

**Subject:** Global Infrastructure and Networks – GSCC004 COLD SHRINK COMPACT JOINTS FOR MV CABLES.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

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**THE HEAD OF NETWORK COMPONENTS**

**Fabrizio Gasbarri**

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## 1 DOCUMENT AIMS AND APPLICATION AREA

This Global Standard applies to 12/20(24) kV and 18/30(36) kV cold shrink compact joints for Medium Voltage underground and aerial cables with extruded insulation, both full and reduced insulating thickness, with copper wires or aluminum tape screen. This Global Standard also applies to transition joints used for the connection of single-pole impregnated paper insulated cables and extruded insulated cable.

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

Country	Distribution Company
Argentina	Edesur
Brazil	Enel Distribuição Rio (RJ) Enel Distribuição Ceará (CE) Enel Distribuição Goiás (GO) Enel Distribuição São Paulo (SP)
Chile	Enel Distribución Chile
Colombia	Codensa
Iberia	e-distribución
Italy	e-distribuzione
Perú	Enel Distribución Perú
Romania	e-distributie Banat e-distributie Dobrogea e-distributie Muntenia

### 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.

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## 2 DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
00	25/11/2015	First emission.
01	23/02/2018	General review of construction design. Material codes updated. Chapter on barcode updated, Tolerance on the positioning of the body; cover for the connector; Painted or coated semiconducting layer not allowed; Elimination of the spiral support and introduction of the self-ejecting support; Cold shrink system for oil sealing for transition joints; Introduction of a separate material code and kit for the transition joints; Introduction of MV aerial cable joint, Specification of "austenitic steel" constant force springs; New tests: robustness test. expiration test. UV test for MV aerial cable joints; Modification of requirements for resistance to fire; Increase of the minimum section of the copper stocking for Italy, Rumania, Spain and Peru from 16 to 25 mm <sup>2</sup> ; Modification of requirements of screen connecting plate (grater); Modification of requirements of sealing compounds; short time duration for Italy, Rumania and Spain. Standard dimension for cable preparation. Class 24 kV for Italy and Rumania.
02	25/05/2018	Revised tables 6, 7 and 8. Expiration test description.
03	09/07/2018	Note on table 8. Edited figure in 10.2. Revised material codes for Brazil.
Addendum Ed 0.	28/05/2020	Enel Distribuição São Paulo is included; Transition joints for 18/30(36) kV is added ;table 2, Rated short time withstand current in the screen (kA) is updated for Colombia; joints for 18/30(36) for Colombia is added; table 6 updated for Argentina; grounding braid system for São Paulo is added; Material codes updated; The range of sections available for 18/30(36) kV joints is updated; Maximum diameter over insulation for 18/30(36) kV joints with cable section 240-400 is updated; special consideration for São Paulo in type tests.
04	12/05/2022	Rated short time withstand current in the screen (kA) is updated for smaller cross-section cable; Material codes and type codes updated; list of component table is reorganized; The copper stocking (Metallic Screen) cross-section is reported directly in the list of component table; Modification of requirements of screen connecting plate (grater). For smaller and larger cross-sections cables, with aluminum tape screen; type test according to HD-629 S3 for straight and aerial joint and extension of compliance for family and Connectors; The assessment criteria for the robustness test is updated; Acceptance Test chapter modifications; Chapter on barcode updated; paragraph on technical conformity assessment (TCA) is added, recognition of homologation for previous revision of the standard; Special Joints are added for aerial-underground cable transition and Joints for screen interruption.

## 3 UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

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

Responsible for authorizing the document:

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

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## 4 REFERENCES

- Enel Group Code of Ethics;
- The Enel Group Zero Corruption Tolerance (ZCT) Plan;
- Organizational and management model as per Italian Legislative Decree no. 231/2001 or equivalent documents adopted in the Countries;
- Enel Human Rights Policy;
- Stop Work 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.
- MAT-O&M-NCS-2021-0033-EGIN version 3 "Global Infrastructure and Networks – GSCG002 Technical Conformity Assessment".
- CNS-O&M-S&L-2021-0032-EGIN "Global Infrastructure and Networks Barcode specification.

*International technical references related with the material:*

Reference documents listed below (amendments included) shall be the edition in-force at the contract date.

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)

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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
HD 629.1 S3	Test requirements for accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV Part 1: Accessories for cables with extruded insulation
HD 629.2 S2	Test requirements for accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV Part 2: Cables with impregnated paper insulation
IEC 61238-1	Compression and mechanical connectors for power cables - Part 1: Test methods and requirements
IEC 60695-11-10	Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods
IEC 60721-2-1	Classification of environmental conditions - Part 2-1: Environmental conditions appearing in nature - Temperature and humidity.
ISO IEC 17067	Conformity assessment — Fundamentals of product certification and guidelines for product certification schemes.

*Enel Global Standards*

- GSC001<sup>1</sup> “Underground Medium Voltage Cables”.
- GSCC015 “Cable preparation for MV Cables”
- GSCC008 “Medium Voltage Aerial Bundled Cables”

<sup>1</sup> The characteristics of the cables are included in the Enel Group Global Standard. Besides installation on new cables, which comply to GSC001, the joints may be installed on the existing network, which is made of cables compliant to older local standards. Nevertheless, this Global Standard also takes into account the main characteristics of existing cables for each Country (rated voltage, section and min/max diameter over insulation).

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*Local Standard**Italy*

- Nota Operativa PVR001 – Rev. 2 – Ott. 2012 - Gestione Garanzie dei materiali di ENEL Distribuzione.

*Brazil*

- NBR14643, Corrosão atmosférica – Classificação da corrosividade de atmosferas
- Nr-10, Segurança em Instalações e Serviços em Eletricidade

*Colombia*

- RETIE – Reglamento Técnico de Instalaciones Eléctricas.

*Chile*

- NSEC 5 Reglamento de Instalaciones Eléctricas de Corrientes Fuertes

*Iberia*

- 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.).

*Romania*

- Legea securității și sănătății în muncă nr.319/2006, cu modificările și completările ulterioare.
- Ordonanța de Urgență nr. 195/22.12.2005 privind protecția mediului, cu toate modificările și completările în vigoare.
- Legea nr. 211/25.11.2011 privind regimul deșeurilor.
- H.G. 1037/03.11.2010 privind deșeurile de echipamente electrice și electronice.

*Europa*

- Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006.
- Directive 2004/108/EC electromagnetic compatibility.

*Other standards*

- HN 33-E-03 Essai de robustesse pour jonctions et transitions HTA November 2008.

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## 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>Technical Conformity Assessment (TCA)</b>	A “conformity assessment” with respect to “specified requirements” 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.
<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.

Additional terms and definitions are available in Cenelec HD 629.1 S3 and HD 629.2 S2 (See Chapter 4).

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## 7 DESCRIPTION

### 7.1 List of Components

Type code	Distribution Company and Country	Country Code	Rated voltage U0/U (Um) (kV)	Joint type	Cable section (mm <sup>2</sup> )	Copper stocking section (mm <sup>2</sup> )	Min/max Diameter over insulation (mm)	Rated short time withstand current in the screen (kA)	Grounding Braid System
GSCC004/11	ED-ITALY	270002	12/20(24)	STRAIGHT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/11	ED-ROMANIA	270002	12/20(24)	STRAIGHT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/11	RJ/CE/GO -BRAZIL	251985	12/20(24)	STRAIGHT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/11	ED-COLOMBIA	274606	12/20(24)	STRAIGHT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/11	ED-CHILE	271927	12/20(24)	STRAIGHT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/11	ED-ARGENTINA	0114-0188	12/20(24)	STRAIGHT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/11	ED-PERU	274235	12/20(24)	STRAIGHT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/12	SP -BRAZIL	337829	12/20(24)	STRAIGHT	35÷95	25	14.9/25.0	3kA@1seg	Yes
GSCC004/13	ED-ITALY	270001	12/20(24)	STRAIGHT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/13	ED-ROMANIA	270001	12/20(24)	STRAIGHT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/13	ED-SPAIN	270090	12/20(24)	STRAIGHT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/13	RJ/CE/GO -BRAZIL	275029	12/20(24)	STRAIGHT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/13	ED-COLOMBIA	274607	12/20(24)	STRAIGHT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/13	ED-CHILE	270016	12/20(24)	STRAIGHT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/13	ED-PERU	274236	12/20(24)	STRAIGHT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/14	SP -BRAZIL	270321	12/20(24)	STRAIGHT	95÷240	25	20.6/32.2	5kA@1seg	Yes
GSCC004/15	ED-ARGENTINA	0114-0189	12/20(24)	STRAIGHT	95÷240	50	20.6/32.2	10kA@0,5seg	No
GSCC004/16	ED-SPAIN	270002	12/20(24)	STRAIGHT	240÷400	25	26.1/37.5	5kA@1seg	No
GSCC004/16	RJ/CE/GO -BRAZIL	275152	12/20(24)	STRAIGHT	240÷400	25	26.1/37.5	5kA@1seg	No
GSCC004/16	ED-CHILE	271928	12/20(24)	STRAIGHT	240÷400	25	26.1/37.5	5kA@1seg	No
GSCC004/16	ED-PERU	274237	12/20(24)	STRAIGHT	240÷400	25	26.1/37.5	5kA@1seg	No
GSCC004/17	SP -BRAZIL	337830	12/20(24)	STRAIGHT	240÷400	25	26.1/37.5	5kA@1seg	Yes
GSCC004/44	ED-ARGENTINA	0114-0193	12/20(24)	STRAIGHT	240÷400	50	26.1/37.5	10kA@0,5seg	No
GSCC004/18	SP -BRAZIL	337831	12/20(24)	STRAIGHT	400÷630	25	31/43.5	5kA@1seg	Yes





**Technical Specification code: MAT-E&C-NC-2022-0082-GIN**

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Type code	Distribution Company and Country	Country Code	Rated voltage U0/U (Um) (kV)	Joint type	Cable section (mm2)	Copper stocking section (mm2)	Min/max Diameter over insulation (mm)	Rated short time withstand current in the screen (kA)	Grounding Braid System
GSCC004/19	RJ/CE/GO -BRAZIL	310648	12/20(24)	STRAIGHT	400÷630	50	31/43.5	10kA@0,5seg	No
GSCC004/19	ED-CHILE	270122	12/20(24)	STRAIGHT	400÷630	50	31/43.5	10kA@0,5seg	No
GSCC004/19	ED-ARGENTINA	0114-0192	12/20(24)	STRAIGHT	400÷630	50	31/43.5	10kA@0,5seg	No
GSCC004/20	ED-ITALY	270004	12/20(24)	TRANSITION JOINT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/20	ED-ROMANIA	270004	12/20(24)	TRANSITION JOINT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/21	ED-ITALY	270003	12/20(24)	TRANSITION JOINT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/21	ED-ROMANIA	270003	12/20(24)	TRANSITION JOINT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/21	ED-CHILE	270107	12/20(24)	TRANSITION JOINT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/22	ED-ITALY	270006	12/20(24)	AERIAL JOINT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/22	ED-ROMANIA	270006	12/20(24)	AERIAL JOINT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/22	ED-SPAIN	270315	12/20(24)	AERIAL JOINT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/22	ED-COLOMBIA	270129	12/20(24)	AERIAL JOINT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/22	ED-PERU	270117	12/20(24)	AERIAL JOINT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/22	RJ/CE/GO -BRAZIL	990255	12/20(24)	AERIAL JOINT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/22	SP -BRAZIL	337835	12/20(24)	AERIAL JOINT	35÷95	25	14.9/25.0	3kA@1seg	No
GSCC004/23	ED-ITALY	270005	12/20(24)	AERIAL JOINT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/23	ED-ROMANIA	270005	12/20(24)	AERIAL JOINT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/23	ED-SPAIN	270316	12/20(24)	AERIAL JOINT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/23	ED-COLOMBIA	270128	12/20(24)	AERIAL JOINT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/23	ED-PERU	270114	12/20(24)	AERIAL JOINT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/23	RJ/CE/GO -BRAZIL	990254	12/20(24)	AERIAL JOINT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/23	SP -BRAZIL	337836	12/20(24)	AERIAL JOINT	95÷240	25	20.6/32.2	5kA@1seg	No
GSCC004/24	RJ/CE/GO -BRAZIL	270330	18/30(36)	STRAIGHT	35÷95	25	20.4/30.0	3kA@1seg	No
GSCC004/24	ED-CHILE	270125	18/30(36)	STRAIGHT	35÷95	25	20.4/30.0	3kA@1seg	No
GSCC004/25	SP -BRAZIL	337832	18/30(36)	STRAIGHT	35÷95	25	20.4/30.0	3kA@1seg	Yes
GSCC004/26	RJ/CE/GO -BRAZIL	270331	18/30(36)	STRAIGHT	95÷240	25	24.8/37.2	5kA@1seg	No
GSCC004/26	ED-COLOMBIA	270115	18/30(36)	STRAIGHT	95÷240	25	24.8/37.2	5kA@1seg	No
GSCC004/26	ED-CHILE	271917	18/30(36)	STRAIGHT	95÷240	25	24.8/37.2	5kA@1seg	No
GSCC004/26	ED-ARGENTINA	0114-0191	18/30(36)	STRAIGHT	95÷240	25	24.8/37.2	5kA@1seg	No
GSCC004/26	ED-SPAIN	270186	18/30(36)	STRAIGHT	95÷240	25	27.3/37.2	5kA@1seg	No

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Type code	Distribution Company and Country	Country Code	Rated voltage U0/U (Um) (kV)	Joint type	Cable section (mm <sup>2</sup> )	Copper stocking section (mm <sup>2</sup> )	Min/max Diameter over insulation (mm)	Rated short time withstand current in the screen (kA)	Grounding Braid System
GSCC004/27	SP -BRAZIL	600775	18/30(36)	STRAIGHT	95÷240	25	24.8/37.2	5kA@1seg	Yes
GSCC004/28	ED-SPAIN	270001	18/30(36)	STRAIGHT	240÷400	25	29.8/42.5	5kA@1seg	No
GSCC004/29	ED-CHILE	270123	18/30(36)	STRAIGHT	240÷400	50	29.8/42.5	10kA@0,5seg	No
GSCC004/29	RJ/CE/GO -BRAZIL	270322	18/30(36)	STRAIGHT	240÷400	50	29.8/42.5	10kA@0,5seg	No
GSCC004/30	SP -BRAZIL	337833	18/30(36)	STRAIGHT	240÷400	25	29.8/46	5kA@1seg	Yes
GSCC004/31	ED-CHILE	271918	18/30(36)	STRAIGHT	400÷630	50	34.9/49.7	10kA@0,5seg	No
GSCC004/32	SP -BRAZIL	337834	18/30(36)	TRANSITION JOINT	35÷95	25	20.4/30.0	3kA@1seg	Yes
GSCC004/33	ED-SPAIN	270317	18/30(36)	AERIAL JOINT	35÷95	25	20.4/30.0	3kA@1seg	No
GSCC004/33	RJ/CE/GO/SP -BRAZIL	270300	18/30(36)	AERIAL JOINT	35÷95	25	20.4/30.0	3kA@1seg	No
GSCC004/34	ED-SPAIN	270318	18/30(36)	AERIAL JOINT	95÷240	25	24.8/37.2	5kA@1seg	No
GSCC004/34	ED-COLOMBIA	270127	18/30(36)	AERIAL JOINT	95÷240	25	24.8/37.2	5kA@1seg	No
GSCC004/34	ED-CHILE	270104	18/30(36)	AERIAL JOINT	95÷240	25	24.8/37.2	5kA@1seg	No
GSCC004/34	RJ/CE/GO/SP -BRAZIL	270299	18/30(36)	AERIAL JOINT	95÷240	25	24.8/37.2	5kA@1seg	No
GSCC004/35	ED-ITALY	270209	12/20(24)	SPECIAL JOINT	See local Section				
GSCC004/36	ED-ITALY	270028	12/20(24)	SPECIAL JOINT					
GSCC004/37	ED-ITALY	270207	12/20(24)	SPECIAL JOINT					
GSCC004/38	ED-ITALY	270208	12/20(24)	SPECIAL JOINT					
GSCC004/39	ED-ITALY	271140	12/20(24)	SPECIAL JOINT					
GSCC004/40	ED-ITALY	271143	12/20(24)	SPECIAL JOINT					
GSCC004/41	ED-ITALY	271142	12/20(24)	SPECIAL JOINT					
GSCC004/42	ED-SPAIN	270125	12/20(24)	SPECIAL JOINT					
GSCC004/43	ED-SPAIN	270198	18/30(36)	SPECIAL JOINT					

**Table 1 – List of Component**

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Service Function: -

Business Line: *Infrastructure & Networks*

## 7.2 Service conditions

### 7.2.1 General service conditions

According to IEC 60721-2-1 (see chapter 4)

### 7.2.2 Specific service conditions

Colombia (Enel Distribución Colombia): the reference altitude is 2.700 m

## 7.3 Technical characteristics

### 7.3.1 Type of joints

- Straight Joints: Used for the connection of MV underground with extruded insulation cables
- Transition Joints: Used for the connection of single-pole impregnated paper insulated cables and extruded insulated cables
- Aerial Joints: Used for the connection of MV Aerial with extruded insulation cables
- Special Joints: According to the particular definition in the local section.

### 7.3.2 Electrical and dimensional characteristics

The following requirements apply:

Rated voltage $U_0/U (U_m)$ (kV)	12/20(24)	18/30(36)
Rated power frequency withstand voltage (kV) <sup>2</sup>	50	70
Rated impulse withstand voltage (kV)	125	170
Rated short time withstand current in the conductor (kA)	According to HD629 (EN 61442)	
Rated short time withstand current in the screen (kA)	See Table 1	

**Table 2 - Electrical characteristics**

<sup>2</sup> Rated power frequency withstand voltage (kV) values for type test is according to HD629 (EN 61442)

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The rated voltage levels of the cables for which is foreseen the installation of the joints is the following:

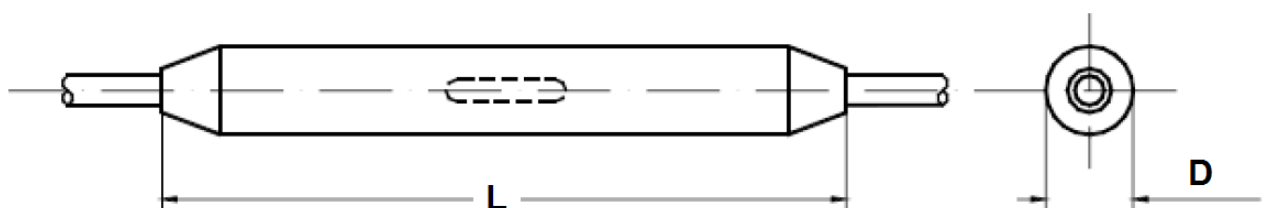
Rated voltage of the joint $U_0/U (U_m)$ (kV)	12/20(24)	18/30(36)
Distribution Company (Country)	Rated voltage of the cables $U_0/U (U_m)$ (kV)	
Enel Distribuição São Paulo (Brazil)	8.7/15(17.5)	15/25(31) 20/35(42)
Enel Distribuição Ceará (Brazil)	8.7/15(17.5)	-
Enel Distribución Colombia (Colombia)	8.7/15(17.5)	18/30(36)
Enel Distribución Chile (Chile)	8.7/15(17.5)	15/25(31)
Enel Distribución Perú (Perù)	8.7/15(17.5); 12/20(24)	-
Edesur (Argentina) Enel Distribuição Rio (Brazil) Enel Distribuição Goiás (Brazil)	8.7/15(17.5)	18/30(36)
e-distribución (Spain)	12/20(24)	18/30(36)
E-distributie Banat (Romania); E-distributie Dobrogea (Romania); E-distributie Muntenia (Romania); E-Distribuzione (Italy)	12/20(24)	-

**Table 3 - Rated voltage of the cables**

With reference to Figure 1, overall dimensions of joints are defined in Table 4:

Rated voltage $U_0/U (U_m)$ (kV)	12/20(24)	18/30(36)
Maximum length L (mm)	1000	
Maximum diameter D (mm)	100	

**Table 4 - Overall dimensions**



**Figure 1 - Maximum dimensions (mm)**

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Service Function: -

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## 7.4 CONSTRUCTION CHARACTERISTICS

### 7.4.1 GENERAL CHARACTERISTICS

#### 7.4.1.1 Shrink technology

The joints shall be cold shrink type.

#### 7.4.1.2 Resistance to corrosion, infiltrations, moisture and dust

The external protection sheath of the joint shall be of insulating material resistant to agents found in soil; the use of tapes, paints, enamels or similar materials is not considered sufficient to ensure the level of protection required. The joint shall be watertight in order to prevent water penetration during the operation. Furthermore, it shall also be designed to prevent the longitudinal migration of water along the cable screens.

#### 7.4.1.3 Resistance to fire

The main insulating housing (see 7.4.2.3) shall be resistant to fire.

#### 7.4.1.4 Heating

All the materials that make up the joint shall withstand the heating conditions expected during operation, without having an adverse effect on their proper functioning of the joint or the cable.

#### 7.4.1.5 Materials compatibility

All the component parts of the joint shall be made out of materials that can be in contact with each other and with the parts that make up the cable, without having an adverse effect on their proper functioning.

Greases and sealing compounds, if any, shall be absolutely neutral in relation to the materials with which they are in contact and shall remain stable in contact with air.

### 7.4.2 COMPACT JOINT

Compact joints are composed by the following elements:

- |    |   |    |                               |
|----|---|----|-------------------------------|
| 1. | Shear bolt connector                    | 5. | Metallic screen               |
| 2. | Component to control the electric field | 6. | External protective sheath    |
| 3. | Main insulating housing                 | 7. | Greases and sealing compounds |
| 4. | Semiconducting layer                    |    |                               |

All the above elements, except item 1 (shear bolt connector) and item 7 (greases and sealing compounds), shall be preassembled on a single body (pre-assembled joint body). It shall be designed in order to allow a tolerance on the positioning during the installation of  $\pm 1$  cm, with respect to the correct position indicated in the installing instructions.

Alternatively the pre-assembled joint body may be designed in order to ensure also the following functions (e.g. through embedded sealing compounds):

- to seal the whole joint,
- to protect the junction of the metallic screens

The compact joint shall be mounted on a self-ejecting support. Spiral supports are not allowed.

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#### 7.4.2.1 Shear bolt connector

The electrical continuity of the cables shall be made through a shear bolt connector compliant with IEC 61238-1, Class A. The connector shall include the shear bolts and shall be made of tin plated aluminum alloy suitable for both aluminum and copper conductors.

No additional hole (e.g. for inspection) shall be made. The shear bolts shall be made to break inside their holes, assuring that no spike of any projection of material remain on the connector surface.

The connectors shall have a central lock and shall assure the correct positioning of the conductors in the same axis of the connector using adapters (for the smaller section in the prescribed range).

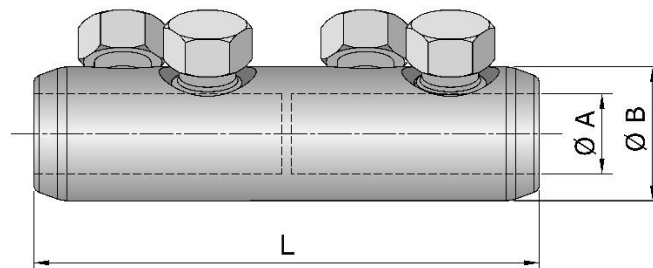
The external surface of the connectors shall not have sharp edges, spikes or deformities.

Connectors must be designed and constructed so that, when properly installed, the electrical resistance of the connection is not greater than the equivalent resistance of the reference conductor.

It is allowed to use greases to improve the electrical contact between the connector and the cable conductors and avoid corrosion. The design of screw cavities protection shall be so that no material is dispersed inside the joint during the cold shrinking operation and/or in the installation.

After the installation, the entire connector shall be protected with a suitable cover with a smooth surface to prevent damages to the joint (e.g. for residual spikes of screws).

With reference to Figure 2, Table 5 reports the main characteristics and dimensions of the connectors:



**Figure 2 – Shear bolts connector example**

Al cable section (mm <sup>2</sup> )	Ø A min (mm)	Ø B max. (mm)	N° of screws (min.)
35÷95	13	30	2
95÷240	19,5	38	4
240÷ 400	26	45	4
400÷630	33	52	6

**Table 5 – Connectors dimensions**

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#### 7.4.2.2 *Component to control the electric field*

It shall be applied on the connector, on the insulation of the cables and connected to the outer semi-conductive screens of the cables.

#### 7.4.2.3 *Main insulating housing*

The main insulating housing shall be made of one single layer and shall ensure, after shrinking, a minimum total thickness of 6 mm (12/20 kV) and 8 mm (18/30 kV) over the connector.

#### 7.4.2.4 *Semiconducting layer*

Painted or coated semiconducting layers are not allowed.

#### 7.4.2.5 *Copper stocking (Metalic Screen)*

The electrical continuity of the metallic screens of the cables shall be made by means of a copper stocking with the minimum sections reported in Table 1.

It shall be compatible with both aluminum tape and copper wire cable screens.

##### 7.4.2.5.a) *Cables with aluminum tape screen*

In the case of cables with aluminum tape screen, the connection of the copper stocking with the screen shall be made by means of a plate of tin-plated hard copper with a tin coating having minimum thickness of 0,5  $\mu\text{m}$ . The plate shall be as shown in the figure Figure 3 and shall be bent on a cylinder of diameter  $25\pm 2$  mm; the convex side of the plate shall include 65 asperities, arranged as shown in the Figure 3. These asperities shall have a particular shape (see example in Figure 3) in order to allow piercing the aluminum tape, to obtain a satisfactory contact with the screen, and to partly penetrate the outer thermoplastic sheath of the cable, to prevent movement or removal of the device.

The edge and the internal side of the plate shall be free of sharp or rough parts, in particular in the lower side in contact with the semiconductive layer of the cable.

The lower side going under the aluminum tape shall have no protruding edge (an example is shown in Figure 3) but a small rounded edge lower than the asperities.

As far as possible, the dimensions of the aluminum tape screen are as described here. The supplier can only modify the measurements for use on cables of smaller (35-95 mm<sup>2</sup>) and larger (400-630) cross-sections in which the dimensions do not allow a correct installation. The proposal will be checked during the TCA process by ENEL.

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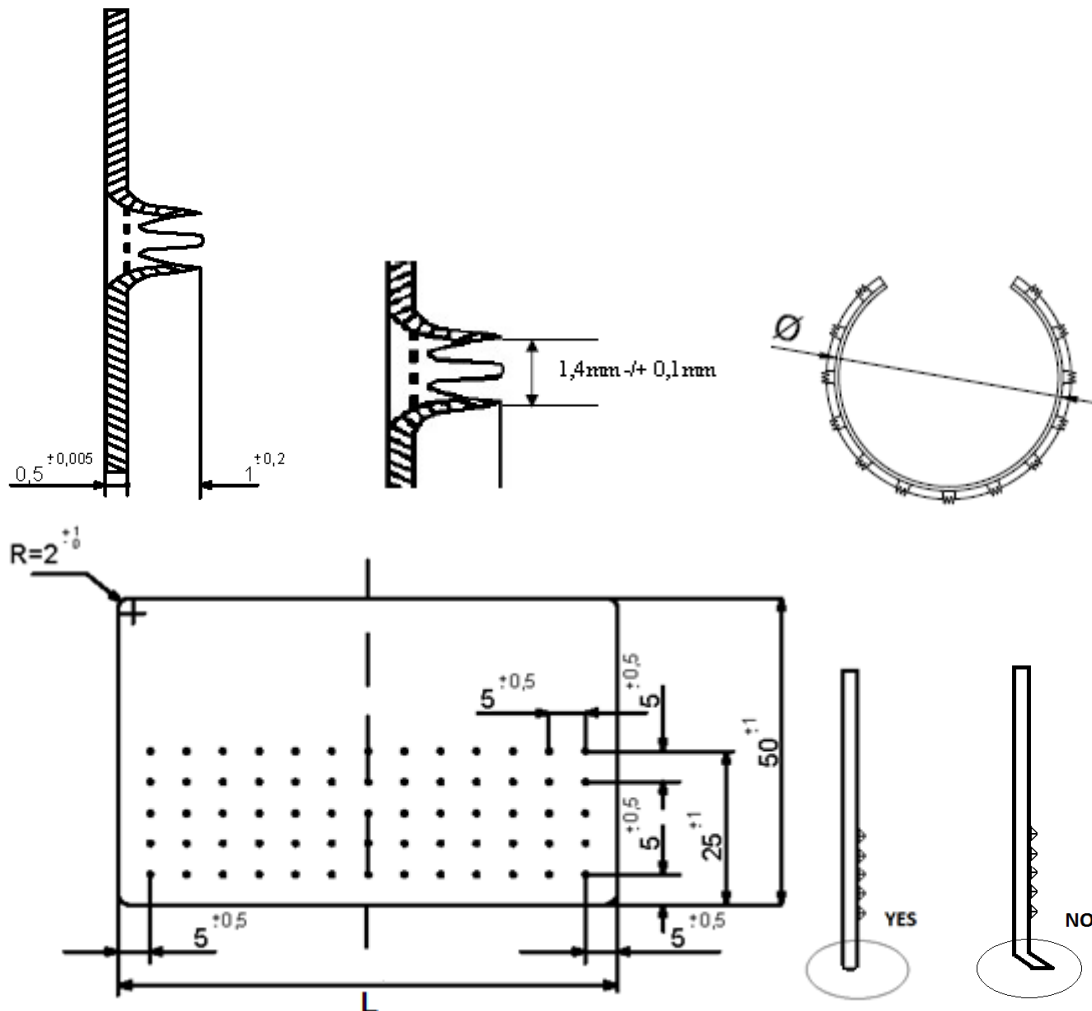
**Application Areas**

Perimeter: *Global*

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**Figure 3 – Detail of rectangular plate for aluminum tape screen connection**

*7.4.2.5.b) Cables with copper wires screen*

In the case of cables with copper wire screen, the copper wires of the metallic screen of the cable shall be fold back over the cable outer sheath and secured by means of a constant force compression system.

*7.4.2.5.c) Constant force compression system*

Electrical continuity of the screens of the cables and copper stocking of the joint may be achieved using austenitic steel constant force springs, the main insulating housing of the joint itself or another equivalent method.



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*7.4.2.5.d) External protective sheath*

The protective sheath for mechanical protection and sealing of the joint shall be made of one single piece. For Aerial Joint type the color of the external sheath shall be gray RAL 7001.

*7.4.2.5.e) Greases and sealing compounds*

Sealing compounds are not allowed, except those:

- to seal the whole joint,
- to protect the junction of the metallic screens.

Greases are not allowed, except those:

- over the main insulation of the cable and over the connector

Greases and sealing compounds shall have no electrical functions for the assembling of the joints but only provide mechanical and/or sealing features.

*7.4.2.5.f) Oil sealing system for transition joints*

In order to contain the impregnating insulating oil, a cold shrink sealing tube shall be provided. Additional compounds or tapes are allowed only for sealing paper edges towards the connector and/or the lead sheath.

*7.4.2.5.g) Grounding Braid*

The Joints with grounding braid system (see table 1). Must be provided with a tin coated copper braid locked at one end, with a minimum length according to table 6.

Due to the installation of the braid to the Joint, it is necessary to add the appropriate mastics and constant force springs or another equivalent method to guarantee the impediment of water entering the installation point.

Length (Meters)	Width (mm)	Section (mm <sup>2</sup> )
1	25.4	25

**Table 6 – Grounding Braid Dimensions**

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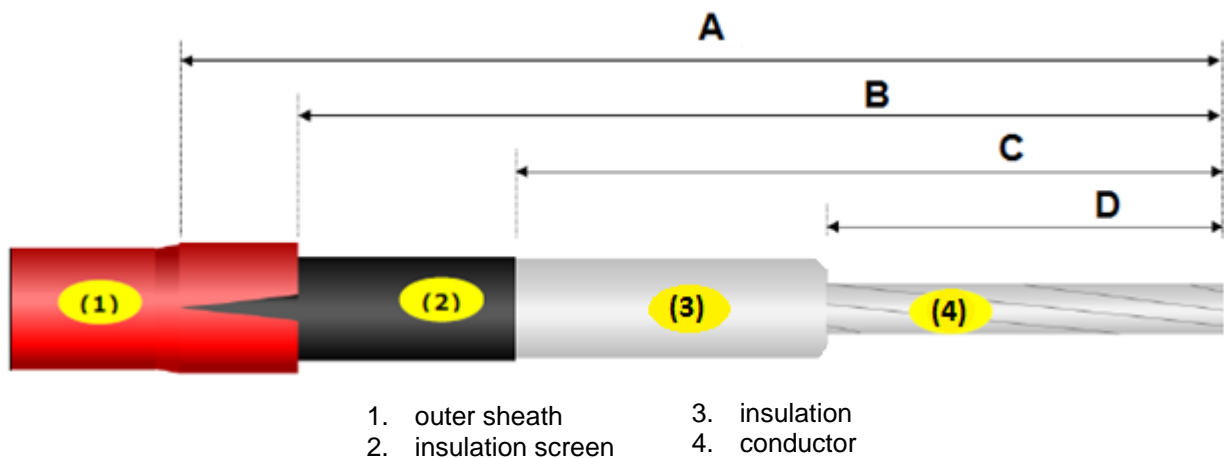
Service Function: -

Business Line: *Infrastructure & Networks*

## 7.5 DIMENSIONS FOR THE PREPARATION OF THE CABLE

Joints shall be designed in order to comply with the dimensions for the preparation of the cables specified in the following paragraphs.

### 7.5.1 Preparation of the cable with aluminum screen



**Figure 4 – cable with aluminum screen**

Cable section (mm <sup>2</sup> )	Dimension 24 kV (mm)				Dimension 36 kV (mm)			
	A	B	C	D	A	B	C	D
35 ÷ 95	225	185	135	50	240	200	150	50
95 ÷ 240	240	200	150	65	255	215	165	65
240 ÷ 400	260	220	170	85	275	235	185	85
400 ÷ 630	285	245	195	110	300	260	210	110

**Table 7 – Cable with aluminum screen dimensions**

Therefore the following dimensions (in mm) are fixed:

$$A-B = 40$$

$$B-C = 50$$

$$C-D = 85 \text{ (for 24 kV); } 100 \text{ (for 36 kV)}$$

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**Application Areas**

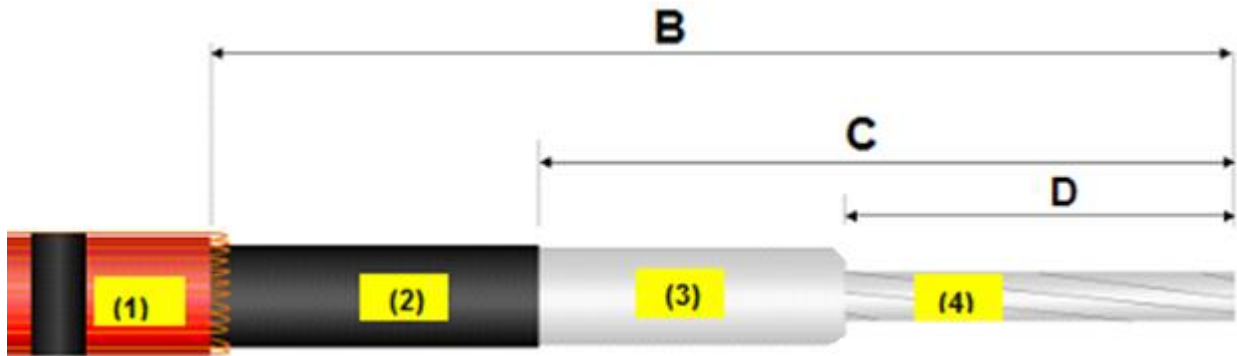
Perimeter: *Global*

Staff Function: -

Service Function: -

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**7.5.2 Preparation of the cable with copper wire screen**



- |                      |               |
|----------------------|---------------|
| 1. outer sheath      | 3. insulation |
| 2. insulation screen | 4. conductor  |

**Figure 5 – cable with copper wire screen**

Cable section (mm <sup>2</sup> )	Dimension 24 kV (mm)			Dimension 36 kV (mm)		
	B	C	D	B	C	D
35 ÷ 95	175	135	50	190	150	50
95 ÷ 240	190	150	65	205	165	65
240 ÷ 400	210	170	85	225	185	85
400 ÷ 630	235	195	110	250	210	110

**Table 8 – Cable with copper wire screen dimensions**

Therefore the following dimensions (in mm) are fixed:

B-C = 40

C-D = 85 (for 24 kV); 100 (for 36 kV)

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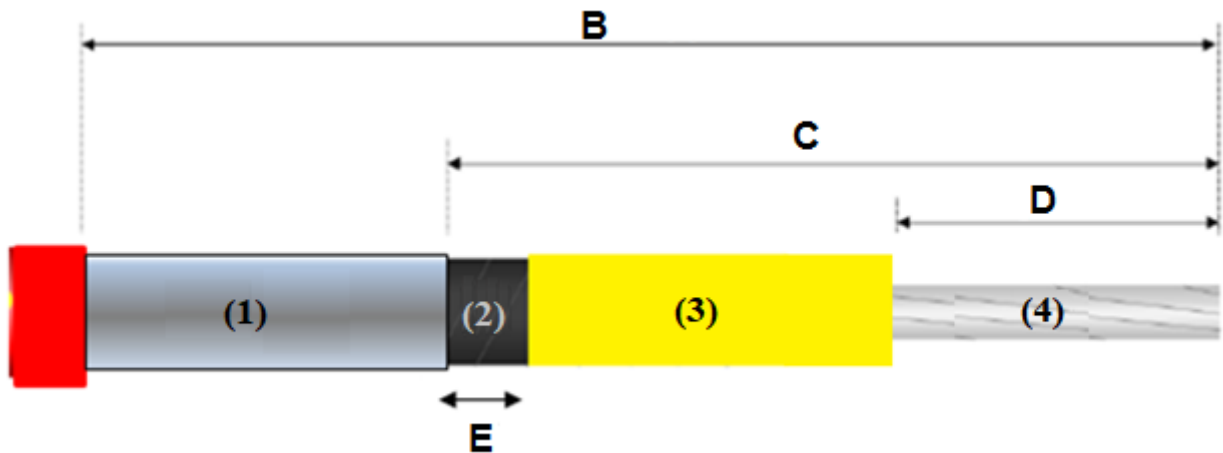
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

**7.5.3 Preparation of the cable with oil-impregnated paper insulation**



- |                            |                     |
|----------------------------|---------------------|
| 1. lead sheath             | 3. paper insulation |
| 2. paper insulation screen | 4. conductor        |

**Figure 6 – Cable with oil-impregnated paper insulation**

Cable section (mm <sup>2</sup> )	Dimension 24 kV (mm)				Dimension 36 kV (mm)
	B	C	D	E	According to manufacturer's design
35 ÷ 95	230	150	50	10	
95 ÷ 240	245	165	65	10	

**Table 9 – Cable with oil-impregnated paper insulation dimensions**

Therefore the following dimensions (in mm) are fixed:

B-C = 80

C-D = 100

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## 7.6 CONTENT OF THE KIT

All the necessary elements and accessories to install the compact joint on-field shall be included, namely:

A. Compact joint for extruded cables:

- 1 (one) pre-assembled joint body (see 7.4.2)
- 1 (one) shear bolt connector (see 7.4.2.1)
- 1 (one) shear bolt connector cover (see 7.4.2.1)
- 2 (two) plates for aluminum tape screen cables (see 7.4.2.5.a)
- Constant force compression system see par. 7.4.2.5.c) (quantity defined according to supplier's design)
- Greases and sealing compounds (see 7.4.2.5.e))
- Accessories for cleaning.
- Plastic bag for collecting residual materials of installation.
- List of materials.
- Identification label (see 7.8.3.2)
- Installation instructions and templates (see 7.8.4)
- Other materials, tools and accessories (according to supplier's design)
- Tinned copper braid for grounding (see 7.5.2.5 g))
- Warning sheet<sup>3</sup>, indicating the expiration date.

B. Compact joints for transition extruded-paper insulated cables (see Table 1):

- 1 (one) pre-assembled joint body (see 7.5.2)
- 1 (one) shear bolt connector (see 7.5.2.1)
- 1 (one) shear bolt connector cover (see 7.5.2.1)
- 1 (one) plates for aluminum tape screen cables (see 7.4.2.5.a)
- Constant force compression system see par. 7.5.2.5.c) (quantity defined according to supplier's design);
- Greases and sealing compounds (see 7.4.2.5.e));
- Accessories for cleaning.
- Plastic bag for collecting residual materials of installation.
- List of materials.
- Identification label (see 7.8.3.2);
- Installation instructions and templates (see 7.8.4);
- Other materials, tools and accessories (according to supplier's design)
- Tinned copper rope blocked for grounding (see 7.4.2.5.g)).
- Oil sealing cold shrink tube (see 7.4.2.5.f))
- Warning sheet<sup>3</sup>, indicating the expiration date.

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<sup>3</sup> It must be inside the kit and is intended to warn the installer about the expiration date of the material; it is independent of the labels.

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## 7.7 TESTING

### 7.7.1 GENERAL

Tests are classified into:

- Type tests
  - Test sequences according to HD 629. (see 7.7.2.1; 7.7.2.2; 7.7.2.3)
  - Expiration Test (see 7.7.2.4)
  - Robustness Test (see 7.7.2.5)
  - UV Resistance Test (if applies, see 7.7.2.6)
  - Additional Type Tests (if applies, see 7.7.2.7)
  - Connector test (see 7.7.2.8)
- Acceptance tests (see 7.7.3)

They shall be carried out according to HD 629-1 S3 for joints for cables with extruded insulation and according to HD629-2 S2 for transition joints.

The connectors shall be tested according to IEC 61238-1, class A.

Tests on transition joints shall be performed using oil insulated paper cables.

The Supplier shall declare the resistance to fire of the main insulating housing according to IEC 60695-11-10 or another equivalent standard.

### 7.7.2 TYPE TEST

#### 7.7.2.1 Type Test for joints for cables with extruded insulation.

Type tests shall be carried out according to table 10 on samples installed on XLPE insulated cables with the minimum diameter over insulation (or lower) specified in Table 1. For E-Distribuzione, E-distributie Banat, E-distributie Dobrogea and E-distributie Muntenia, type tests shall be carried out on HPTE or XLPE insulated cables.

Rated voltage of the cables U <sub>0</sub> /U (U <sub>m</sub> ) (kV)	Cable cross-section selected	Test Sequence	Standard reference
The rated voltage indicated in Table 1 for selected material code.	The minimum section indicated in Table 1 for selected material code.	Sequence B1	Table 12 for HD 629.1 S3:2019
	The maximum section indicated in Table 1 for selected material code.	Sequence B1 and Sequence B2	Table 12 for HD 629.1 S3:2019
Note: samples according HD 629.1 S3:2019			

**Table 10 – Type test for single range.**

e.g., 270092 shall be tested on a 240 mm<sup>2</sup> – 18/30(36) kV cable seq. B1 & seq. B2 and 95 mm<sup>2</sup> 18/30(36) kV cable seq B1. The 271928 shall be tested on a 400 mm<sup>2</sup> – 12/20(24) cable seq. B1 & seq. B2 and 240 mm<sup>2</sup> 12/20(24) kV cable seq B1.

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**7.7.2.2 Extent of compliance for joints for cables with extruded insulation.**

Extension of compliance<sup>4</sup> for the same joint design<sup>5</sup> to smaller or larger cross-sections ranges shall be obtained by satisfactory completion of relevant test, according to table 11. It shall be mandatory to perform the required test for the 95-240 mm<sup>2</sup> cable cross-section range for obtaining the extension to other sections.

Cable cross-section Range (mm <sup>2</sup> )	Test Sequence	Range Approval (mm <sup>2</sup> )			
		35 95	95 240	240 400	400 630
95-240 (*)	Sequence B1 from table 12 on 95 mm <sup>2</sup> cable Sequence B1 from table 12 on 240 mm <sup>2</sup> cable Sequence B2 from table 12 on 240 mm <sup>2</sup> cable		Yes		
35-95	Sequence as per Table 17 (**) on 35 mm <sup>2</sup> cable	Yes	Yes		
240-400	Sequence B1 from table 12 on 400 mm <sup>2</sup> cable		Yes	Yes	
400-630	Sequence B1 from table 12 on 630 mm <sup>2</sup> cable		Yes	Yes	Yes

(\*) Mandatory test to obtain the compliance extension.  
 (\*\*) Test N° 4 in Table 17, should be performed with 63 cycles in water instead of the 12 described in standard HD 629.1 S3:2019.

**Table 11 – Type test for extend compliance**

**7.7.2.3 Type Test for Transition joints.**

Type tests shall be carried out according to table 12 on samples installed on oil insulated paper cables with the minimum diameter over insulation (or lower) specified in Table 1.

Rated voltage of the cables U <sub>0</sub> /U (Um) (kV)	Cable cross-section selected	Test Sequence	Standard reference
The rated voltage indicated in Table 1 for selected material code.	The minimum section indicated in Table 1 for selected material code.	Sequence as per Table 9 (*)	Table 9 for HD 629.2 S2:2006
	The maximum section indicated in Table 1 for selected material code.	Sequence B1-I and Sequence B2	Table 4 for HD 629.2 S2:2006

(\*) Test N° 4 in Table 17, should be performed with 63 cycles in water instead of the 12 cycles in air described in standard HD 629.2 S2:2006.

**Table 12 – Type test for single range for transition Joints.**

<sup>4</sup> Compliance shall extend the use of a joint on cables of the same U<sub>0</sub> as the test cable but with equal or greater nominal insulation thickness.

<sup>5</sup> Same design includes: same architecture, same manufacturing process, same conception, same materials, same sealings, compatible electrical stress.

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#### 7.7.2.4 EXPIRATION TEST

An expiration test shall be performed in order to verify the capability of the joint to maintain its properties during its life according to the expiry date declared by the manufacturer.

The test shall be performed of a new joint and on a joint of the same lot aged 7 days at 65°C in oven in expanded stage (to simulate 2 years of storage at 35°C of mean temperature).

After ageing, the new joint and the aged joint are put in expanded stage at +5°C during 24h. After that cooling phase, the joints are installed on the minimum cross-section cables of their reference range and the loops are immediately immersed in cold water at 0/+5°C.

Then, the following test sequence is applied:

Test	Extruded cable Joint <sup>6</sup> (table 12 of HD 629-1)	Transition Joint <sup>5</sup> (table 4 of HD 629-2)
Partial discharge measurement	X (test n°2)	n/a
Lightning impulse voltage test	X (test n°3)	X (test n°11)
Power-frequency voltage tests	X (test n°1)	X (test n°2)
Partial discharge measurement	X (test n°3)	n/a
Visual inspection of water penetration	X	X

**Table 13 – Expiration test.**

#### 7.7.2.5 ROBUSTNESS TEST

It shall be performed according to the French standard HN 33-E-03 with the following particularities:

The assessment criteria to pass the test is given in HN 33-E-03, except for the classification level which is not applied. However, the index “Evolution of the average breakdown values” must be calculated according to paragraph 5.1.3.2 of the standard. The test execution parameters are described in Table 14.

<sup>6</sup> As defined in paragraph 7.3.1, for the type codes defined in Table 1.



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Joint Type	Rated voltage of the cables U <sub>0</sub> /U (Um) (kV)	Cable cross-section selected	Sample	NH-33 Test Values
Straight or Aerial.	12/20(24) KV	35-95 (Al) 95-240 (Al)	150 mm <sup>2</sup> – Extruded cable. Or 240 mm <sup>2</sup> – Extruded cable. (Cables with aluminum tape screen)	Min breakdown values:  4.5 U <sub>0</sub> for new samples and after aging
		240-400 (Al) 400-630 (Al/Cu)	630 mm <sup>2</sup> – Extruded cable.	
	18/30(36) KV (*)	35-95 (Al) 95-240 (Al)	150 mm <sup>2</sup> – Extruded cable. Or 240 mm <sup>2</sup> – Extruded cable. (Cables with aluminum tape screen)	
		240-400(Al) 400-630(Al/Cu)	630 mm <sup>2</sup> – Extruded cable.	
Transition.	12/20(24) KV	35-95 (Al) 95-240(Al)	150 mm <sup>2</sup> - oil insulated paper cables. Or 240 mm <sup>2</sup> - oil insulated paper cables.	Min breakdown values:  4.5 U <sub>0</sub> for new samples. 3 U <sub>0</sub> After aging
	18/30(36) KV (*)	35-95 (Al) 95-240 (Al)		

(\*) The test shall be performed considering 18/30(36) kV class, thus applying and considering all the reference test values to the corresponding U<sub>0</sub>.

**Table 14 – Robustness Test.**

#### 7.7.2.6 UV RESISTANCE TEST FOR MV AERIAL CABLE JOINTS

Joints to be installed on MV aerial cables (see Table 1) shall be tested according to the IEC 62217 2012 par 9.3.2 (1000 h).

#### 7.7.2.7 ADDITIONAL TYPE TESTS

For Enel Sao Paulo Only, an additional test is required for 18/30(36) kv class Joints, shall be carried out all the tests prescribed by HD 629-1, table 17 with the Test requirements for U<sub>0</sub>/U (Um) 20,8/36(42) kV.

#### 7.7.2.8 Connectors Tests

The connectors shall be tested according to IEC 61238-1, class A, and shall be tested both for their maximum and minimum section.

The qualification can be extended to an alternative connector by carrying out all tests prescribed by HD 629-1, Table 16. The alternative connector shall comply with all the requirements specified in this document (see 7.4.2.1).

**Subject:** Global Infrastructure and Networks – GSCC004 COLD SHRINK COMPACT JOINTS FOR MV CABLES.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

### 7.7.3 ACCEPTANCE TESTS

For each material code, acceptance tests shall be carried out using the smallest cable section (see Table 1 for reference) for each rated voltage of the cable according to Table 3 (e.g. 201149 shall be tested on a 95 mm<sup>2</sup> – 12/20(24) kV cable).

For Enel Distribución Perú acceptance tests shall be carried out using the smallest cable section with 12/20(24) kV rated voltage<sup>7</sup> (e.g. 274236 shall be tested on a 95 mm<sup>2</sup> – 12/20(24) kV).

**During the acceptance tests performed autonomously by the supplier:** The supplier must perform all tests listed in Table 16 with the sampling criteria indicated in Table 15.

The reports of the tests carried out and the tested samples shall be made available in case of repetition of the acceptance tests at the presence of the Enel or designated inspector

**During the repetition of the acceptance tests at the presence of the Enel or designated inspector:** The test shall be carried out on a sample chosen randomly from the batch already successfully tested by the supplier.

The samplings plans are the follow:

Sample Type	Batch (units)		
	≤ 50 units	> 50 and ≤ 1200	> 1200
<b>A</b>	2 samples	5 samples	10 samples
<b>B</b>	1 sample	2 samples	3 samples
<b>C</b>	1 sample	2 samples	5 samples
<b>D</b>	1 sample	1 sample	2 samples

**Table 15 – Samples for acceptance Tests**

In all cases:

- The quantities are always referred to each type of material code prepared for testing;
- The acceptance number will be 0, and the rejection number will be 1;
- On the scheduled acceptance testing date, the supplier shall prepare the cables, stripped as required by the assembly instructions of joints being tested. This will facilitate the joint assembly and reduce the testing time, which benefits both parties.

<sup>7</sup> Tests performed on a 12/20(24) kV are considered sufficient to demonstrate compliance also for the installation on a 8.7/15(17.5) kV cable with normal thickness insulation.

**Subject:** Global Infrastructure and Networks – GSCC004 COLD SHRINK COMPACT JOINTS FOR MV CABLES.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

All the tests to be performed and the relative sampling are listed in the following table:

Test	Sampling during execution by Supplier	Sampling during repetition by Enel	Note
1. Visual check, Accessory manufacturing specifications check, and joint marking	A	C	<ul style="list-style-type: none"> <li>- Verification of correspondence to the approved prototype (dimensions, completeness of the accessory kit, presence, and correctness of identification labels and joint marking, packaging, and barcodes).</li> <li>- The nominal tightening torque of shear bolts specified by the manufacturer shall always be verified.</li> </ul>
2. Accessory assembly check	B	D	<ul style="list-style-type: none"> <li>- Check the assembly according to the approved manual.</li> </ul>
3. Power-frequency withstand test	B	D	<ul style="list-style-type: none"> <li>- Required values according to table N° 2 and test description according to IEC-61442.</li> </ul>
4. Partial discharge test at ambient temperature	B	D	<ul style="list-style-type: none"> <li>- According to test N° 2 to table 12 of HD 629-1 S3. Partial discharge measurement is not applicable for Transition Joints.</li> </ul>

**Table 16 – Acceptance Tests**

**7.7.4 RETIE Certification (only apply to Enel Distribución Colombia)**

For Enel Distribución Colombia (Colombia), RETIE certification shall be also provided according to local regulation (see chapter 4). It is requested that this certification be made under the scheme 5 (ISO IEC 17067).

**Subject:** Global Infrastructure and Networks – GSCC004 COLD SHRINK COMPACT JOINTS FOR MV CABLES.

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

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## 7.8 Conditions of Supply

### 7.8.1 Warranty

The manufacturer shall guarantee that the cold shrink compact joints are supplied to meet all requirements of this technical specification.

The cold shrink compact joints shall be warranted against manufacturing defects for a period of 2 years.

### 7.8.2 Labelling

The joint must bear the following information:

- a) name of the manufacturer;
- b) maximum voltage  $U_m$  in kV
- c) year and month of manufacture (e.g.: 15/2);

In particular, this information shall be placed on the external sheath of the joint by means of indelible and permanent screen printing or an equivalent method accepted by the Distribution Companies of Enel Group.

### 7.8.3 Packaging

Joints shall be supplied in individual packages which shall bear the following information:

- Material code assigned by the Distribution Companies of Enel Group;
- Name of the manufacturer;
- Type of joint (e.g. cold shrink compact);
- Type of cables for which the accessory is intended, section and conductor material allowed (aluminum/copper);
- Year and month of packaging;
- Progressive identification number assigned by the manufacturer (or serial number);
- Barcode (see 7.8.3.1)
- Production batch number;
- Identification abbreviation;
- Maximum voltage  $U_m$  in kV;
- Expiry date (year/month) of the materials.

Furthermore, the packages shall contain a self-adhesive label with the following information (only for E-distribuzione and Endesa Distribucion):

- manufacturer identification code (CUI);
- material code assigned by the Distribution Companies of Enel Group;
- year and month of manufacture (e.g.: 15/2);
- progressive identification number (assigned by the manufacturer);
- barcode see 7.8.3.1)

For E-distribuzione, shipping (of several individual packages) shall meet the requirements of the packaging in compliance with GUI 101 specifications.

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**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

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### 7.8.3.1 Barcode

The characteristics of the barcode are listed in E-distribuzione specification PVR 006 and Global Infrastructure and Networks Barcode specification CNS-O&M-S&L-2021-0032-EGIN

### 7.8.3.2 Identification label

It shall include blank fields to be filled after installation:

Name: .....

Date: .....

Company: .....

### 7.8.4 Installation instructions and templates

The instruction for the preparation of the cable shall be written in compliance with Enel Global Standard (GSCC015). For E-distribuzione the technical specification DJ4580 also applies.

Accessory assembly instructions shall be written on A4 paper, and the various stages of construction of the joint shall be illustrated by photographs or diagrams in color.

Templates shall be included for the following types of cables:

- Extruded cables with aluminum tape screen
- Extruded cables with copper wires screen
- Paper insulated cable

Furthermore, for processing steps that require the use of a special tool, the description of these operations shall be accompanied by the Distribution Companies of Enel Group material code/type code<sup>8</sup> for the tool and a color photograph.

Additionally a QR code shall be included for each step of the installation instructions to provide a web-link to demonstration videos and tutorials on the related joint. The videos shall be in the local language of the Country of delivery.

Installing instruction and templates shall be in the local language of the Country of delivery and shall be approved by Distribution Companies of Enel Group.

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<sup>8</sup> This information, if any, will be provided by Distribution Companies of Enel Group during the examination of the installation instructions (before the certification process)

**Subject:** Global Infrastructure and Networks – GSCC004 COLD SHRINK COMPACT JOINTS FOR MV CABLES.

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

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## 7.9 TECHNICAL CONFORMITY ASSESSMENT

### 7.9.1 General conditions

The manufacturer shall provide personnel and equipment necessary to carry out type tests and acceptance tests described herein. Otherwise, the supplier could hire the service to a laboratory previously accepted by the customer and assume the cost. The product shall comply with the requirements of GSCG002 regarding the Technical Conformity Assessment.

The equipment should be properly calibrated by a laboratory certified or approved by the client. The manufacturer shall possess up to date calibration certificates (to turn over) at the time of inspection.

### 7.9.2 Acknowledgement of TCA for previous revision of the standard.

Products with TCA in force under the ENEL Global standard GSCC004 Rev 3 of 09/07/2018 and their respective addendums will be recognized as homologated material for the present technical specification. Enel, therefore, reserves the right to check that the conditions of supply, contents of the kit, type codes, country codes, manuals, labels, etc., shall comply with the requirements of this technical specification.

**Subject:** Global Infrastructure and Networks – GSCC004 COLD SHRINK COMPACT JOINTS FOR MV CABLES.

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Infrastructure & Networks*

## 8 ANNEXES

### 8.1 Technical Check List example

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

Item	Description	Unit	Required	Offered
<b>1</b>	<b>GENERAL INFORMATION</b>			
1.1	Supplier	-		
1.2	Factory	-		
1.3	Supplier Product Designation	-		
<b>2</b>	<b>MAIN FEATURES</b>			
2.1	Distribution Company and Country	-		
2.2	Country Code	-		
2.3	GS Type Code			
2.4	Joint Type			
2.5	Rated voltage U0/U (Um)	(kV)		
2.6	Rated power frequency withstand voltage	(kV)		
2.7	Rated impulse withstand voltage			
2.8	Rated short time withstand current in the conductor			
2.9	Rated short time (0,5 s) withstand current in the screen.			
2.10	Maximum length L	(mm)		
2.11	Maximum diameter D	(mm)		
2.12	Shrink Technology			
2.13	Resistance to fire			
2.14	Type of connector			
2.15	Copper stocking cross section	(mm <sup>2</sup> )		
2.16	Cable section	(mm <sup>2</sup> )		
2.17	Min/max diameter over insulation	(mm)		
2.18	Maximum external diameter of shear bolts connector:	(mm)		
2.18.1	Minimum internal diameter of shear bolts connector	(mm):		
2.18.2	Number of screws of shear bolts connector			
2.19	Minimum total thickness over the connector of main insulating housing after shrinking	(mm)		
2.2	Grounding Braid System	Yes/no		
The "L" and "D" dimensions, as defined in figure 1				

**Table 17 – Check list**

**Subject:** Global Infrastructure and Networks – GSCC004 COLD SHRINK COMPACT JOINTS FOR MV CABLES.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

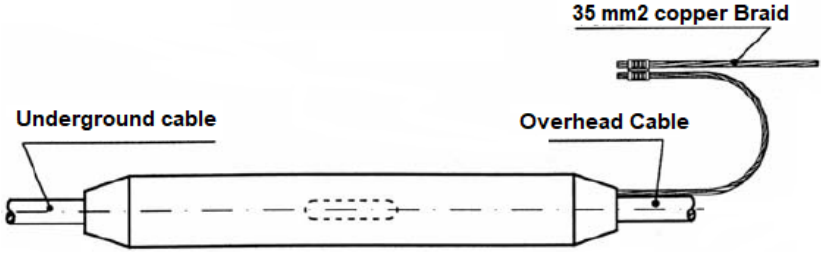
Business Line: *Infrastructure & Networks*

## 9 LOCAL SECTION

### 9.1 LOCAL SECTION A – E-DISTRIBUZIONE ITALY

#### 9.1.1 Special Joints for Overhead – Underground cables.

The type code's GSCC004/35, GSCC004/36, GSCC004/37 and GSCC004/38 from Italy, is for all purposes defined according to this technical specification, with the following exceptions:

ITEM	TITLE	DESCRIPTION																																											
7.1	List of component	<table border="1"> <thead> <tr> <th rowspan="2">Type code</th> <th rowspan="2">Country Code</th> <th colspan="3">Cable section (mm<sup>2</sup>)</th> <th rowspan="2">Copper stocking section (mm<sup>2</sup>)</th> <th rowspan="2">Min/max Diameter over insulation (mm)</th> <th rowspan="2">Grounding Braid System</th> </tr> <tr> <th>overhead XLPE Cable</th> <th>Underground XLPE Cable</th> <th>Oil impregnated paper insulation</th> </tr> </thead> <tbody> <tr> <td>GSCC004/35</td> <td>270209</td> <td>35÷150</td> <td>70÷150</td> <td>---</td> <td>25</td> <td>16/30</td> <td>Yes</td> </tr> <tr> <td>GSCC004/36</td> <td>270028</td> <td>95÷150</td> <td>150÷240</td> <td>---</td> <td>25</td> <td>16/33</td> <td>Yes</td> </tr> <tr> <td>GSCC004/37</td> <td>270207</td> <td>35÷95</td> <td>---</td> <td>95÷150</td> <td>25</td> <td>16/27</td> <td>Yes</td> </tr> <tr> <td>GSCC004/38</td> <td>270208</td> <td>150</td> <td>---</td> <td>240</td> <td>25</td> <td>27/33</td> <td>Yes</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Table A.1</b> 12/20(24) kV Special Joints</p>	Type code	Country Code	Cable section (mm <sup>2</sup> )			Copper stocking section (mm <sup>2</sup> )	Min/max Diameter over insulation (mm)	Grounding Braid System	overhead XLPE Cable	Underground XLPE Cable	Oil impregnated paper insulation	GSCC004/35	270209	35÷150	70÷150	---	25	16/30	Yes	GSCC004/36	270028	95÷150	150÷240	---	25	16/33	Yes	GSCC004/37	270207	35÷95	---	95÷150	25	16/27	Yes	GSCC004/38	270208	150	---	240	25	27/33	Yes
		Type code			Country Code	Cable section (mm <sup>2</sup> )					Copper stocking section (mm <sup>2</sup> )	Min/max Diameter over insulation (mm)	Grounding Braid System																																
			overhead XLPE Cable	Underground XLPE Cable		Oil impregnated paper insulation																																							
		GSCC004/35	270209	35÷150	70÷150	---	25	16/30	Yes																																				
		GSCC004/36	270028	95÷150	150÷240	---	25	16/33	Yes																																				
GSCC004/37	270207	35÷95	---	95÷150	25	16/27	Yes																																						
GSCC004/38	270208	150	---	240	25	27/33	Yes																																						
7.4.2.1	Shear bolt connector	Dimensions according to manufacturer's design																																											
7.4.2.5	Grounding Braid	<p>The joint is provided with a flat copper braid to connect the aluminum tube screen of the overhead cable with the copper wire 35 mm<sup>2</sup> with the function of an additional grounding conductor, necessary if - for short distances - the underground laying of the overhead cable is adopted.</p>  <p>The manufacturer shall include in the kit a mechanical connector of adequate size to make the connection between the flat copper braid and the ground wire.</p>																																											
7.4.2.5e)	Greases and sealing compounds	is allowed to use mastics tapes for increase the insulation thickness if necessary																																											
7.5	Dimensions for the preparation cable	According to manufacturer's design																																											
7.7	Type Test	Type testing shall be in accordance with chapter 7.7 of this standard, and the robustness test is optional.																																											



**Subject:** Global Infrastructure and Networks – GSCC004 COLD SHRINK COMPACT JOINTS FOR MV CABLES.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

### 9.1.2 Special Joints for screen interruption

The type code's GSCC004/39, GSCC004/40 and GSCC004/41 from Italy, is for all purposes defined according to this technical specification, with the following exceptions:

ITEM	TITLE	DESCRIPTION																														
7.1	List of component	<table border="1"> <thead> <tr> <th rowspan="2">Type code</th> <th rowspan="2">Country Code</th> <th colspan="2">Cable section (mm<sup>2</sup>)</th> <th rowspan="2">Copper stocking section (mm<sup>2</sup>)</th> <th rowspan="2">Min/max Diameter over insulation (mm)</th> <th rowspan="2">Grounding Braid System</th> </tr> <tr> <th>Extruded insulation</th> <th>Oil impregnated paper insulation</th> </tr> </thead> <tbody> <tr> <td>GSCC004/39</td> <td>271140</td> <td>70÷240</td> <td>---</td> <td>25</td> <td>16/30</td> <td>No</td> </tr> <tr> <td>GSCC004/40</td> <td>271143</td> <td>35÷150</td> <td>---</td> <td>25</td> <td>16/33</td> <td>No</td> </tr> <tr> <td>GSCC004/41</td> <td>271142</td> <td>---</td> <td>95÷240</td> <td>25</td> <td>16/27</td> <td>No</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Table A.2</b> 12/20(24) kV Special Joints</p>	Type code	Country Code	Cable section (mm <sup>2</sup> )		Copper stocking section (mm <sup>2</sup> )	Min/max Diameter over insulation (mm)	Grounding Braid System	Extruded insulation	Oil impregnated paper insulation	GSCC004/39	271140	70÷240	---	25	16/30	No	GSCC004/40	271143	35÷150	---	25	16/33	No	GSCC004/41	271142	---	95÷240	25	16/27	No
Type code	Country Code	Cable section (mm <sup>2</sup> )			Copper stocking section (mm <sup>2</sup> )	Min/max Diameter over insulation (mm)				Grounding Braid System																						
		Extruded insulation	Oil impregnated paper insulation																													
GSCC004/39	271140	70÷240	---	25	16/30	No																										
GSCC004/40	271143	35÷150	---	25	16/33	No																										
GSCC004/41	271142	---	95÷240	25	16/27	No																										
7.4.2.1	Shear bolt connector	Dimensions according to manufacturer's design																														
7.4.2	Compact Joint	The main insulating housing and the component to control the electric field must be of a single body design; the rest of the joint parts are integrated according to the manufacturer's design.																														
7.4.2.5	Copper stocking (Metalic Screen)	<p>The joint shall have two half-screens, overlapped by at least 10 mm, but insulated between them with the interposition of insulating material of suitable dielectric characteristics (see table A.3). The two half-screens shall be connected to the respective screens of the two cable segments see par (7.4.2.5);</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Electrical Characteristics</th> </tr> </thead> <tbody> <tr> <td>Rated voltage insulation between shields</td> <td>20 kV</td> </tr> <tr> <td>Lightning impulse withstand voltage between shields</td> <td>60 kV</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Table A.3</b> 12/20(24) kV Special Joints</p>	Electrical Characteristics		Rated voltage insulation between shields	20 kV	Lightning impulse withstand voltage between shields	60 kV																								
Electrical Characteristics																																
Rated voltage insulation between shields	20 kV																															
Lightning impulse withstand voltage between shields	60 kV																															
7.5	Dimensions for the preparation cable	According to manufacturer's design																														
7.7	Type Test	Type testing shall be in accordance with chapter 7.7 of this standard, and the robustness test is optional.																														

**Subject:** Global Infrastructure and Networks – GSCC004 COLD SHRINK COMPACT JOINTS FOR MV CABLES.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

## 9.2 LOCAL SECTION B – E-DISTRIBUCIÓN SPAIN

### 9.2.1 Special transition Joint

The type code's GSCC004/42 from Spain is for all purposes defined according to this technical specification, with the following exceptions:

ITEM	TITLE	DESCRIPTION																
7.1	List of component	<table border="1" data-bbox="577 763 1423 902"> <thead> <tr> <th rowspan="2">Type code</th> <th rowspan="2">Country Code</th> <th colspan="2">Cable section (mm2)</th> <th rowspan="2">Copper stocking section (mm2)</th> <th rowspan="2">Min/max Diameter over insulation (mm)</th> <th rowspan="2">Grounding Braid System</th> </tr> <tr> <th>Extruded insulation</th> <th>Oil impregnated paper insulation</th> </tr> </thead> <tbody> <tr> <td>GSCC004/42</td> <td>270125</td> <td>50÷240</td> <td>50÷240</td> <td>25</td> <td>20.6/32.2</td> <td>No</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Table A.412/20(24) kV Special Joints</b></p> <p>Transition joint for oil impregnated paper insulation to Extruded insulation RH5Z1 Cable.</p>	Type code	Country Code	Cable section (mm2)		Copper stocking section (mm2)	Min/max Diameter over insulation (mm)	Grounding Braid System	Extruded insulation	Oil impregnated paper insulation	GSCC004/42	270125	50÷240	50÷240	25	20.6/32.2	No
Type code	Country Code	Cable section (mm2)			Copper stocking section (mm2)	Min/max Diameter over insulation (mm)				Grounding Braid System								
		Extruded insulation	Oil impregnated paper insulation															
GSCC004/42	270125	50÷240	50÷240	25	20.6/32.2	No												
7.4.2.1	Shear bolt connector	Dimensions according to manufacturer's design																
7.5	Dimensions for the preparation cable	According to manufacturer's design																
7.7	Type Test	Type testing shall be in accordance with chapter 7.7 of this standard, and the robustness test is optional.																
7.9.2	Acknowledgement of TCA for previous revision of the standard.	Products with TCA in force under the Endesa Distribucion Local standard 6710951 Rev II of 23/04/2014 will be recognized as homologated material for the present technical specification. Enel, therefore, reserves the right to check that the conditions of supply, contents of the kit, type codes, country codes, manuals, labels, etc., shall comply with the requirements of this technical specification.																

**Subject:** Global Infrastructure and Networks – GSCC004 COLD SHRINK COMPACT JOINTS FOR MV CABLES.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

### 9.2.2 Special straight Joint

The type code's GSCC004/43 from Spain or all purposes defined according to this technical specification, with the following exceptions:

ITEM	TITLE	DESCRIPTION																
7.1	List of component	<table border="1"> <thead> <tr> <th rowspan="2">Type code</th> <th rowspan="2">Country Code</th> <th colspan="2">Cable section (mm2)</th> <th rowspan="2">Copper stocking section (mm2)</th> <th rowspan="2">Min/max Diameter over insulation (mm)</th> <th rowspan="2">Grounding Braid System</th> </tr> <tr> <th>Extruded insulation</th> <th>Extruded insulation (Existing network cable)</th> </tr> </thead> <tbody> <tr> <td>GSCC004/43</td> <td>270198</td> <td>150÷240</td> <td>50÷95</td> <td>25</td> <td>20.6/32.2</td> <td>No</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Table A.5</b> 18/30(36) kV Special Joints</p>	Type code	Country Code	Cable section (mm2)		Copper stocking section (mm2)	Min/max Diameter over insulation (mm)	Grounding Braid System	Extruded insulation	Extruded insulation (Existing network cable)	GSCC004/43	270198	150÷240	50÷95	25	20.6/32.2	No
		Type code			Country Code	Cable section (mm2)				Copper stocking section (mm2)	Min/max Diameter over insulation (mm)	Grounding Braid System						
Extruded insulation	Extruded insulation (Existing network cable)																	
GSCC004/43	270198	150÷240	50÷95	25	20.6/32.2	No												
		Straight joint for extruded insulation RH5Z1/RHZ1 Cable to RHV/RHZ Cable.																
7.4.2.1	Shear bolt connector	Dimensions according to manufacturer's design																
7.5	Dimensions for the preparation cable	According to manufacturer's design																
7.7	Type Test	Type testing shall be in accordance with chapter 7.7 of this standard, and the robustness test is optional.																
7.9.2	Acknowledgement of TCA for previous revision of the standard.	Products with TCA in force under the Endesa Distribucion Local standard 6711722 Rev II of 23/04/2014 will be recognized as homologated material for the present technical specification. Enel, therefore, reserves the right to check that the conditions of supply, contents of the kit, type codes, country codes, manuals, labels, etc., shall comply with the requirements of this technical specification.																