Technical Specification code: GRI-GRI-MAT-E&C-0134
Version no. 0 dated 30/12/2022

Subject: GSCC027 ANSI SEPARABLE CONNECTORS FOR MV CABLES

Application Areas
Perimeter: *Global*
Staff Function: -
Service Function: -
Business Line: *Infrastructure & Networks*

CONTENTS

THE HEAD OF NETWORK COMPONENTS
Fabrizio Gasbarri

1 DOCUMENT AIMS AND APPLICATION AREA

This Global Standard applies to 12/20(24) kV and 18/30(36) kV indoor and outdoor ANSI separable connectors for Medium Voltage cables with extruded insulation, both full and reduced insulating thickness, with copper wires or aluminum tape screen.

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

These requirements apply to the 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.

Material exclusive for application in existing networks for ENEL Group Companies for maintenance issues, The ENEL Group's current standard for Separable connectors is GSCC006 12/20(24) kV AND 18/30(36) kV SEPARABLE CONNECTORS FOR MV CABLES.

1.1 RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL

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

2 DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
00	30/12/2022	First emission.

3 UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

- Global Infrastructure and Networks: Operation and Maintenance / Network Components Standardization

Responsible for authorizing the document:

- Global Infrastructure and Networks: Head of Operation and Maintenance unit
- Global Infrastructure and Networks: Head of Health, Safety, Environment and Quality unit.

4 REFERENCES

- Code of Ethics of Enel Group;
- Enel Human Right Policy;
- The Enel Group Zero Tolerance of Corruption (ZTC) Plan;
- Organization and management model as per Legislative Decree No. 231/2001;
- RACI Handbook Infrastructure and Networks no. 06;
- 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)
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
IEEE 386-2016	IEEE Standard for Separable insulated Connector System for Power Distribution System Rated 2.5kV through 36kV
IEEE Std 592	For Exposed Semiconducting Shields;
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[1] "Underground Medium Voltage Cables".
- GSCC015 "Cable preparation for MV Cables"
- GSCC008 "Medium Voltage Aerial Bundled Cables"

Local Standard

Brazil

- NBR14643, Corrosão atmosférica – Classificação da corrosividade de atmosferas
- Nr-10, Segurança em Instalações e Serviços em Eletricidade
- ABNT-NBR-11835/91 – Acessórios isolados desconectáveis para cabos de potência para tensões de 15kV a 35kV – Especificação.

Colombia

- RETIE – Reglamento Técnico de Instalaciones Eléctricas.

Chile

- NSEC 5 Reglamento de Instalaciones Eléctricas de Corrientes Fuertes

[1] The characteristics of the cables are included in the Enel Group Global Standard. Besides installation on new cables, which comply to GSC001, the termination 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).

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
Medium Voltage (MV)	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.
Technical Conformity Assessment (TCA)	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.
Type A documentation	Not confidential documents used for product manufacturing and management from which it is possible to verify the product conformity to all technical specification requirements, directly or indirectly.
ANSI	American Standards Association

Additional terms and definitions are available in IEEE 386 Standard (2016) for Separable insulated Connector Systems for Power Distriburion System, Chapter 3.

7 DESCRIPTION

7.1 LIST OF COMPONENTS

For update list of components see Table 1 in page 31.

7.2 Service Conditions

7.2.1 General Service conditions.

According to IEEE 386 Standard (2016) for Separable insulated Connector Systems for Power Distribution System, Chapter 3-., for Colombia (Enel Distribución Colombia): the reference altitude is 2.700 m.

7.3 Technical characteristics

7.3.1 Electrical and dimensional Characteristics

7.3.1.1 Voltage Ratings and Characteristics

The following requirements apply:

Voltage Class	Maximum voltage rating (kV rms)[a]	Withstand voltages		
		BIL and full wave (kV crest)	BIL and full wave (kV crest)	BIL and full wave (kV crest)
15 kV	8.3	95	34	11
15 Kv	8.3/14.4	95	34	11
25 kV	15.2	125	40	19
25 kV	15.2/26.3	125	40	19
28 kV	16.2/28.0	125	45	21.5
35 kV	21.1	150	50	26
35 kV	21.1/36.6	150	50	26
a: The highest steady-state voltage across the open contacts that a loadbreak connector is rated to switch is the maximum phase-to-ground rms voltage for phase-to-ground rated devices or the maximum phase-to-phase rms voltage for phase-to-ground/phase-to-phase rated devices.				

Table 2 – Voltage ratings and characteristic for loadbreak connectors

Voltage Class	Maximum voltage rating (kV rms)[a]	Withstand voltages		
		BIL and full wave (kV crest)	BIL and full wave (kV crest)	BIL and full wave (kV crest)[b]
15 kV	8.3	95	34	11
25 Kv	15.2	125	40	19
28 kV	16.2	125	45	21.5
35 kV	21.1	150	50	26
a: Phase to Ground. b: Based on a sensitivity of 5 pC (see par 7.4 IEEE-386-2016)				

Table 3 – Voltage ratings and characteristic of deadbreak connectors

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

Voltage Class (Kv)	**15**	**25**	**35**
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) Enel Distribución Colombia (Colombia)	8.7/15(17.5)	-	-
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)

Table 4 – Rated voltage of the cables

7.3.1.2 Current Ratings and Characteristics

The following requirements apply:

Continuous Current Rating (A rms)	Voltage class	Switching current rating		Fault-closure current rating			Short-time current rating		
		A rms sym	Number of operation	A rms, sym	Duration (seconds)	x/r	A rms, sym	Duration (seconds)	x/r
200	All	200	10	10000	0.17	6	10000	0.17	6
							3500	3.00	6
600	15 kV	600	10	16000	0.17	20	16000	0.17	20
							10000	3.00	20
600	25,28 kV	600	5	10000	0.17	20	10000	0.17	20
							10000	3.00	20
600	35 kV	600	1	10000	0.17	20	10000	0.17	20
							10000	3.00	20

Table 5 – Current Ratings and Characteristics for loadbreak connectors

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Continuous Current Rating (A rms)	Voltage class	Overload current 4 h rating (A rms)	Short-time current rating		
			A rms, sym	Duration (seconds)	x/r
200	All	300	10000	0.17	6
			3500	3.00	6
600	All	900	25000	0.17	20
			10000	3.00	20
900	All	1200	40000	0.17	20
			10000	3.00	20

Table 6 – Current Ratings and Characteristics for deadbreak connectors

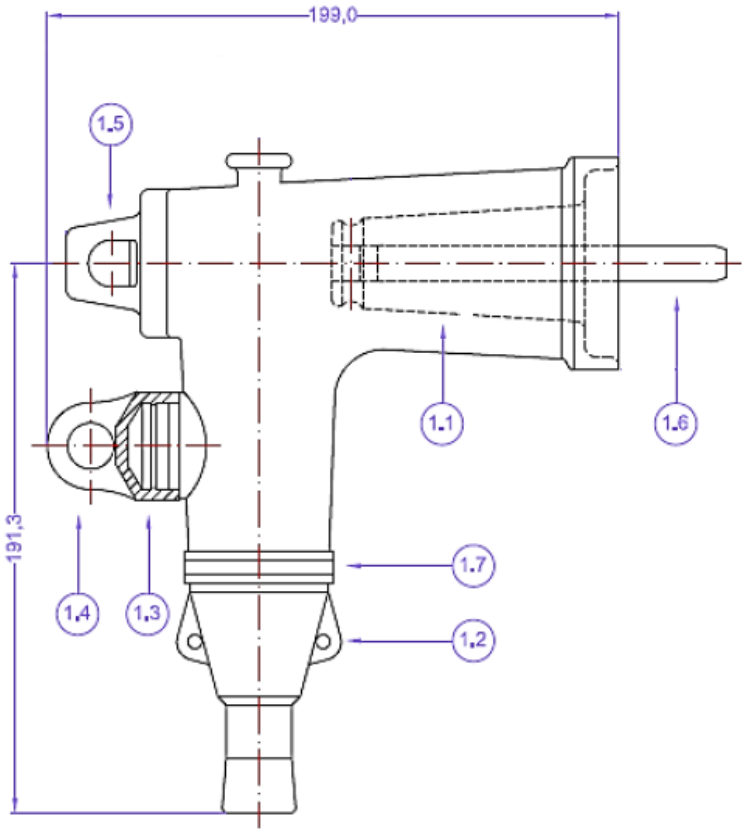
7.4 Overall Dimensions and mechanical characteristics

7.4.1 Overall Dimensions

With reference to Figure 1, Figure 2, Figure 3 , Figure 4, Figure 5 and Figure 6 , overall dimension of terminations are defined in Table 6:

Dimensions [1]	Elbow Whit Test Point Loadbreak(200A)			Straight (200A) Deadbreak	T-Body (600A) Deadbreak	
	15kV	25kV	35kV		15kV 25kV	35kV
Width (mm)	199	213.4	241.1	-	211	262
Length (mm)	191.3	191.3	192.1	246	311.4	341

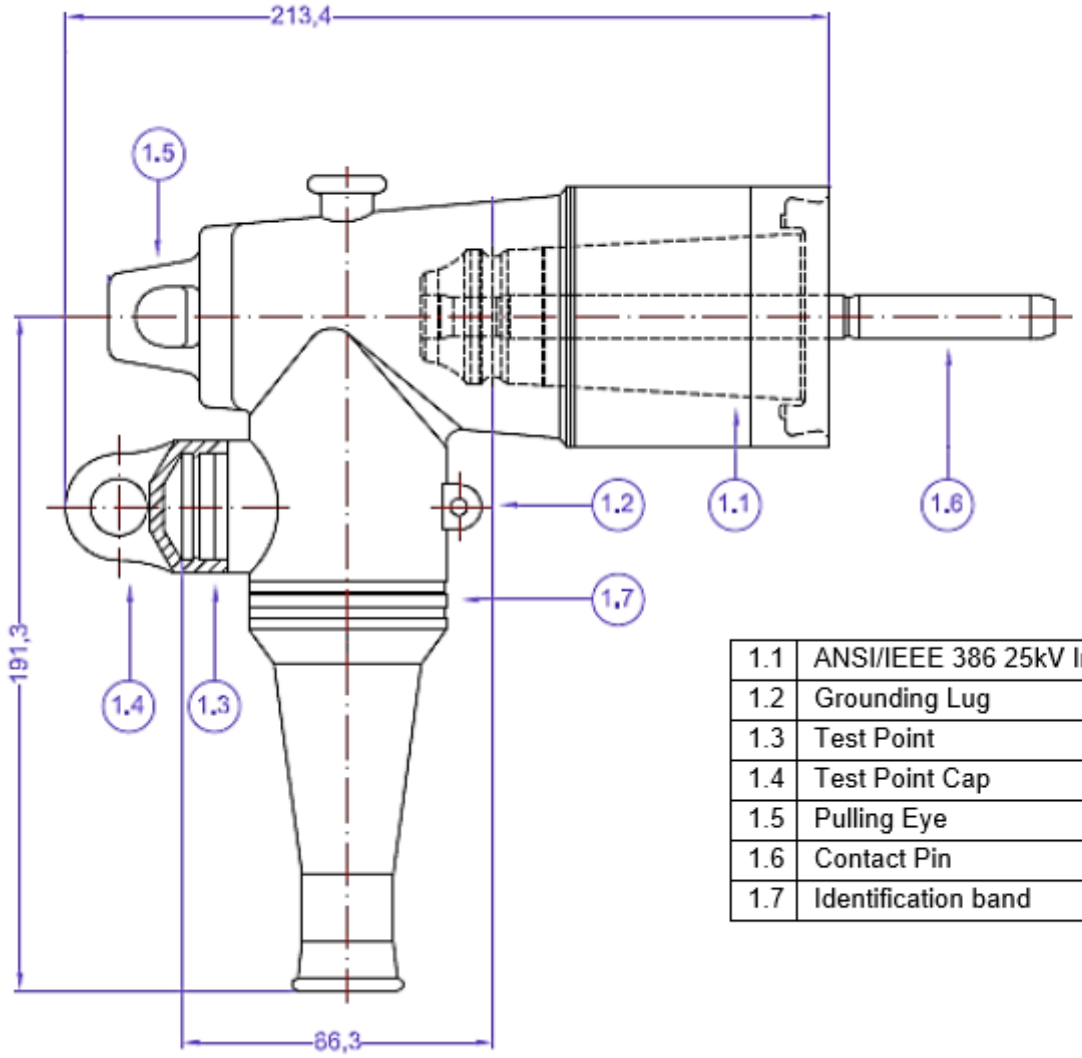
Table 7 - Dimensional characteristics



1.1	ANSI/IEEE 386 15kV Interface (a)
1.2	Drain Wire Tab
1.3	Capacitive Test Point
1.4	Test Point Cap
1.5	Pulling Eye
1.6	Contact Pin
1.7	Identification band

a: Mates with Bushing interfaces that conform to Figure 5 – Interface 5 IEE Std 386 – 2016. (Previously Fig 5 in IEEE Std 386-2006)

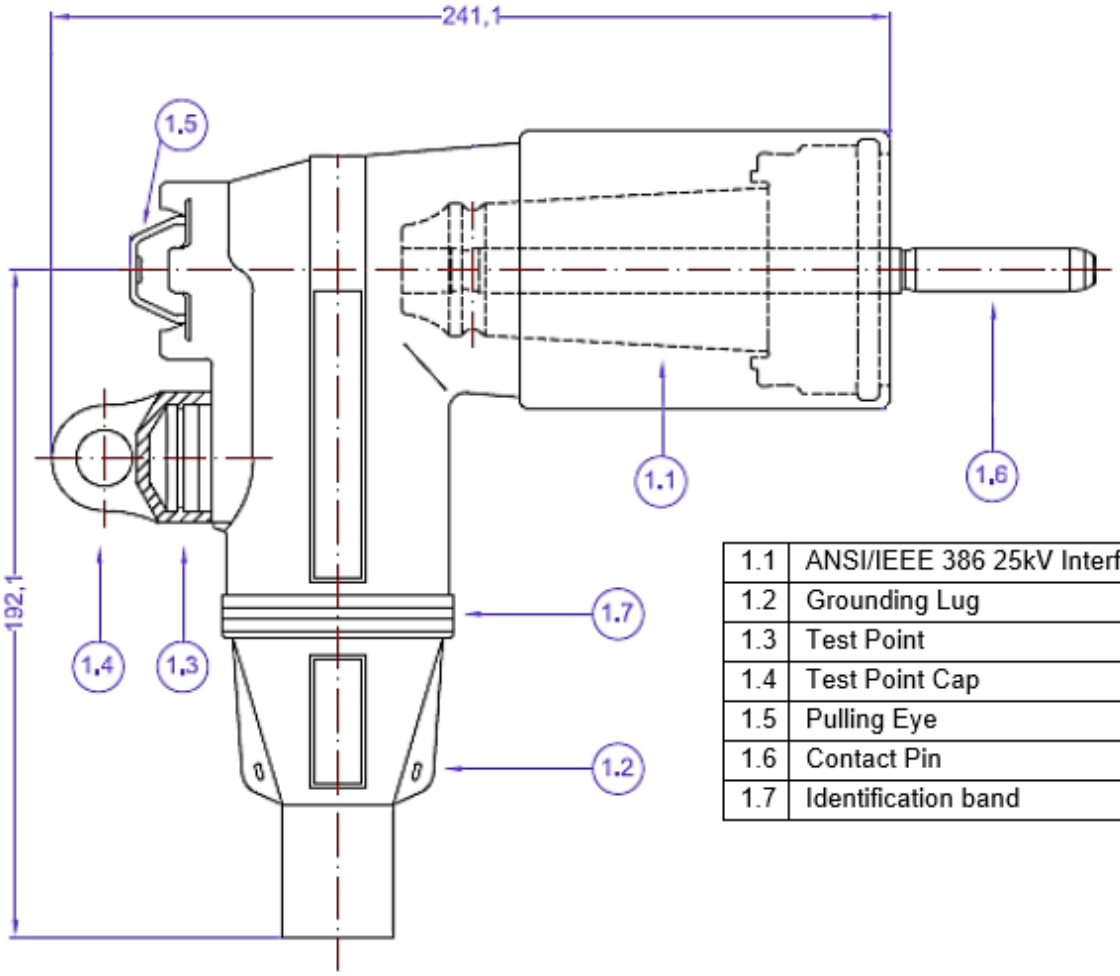
Figure 1 – Elbow 15kV 200A Loadbreak Connector with test Point



1.1	ANSI/IEEE 386 25kV Interface (a)
1.2	Grounding Lug
1.3	Test Point
1.4	Test Point Cap
1.5	Pulling Eye
1.6	Contact Pin
1.7	Identification band

a: Mates with Bushing interfaces that conform to Figure 6 – Interface 7A IEE Std 386 – 2016. (Previously Fig 7 in IEEE Std 386-2006)

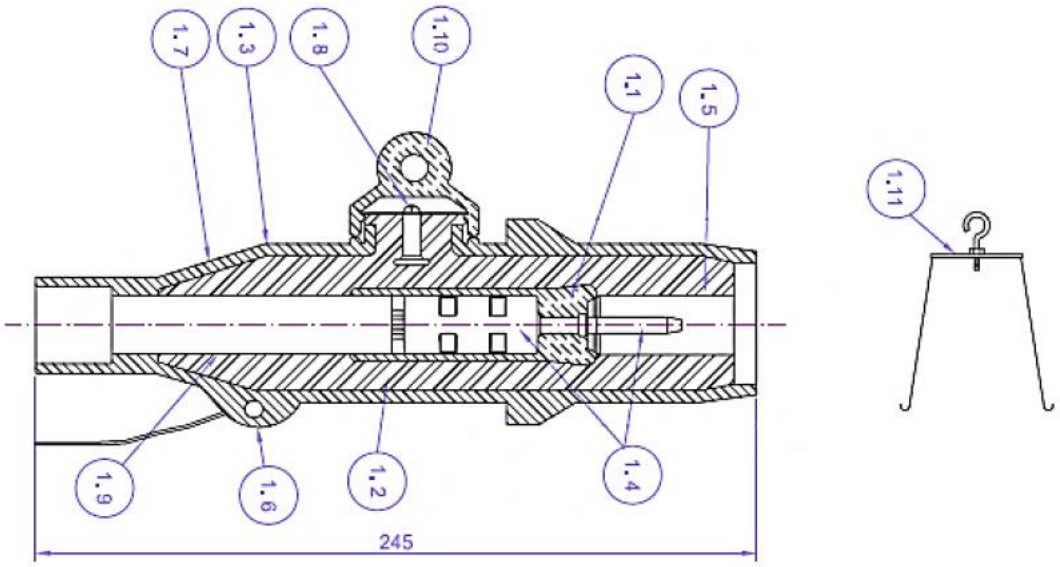
Figure 2 – Elbow 25kV 200A Loadbreak Connector with test Point



1.1	ANSI/IEEE 386 25kV Interface (a)
1.2	Grounding Lug
1.3	Test Point
1.4	Test Point Cap
1.5	Pulling Eye
1.6	Contact Pin
1.7	Identification band

a: Mates with Bushing interfaces that conform to – Interface 7A IEE Std 386 – 2016.

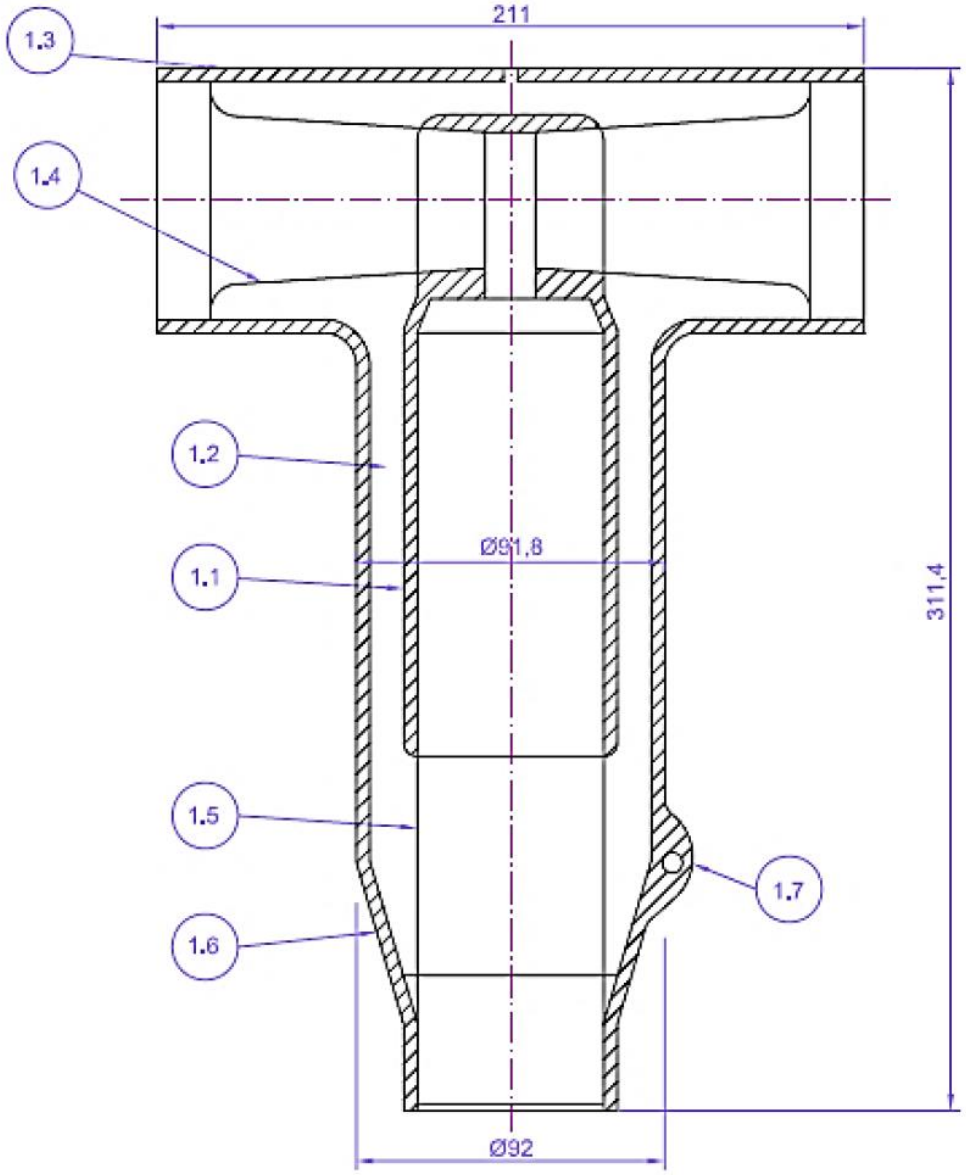
Figure 3 – Elbow 35kV 200A Loadbreak Connector with test Point



1.1	Semi-Conducting Insert	1.7	Stress Relief
1.2	Insulation	1.8	Capacitive Test Point
1.3	Semi-Conducting Shield	1.9	Insulation
1.4	Contact Pin	1.10	Test Point Cap
1.5	ANSI/IEEE 386 15/25kV Interface (a)	1.11	Fastening Device
1.6	Grounding Tab		

a: Mates with Bushing interfaces that conform to Figure 4 in IEEE Std 386-2006

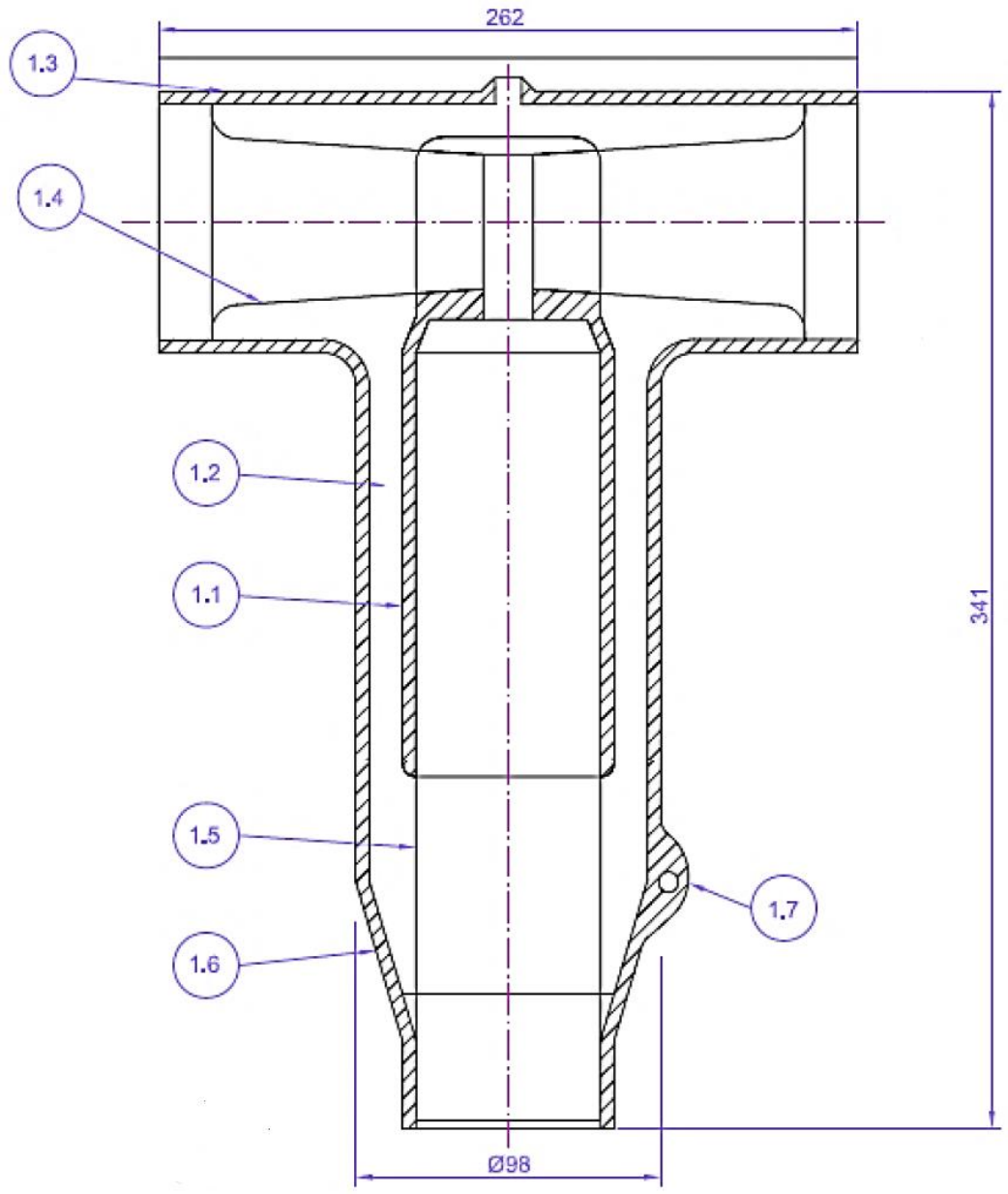
Figure 4 – Straight 15/25kV 200A Deadbreak Connector with test Point



1.1	Semi-Conducting Insert	1.5	Cable Adapter
1.2	Insulation	1.6	Stress Relief
1.3	Semi-Conducting Shield	1.7	Grounding Tab
1.4	ANSI/IEEE 386 15/25kV Interface (b)		

b: Mates with Bushing interfaces that conform to Figure 13 – Interface 5 IEEE Std 386 – 2016. (Previously Fig 11 in IEEE Std 386-2006)

Figure 5 – T-Body 15/25kV 600A Deadbreak Connector.



1.1	Semi-Conducting Insert	1.5	Cable Adapter
1.2	Insulation	1.6	Stress Relief
1.3	Semi-Conducting Shield	1.7	Grounding Tab
1.4	ANSI/IEEE 386 15/25kV Interface (b)		

b: Mates with Bushing interfaces that conform to Figure 13 – Interface 5 IEEE Std 386 – 2016. (Previously Fig 11 in IEEE Std 386-2006)

Figure 6 – T-Body 35kV 600A Deadbreak Connector.

7.5 CONSTRUCTION CHARACTERISTICS

7.5.1 General Characteristics

7.5.1.1 Resistance to corrosion, infiltrations, moisture and dust

The external surfaces of separable connectors (including caps used in shipping and storage) shall be resistant to atmospheric conditions that can occur during normal operation (moisture, dust, UV rays, etc.). The insulating body shall ensure non-infiltration of moisture and dust and there shall be no standing water at the seals under normal conditions of installation.

The supplier shall provide appropriate documentation of the material used, the characteristics of aging, the details of construction and assembly demonstrating the reliability of seals; the use of paints, enamels or similar materials is not be considered sufficient to ensure the level of protection required.

Furthermore, special precautions must be taken to avoid the risk of corrosion resulting from contact of different metals. All parts of ferrous material in contact with the air, including hardware, must be made of austenitic stainless steel.

7.5.1.2 Heating

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

7.5.1.3 Resistance to fire

The main insulating housing shall be resistant to fire

7.5.1.4 Resistance to surface currents

The main insulating housing shall be resistant to surface currents

7.5.1.5 Materials compatibility

All the component parts of the separable connector 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.

7.5.2 *ANSI/IEEE Separable Connectors*

Separable connectors are composed by the following elements:

1. Shear bolt lug
2. Cable adapter
3. Main insulating housing
4. Test Point Cap
5. Wrench Tool.
6. Interface and contact device
7. Metallic screen earthing connection
8. Equipotential connection
9. Fastening device
10. Phase marking plates
11. Greases and sealing compounds

Separable connectors shall be supplied as a single, pre-assembled part, including the main insulating housing and protection cap.

7.5.2.1 Shear bolt lug

The shear bolt lug shall be made of tin plated aluminum alloy suitable for both aluminum and copper cables and shall be compliant with IEC 61238-1, Class A.

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 lug surface.

The lugs shall have a lock to assure the correct positioning of the conductor, even for the smaller sections.

The internal and external surface of the lugs shall not have sharp edges, spikes or deformities.

Lugs 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 lug and the cable conductor and avoid corrosion as well as a sealing compound to fill screw cavities of the lug.

Lug shall be designed to assure the connection and interface with the contact device specified in Table 7

Depending on the type of separable connector, interface and contact device, the following requirements apply:

	Elbow Loadbreak (200A)			**Straight (200A) Deadbreak**	**T-Body (600A) Deadbreak**	
Kv Class	**15kV**	**25kV**	**35kV**	**15/25Kv**	**15/25Kv**	**35kV**
Interface	**5**	**7A**	**8**	**4**	**13**	
Contact device	Pin			Pin	Screw	
1: Mates with Bushing interfaces that conform to Interfaces IEEE Std 386 – 2016						

Table 8 – Lug

7.5.2.2 Cable Adapter

It shall be made of a semiconductor prefabricated rubber to cover the area between the outer sheath of the cable and the main insulating housing.

7.5.2.3 Main insulating housing

The main insulating housing consists of:

1) an internal semiconductor layer which functions as a shield for the electrical connections. Painted semiconducting layers are not allowed.
2) an insulating layer;
3) an external semiconductor layer for the electrical field control which also functions as an electrostatic shield. Painted semiconducting layers are not allowed;
4) a Test Point as described in par. 7.5.2.4;
5) a protection cap for the capacitive socket as described in par. 7.5.2.5;
6) a coupling device for inserting and detaching the terminal which is also capable of bearing the stress of the fastening device described in par. 7.5.2.10 (only for elbow and straight separable connectors).

7.5.2.4 Test Point

Separable connectors shall be provided with a Test Point, A capacitively coupled terminal for use voltage sensor device.

7.5.2.5 Protection cap

Separable connectors shall be supplied with a protection cap firmly fastened to its position. When properly installed, it shall provide IP 66 degree of protection.

7.5.2.6 Interface and contact device

The dimensions of the interfaces of separable connector and contact device are stated in IEEE Std 386 – 2016.

7.5.2.8 Metallic screen earthing connection

The metallic screen earthing connection as defined in par. 7.5.4

7.5.2.9 Equipotential connection

The main housing shall be stably connected to the cable screen earth connection through an annealed tinned copper wire of 1.0÷1.2 mm in diameter (or a equivalent system).

7.5.2.10 Fastening device

Elbow and straight separable connectors must be equipped with fastening devices made out of austenitic stainless steel to to lock the connector of the interface and ensure the required pressure.

The sizes of the fastening devices for connectors are indicated in Figure 7 and Figure 8. The geometric details of the figures are provided only as a guideline.

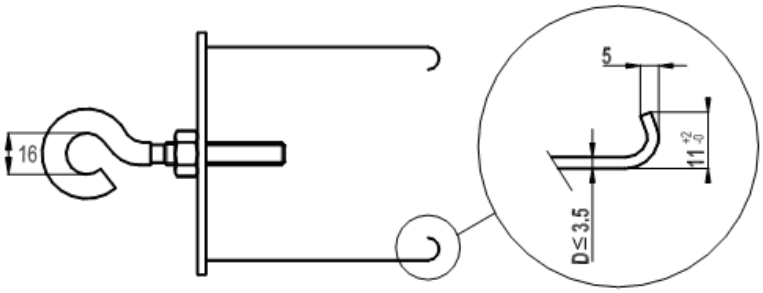


Figure 7 - Fastening device for straight separable connectors

7.5.2.11 Identification

Separable connectors shall be provided with an identification band complying with all the requirements of chapter 6.1 of the standard IEEE Std 386 – 2016.

7.5.2.12 Greases and sealing compounds

Greases are not allowed, except those:

- over the main insulation and the lug.

Sealing compounds are not allowed, except those:

- to seal the separable connector,
- to protect the junction of the metallic screen
- inside the lug screws cavities

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

7.5.4 Metallic screen earthing connection

7.5.4.1 Earthing lug

The metallic screens of the cables shall be connected to earth by means of a tin plated copper palm straight lug with a M12 screw hole, to be applied by compression with the tools indicated in Figure 14 or equivalent.

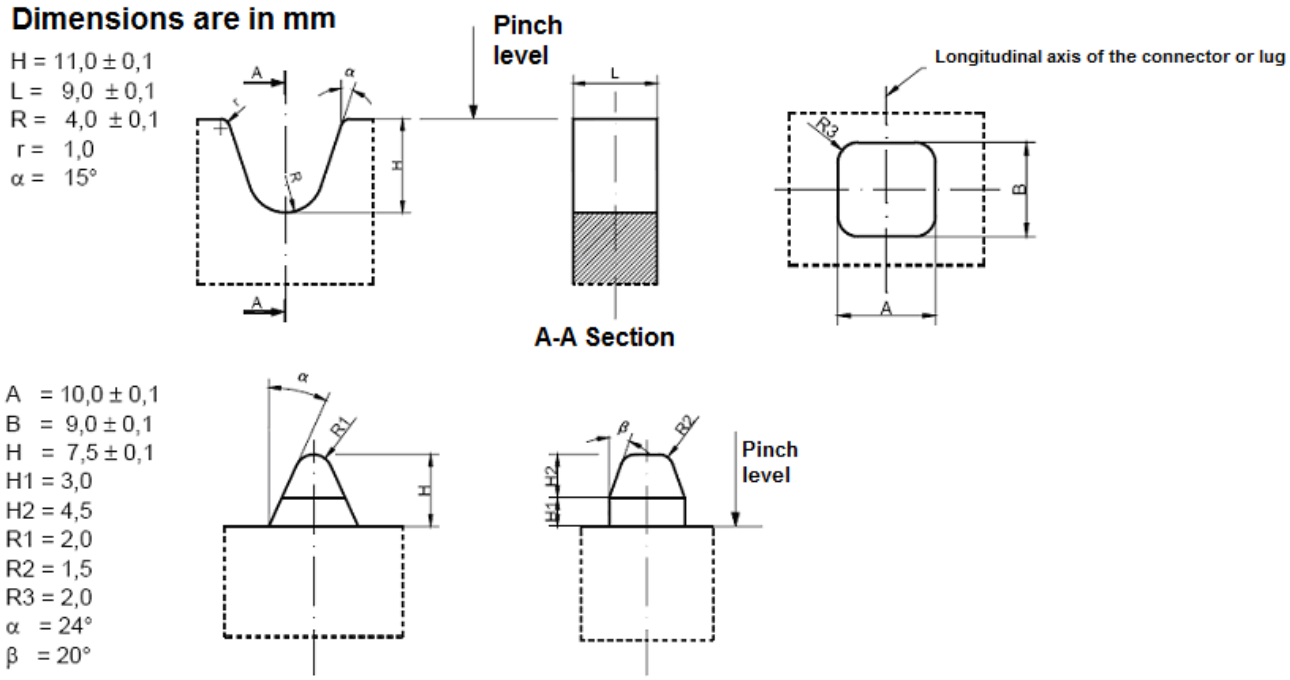


Figure 8 – Tool for compressing the earthing lug

The lug [2]shall be suitable for connecting the metallic screen sections reported in Table 1. It shall be compatible with both aluminum tape and copper wire cable screens.

The lug shall be supplied un-mounted and compressed on field. It shall be compatible with both aluminum tape and copper wire cable screens.

The lug shall be supplied un-mounted and compressed on field.

7.5.4.2 Cables with aluminum tape screen

In the case of cables with aluminum tape screen, the connection with the screen of the cable shall be made by means of:

[2] for Edesur (Argentina) no earthing lug is required

1) plate of tin-plated hard copper with a tin coating having minimum thickness of 0,5 µm. The plate shall be as shown in Figure 15 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 15. These asperities shall have a particular shape (see example in Figure 15) 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 15) 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 mm2) 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.

2) A tin coated copper braid with a minimum length of 0,6 m. One end of the braid shall be welded to the rectangular plate described above at the position shown in Figure 15; the other end shall be connected to the lug described in 7.5.4.1. The section of the tin copper braid shall be compatible with the sections prescribed in Table 1

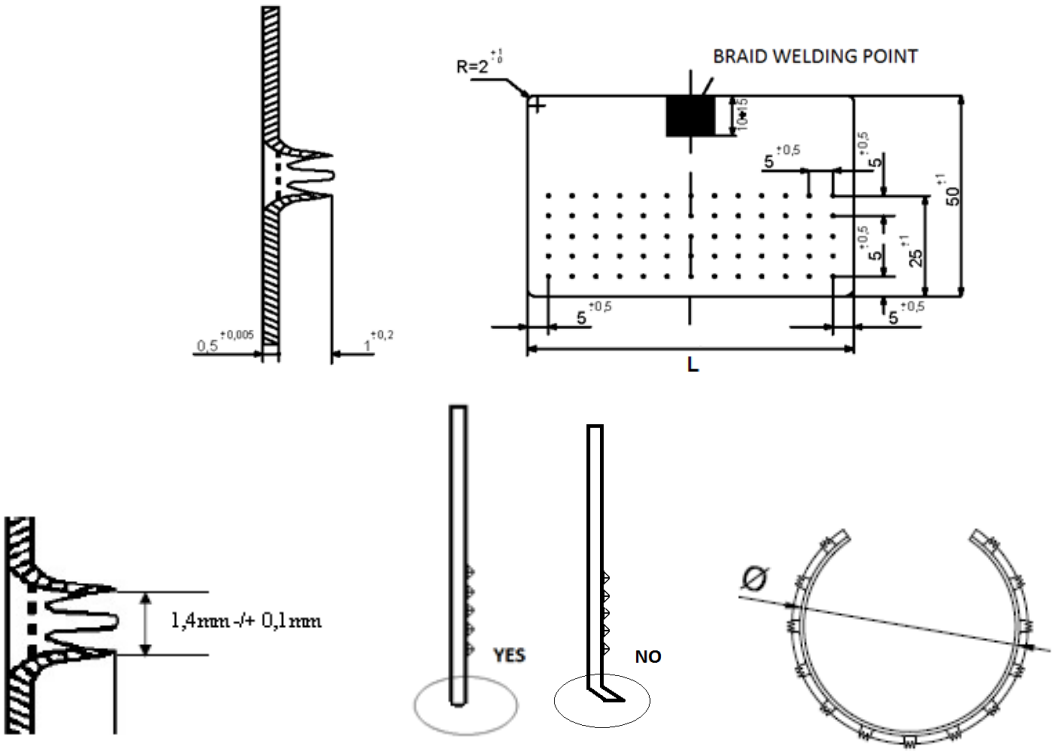


Figure 9 – Detail of rectangular plate for aluminum tape screen connection

7.5.4.3 Cables with copper wires screen

For cables with copper wires metallic screen, the earthing connection shall be made by collecting the copper wires of the metallic screen and connecting them to the tin coated copper braid described in 7.5.4.2. number

2. In order to do so, the braid shall be cut at the point of welding to the rectangular plate. The connection of copper wires and the tin coated copper braid shall be made by means of the connector described in. 7.5.4.4

If the distance is sufficient, connection to earth could be made directly connecting the copper wires of the screen to earth with the earthing lug described in 7.5.4.1

7.5.4.4 Connector for copper wire screen

The copper wires of the metallic screen of the cable shall be connected to the tin-coated copper braid described in 7.5.4.2 Number 2 by means of a straight compression connector with the tools indicated in Figure 14 or equivalent. The section of the connector shall be compatible with the screen sections prescribed in Table 1.

The connector shall be supplied un-mounted and compressed on field.

7.6 CONTENT OF THE KIT

All the necessary elements and accessory to install the separable connector on-field shall be included, namely:

A. ANSI Separable Connectors (see 7.5.2)

- 1 (one) shear bolt lug
- 1 (one) cable adapter
- 1 (one) main insulating housing
- 1 (one) capacitive socket
- 1 (one) protection cap
- 1 (one) contact device
- 1 (one) earthing lug
- 1 (one) plate for aluminum tape screen cables
- 1 (one) connector for copper wire screen
- 1 (one) equipotential connection
- 1 (one) fastening device (only for straight separable connectors)
- 3 (three) Identification Band
- 1(one) joint element
- Greases and sealing compounds
- Accessories for cleaning;
- Plastic bag for collecting residual materials of installation;
- List of materials.
- Identification label.
- Installing instructions and templates.
- Other materials, tools and accessories (according to supplier’s design).

7.7 TESTING

7.7.1 General

Tests are classified into: Type tests (T); Routine Test (R); Acceptance tests (A)

They shall be carried out according to IEEE Std 386 – 2016. Lugs shall be tested according to IEC 61238-1 class A

7.7.2 Test List

N°	Test	Requirements and Test Method	R	T
1	Visual check, Accessory manufacturing specifications check, and joint marking	- Verification of correspondence to the approved prototype (dimensions, accessory kit, presence, and correctness of identification labels marking, packaging, and barcodes).	X	-
2	Cable pull-out test (tensile strength)	Chapter 7.13 IEEE Std 386 – 2016	-	X
3	Short-time current test	Chapter 7.6 IEEE Std 386 – 2016		X
4	**Current-cycling test** For uninsulated components of 600A For 200A insulated connectors For 600A insulated connectors	Chapter 7.9 IEEE Std 386 – 2016 Chapter 7.10 IEEE Std 386 – 2016 Chapter 7.11 IEEE Std 386 – 2016		X
5	**Dielectric Test**	Chapter 7.5 IEEE Std 386 – 2016		
	AC withstand voltage test	Chapter 7.5.1 IEEE Std 386 – 2016	X	X
	Operating interface ac withstand test	Chapter 7.5.2 IEEE Std 386 – 2016		
	Impulse withstand voltage test (BIL)	Chapter 7.5.3 IEEE Std 386 – 2016	X	X
6	**Partial discharge test**	Chapter 7.4 IEEE Std 386 – 2016	X	X
7	**Thermal cycle withstand test**	Chapter 7.20 IEEE Std 386 – 2016		
8	**Test point tests**	Chapter 7.17 IEEE Std 386 – 2016		X
	Test Point capacitance test	Chapter 7.17.1 IEEE Std 386 – 2016		X
	Test Point voltage test	Chapter 7.17.2 IEEE Std 386 – 2016	X	X
9	**Shielding test**	Chapter 7.18 IEEE Std 386 – 2016		X
10	**Accelerated sealing life test**	Chapter 7.12 IEEE Std 386 – 2016		X
11	**Operating-force test for separable connectors with an operating eye**	Chapter 7.14 IEEE Std 386 – 2016		X
12	**Operating-eye test**	Chapter 7.15 IEEE Std 386 – 2016		X
13	**Test point cap test**	Chapter 7.16 IEEE Std 386 – 2016		X
14	**Bushing well stud torque withstand test**	Chapter 7.19 IEEE Std 386 – 2016		X
15	**Switching test**	Chapter 7.7 IEEE Std 386 – 2016		X
16	**Fault-closure test**	Chapter 7.7 IEEE Std 386 – 2016		X

Table 9 – Test List

7.7.2.3 UV Resistance Test

Separable Connectors shall be tested according to the IEC 62217 2012 par 9.3.2 (1000 h) or equivalent standard.

7.7.2.4 Lugs Test

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

7.7.3 Acceptance Test

For each material code, acceptance tests shall be carried out using the smallest cable section

During the acceptance tests performed autonomously by the supplier: The supplier must perform all tests listed in Table 13 with the sampling criteria indicated in Table 12.

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**
A	2 samples	5 samples	10 samples
B	1 sample	2 samples	3 samples
C	1 sample	2 samples	5 samples
D	1 sample	1 sample	2 samples

Table 10– 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 separable connectors being tested. This will facilitate the separable connector assembly and reduce the testing time, which benefits both parties.

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	- 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). - The nominal tightening torque of shear bolts specified by the manufacturer shall always be verified.
2.Accessory assembly check	B	D	- Check the assembly according to the approved manual.
3. Power-frequency withstand test	B	D	- Required values according to table N° 3 and test description according to IEC-61442.
4. Partial discharge test at ambient temperature	B	D	

Table 11 – Acceptance Tests

7.7.4 RETIE Certification (only apply to Enel Distribución Colombia)

For Codensa (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).

7.8 SUPPLY REQUIREMENTS

7.8.1 LABELLING

The separable connector and its accessories must bear the following information:

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

In particular, this information shall be placed on the external surface of the main insulating housing of the separable connector by means of indelible and permanent screen printing or an equivalent method accepted by the Distribution Companies of Enel Group.

7.8.2 PACKAGING

Separable connectors 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 separable connector (e.g. elbow separable connector);
- type of cables for which the accessory is intended, section and conductive material allowed;
- year and month of packaging.
- progressive identification number assigned by the manufacturer (or serial number);
- barcode (see 7.8.2.1).
- 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 7.8.2.1)

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

7.8.2.1 ***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

7.8.2.2 ***Identification Label***

It shall include blank fields to be filled after installation:

Name: ……
Date: ……
Company: ……

7.8.3 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
- Extruded cables with copper wires screen

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[3] 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.

[3] This information, if any, will be provided by Distribution Companies of Enel Group during the examination of the installation instructions (before the certification process)

7.9 TECHNICAL CONFORMITY ASSESMENT

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.

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
1	**GENERAL INFORMATION**			
1.1	Supplier	-		
1.2	Factory	-		
1.3	Supplier Product Designation	-		
2	**MAIN FEATURES**			
2.1	Distribution Company and Country	-		
2.2	Country Code	-		
2.3	GS Type Code			
2.4	Rated voltage U0/U (Um)	(kV)		
2.9	Earthing lug section.	(mm2)		
2.10	Max width	(mm)		
2.11	Max length	(mm)		
2.15	Connector type			
2.16	Interface Type (IEEE 386-2016)			
2.17	Rated current In (A)	(A)		
2.18	Cable section	(mm2)		
2.19	Min/max diameter over insulation	(mm)		
"Max width and length" dimensions, as defined in Table 4				

Table 12– Check list