

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

## CONTENTS

1.....	DOCUMENT AIMS AND APPLICATION AREA.....	2
1.1	RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL.....	2
2.....	DOCUMENT VERSION MANAGEMENT.....	2
3.....	UNITS IN CHARGE OF THE DOCUMENT .....	3
4.....	REFERENCES.....	3
5.....	ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY.....	5
6.....	DEFINITIONS AND ACRONYMS .....	5
7.....	DESCRIPTION.....	6
7.1	LIST OF COMPONENTS .....	6
7.2	SERVICE CONDITIONS .....	8
7.2.1	General service conditions .....	8
7.2.2	Specific service conditions .....	8
7.3	TECHNICAL CHARACTERISTICS.....	8
7.4	MV SINGLE-CORE CABLE .....	8
7.4.1	Cable accessories.....	9
7.5	TYPE OF PRE-ASSEMBLED CONNECTION CABLES .....	10
7.6	TESTING.....	11
7.6.1	Acceptance test.....	11
7.6.2	Acceptance test repeated in the presence of an Enel inspector or appointed person .....	12
7.7	TECHNICAL CONFORMITY ASSESSMENT (TCA) .....	13
7.8	WARRANTY .....	13
7.9	CONDITIONS OF SUPPLY.....	13
7.9.1	Barcode.....	14
8.....	ANNEX A – Technical Check List.....	14

**THE HEAD OF Network Components**  
**Maurizio Mazzotti**

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## 1 DOCUMENT AIMS AND APPLICATION AREA

The aim of this document is to provide technical requirements for the supply of 12/20(24) and 18/30(36) pre-assembled cable connections to be used in the secondary substations to connect the distribution transformers with Medium Voltage (MV) equipment such as Switchgears.

These Global Standard applies to the Distribution Companies of Enel Group listed below:

Country	Distribution Company
Argentina	Edesur
Brazil	Enel Distribuição Rio Enel Distribuição Ceará Enel Distribuição Goiás Enel Enel Distribuição São Paulo
Chile	Enel Distribución Chile
Colombia	Enel Codensa
Iberia	e-distribución
Italy	e-distribuzione
Peru	Enel Distribución Perú
Romania	Enel Distribuție Banat Enel Distribuție Dobrogea Enel Distribuție Muntenia

**Table 1 – Distribution Companies**

### 1.1 RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL

This document applies to both Enel Global Infrastructure and Networks Srl Company and to Infrastructure and Networks Business Line perimeter when each Company does not have to issue further documents.

## 2 DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
0	07/11/2017	First issuing only for Italy.
01	12/2021	Extension to other Countries

**Application Areas**Perimeter: *Global*

Staff Function: -

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Business Line: *Infrastructure & Networks*

### 3 UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

- Global Infrastructure and Networks: Engineering and Construction / Network Components unit

Responsible for authorizing the document:

- Global Infrastructure and Networks: Head Network Components unit
- Global Infrastructure and Networks: Head of Quality unit.

### 4 REFERENCES

- Code of Ethics of Enel Group;
- The Enel Group Zero Tolerance of Corruption (ZTC) Plan;
- Organization and management model as per Legislative Decree No. 231/2001;
- Stop Work Policy;
- Enel Human Right Policy;
- Enel Global Compliance Program (EGCP);
- Integrated Policy of Quality, Health and Safety, Environment and anti-Bribery;
- ISO 9001:2015 - Quality Management System - Requirements;
- ISO 14001:2015 - Environmental Management System - Requirements and user guide;
- ISO 45001:2018 - Occupational Health and Safety Management System - Requirements and user guide;
- ISO 50001:2018 - Energy management systems - Requirements with guidance for use;
- ISO 37001:2016 - Anti-bribery Management System - Requirements with guidance for use.
- ISO/IEC 17000 Conformity assessment – Vocabulary and general principles
- ISO/IEC 17020 General criteria for the operation of various types of bodies performing inspection
- ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- ISO/IEC 17050-1 Conformity assessment - Supplier's declaration of conformity - Part 1: General requirements (ISO/IEC 17050-1:2004, corrected version 2007-06-15)
- ISO/IEC 17050-2 Conformity assessment - Supplier's declaration of conformity - Part 2: Supporting documentation (ISO/IEC 17050-2:2004)
- ISO/IEC 17065 Conformity assessment – Requirements for bodies certifying products, processes and services
- UNI ISO 2859-1 Ed5-2007

### GLOBAL STANDARDS

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

- 
- GSCC006 “Separable Connectors for MV Cables”, rev. 04.
  - GSCC005 “Cold Shrink Terminations for MV Cables”, rev.04.

**LOCAL STANDARDS AND LAWS**

- GUI 101 “Caratteristiche generali e prescrizioni di impiego del pallet in legno da utilizzare per l’imballo di trasporto”;
- DECRETO N° 109, Reglamento de seguridad de las instalaciones eléctricas destinadas a la producción, transporte, prestación de servicios complementarios, sistemas de almacenamiento y distribución de energía eléctrica.
- DECRETO N°8, Reglamento de seguridad de las instalaciones de consumo de energía eléctrica.
- R.D. 614/2001, de 8 de junio, sobre disposiciones mínimas para la protección de la salud y seguridad de los trabajadores frente al riesgo eléctrico.
- R.D. 337/2014, de 9 de mayo, por el que se aprueban el Reglamento sobre condiciones técnicas y garantías de seguridad en instalaciones eléctricas de alta tensión y sus Instrucciones Técnicas Complementarias ITC-RAT 01 a 23.
- R. D, 223/2008 de 15 de febrero, por el que aprueba el Reglamento sobre condiciones técnicas y garantías de seguridad en líneas eléctricas de alta tensión y sus instrucciones técnicas complementarias ITC-LAT 01 a 09 (R.L.A.T.).
- UNE-HD 620 9-E Cables eléctricos de distribución con aislamiento extruido, de tensión asignada desde 3,6/6 (7,2) kV hasta 20,8/36 (42) kV inclusive. Parte 9: Cables unipolares y unipolares reunidos con aislamiento de HEPR. Sección E: Cables con cubierta de compuesto de poliolefina (Tipos 9E-1, 9E-3 y 9E-5)

**REPLACED LOCAL STANDARDS**

- DJ 4448 “Collegamenti in cavo unipolare MT confezionati con terminali sconnettibili”
- DJ 4447 “Collegamenti in cavo unipolare MT confezionati con terminali per interno e terminali sconnettibili”

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

**5 ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY**

- Value Chain/Process Area: Networks Management
- Macro Process: Materials management
- Process: Network components standardization

**6 DEFINITIONS AND ACRONYMS**

Acronym and Key words	Description
<b>Acceptable Quality Level (AQL)</b>	The maximum percentage of malfunctions that can be detected during a sample inspection and can still be considered satisfactory
<b>Medium Voltage (MV)</b>	Any set of nominal voltage levels exceeding 1 kV and below a value between 30 kV and 100 kV. NOTE: The boundary value between medium voltage and high voltage depends on local and historical circumstances or on common usage. Nevertheless the band 30 kV to 100 kV normally contains the accepted boundary.
<b>Technical Conformity Assessment (TCA)</b>	A “conformity assessment” with respect to “specified requirements” <sup>1</sup> 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 by Enel Group distribution companies. This also includes the verification of conformity with respect to local applicable regulation and laws and possession of relevant requested certifications

**Table 2 - Definitions**

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Infrastructure & Networks*
**7 DESCRIPTION**
**7.1 LIST OF COMPONENTS**

Global Type	Country	Country Code	Figure	Rated Voltage [kV]	Cable Link		SIDE ONE	SIDE TWO
					Length [m]	Cross-section [mm <sup>2</sup> ]	Global Type	Global Type
GSCC011/1	IT	270019	Fig.1	12/20(24)	6	25	GSCC005/11	GSCC005/11
GSCC011/1	RO	270047	Fig.1	12/20(24)	6	25	GSCC005/11	GSCC005/11
GSCC011/1	AR	0115-0467	Fig.1	12/20(24)	6	25	GSCC005/11	GSCC005/11
GSCC011/2	IT	270021	Fig.1	12/20(24)	11	25	GSCC005/11	GSCC005/11
GSCC011/2	RO	270045	Fig.1	12/20(24)	11	25	GSCC005/11	GSCC005/11
GSCC011/2	AR	0115-0466	Fig.1	12/20(24)	11	25	GSCC005/11	GSCC005/11
GSCC011/3	CO	270291	Fig.1	12/20(24)	11	35	GSCC005/12	GSCC005/12
GSCC011/4	IT	270020	Fig.2	12/20(24)	6	25	GSCC006/56	GSCC006/56
GSCC011/4	RO	270046	Fig.2	12/20(24)	6	25	GSCC006/56	GSCC006/56
GSCC011/5	CO	270290	Fig.3	12/20(24)	11	35	GSCC005/12	GSCC006/21
GSCC011/6	AR	0115-0470	Fig.3	12/20(24)	11	25	GSCC005/11	GSCC006/20
GSCC011/7	AR	0115-0469	Fig.3	12/20(24)	6	25	GSCC005/11	GSCC006/20
GSCC011/8	BR	270275	Fig.4	18/30(36)	11	50	GSCC006/25	GSCC006/17
GSCC011/9	CO	270289	Fig.4	12/20(24)	11	35	GSCC006/21	GSCC006/12
GSCC011/10	PE	270281	Fig.4	12/20(24)	11	25	GSCC006/20	GSCC006/11
GSCC011/10	BR	270274	Fig.4	12/20(24)	11	25	GSCC006/20	GSCC006/11
GSCC011/11	IT	270023	Fig.5	12/20(24)	6	25	GSCC005/11	GSCC006/ 11
GSCC011/11	RO	270043	Fig.5	12/20(24)	6	25	GSCC005/11	GSCC006/ 11
GSCC011/11	AR	0115-0471	Fig.5	12/20(24)	6	25	GSCC005/11	GSCC006/ 11
GSCC011/12	IT	270022	Fig.5	12/20(24)	11	25	GSCC005/11	GSCC006/ 11
GSCC011/12	RO	270044	Fig.5	12/20(24)	11	25	GSCC005/11	GSCC006/ 11
GSCC011/12	AR	0115-0468	Fig.5	12/20(24)	11	25	GSCC005/11	GSCC006/ 11
GSCC011/12	BR	270273	Fig.5	12/20(24)	11	25	GSCC005/11	GSCC006/11

**Application Areas**

Perimeter: *Global*

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Business Line: *Infrastructure & Networks*

Global Type	Country	Country Code	Figure	Rated Voltage [kV]	Cable Link		SIDE ONE	SIDE TWO
					Length [m]	Cross-section [mm <sup>2</sup> ]	Global Type	Global Type
GSCC011/13	CO	270288	Fig.5	12/20(24)	11	35	GSCC005/12	GSCC006/12
GSCC011/14	BR	270272	Fig.5	18/30(36)	11	50	GSCC005/29	GSCC006/17
GSCC011/15	IT	270026	Fig.6	12/20(24)	6	25	GSCC005/11	GSCC006/56
GSCC011/15	RO	270040	Fig.6	12/20(24)	6	25	GSCC005/11	GSCC006/56
GSCC011/16	IT	270025	Fig.6	12/20(24)	11	25	GSCC005/11	GSCC006/56
GSCC011/16	RO	270041	Fig.6	12/20(24)	11	25	GSCC005/11	GSCC006/56
GSCC011/17	IT	270024	Fig.7	12/20(24)	6	25	GSCC006/56	GSCC006/ 11
GSCC011/17	RO	270042	Fig.7	12/20(24)	6	25	GSCC006/56	GSCC006/ 11
GSCC011/18	CL	270295	Fig.8	12/20(24)	7	25	GSCC006/11	GSCC006/11
GSCC011/18	BR	270271	Fig.8	12/20(24)	7	25	GSCC006/11	GSCC006/11
GSCC011/18	PE	270278	Fig.8	12/20(24)	7	25	GSCC006/11	GSCC006/11
GSCC011/19	BR	270270	Fig.8	18/30(36)	7	50	GSCC006/17	GSCC006/17
GSCC011/19	CL	270294	Fig.8	18/30(36)	7	50	GSCC006/17	GSCC006/17
GSCC011/20	CO	270287	Fig.8	12/20(24)	11	35	GSCC006/12	GSCC006/12
GSCC011/21	PE	270282	Fig.8	12/20(24)	11	25	GSCC006/11	GSCC006/11
GSCC011/22	ES	200010	Fig.8	12/20(24)	8	50	GSCC006/12	GSCC006/12
GSCC011/23	ES	200011	Fig.8	18/30(36)	8	50	GSCC006/17	GSCC006/17

**Table 3 – Pre-assembled cables links Global Types**

**Application Areas**

 Perimeter: *Global*

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Service Function: -

 Business Line: *Infrastructure & Networks*

## 7.2 SERVICE CONDITIONS

### 7.2.1 General service conditions

- IEC 60721-2-1.

### 7.2.2 Specific service conditions

Colombia (Enel Codensa): the reference altitude is 2.700 m.

## 7.3 TECHNICAL CHARACTERISTICS

The Pre-assembled connection cables are made by a piece of cable (connection cable) and two terminations.

### 7.3.1 MV Single-core Cable

Design and manufacturing of the cables shall be according with IEC 60502-2 with the characteristics indicated below.

<b>Rated Voltage [kV]</b>	12/20(24)	18/30(36)
<b>Conductor Material</b>	Copper	Aluminium
<b>Conductor cross-section</b>	25 mm <sup>2</sup> *	50 mm <sup>2</sup>
<b>Conductor screen</b>	Black semi-conductive thermosetting compound	Black semi-conductive thermosetting compound
<b>Insulation</b>	HEPR	HEPR
<b>Insulation thickness</b>	5,5 mm nom./ 4,9 mm min.	8 mm nom./7,1 mm min.
<b>Insulation screen</b>	Black layer of semi-conductive thermosetting compound	Black layer of semi-conductive thermosetting compound
<b>Longitudinal water-tightness</b>	Semi-conductive swelling tape	Semi-conductive swelling tape
<b>Earth screen</b>	Continuous crown of annealed copper wires	Continuous crown of annealed copper wires
<b>Earth screen cross-section</b>	16	16
<b>Outer sheath</b>	PO	PO
<b>Outer sheath thickness</b>	2,2	2,7
*Note: For Colombia conductor cross-section shall be 35 mm <sup>2</sup>		

**Table 4 – Medium Voltage cables characteristics**

For **Spain**, design and manufacturing of the cables shall be according with UNE-HD 620 9-E, particularly:

- HEPRZ1 12/20 kV 1X50 K Al+H16
- HEPRZ1 18/30 kV 1X50 K Al+H16

With insulation thickness defined in the following table:

<b>Rated Voltage [kV]</b>	12/20(24)	18/30(36)
<b>Insulation thickness</b>	5,5 mm nom./ 4,9 mm min.	8 mm nom./7,1 mm min.



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Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

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**7.3.2 Cable accessories**

Two types of cable accessories are pre-assembled: one on the transformer side and one on the MV switchgear side.

According to the different applications, the cable accessories could be:

- Cold shrink indoor terminations;
- Separable connectors (inner cone or outer cone, straight or elbow);

The cold shrink terminations shall compliance with GSCC005.

The separable connectors shall be compliance with GSCC006.

Depending on the combinations of transformer-side and switchboard-side terminations, 8 types of Pre-assembled connection cables are defined.

The connection with the cable shall be assembled in the factory by the Supplier according to cable accessories manufacturer instructions and in compliance respectively with GSCC005, GSCC006.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

**7.4 TYPE OF PRE-ASSEMBLED CONNECTION CABLES**

The specific connections are shown below. The drawing is just indicative of binding quoted dimensions.



FIG 1

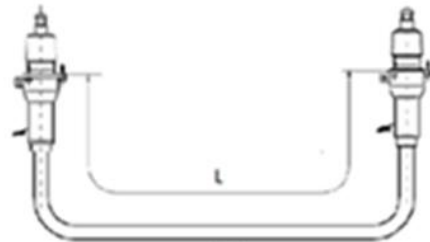


FIG 2

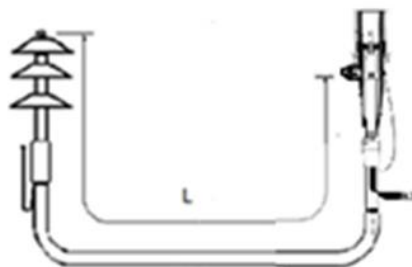


FIG 3

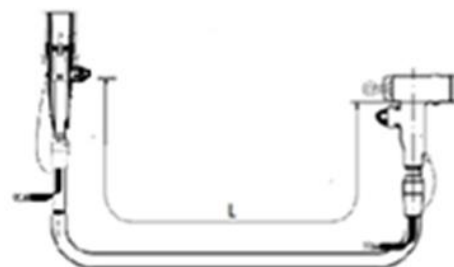


FIG 4

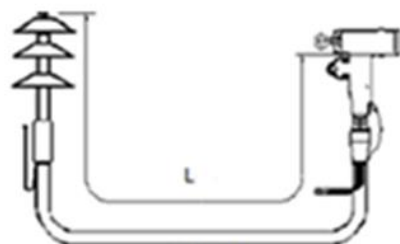


FIG 5

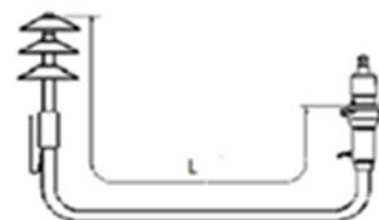


FIG 6



FIG 7



FIG 8

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

## 7.5 TESTING

### 7.5.1 Acceptance test

The acceptance tests shall be carried out considering the following items:

N°	Tests	Notes
1	Visual and dimensional inspection	Check the correspondence of the: material used to assemble the cables links, packaging and bar code with the approved prototype
2	Voltage test at industrial frequency	Insulation at 24 kV: 30 kV for 5 min Insulation at 36 kV: 45 kV for 5 min
3	Measurement of partial discharges	Insulation at 24 kV: 20 kV max 10 pC. Insulation at 36 kV: 30 kV max 10 pC

**Table 5**

The samples to be tested shall be chosen from the entire lot, even if composed of different Material Codes.

Acceptance tests shall be performed applying the UNI ISO 2859-1 Ed5-2007 standard according to the following criteria: Single sampling plans for normal inspection (Tab 2-A), General inspection level – LEVEL II (Tab. 1), Acceptance Quality Limit – AQL 1% (Tab 2-A) as show in the table below.

From	To	Sample	Acceptance*	Rejection*
0	13	100%	0	1
14	150	13	0	1
151	500	50	0	1
501	1200	80	0	1
1201	3200	125	0	1
3201	10000	200	0	1

**Table 6**

\* The Acceptance and Rejection values are referred to the number of non-conformities detected during the tests necessary to accept or reject the whole lot.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

**7.5.2 Acceptance test repeated in the presence of an Enel inspector or appointed person**

The acceptance tests shall be repeated in the same way described in section 7.5.1. but with the quantities indicated in the table below (50% of Required Sampling):

From	To	Sample	Acceptance*	Rejection*
0	13	50%	0	1
14	150	6	0	1
151	500	25	0	1
501	1200	40	0	1
1201	3200	62	0	1
3201	10000	100	0	1

**Table 7**

\* The **Acceptance** and **Rejection** values are referred to the number of non-conformities detected during the tests necessary to accept or reject the whole lot.

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks***7.6 TECHNICAL CONFORMITY ASSESSMENT (TCA)**

The TCA shall be carried out in accordance to GSCG002 REV 03.

In order to finalize the TCA of this component, it is necessary that cold shrink terminations and Separable connectors have approved TCA.

About cable, it is necessary a Certificate of conformity ISO17065 attesting the conformity of the cable with the specifications considered (IEC 60502-2 or UNE-HD 620 9-E for Spain).

For Colombia, RETIE certification shall be also provided according to local regulation.

**7.7 WARRANTY**

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

**7.8 CONDITIONS OF SUPPLY**

The supplier shall provide appropriate instructions, documentation showing tests and the user manual to give information about transport conditions, storage and installation.

The documents shall be in the local language of the destination country.

All the documentation delivered will be checked by ENEL, which will certify its compliance with the technical specifications.

Pre-assembled connections shall be supplied in individual packages which shall be marked with the following information:

- Material code assigned by the Distribution Companies of Enel Group;
- Name of the manufacturer;
- Year and month of packaging;
- Type of cable accessories;
- Type of cables for which the accessory is intended, cross-section and conductor material allowed;
- Progressive identification number assigned by the manufacturer (or serial number);
- Barcode (only for E-distribuzione and Endesa Distribucion);
- Production batch number;
- Rated voltage  $U_0/U$  ( $U_m$ ) in kV;

The connection cable and the connectors shall be adequately protected (e.g. by a plastic mesh).

Packages shall be in compliance with DM 2016 003.

For E-distribuzione, packages shall meet the requirements of the packaging in compliance with GUI 101 specifications.

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Infrastructure & Networks*
**7.8.1 Barcode**

The characteristics of the barcode are listed in E-Distribuzione specification CNS-O&M-S&L-2021-0032-EGIN “Global Infrastructure and Networks Barcode specification. Packaging, transport, and delivery requirements rev2.

**8 ANNEX A – TECHNICAL CHECK LIST**

The following chart indicates the minimum technical information that suppliers shall provide.

Item	Description	Unit	Value
<b>1</b>	<b>GENERAL INFORMATION</b>		
1.1	Supplier		
1.2	Factory		
1.3	Location Factory		
<b>2</b>	<b>MAIN FEATURES</b>		
2.1	Distribution Company and Coutry		
2.2	Country code		
2.3	GS Type Code		
<b>3</b>	<b>MV Accessory 1</b>		
3.1	Accessory type		
3.2	Standard		
3.3	Country code		
3.4	GS Type Code		
3.5	Cross section	mm <sup>2</sup>	
3.6	Min/Max diameter over insulation	mm	
<b>4</b>	<b>MV Accessory 2</b>		
4.1	Accessory type		
4.2	Standard		
4.3	Country code		
4.4	GS Type Code		
4.5	Cross section	mm <sup>2</sup>	
4.6	Min/Max diameter over insulation	mm	
<b>5</b>	<b>Cable</b>		
5.1	Standard		
5.2	Conducror material		
5.3	Cross section	mm <sup>2</sup>	
5.4	Lenght	m	
5.5	Min/Max diameter over insulation	mm	