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## 12/20(24) kV AND 18/30(36) kV COLD SHRINK COMPACT JOINTS FOR MV CABLES

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Revision	Date	List of modifications
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.

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## 1 SCOPE

This Global Standard applies to 12/20(24) kV and 18/30(36) kV cold shrink compact joints for MV 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:

<i>Enel Distribución Colombia</i>	<i>Colombia</i>
<i>Enel Distribución Perú</i>	<i>Perú</i>
<i>Edesur</i>	<i>Argentina</i>
<i>e-distributie Banat</i>	<i>Romania</i>
<i>e-distributie Dobrogea</i>	<i>Romania</i>
<i>e-distributie Muntenia</i>	<i>Romania</i>
<i>e-distribuzione</i>	<i>Italy</i>
<i>Endesa Distribución Eléctrica</i>	<i>Spain</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>

## 2 FIELD OF APPLICATION

These requirements apply to the underground and aerial cable distribution network with rated maximum voltage of 24 kV and 36 kV. Other existing rated maximum voltage levels up to 24 kV are covered by the 12/20(24) kV class, whereas those with rated maximum voltage up to 36 kV are covered by the 18/30(36) kV class.

## 3 REFERENCE LAWS AND STANDARDS

### 3.1 International standards

Unless otherwise specified the following standards applies:

- Cenelec HD 629-1 and HD 629-2;
- IEC 61238-1
- IEC 60721-2-1
- ISO IEC 17067

### 3.2 Global Standards

- GSC001<sup>1</sup>.
- GSCC015

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<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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### 3.3 Local standards

#### 3.3.1 Italy

- DJ4580
- PVR 006
- GUI 101

#### 3.3.2 Brazil

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

#### 3.3.3 Colombia

- RETIE – Reglamento Técnico de Instalaciones Eléctricas.

#### 3.3.4 Chile

- NSEC 5
- NCH 4/2003

#### 3.3.5 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.).

#### 3.3.6 Other standards

HN 33-E-03

## 4 TERMS AND DEFINITIONS

See Cenelec HD 629-1 and HD 629-2.

## 5 UNIT OF MEASURE

Number of pieces.

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## 6 TYPES OF JOINTS

The following types of joints are defined:

Type code	Rated voltage $U_0/U (U_m)$ (kV)	
	12/20(24)	18/30(36)
GSCC004/1	X	
GSCC004/2		X
GSCC004/3	X*	
GSCC004/4	X**	
GSCC004/5		X**
* Transition joint for extruded cables-paper insulated cables		
** Joint for MV aerial cable		

**Table 1 – Type codes**

## 7 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)	50	70
Rated impulse withstand voltage (kV)	125	170
Rated short time withstand current in the conductor (kA)	According to HD629-1 (EN 61442)	
Rated short time (0,5 s <sup>a</sup> ) withstand current in the screen (kA)	5 <sup>b</sup> ; 10 <sup>c</sup>	
NOTE (see Table 6): a: for E-distribuzione, E-distributie, Endesa Distribución Eléctrica the rated short time is 1 s b: for 16 mm <sup>2</sup> and 25 mm <sup>2</sup> joint screen (all Distribution Companies except Enel Distribución Colombia) c: for 25 mm <sup>2</sup> joint screen (only for Enel Distribución Colombia) and 50 mm <sup>2</sup> joint screen (all Distribution Companies to which applies)		

**Table 2 – Electrical characteristics**

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

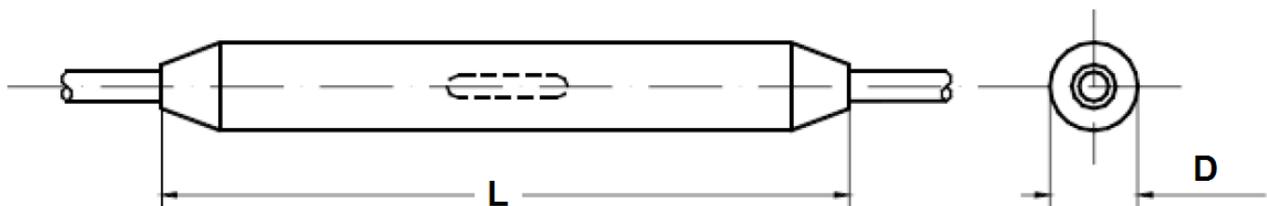
Rated voltage of the joint $U_0/U (U_m)$ (kV)	12/20(24)	18/30(36)
Distribution Company (Country)	Rated voltage of the cables $U_0/U (U_m)$ (kV)	
Enel Distribuição Ceará (Brazil) Enel Distribución Colombia (Colombia)	8.7/15(17.5)	-
Enel Distribución Chile (Chile)	8.7/15(17.5)	15/25(31)
Enel Distribución Perú (Perú)	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)
Endesa Distribución Eléctrica (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)**

## 8 SERVICE CONDITIONS

### 8.1 General service conditions

- IEC 60721-2-1.

### 8.2 Specific service conditions

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

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## 9 CONSTRUCTION CHARACTERISTICS

### 9.1 GENERAL CHARACTERISTICS

#### 9.1.1 Shrink technology

The joints shall be cold shrink type.

#### 9.1.2 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.

#### 9.1.3 Resistance to fire

The main insulating housing (see 9.2.3) shall be resistant to fire.

#### 9.1.4 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.

#### 9.1.5 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.

### 9.2 COMPACT JOINT

Compact joints are composed by the following elements:

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

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.

### 9.2.1 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:

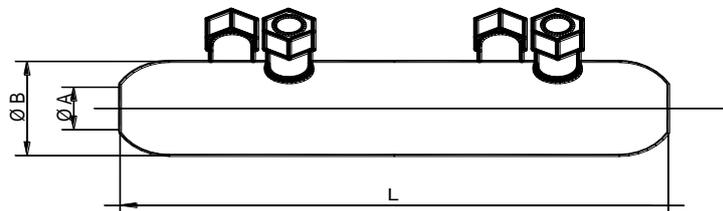


Figure 2 – Shear bolts connector example

Al cable section (mm <sup>2</sup> )	Ø A min (mm)	Ø B max. (mm)	N° of screws (min.)
35÷120	15,8	30	2
70÷240	19,5	38	4
150÷240	19,5	38	4
240÷ 400	26	45	4
400÷630	33	52	6

Table 5 – Connectors dimensions

### 9.2.2 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.

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### 9.2.3 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.

### 9.2.4 Semiconducting layer

Painted or coated semiconducting layers are not allowed.

### 9.2.5 Copper stocking

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 6.

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

Distribution Company (Country)	Cable section (mm <sup>2</sup> )	Copper stocking section (mm <sup>2</sup> )
Enel Distribuição Rio (Brazil) Enel Distribuição Ceará (Brazil) Enel Distribuição Goiás (Brazil)	≤ 240	25
Enel Distribución Chile (Chile) Enel Distribución Colombia (Colombia)	400 and 630	50
Edesur (Argentina)	70	25
	185; 240 and 400	50
Enel Distribución Perú (Perù) Endesa Distribución Eléctrica (Spain) E-distributie Banat (Romania) E-distributie Dobrogea (Romania) E-distributie Muntenia (Romania) E-Distribuzione (Italy)	all sections <sup>a</sup>	25
NOTE: a: in those companies, MV cables may have aluminum tape screen or copper wire screens. The copper stocking of the joint shall be compatible with both aluminum tape screen and copper wires screen of cables.		

**Table 6 – Copper stocking sections**

#### 9.2.5.1 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 μm. The plate shall be as shown in the figure Figure 3 and shall be bent on a cylinder of diameter 25 ± 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.

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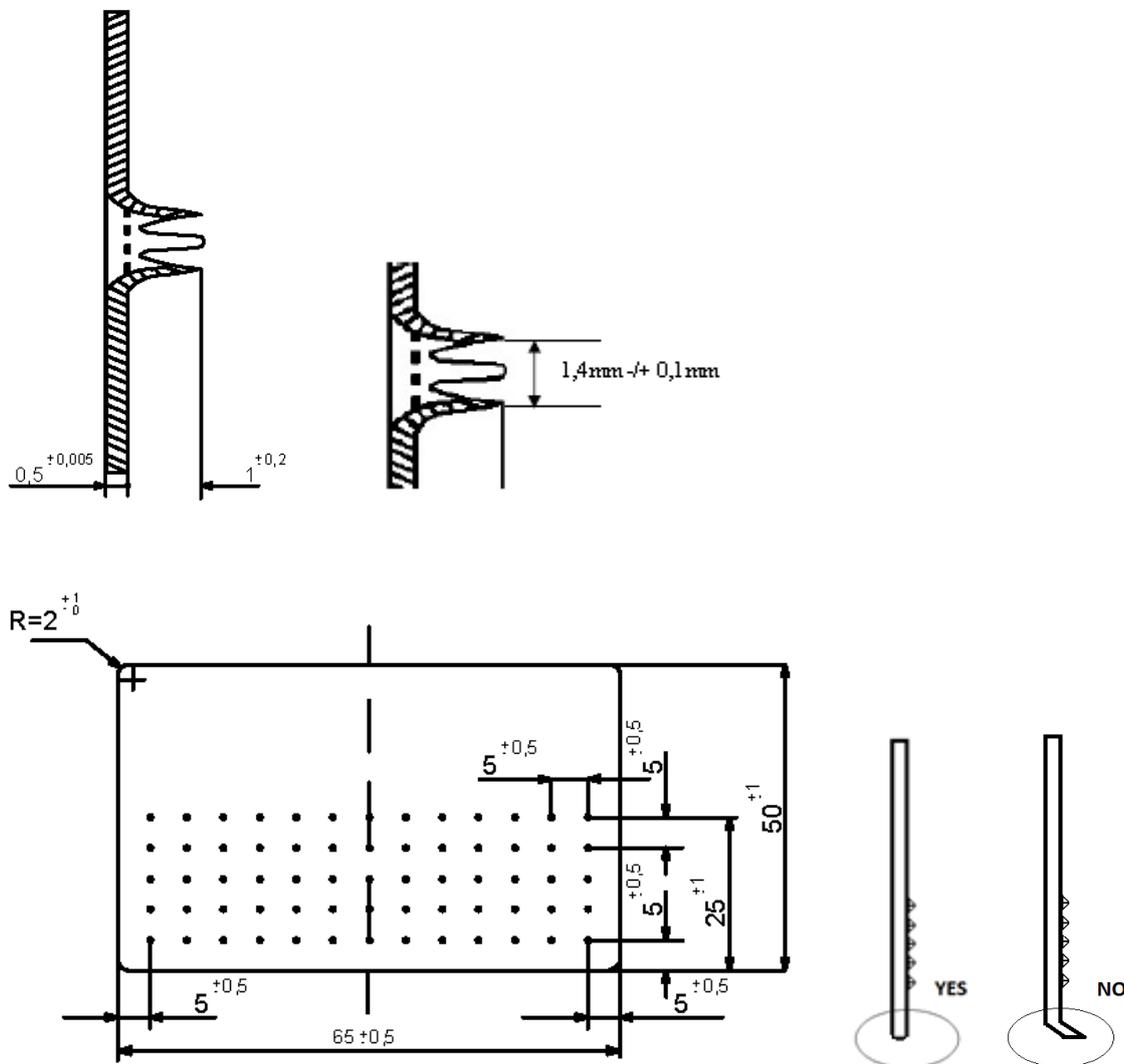


Figure 3 – Detail of rectangular plate for aluminum tape screen connection

### 9.2.5.2 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.

### 9.2.5.3 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.

### 9.2.6 External protective sheath

The protective sheath for mechanical protection and sealing of the joint shall be made of one single piece. For type GSCC004/4 and GSCC004/5 the color of the external sheath shall be gray RAL 7001.

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### 9.2.7 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.

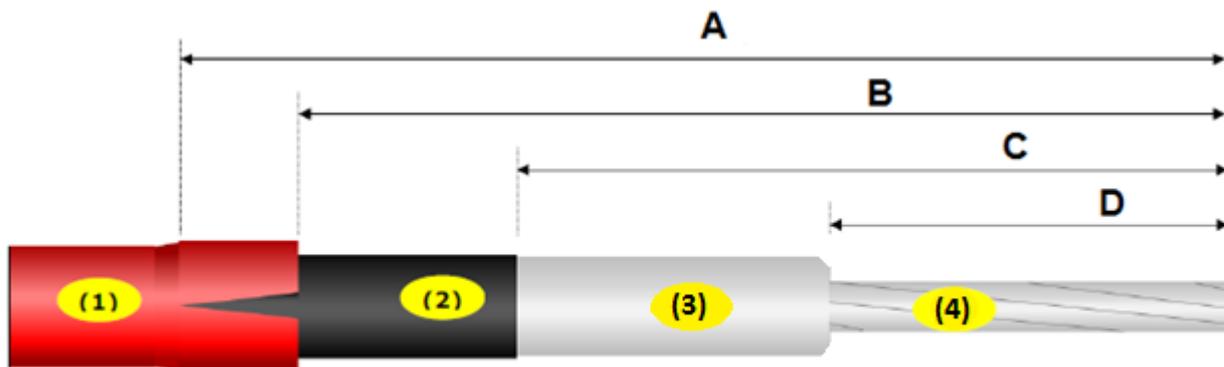
### 9.2.8 Oil sealing system for transition joints

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.

## 10 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.

### 10.1 Preparation of the cable with aluminum screen



- (1): outer sheath  
(2): insulation screen  
(3): insulation  
(4): conductor

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

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

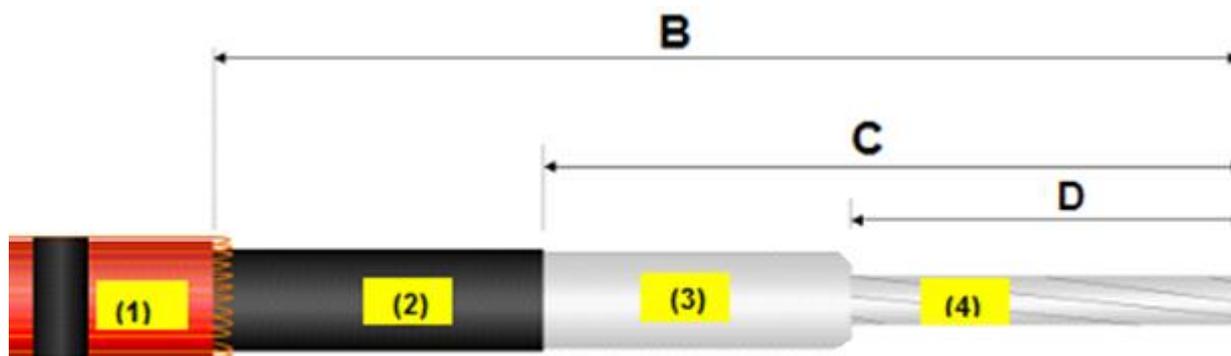
Therefore the following dimensions (in mm) are fixed:

A-B = 40

B-C = 50

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

## 10.2 Preparation of the cable with copper wire screen



- (1): outer sheath
- (2): insulation screen
- (3): insulation
- (4): conductor

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

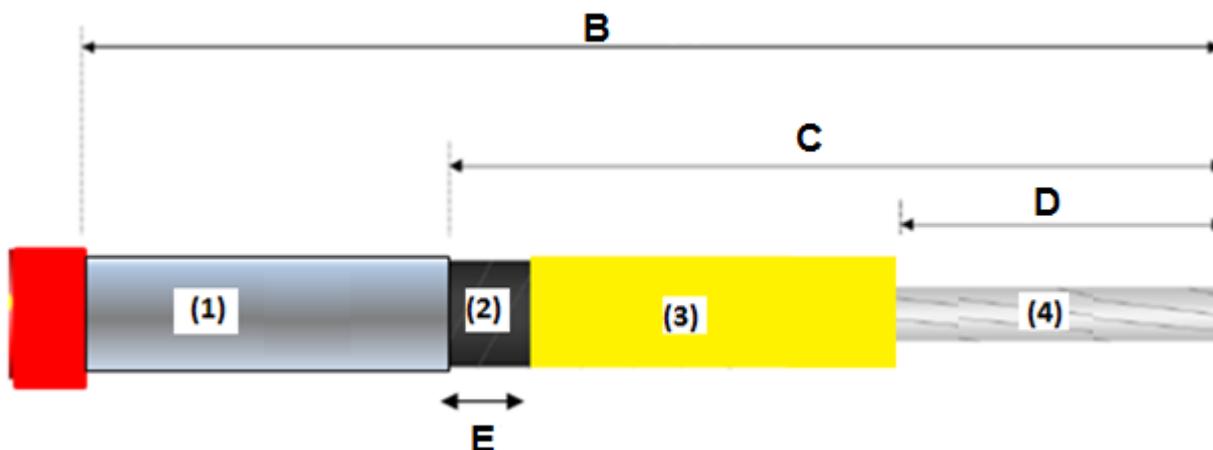
Cable section (mm <sup>2</sup> )	Dimension 36 kV (mm)		
	B	C	D
35 ÷ 95	190	150	50
95 ÷ 240	205	165	65
240 ÷ 400	225	185	85
400 ÷ 630	250	210	110

Therefore the following dimensions (in mm) are fixed:

B-C = 40

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

### 10.3 Preparation of the cable with oil-impregnated paper insulation



(1): lead sheath

(2): paper insulation screen

(3): paper insulation

(4): conductor

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

Therefore the following dimensions (in mm) are fixed:

B-C = 80

C-D = 100

## 11 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 9.2)

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- 1 (one) shear bolt connector (see 9.2.1);
- 1 (one) shear bolt connector cover (see 9.2.1);
- 2 (two) plates for aluminum tape screen cables (see 9.2.5.1) (only in the Countries which use them, see Table 6);
- Constant force compression system see par. 9.2.5.3 (quantity defined according to supplier's design);
- Greases and sealing compounds (see 9.2.7);
- Accessories for cleaning;
- Plastic bag for collecting residual materials of installation;
- List of materials;
- Identification label (see 14.2.2);
- Installation instructions and templates (see 14.3);
- Other materials, tools and accessories (according to supplier's design)

B. Compact joints for transition extruded-paper insulated cables (see Table 8):

- 1 (one) pre-assembled joint body (see 9.2)
- 1 (one) shear bolt connector (see 9.2.1);
- 1 (one) shear bolt connector cover (see 9.2.1);
- 1 (one) plate for aluminum tape screen cables (see 9.2.5.1) (only in the Countries which use them, see Table 6);
- Constant force compression system see par. 9.2.5.3 (quantity defined according to supplier's design);
- Greases and sealing compounds (see 9.2.7);
- Accessories for cleaning;
- Plastic bag for collecting residual materials of installation;
- List of materials;
- Identification label (see 14.2.2);
- Installation instructions and templates (see 14.3);
- Other materials, tools and accessories (according to supplier's design)
- Oil sealing cold shrink tube (see 9.2.8)

## 12 LIST OF COMPONENTS

The list of components included in this Global Standard is reported in the following tables for 12/20(24) kV and 18/30(36) kV rated voltages:



12/20(24) kV AND 18/30(36) kV COLD SHRINK  
COMPACT JOINTS FOR MV CABLES

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Distribution Company (Country)	Type: GSCC004/1, GSCC004/3 and GSCC004/4			
Enel Distribuição Rio (Brazil) Enel Distribuição Ceará (Brazil) Enel Distribuição Goiás (Brazil)	6788369	6776209	6794284	6794285
Enel Distribución Chile (Chile)	6812036	6812037	6812038	6812039
Enel Distribución Colombia (Colombia)	6811861	6811862	-	-
Enel Distribución Perú (Perú)	6811499	6811500	6811501	-
Edesur (Argentina)	-	-	-	-
Endesa Distribución Eléctrica (Spain)	270315**	270090 270316**	270002	-
E-distributie Banat (Romania); E-distributie Dobrogea (Romania); E-distributie Muntenia (Romania); E-Distribuzione (Italy)	270002 270004* 270006**	270001 270003* 270005**	-	-
<b>Characteristics of the cable</b>				
Cable section (mm <sup>2</sup> )	35 ÷ 95	95 ÷ 240	240 ÷ 400	400 ÷ 630
Rated voltage $U_0/U$ ( $U_m$ ) (kV)	See Table 3			
Min/max diameter over insulation (mm)	14.9/ 25.0	20.6/32.2	26.1/37.5	31/43.5
* Transition joints GSCC004/3 ** Joints for MV aerial cable GSCC004/4				

**Table 7 – Material codes for cold shrink 12/20(24) kV compact joints**



12/20(24) kV AND 18/30(36) kV COLD SHRINK  
COMPACT JOINTS FOR MV CABLES

**GSCC004**

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Distribution Company (Country)	Type: GSCC004/2 and GSCC004/5					
Enel Distribuição Rio (Brazil) Enel Distribuição Goiás (Brazil)	-	T160113	-	-	-	-
Enel Distribución Chile (Chile)	-	-	6811535	6811536	6812035	6811537
Enel Distribución Colombia (Colombia)	-	-	-	-	-	-
Enel Distribuição Ceará (Brazil)	-	-	-	-	-	-
Enel Distribución Perú (Perù)	-	-	-	-	-	-
Edesur (Argentina)	-	-	-	-	-	-
Endesa Distribución Eléctrica (Spain)	270317**	270318**		270092	270001	-
E-distributie Banat (Romania); E-distributie Dobrogea (Romania); E-distributie Muntenia (Romania); E-Distribuzione (Italy)	-	-	-	-	-	-
<b>Characteristics of the cable</b>						
Cable section (mm <sup>2</sup> )	35 ÷ 95	95 ÷ 240	70 ÷ 150	150 ÷ 240	240 ÷ 400	400 ÷ 630
Rated voltage $U_0/U (U_m)$ (kV)	See Table 3					
Min/max diameter over insulation (mm)	20.4/30.0	24.8/37.2	19.0/32.2	27.3/37.2	29.8 /42.5	34.9/49.7
** Joints for MV aerial cable GSCC004/5						

**Table 8 – Material codes cold shrink 18/30(36) kV compact joints**

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## 13 TESTS

### 13.1 GENERAL

Tests are classified into:

- Type tests
- Acceptance tests

They shall be carried out according to HD 629-1 (according to HD629-2 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.

### 13.2 TYPE TESTS

For each material code, type tests shall be carried out on samples installed on cables, with the maximum section indicated in Table 7 and Table 8, respectively for  $U_0/U (U_m)$  12/20(24) kV and 18/30(36) kV (e.g. 270092 shall be tested on a 240 mm<sup>2</sup> – 18/30(36) kV cable and 6811501 on a 400 mm<sup>2</sup> 12/20(24) kV cable).

Type tests shall be carried out at the maximum rated voltage level prescribed for the joints (i.e. 12/20(24) kV or 18/30(36) kV).

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

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

For E-Distribuzione, E-distributie Banat, E-distributie Dobrogea and E-distributie Muntenia, type tests shall be carried out on both HPTE and XLPE insulated cables.

#### 13.2.1 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:

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Test	GSCC004/1, GSCC004/2, GSCC004/4 and GSCC004/5 (table 5 of HD 629-1)	GSCC004/3 (table 4 of HD 629-2)
Partial discharge measurement	X (test n°3)	n/a
Lightning impulse voltage test	X (test n°12)	X (test n°11)
Power-frequency voltage tests	X (test n°2)	X (test n°2)
Partial discharge measurement	X (test n°3)	n/a
Visual inspection of water penetration	X	X

### 13.2.2 ROBUSTNESS TEST

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

- For GSCC004/2 and GSCC004/5 the test shall be performed considering 18/30(36) kV class, thus applying and considering all the reference test values to the corresponding  $U_0$ .

The assessment criteria to pass the test is given in HN 33-E-03, except for the classification level which is not applied.

The test shall be performed on the maximum cross-section in the reference range with the criteria given in 13.2. The extension of compliance from maximum section to minimum section in the reference range is according to the criteria given in 13.2.4.

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

Joints to be installed on MV aerial cables (GSCC004/4 and GSCC004/5) shall be tested according to the IEC 62217 2012 par 9.3.2 (1000 h).

### 13.2.4 ADDITIONAL TYPE TESTS

For each material code, the extension of compliance from maximum section to minimum section in the reference range shall be verified on a cable having the minimum diameter over insulation (or lower) specified in Table 7 and Table 8, by carrying out all the additional tests prescribed by HD 629-1, table 10, (HD629-2 table 9 for transition joints) taking into account that test No. 5 (test No. 4 for transition joints) must be performed, additionally to prescribed conditions, also by subjecting the samples to 63 cycles in water to be performed according to HD 629-1, table 5, test No. 7 (according to HD629-2, table 4, No. 6 for transition joints). Additional type tests shall be carried out at the maximum rated voltage level prescribed for the joint (i.e. 12/20(24) kV or 18/30(36) kV).

For E-distribuzione, E-distributie Banat, E-distributie Dobrogea and E-distributie Muntenia additional type tests shall be carried out on both HPTE and XLPE insulated cables.

## 13.3 ACCEPTANCE TESTS

For each material code, acceptance tests shall be carried out using the smallest cable section (see Table 7 and Table 8 for reference) for each rated voltage of the cable according to Table 3 (e.g. 6811862 shall be tested on a 95 mm<sup>2</sup> – 12/20(24) kV cable).

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For Enel Distribución Perú acceptance tests shall be carried out using the smallest cable section with 12/20(24) kV rated voltage<sup>2</sup> (e.g. 6811500 shall be tested on a 95 mm<sup>2</sup> – 12/20(24) kV).

The samples for the acceptance tests shall be selected from among the entire batch that was prepared for testing even if made up of different material codes.

Acceptance test	Batch (units)		
	≤ 50 units	> 50 and ≤ 1200	> 1200
Visual inspection	2 samples for each material code prepared for testing	5 samples for each material code prepared for testing.	10 samples for each material code prepared for testing.
Accessory manufacturing specifications check*			
Accessory assembly check	1 sample for each material code prepared for testing.	2 samples for each material code prepared for testing	3 samples for each material code prepared for testing
Power frequency withstand test			
Partial discharge test at ambient temperature			
* the nominal tightening torque of shear bolts specified by the manufacturer shall be always verified.			

**Table 9 – Samples for acceptance tests**

In all cases, 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 assembly of the joint and reduce the testing time, which benefits both parties.

#### 13.4 RETIE Certification (only apply to Enel Distribución Colombia)

For Enel Distribución Colombia (Colombia), RETIE certification shall be also provided according to local regulation (see 3.3.3). It is requested that this certification be made under the scheme 5 (ISO IEC 17067).

### 14 SUPPLY REQUIREMENTS

#### 14.1 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.

#### 14.2 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);

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<sup>2</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.

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- 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 (only for E-distribuzione and Endesa Distribucion, see 14.2.1) ;
- 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 (only for E-distribuzione and Endesa Distribucion, see 14.2.1)

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

#### 14.2.1 Barcode (only for E-distribuzione and Endesa Distribucion)

The characteristics of the barcode are listed in E-distribuzione specification PVR 006.

#### 14.2.2 Identification label

It shall include blank fields to be filled after installation:

Name: .....

Date: .....

Company: .....

### 14.3 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 (only for the Country listed in table Table 6)
- 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>3</sup> for the tool and a color photograph.

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<sup>3</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)

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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.