis.
- EN 50397-1 – Covered conductors for overhead lines and the related accessories for rated voltages above 1 kV a.c. and not exceeding 36 kV a.c. Part 1: Covered conductors
- EN 50356 - Method for spark testing of cables.
- HD 605 - Electric cables - Additional test methods

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- IEC 60811 series - Electric and optical fibre cables
- IEC 60502-2 - Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1,2$ kV) up to 30 kV ($U_m = 36$ kV) - Part 2: Cables for rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV)
- EN 50182 - Conductors for overhead lines - Round wire concentric lay stranded conductors.
- IEC 60228 – Conductors of insulated cables
- IEC 60889 – Hard-drawn aluminum wire for overhead line conductors
- IEC 61089:1991 Standard | Round wire concentric lay overhead electrical stranded conductors.
- 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

2.3 Local standards

See local section

3 DEFINITIONS

3.1 Conductor

A wire or combination of wires not insulated from one another, suitable for carrying an electric current.

3.2 Wire

Flexible cylindrical conductor, the length of which is large with respect to its cross-sectional dimensions. Used in the manufacture of a stranded conductor.

4 SERVICE CONDITIONS

The service conditions to be considered for the material included in this standard are:

4.1 Temperature

Covered conductor shall be installed in areas with a range of ambient air temperatures from -5°C to 45°C .

4.2 Pollution

Covered conductor shall be installed in areas with different pollution levels, particularly avoiding those with presence of saline contamination.

4.3 Altitude

The maximum reference altitude is 2.700 masl (Colombia).

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5 TYPOLOGIES

5.1 Type I – Covered aluminum conductor for Spacer system

Hard Aluminum conductor, water blocked, semi-conductor, XLPE layer, HDPE outer sheath (resistant to external conditions and to tracking).

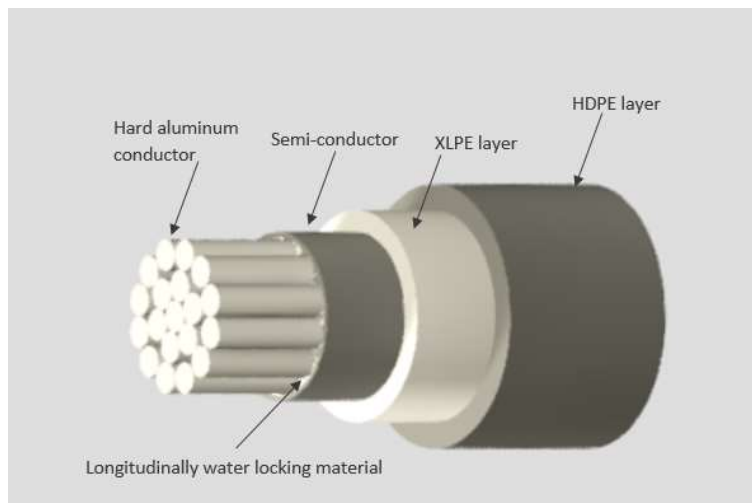


Figure 1 Type I Covered Conductor

5.2 Type II - Covered aluminum conductor steel reinforced for self-supporting system

Aluminum conductor Steel reinforced, water blocked, semi-conductor, XLPE layer, HDPE outer sheath (resistant to external conditions and to tracking).

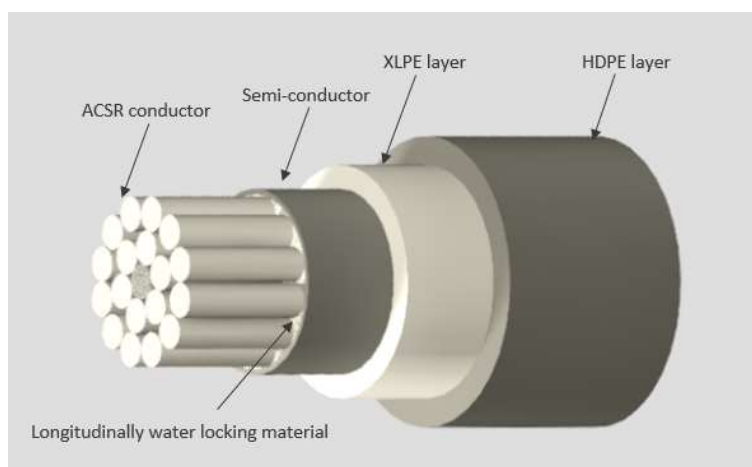


Figure 2 Type II Covered Conductor

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6 DESIGN, MATERIALS AND CONSTRUCTION CHARACTERISTICS

6.1 Conductor

6.1.1 Aluminum conductor

The conductor shall be stranded compacted circular (class 2, IEC 60228), based upon pure aluminum wires. This aluminum shall have a minimum 99,5% of aluminum content and a minimum conductivity equivalent to 61% IACS at 20°C as defined per IEC 60889. This conductor is also known as AAC.

The number of wires per conductor and their diameter shall be as described on table 1.

Nominal Cross-section (mm ²)	Minimum number of wires	Diameter (mm)		Minimum breaking load (daN)	Maximum electrical resistance at 20°C (Ω/km)
		Minimum	Maximum		
50	6	7,7	8,6	650	0,641
95	15	11,0	12,0	1235	0,320
185	30	15,3	16,8	2405	0,164
300 *	30	19,7	21,6	3900	0,100

Table 1- Aluminum conductor characteristics

(*) Cross section not considered in Policy 214, to be used only for refurbishment/maintenance of the existing grid.

The different layers conforming the conductor shall be stranded so that adjacent ones shall have opposite direction of lay and the outer layer shall be right-hand.

6.1.2 Aluminum conductor steel reinforced

The conductor shall be stranded circular (IEC 61089), based upon aluminum wires stranded around a core of steel wires.

The number of wires per conductor and their diameter shall be as described on table 2.

Nominal Cross-section (mm ²) Al/St	Minimum number of wires Al/St	Diameter (mm) before stranding		Rated strength before stranding (kg/mm ²)		Maximum electrical resistance at 20°C (Ω/km)
		Al wires	St wires	Al wires	St wires	
25/4*	6/1	2,25 ± 0,02	2,25 ± 0,03	18,0	131	1,200
50/8	6/1	3,20 ± 0,02	3,20 ± 0,05	16,8	131	0,595
95/15	26/7	2,15 ± 0,02	1,67 ± 0,02	18,0	131	0,306

Table 2- ACSR characteristics

(*) Cross sections not considered in Policy 214.

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The different layers conforming the conductor shall be stranded so that adjacent ones shall have opposite direction of lay and the outer layer shall be right-hand.

6.2 Semi-conductive screen

It shall consist of a fully bonded layer of black semi-conductive cross-linked compound. It shall be extruded over the conductor to provide a smooth surface without causing any damage to the conductor.

The conductor screen minimum thickness measured and accepted at any point shall not be less than 0,32 mm. In addition, the average of all the measures shall not be less than the nominal thickness (0,4 mm).

6.3 Outer sheath

6.3.1 Insulating layer

The first layer of the sheath is the insulating layer (not being the same level of insulation as a standard insulated cable). The insulation layer shall be applied by a suitable extrusion process, simultaneously with the semi-conductive screen, and shall form a compact and homogenous body. In addition, it shall be possible to remove it without creating any damage to the conductor.

This layer shall be built in XLPE compliant with IEC 60502-2 characteristics, with nominal thickness as described in table 3. The minimum thickness measured and accepted at any point of the insulation layer shall not be less than 90% of the nominal value minus 0,1 mm.

6.3.2 Protective layer

The second layer will be an extruded covering layer and will provide resistance to adverse weather conditions, electrical tracking, ultraviolet radiation and mechanical abrasion. It shall be adhered to the insulating layer. Besides the characteristics indicated herein, the material shall be compliant with Polyethylene designation ST7 as described in standard IEC 60502-2.

The minimum thickness measured and accepted at any point of the protective layer shall not be less than 90% of the nominal value minus 0,1 mm.

Nominal voltage U_{Max} (kV)	Nominal Thickness Screen (mm)	Minimum Thickness Screen (mm)	Nominal thickness outer sheath (mm)	
			XLPE	HDPE
15	0,40	0,32	1,5	1,5
25			2,0	2,0
35			3,8	3,8

Table 3- Type I and Type II Covered Conductors outer sheath dimensional characteristics

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6.4 Characteristics

Outer diameter of the covered conductor shall be as described in Annex A.

The covered conductor shall support until 90 °C under normal operating conditions, 100 °C when emergency overload and 250 °C under short-circuit condition. Emergency overload shall not overpass 100 h in any period of 12 months, neither 500 h along his whole life. Short-circuit condition shall not be longer than 5s.

The covered conductor shall be blocked longitudinally against water penetration.

The locking material shall completely fill the interstices between wires, it shall be chemically and thermally compatible material with the rest of the components.

The outer sheath and the semi-conductive screen, both, shall be extruded simultaneously over the conductor in order to preserve the water blocking.

6.4.1 Ampacity

The ampacity estimated value shall be given for network design purposes.

Unless otherwise indicated in local sections, such ampacity values shall be calculated in steady state condition, for single core laying and triplex laying using the following operational conditions:

Maximum conductor temperature 90 °C

Ambient air temperature 30 °C and 40 °C

Wind speed 2,2 km/h

Sheath resistivity 3,5 mK/W

Absorption coefficient of sheath material 0,4

Thermal emissivity of sheath material 0,8

Solar radiation 1000 W/m²

Electrical resistance according to table 4

Cross-section [mm ²]	Maximum electrical resistance AC Ω/km			
	20 °C	70 °C	75 °C	90 °C
50	0,641	0,770	0,783	0,822
95	0,320	0,384	0,391	0,410
185	0,164	0,197	0,200	0,210
300	0,100	0,120	0,122	0,128

Table 4 – Maximum electrical resistance AC

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7 DESIGNATION AND MARKING

7.1 Designation

The conductor shall be designed with:

- CC (meaning covered conductor);
- Cross section in sqmm and material (x-AAC or x-AL/y-ST);
- BLOCKED;
- Nominal voltage;
- XLPE/HDPE (for both type I and II);

Example for Brazil Country Code 6808986: CC 50-AAC BLOCKED 15KV XLPE/HDPE.

Note: As an alternative, and due to the fact that this type of conductors are only foreseen for LatAm, it could be also designated in Spanish/Portuguese: CC 50-AAC BLOQUEADO 15KV XLPE/HDPE.

7.2 Marking

The outer surface of the cable sheath shall be marked at regular intervals of 500 mm with permanent readable characters. The marking will not favor the electrical tracking on the cover and will pass the test of durability described on HD 605, clause 2.5.4.

The marking shall include:

- Manufacturer;
- CC;
- Material and nominal cross-section (in mm²) of the conductor (x-AL or x-AL/y-ST);
- Nominal voltage U_{Max} (kV);
- Sheath material (XLPE/HDPE);
- “Blocked – Bloqueado”;
- Manufacturing year;
- ENEL;
- “Covered conductor. Danger. Non-insulated cable. Conductor coberto. Perigo. Cabo não isolado. Conductor cubierto. Peligro. Cable no aislado”.

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8 TESTING

The covered conductor shall accomplish the tests according to EN 50357, including two additional tests.

Tests shall be performed according to the following considerations. Tests are divided into three groups:

- Type tests
- Sample tests
- Routine tests

Type tests are performed once, during the TCA process. Sample and routine tests shall be carried out on every singular purchased lot.

TESTS	TYPE	SAMPLE	ROUTINE	STANDARD	
1 ELECTRIC TESTS					
1.1	Conductor resistance	X	X	EN 50397-1 & HD 605	
1.2	High voltage tests	X	X	EN 50397-1 & HD 605	
1.3	Spark test on the covering		X	EN 50397-1 & EN 50356	
1.4	Leakage current	X		EN 50397-1	
1.5	Tracking resistance	X		EN 50397-1	
2 CONSTRUCTIONS AND DIMENSIONS					
2.1	Compliance with the design requirements	X	X	X	EN 50397-1
2.2	Thickness of the covering	X	X	X	EN 50397-1 & IEC 60811 series
3 CONSTRUCTIONS AND MECHANICAL PROPERTIES OF THE CONDUCTOR					
3.1	Rated tensil strength	X	X		EN 50397-1 & EN 50182
3.2	Constructions and dimensions	X	X		EN 50397-1 & EN 50182
3.3	Conductor breaking strength	X	X		EN 50182
4 NON-ELECTRICAL TESTS ON THE COVERING					
4.1	Mechanical properties	X			EN 50397-1 & IEC 60811 series
4.2	Carbon black content	X			EN 50397-1 & IEC 60811 series
4.3	Resistance to UV rays	X			EN 50397-1 & HD 605
5 TEST OF COMPATIBILITY					
5.1	Ageing of complete product sample	X			EN 50397-1 & IEC 60811 series
6 THERMAL PROPERTIES OF THE COVERING					
6.1	Shrinkage test	X			EN 50397-1 & IEC 60811 series
6.2	Hot-set-test	X	X		EN 50397-1 & IEC 60811 series
6.3	Pressure test at high temperature	X			EN 50397-1 & IEC 60811 series
6.4	Melting point and oxidation temperature of sheath material	X	X		ASTM D 3418 ASTM E 2009
7 FURTHER TESTS ON THE COVERING					
7.1	Water absorption	X			EN 50397-1 & IEC 60811 series
7.2	Shore D hardness	X			EN 50397-1 & HD 605
8 TEST OF THE LONGITUDINAL WATERTIGHTNESS					
8.1	With heat cycle	X			EN 50397-1 & IEC 60502-2
8.2	Without heat cycle		X		EN 50397-1 & IEC 60502-2
9 MARKING					
9.1	Content, legibility	X	X	X	EN 50397-1
9.2	Durability	X			EN 50397-1 & HD 605
10 SLIPPAGE TEST					
10.1	Slippage test	X			EN 50397-1
Notes:					
4.2 If carbon black is used for UV stabilisation					
4.3 If other than carbon black is used for UV stabilisation					
6.4 See annex D					

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8.1 Sample plan

According to GSCC022, the supplier shall perform the sampling tests following a single sampling plan for normal inspection, AQL=1,5%, Level I in compliance with standard ISO 2859-1, as long as the resulting minimum number of samples (8) does not exceed 25% of the total lot size. In such case, the number of samples shall be 25% of the total lot size rounded down to the nearest unit.

The routine tests shall be performed at 100% of delivered spools.

Tests performed during the production process on semi-finished products may also be considered valid, as acceptance test, if:

- the tests are performed as required by the relevant technical specifications and technical Standards;
- the sampling plans adopted by the Supplier are in compliance with the aforementioned ones;
- the performed test results are properly recorded;
- the supplier demonstrates that the components/materials features do not vary during further production phases after the test.

The reports of the acceptance tests performed by the supplier shall be prepared and retained for a possible verification by Enel inspectors.

The supplier shall be available to repeat the tests in the presence of Enel's Inspector on a "reduced" sample of the supply lot defined as follows:

- routine test: the minimum between a single sampling plan for normal inspection, AQL=1%, Level I and 1/3 of the total number of delivered spools (rounded down to the nearest unit);
- sample test: 1/2 of the sampling (rounded down to the nearest unit) already adopted for the sample test independently performed by the supplier (Enel inspector can choose to perform the test on spools already tested by the Supplier or on others from the lot).

In case of repetition of routine test attended by Enel Inspector, the spark test is not applicable.

The negative result of a single test will result in the rejection of the lot or, when possible, in the repetition of the test on all the units, in order to accept only the compliant ones.

If only a single spool is purchased, it shall be tested according to what is indicated for a single sample.

On a spool among those subjected to the electrical resistance measurement, shall be performed the verification of the total length of the cable, that shall be not shorter than that declared by the supplier by more than 0,5 m.

9 TECHNICAL CONFORMITY ASSESSMENT

Technical Conformity is issued by Enel Group according to the Global Standard GSCG002 and shall be supported by accomplishing all of the Type tests on every code. Type tests are performed once and shall be repeated when it changes the design of the equipment, the materials, production process or the reference standards (if these changes could affect them).

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9.1 Local Certifications

For Colombia, RETIE certification shall be also provided according to local regulation (see 2.1).

10 GUARANTEE

Requirement of warranty will be indicated in the request for bids, indicating periods and standards, although any material will be warrantied 24 months as a minimum.

11 CONDITIONS OF SUPPLY

Manufacturers shall provide appropriate instructions, documents showing routine tests and information covering general conditions during transport, storage and installation of the materials. These instructions shall include recommendations for handling and installation. The documents shall be in the local language of the destiny country.

The covered conductor shall be delivered on spools suitable to protect the covered conductor during handling, transport and storage, even when exposed to different weather conditions. The spool shall be of the required strength and free of defects which may damage the product. The standard packaging on reels shall be limited to a net weight of 1500 kg \pm 20% (see local section for more details). Spools shall also be prepared to prevent degradation over time.

Spools made of wood shall be conveniently treated in accordance with the phytosanitary regulations of the destination country and the international requirements for the control of plant disease, avoiding "Pentachlorophenol" and "Creosote". The treatment shall also be respectful with the covered conductor. It shall be informed the wood origin.

The ends of the cables shall be properly sealed with heat-resistant, weatherproof hoods to prevent the entry of moisture.

The drums shall be identified by means of an anodised aluminum plate containing at least the following information:

- a) manufacturer's name;
- b) "Covered conductor", CC, conductor material, nominal section in mm² and the word "BLOCKED";
- c) sheath materials;
- d) rated voltage in kV;
- e) length of each shipping unit in meters;
- f) net and gross weight in kg;
- g) the name of the Enel company of destiny;
- h) drum serial number;
- i) year of manufacture of the cable;
- j) arrow in the direction of rotation to unfold and the phrase "ROLL IN THIS DIRECTION".

All the packages shall be properly identified about transport and destination.



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ANNEX A TECHNICAL REQUIREMENTS

GS Type Code	Distribution Company and Country	Country Code	Rated Voltage (U _{max}) [kV]	Cross-section [mm ²]	Type of conductor	Conductor material	Conductor screen nominal thickness [mm]	Conductor screen minimum thickness [mm]	Inner layer material	Inner layer minimum thickness [mm]	Outer layer material	Inner layer minimum thickness [mm]	Minimum outer diameter [mm]	Maximum outer diameter [mm]	Outer colour	Longitudinal watertightness [Yes/Not]	Estimated total mass [kg/km]	Estimated current [A]
GSCC021/01	RJ/CE/GO-BRASIL	6808986	15	50	I	Aluminum	0,40	0,32	XLPE	1,5	HDPE	1,5	13,7	16,6	Grey	Yes	235	174
GSCC021/02	RJ/CE/GO-BRASIL	T330022	15	95	I	Aluminum	0,40	0,32	XLPE	1,5	HDPE	1,5	17	20	Grey	Yes	400	266
GSCC021/02	COLOMBIA	330015	15	95	I	Aluminum	0,40	0,32	XLPE	1,5	HDPE	1,5	17	20	Grey	Yes	400	266
GSCC021/03	RJ/CE/GO-BRASIL	6808987	15	185	I	Aluminum	0,40	0,32	XLPE	1,5	HDPE	1,5	21,3	24,8	Grey	Yes	695	403
GSCC021/03	COLOMBIA	330013	15	185	I	Aluminum	0,40	0,32	XLPE	1,5	HDPE	1,5	21,3	24,8	Grey	Yes	695	403
GSCC021/04	EDESUR-ARGENTINA	0101-0509	15	25/4	II	Aluminum/Steel	0,40	0,32	XLPE	1,5	HDPE	1,5			Grey	Yes		
GSCC021/05	EDESUR-ARGENTINA	0101-0508	15	50/8	II	Aluminum/Steel	0,40	0,32	XLPE	1,5	HDPE	1,5			Grey	Yes		
GSCC021/06	EDESUR-ARGENTINA	0101-0507	15	95/15	II	Aluminum/Steel	0,40	0,32	XLPE	1,5	HDPE	1,5			Grey	Yes		
GSCC021/07	RJ/CE/GO-BRASIL	6809072	25	50	I	Aluminum	0,40	0,32	XLPE	2,0	HDPE	2,0	15,7	18,7	Grey	Yes	385	164
GSCC021/07	Enel Distribución CHILE	330008	25	50	I	Aluminum	0,40	0,32	XLPE	2,0	HDPE	2,0	15,7	18,7	Grey	Yes	385	164
GSCC021/08	RJ/CE/GO/SP-BRASIL	T330023 323302	25	95	I	Aluminum	0,40	0,32	XLPE	2,0	HDPE	2,0	19	22,1	Grey	Yes	460	256
GSCC021/08	Enel Distribución CHILE	330009	25	95	I	Aluminum	0,40	0,32	XLPE	2,0	HDPE	2,0	19	22,1	Grey	Yes	460	256
GSCC021/09	RJ/CE/GO/SP-BRASIL	6783281 323185	25	185	I	Aluminum	0,40	0,32	XLPE	2,0	HDPE	2,0	23,3	26,9	Grey	Yes	770	400
GSCC021/09	Enel Distribución CHILE	330010	25	185	I	Aluminum	0,40	0,32	XLPE	2,0	HDPE	2,0	23,3	26,9	Grey	Yes	770	400
GSCC021/10	SP-BRASIL	323301	25	300	I	Aluminum	0,40	0,32	XLPE	2,0	HDPE	2,0	27,7	31,5	Grey	Yes	1155	543
GSCC021/10	Enel Distribución CHILE	330011	25	300	I	Aluminum	0,40	0,32	XLPE	2,0	HDPE	2,0	27,7	31,5	Grey	Yes	1155	543
GSCC021/11	RJ/CE/GO-BRASIL	T330038	35	95	I	Aluminum	0,40	0,32	XLPE	3,8	HDPE	3,8	26,8	30,6	Grey	Yes	775	252



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GS Type Code	Distribution Company and Country	Country Code	Rated Voltage (U _{max}) [kV]	Cross-section [mm ²]	Type of conductor	Conductor material	Conductor screen nominal thickness	Conductor screen minimum thickness	Inner layer material	Inner layer minimum thickness	Outer layer material	Inner layer minimum thickness	Minimum outer diameter	Maximum outer diameter	Outer colour	Longitudinal watertightness	Estimated total mass	Estimated current
GSCC021/11	COLOMBIA	330014	35	95	I	Aluminum	0,40	0,32	XLPE	3,8	HDPE	3,8	26,8	30,6	Grey	Yes	775	252
GSCC021/12	RJ/CE/GO/SP -BRASIL	6808989 323303	35	185	I	Aluminum	0,40	0,32	XLPE	3,8	HDPE	3,8	31,1	35,4	Grey	Yes	1150	379
GSCC021/12	COLOMBIA	330012	35	185	I	Aluminum	0,40	0,32	XLPE	3,8	HDPE	3,8	31,1	35,4	Grey	Yes	1150	379
GSCC021/13	SP -BRASIL	323304	35	300	I	Aluminum	0,40	0,32	XLPE	3,8	HDPE	3,8	35,5	40	Grey	Yes	1585	512

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ANNEX B- LOCAL SECTIONS

BRAZIL

2.3 Local standards

- NBR11873 – Covered cables with polymeric material for overhead distribution lines in spacers for voltages 13,8kV up to 34,5kV
- ABNT NBR 11137 - Wooden reel for wiring wires and cables — Dimensions and structures
- ABNT NBR 6236 - Wood for reel of wires, ropes and cables - Requirements
- ABNT NBR 6653 - Steel bands for package - Specification
- ABNT NBR 7309 - Storage, transportation and movement of the component elements of the wooden reels for wires, cables and winding zinc coated steel wires ropes
- ABNT NBR 7310 - Storage , transportation and use of reels for wires, cables and winding zinc coated steel wires ropes

11 CONDITIONS OF SUPPLY

The spool shall have dimensions according to ABNT NBR 11137, with drum diameter respecting the minimum calculated according to ABNT NBR 9511.

Wood and the hoods used in the manufacture of the reels shall comply with the requirements of ABNT NBR 6236.

The steel straps for packaging and final wrapping of the reels shall comply with ABNT NBR 6653.

The required conditions for packing, transporting, storing and moving electric conductor coils are in the ABNT NBR 7309 and ABNT NBR 7310 standards.

COLOMBIA

7.2 Marking

Marking shall be according to RETIE.

11 CONDITIONS OF SUPPLY

The cable shall be delivered by the manufacturer on a wooden or metal spool, which will not be returned, as per maximum and minimum dimensions indicated in Table 4 and in accordance with Figure 3.

In order to use the reel in a spooling machine, the reel shall be supplied with two holes spaced at 50 cm, equidistant and aligned with central hole.

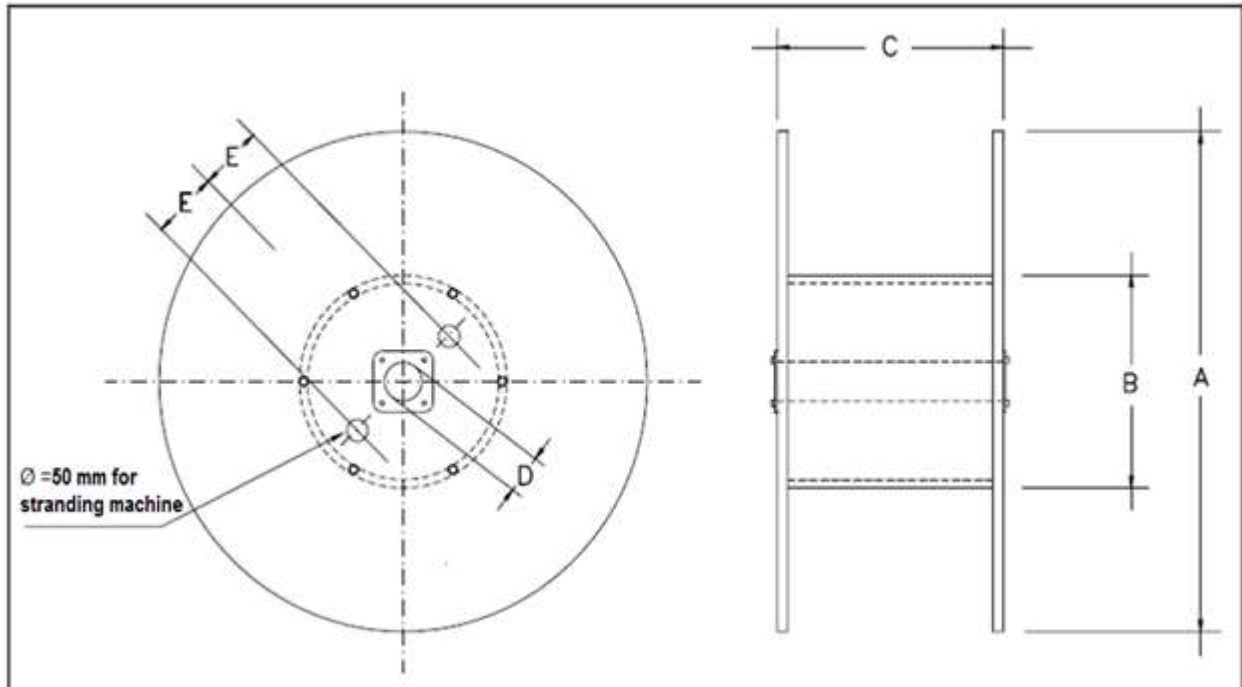


Figure 3 – Drum

A (1) [mm]	B [mm]	C (1) [mm]	D (2) [mm]	E [mm]	Φ [mm]
1730	(3)	1120	80	(4)	50

Table 5 – Reel dimensions

Notes:

- 1) Maximum value
- 2) Minimum value
- 3) Two times the minimum bending radius indicated by the supplier
- 4) 300 or 180 mm according to spool type (large or small, respectively)

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ANNEX C - Technical Check list

Check list for Type I Covered Conductor

Item	Description			
1	GENERAL INFORMATION			
1.1	Supplier			
1.2	Factory			
1.3	Distribution Company and Country			
1.4	Country Code			
1.5	GS Type Code			
1.6	Designation			
1.7	Cable type	I		
1.8	Supplier reference			
1.9	Standard	GSCC021		
2	TECHNICAL CHARACTERISTICS	Unit	Required	Offered
2.1	Rated Voltage (U_{Max})	kV		
2.2	Average thickness screen	mm		
2.3	Average thickness sheath, inner layer, XLPE	mm		
2.4	Average thickness sheath, outer layer, HDPE	mm		
2.5	Aluminum Cross section	mm ²		
2.6	Minimum outer diameter (covered conductor)	mm		
2.7	Maximum outer diameter (covered conductor)	mm		
2.8	Total weight (estimated)	kg/km		
2.9	Current (estimated according GSCC021 6.4.1)	A		
2.10	Type Tests	Acc Standard		

Table 6- Check list type I

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Check list for Type II Covered Conductor

Item	Description			
1	GENERAL INFORMATION			
1.1	Supplier			
1.2	Factory			
1.3	Distribution Company and Country			
1.4	Country Code			
1.5	GS Type Code			
1.6	Designation			
1.7	Cable type	II		
1.8	Supplier reference			
1.9	Standard	GSCC021		
2	TECHNICAL CHARACTERISTICS	Unit	Required	Offered
2.1	Rated Voltage (U_{Max})	kV		
2.2	Average thickness screen	mm		
2.3	Average thickness sheath, inner layer, XLPE	mm		
2.4	Average thickness sheath, outer layer, LDPE	mm		
2.5	Aluminum Cross section	mm ²		
2.6	Steel Cross section	mm		
2.7	Outer diameter	mm		
2.8	Total weight (estimated)	kg/km		
2.9	Current (estimated according GSCC021 6.4.1)	A		
2.10	Type Tests	Acc Standard		

Table 7 – Check list Type II

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ANNEX D – Melting point and oxidation temperature of sheath material test

This requirement applies only to the cover layer(s) of the finished cable.

The melting temperature of the cover material must be at least 105 °C and there must be no transition points at temperatures below this (in the test temperature range).

The initial degradation temperature of the cover material shall not be lower than 245 °C.

The test shall be performed by differential scanning calorimetry (DSC), covering the temperature range from ambient (around 20 °C) to +300 °C, with a heating rate of 10 °C/min, in O₂ atmosphere. The analysis shall be performed according to ASTM D 3418, for the melting point, and according to ASTM 2009, for oxidation temperature.

The specimens must be prepared from the sheath taken from the complete cable sample. It shall be obtained three specimens, if possible from three different component drums from the batch produced. The specimens, taken from the sheath, shall have a diameter of 4 mm, they shall be 0,5 mm thick and have a mass of approximately 3 mg.

Type test will be considered not passed if any of the specimens do not pass the requirement, and if there are variations of more than 2 °C between the extreme values obtained in any of the specimens.

Sample test will be considered not passed when it happens any of the following conditions:

- Mean of the values obtained for the melting temperature of the test specimens outside the range comprised by the mean of the respective values obtained in the type test ± 2 °C
- Variation superior to 2°C between the extreme values obtained for melting temperature of the specimens
- Occurrence of transition peaks below the melting point in the test temperature range with any of the specimens below 105 °C
- Occurrence of oxidation or degradation of the material at a temperature below 254 °C