

CONTENTS

1. DOCUMENT AIMS AND APPLICATION AREA	3
1.1 RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL	3
2. DOCUMENT VERSION MANAGEMENT	4
3. UNITS IN CHARGE OF THE DOCUMENT	4
4. REFERENCES	4
5. ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY	6
6. DEFINITIONS AND ACRONYMS.....	6
7. DESCRIPTION	7
7.1 LIST OF COMPONENTS.....	7
7.2 APPLCABLE LAWS AND REFERENCE STANDARDS.....	10
7.2.1. GLOBAL STANDARDS.....	10
7.2.2. LOCAL STANDARDS	10
7.2.3. INTERNATIONAL STANDARD	10
7.2.4. REPLACED LOCAL STANDARDS	11
7.3 SERVICE CONDITIONS	12
7.3.1. GENERAL SERVICE CONDITIONS	12
7.3.2. SPECIFIC SERVICE CONDITIONS	12
7.4 TECHNICAL CHARACTERISTICS.....	12
7.4.1. PROTECTION TYPES AND EQUIPMENT	12
7.5 CONSTRUCTION CHARACTERISTICS.....	14
7.5.1. TYPE I.....	14
7.5.2. TYPE II	15
7.6 MARKING AND DESIGNATION.....	15
7.6.1. DESIGNATION	15
7.6.2. MARKING	15
7.7 TESTING	15
7.7.1. TYPE TEST.....	15
7.7.2. ACCEPTANCE TESTS	22
7.8 TECHNICAL CONFORMITY ASSESSMENT.....	25
7.8.1. GENERAL CONDITIONS	25
7.8.2. ACKNOWLEDGEMENT OF TCA FOR PREVIOUS REVISION OF THE STANDARD.	25
8. LOCAL SECTION.....	26
9. DESCRIPTION OF EVIDENCE	49



Material Specification code: GRI-GRI-MAT-E&C-0027

Version no. 0 dated 10/2023

Subject: GSCC030 PROTECTIVE DEVICES TO AVOID THE RISK OF ELECTROCUTION OF BIRDS

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

9.1	CHECK LIST TYPE I.....	49
9.2	CHECK LIST TYPE II.....	50

THE HEAD OF GLOBAL NETWORK COMPONENTS

Fabrizio Gasbarri

1. DOCUMENT AIMS AND APPLICATION AREA

The purpose of this document is to provide the technical requirements for the provision of material to safeguard bird life. The protections also serve to ensure the proper functioning of the network.

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

Country	Distribution Company
Brazil	Enel Distribuição Rio (RJ) Enel Distribuição Ceará (CE) 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

Table 1 Distribution Companies.

This document shall be implemented and applied to the extent possible within the Enel Grids Business Line and in compliance with any applicable laws, regulations and governance rules, including any stock exchange and unbundling-relevant provisions, which in any case prevail over the provisions contained in this document.

1.1 RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL

This document doesn't require implementation of further documents.

2. DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
0	17/10/2023	First emission of "GSCC030 PROTECTIVE DEVICES TO AVOID THE RISK OF ELECTROCUTION OF BIRDS" Material Specification.

Table 2 Version management.

3. UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

- Enel Grids: Engineering and Construction / Components and Devices Design unit / Network Components unit

Responsible for authorizing the document:

- Enel Grids: Head of Network Components unit;
- Enel Grids: Head of Quality unit.

4. REFERENCES

- Enel Human Rights Policy;
- Enel Group Code of Ethics;
- The Enel Group Zero Corruption Tolerance (ZCT) Plan;
- Enel Global Compliance Program (EGCP);
- Stop Work Policy;
- Integrated Policy for Quality, Health and Safety, Environment, anti-Bribery and Information security;
- ISO 9001- Quality Management System – Requirements;
- ISO 14001 - Environmental Management System - Requirements with guidance for use;
- ISO 45001 - Occupational Health and Safety Management System - Requirements with guidance for use;
- ISO 37001 - Anti-bribery Management System - Requirements with guidance for use;

-
- ISO 27001 - Information Security Management System – Requirements
 - MAT-O&M-NCS-2021-0033-EGIN version 3 “Global Infrastructure and Networks – GSCG002 Technical Conformity Assessment”.
 - Contractual Requirements for Components and Materials Quality management.
 - CNS-O&M-S&L-2021-0032-EGIN “Global Infrastructure and Networks Barcode specification”.
 - Packaging, transport, and delivery requirements rev.2.
 - GRI-GRI-GTS-O&M-0001 “Material Category of Merchandise Group”
 - GRI-GRI-WKI-O&M-0020 “Contractual Requirements for Components and Materials Quality Management”.

Enel Grids countries Reference standards

- 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.

Group Pillar References

- [The Code of Ethics of Enel Group](#);
- [The Enel Group Zero Corruption Tolerance Plan \(ZTC\)](#);
- [Human Rights Policy](#);
- [Organization and Management Model as per Legislative Decree No. 231/2001](#);
- [Enel Global Compliance Program \(EGCP\)](#).

5. ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

Value Chain/Process Area: Engineering and Construction

Macro Process: Devices and components development

Process: Standard Catalog Management

6. DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
Acceptable Quality Level (AQL)	The maximum percentage of malfunctions that can be detected during a sample inspection and can still be considered satisfactory
Low Voltage (LV)	Any set of nominal voltage levels in the range 0,5 to 1 kV AC or 120 to 1500 V DC
Medium Voltage (MV)	System with a nominal operative voltage between the phases higher than 1 kV to 35 kV included. NOTE: The boundary value between medium voltage and high voltage depends on local and historical circumstances or on common usage. Nevertheless for internal standardization purposes, medium voltage is defined as a system with a nominal operative voltage between the phases higher than 1 kV to 35 kV included".
Technical Conformity Assessment (TCA)	A "conformity assessment" with respect to "specified requirements" ¹ consists in functional, dimensional, constructional and test characteristics required for a product (or a series of products) and quoted in technical specifications and quality requirements issued by Enel Group distribution companies. This also includes the verification of conformity with respect to local applicable regulation and laws and possession of relevant requested certifications

Table 3

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

7. DESCRIPTION
7.1 LIST OF COMPONENTS
Guards to protect birds from direct contact with our power lines (Type I)

GS Type code	Serial number	Country	Material	Description	Voltage U_max [kV]
GSCC030/1	300019	ES	Polymeric material	Insulation kit for GS1-GS2 suspension assembly and conductor up to 16mm diameter	30
GSCC030/2	300025	ES	Polymeric material	Insulation kit for GS3 suspension and conductor up to 18mm diameter	30
GSCC030/3	300100	ES	Polymeric material	Insulation kit for GA1-GA2 dead-end assembly and conductor up to 16mm diameter	30
GSCC030/4	300023	ES	Polymeric material	Insulation kit for GA3 dead-end assembly and conductor up to 18mm diameter	30
GSCC030/5	300018	ES	Polymeric material	Insulation kit, rigid insulator and conductor up to 14 mm Ø	30
GSCC030/6	300013	ES	Polymeric material	Conductor cover up to 16 mm diameter	30
GSCC030/7	300012	ES	Polymeric material	Conductor cover up to 18 mm diameter	30
GSCC030/8	300002	ES	Polymeric material	Conical tapping lining. Conductor up to 18 mm diameter	30
GSCC030/9	300041	ES	Polymeric material	Conductor cover up to 12 mm diameter	30
GSCC030/10	300030	ES	Polymeric material	Insulation kit, M.V. cable terminations	30
GSCC030/11	300034	ES	Polymeric material	Insulation kit, cut out fuse basis	30
GSCC030/12	300027	ES	Polymeric material	Insulation kit for GS1 suspension assembly and conductor up to 12 mm diameter	30
GSCC030/13	300026	ES	Polymeric material	Insulation kit for GA1 dead-end assembly and conductor up to 12 mm diameter	30
GSCC030/14	300048	ES	Polymeric material	Insulation kit for RGDAT sensor plate	30
GSCC030/15	300046	ES	Polymeric material	Insulation kit for connection conductor to IS (longitudinal connection)	30
GSCC030/16	300049	ES	Polymeric material	Insulation kit for connection conductor to IS (angle connection)	30
GSCC030/17	300059	ES	Polymeric material	Insulation kit for double yoke plate 300x85	30
GSCC030/18	860001	ES	Polymeric material	Wedge connector cover. Conductor up to 14 mm Ø	30
GSCC030/19	686116	RO	PVC	Electro-insulating sheath 1000 mm long for normal rod, single/double support connections in alignment/neck	20
GSCC030/20	686117	RO	PVC	Electro-insulating sheath 1000 mm long for rotating beacon, single/double stretch connections on support insulators	20
GSCC030/21	686118	RO	PVC	Electro-insulating sheathing, for single/double stretch connections on support insulators, length 500 mm	20
GSCC030/22	686119	RO	PVC	Electro-insulating sheath, for single/double stretch connections on support insulators/insulator chain, length 3000 mm	20
GSCC030/23	270453	PE	Polymeric material	ANTI BIRD PROTECTIVE COVER FOR AIRWAYS. INSULATOR LINE POST. 20 kV	20
GSCC030/24	270452	PE	Polymeric material	PROTECTIVE COVERING FOR OVERHEAD LINES 50 TO 150 mm ² 10 kV and 20 kV	20
GSCC030/25	270451	PE	Polymeric material	PROTECTIVE COVERING FOR OVERHEAD LINES 180 TO 240 mm ² 20 kV	20
GSCC030/26	270033	IT	Polymeric material	Insulation kit for rigid insulator and conductor up to 16,5 mm Ø, suitable for conductors up to 150 mm ² cross section.	20
GSCC030/27	270032	IT	Polymeric material	Insulation kit for tie chain and conductor up to 16,5 mm Ø, suitable for conductors up to 150 mm ² cross section.	20
GSCC030/28	270031	IT	Polymeric material	Insulation kit for tension clamp	20
GSCC030/29	270030	IT	Polymeric material	Insulation for conductor up to 16,5 mm diameter, suitable for conductors up to 150 mm ²	20

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Guards to protect birds from direct contact with our power lines (Type I)

GS Type code	Serial number	Country	Material	Description	Voltage U_max [kV]
GSCC030/30	860196	CO	Polymer material (NO silicone rubber)	[FLEXIBLE TUBULAR CABLE 2/0-605 AWG 36kV]	36
GSCC030/31	860190	CO	Polymer material (NO silicone rubber)	[Cubierto flexible cable desn2/0-605AWG 17,5kV]	17,5
GSCC030/32	275897 [Enel Ceará e Rio]	BR	EPR rubber covered with a thermally stable mastic layer for sealing and adhering for sealing	Cover for connectors and splices. [A=400mm; B=210±2 mm]	25
GSCC030/33	337907 [Enel São Paulo]	BR	EPR rubber covered with a thermally stable mastic layer for sealing and adhering for sealing	Cover for connectors and splices. [A=140mm; B=200±2 mm]	25
GSCC030/34	337908 [Enel São Paulo]	BR	EPR rubber covered with a thermally stable mastic layer for sealing and adhering for sealing	Cover for connectors and splices. [A=400mm; B=200±2 mm]	25
GSCC030/35	337909 [Enel São Paulo]	BR	EPR rubber covered with a thermally stable mastic layer for sealing and adhering for sealing	Cover for connectors and splices. [A=550mm; B=200±2 mm]	25
GSCC030/36	337910 [Enel São Paulo]	BR	EPR rubber covered with a thermally stable mastic layer for sealing and adhering for sealing	Cover for connectors and splices. [A=550mm; B=550±2 mm]	34,5
GSCC030/36	270421 [Enel Ceará e Rio]	BR	EPR rubber covered with a thermally stable mastic layer for sealing and adhering for sealing	Cover for connectors and splices. [A=550mm; B=550±2 mm]	34,5
GSCC030/37	251901	BR	High-density polyethylene	Bracket and live line clip protection [50 up to 185 (mm ²); Ø: 13,7 up to 26,9 (mm)]	36,2
GSCC030/38	329705 (FPM)	BR	High-density polyethylene	Bracket and live line clip protection [70 (mm ²); Ø: 17,5 up to 20,1 (mm)]	36,2
GSCC030/39	329701	BR	High-density polyethylene	Bracket and live line clip protection [185 up to 300 (mm ²); Ø: 23,3 up to 31,5 (mm)]	36,2
GSCC030/40	250041	BR	High-density polyethylene	Bracket and live line clip protection [95 up to 300 (mm ²); Ø: 26,8 up to 40 (mm)]	36,2
GSCC030/41	275133	BR	Polypropylene	Wedge connector protective cover with bracket	15
GSCC030/42	274702	BR	Polypropylene	Wedge connector protective cover with bracket	15
GSCC030/43	600449	BR	Polypropylene	Wedge connector protective cover with bracket	15
GSCC030/44	164564	BR	Polypropylene	Wedge connector protective cover with bracket	15
GSCC030/45	329619	BR	Black polyethylene	Wedge connector cover - [Dimensions [mm]: A=151; B=57; C=35]	1
GSCC030/46	252863	BR	Black polyethylene	Wedge connector cover - [Dimensions [mm]: A=65; B=29; C=16,5]	1
GSCC030/47	252634	BR	Black polyethylene	Wedge connector cover - [Dimensions [mm]: A=53; B=26; C=16]	1
GSCC030/48	6792559	BR	Black polyethylene	Wedge connector cover - [Dimensions [mm]: A=51; B=23; C=12,5]	1
GSCC030/49	300927	BR	High-density polyethylene	Insulating pin cover	36,2
GSCC030/50	270176	CL	Polymeric material	Protective conductor sheath [diam int 11mm]	25
GSCC030/51	270187	CL	Polymeric material	Protective conductor sheath [diam int 22mm]	25
GSCC030/52	270186	CL	Polymeric material	Protective conductor sheath [diam int 30mm]	25
GSCC030/53	270185	CL	Low-density polyethylene	Rigid Insulator Coating 35kV	

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Guards to protect birds from direct contact with our power lines (Type I)

GS Type code	Serial number	Country	Material	Description	Voltage U_max [kV]
GSCC030/54	270175	CL	Dielectric silicone	Flexible insulator cladding 12kV	
GSCC030/55	270184	CL	Dielectric silicone	Flexible insulator cladding 23kV	
GSCC030/56	270183	CL	Low-density polyethylene	Protector final red 16-24m	
GSCC030/57	270182	CL	Low-density polyethylene	Protector final red 25-33mm	

Guards to protect animals from direct contact with station equipment (e.g., transformers) (Type II)

GS Type code	Serial number	Country	Material	Description	Voltage U_max [kV]
GSCC030/58	275620	BR	High-density polyethylene	Distribution transformer bushing protection	15
GSCC030/59	986739	BR	High-density polyethylene	Distribution transformer bushing protection	15
GSCC030/60	270301	BR	High-density polyethylene	Distribution transformer bushing protection	36
GSCC030/61	201220	CO	Polymer material (NO silicone rubber)	Heat shrink cover for busbar MT 50 MM	36
GSCC030/62	201221	CO	Polymer material (NO silicone rubber)	Heat shrink cover for busbar MT 25 MM	36
GSCC030/63	860189	CO	Polymer material (NO silicone rubber)	Heat shrink cover for busbar MT-15kV	15
GSCC030/64	860193	CO	Polymer material (NO silicone rubber)	SHUNT CONNECTION COVER. BUSBAR 400MM	36
GSCC030/65	860195	CO	Polymer material (NO silicone rubber)	COVER FOR DERIVATION BUSBAR 600 MM	36
GSCC030/66	300040	ES	Polymeric material	Insulation kit for, M.V. bushings for pole-mounted transformers	30
GSCC030/67	300029	ES	Polymeric material	Insulation kit for, lightning arrester terminals	30
GSCC030/68	300028	ES	Polymeric material	Insulation kit, for single-pole disconnectors	30
GSCC030/69	300039	ES	Polymeric material	Insulation kit, expulsion fuses, disconnecting switches	30

Table 4 List of components, main characteristics.

7.2 APPLCABLE LAWS AND REFERENCE STANDARDS

7.2.1.Global Standards

- GST-001 MV/LV TRANSFORMERS

7.2.2.Local Standards

Brazil

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

Chile

- NSEG 5 En.71 *Reglamento de Instalaciones Eléctricas de Corrientes Fuertes.*

Colombia

- RETIE, *Reglamento Técnico de Instalaciones Eléctricas.*
- Código Eléctrico Colombiano, NTC 2050.

Peru

- Código Nacional de Electricidad – Suministro 2011.
- Norma Técnica de Calidad de los servicios eléctricos (NTCSE).

Romania

- NTE007/08/00 *Normativ pentru proiectare și executarea rețelelor de cabluri electrice.*

Spain

- 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.
- REAL DECRETO 842/2002, de 2 de agosto, por el que se aprueba el Reglamento Electrotécnico para Baja Tensión e Instrucciones Técnicas Complementarias (R.E.B.T.)
- 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.

7.2.3.International standard

- IEC 60243 “Dielectric strength”

-
- *ISO 2859-1 "Sampling procedures for inspection by attributes. Part 1: Sampling plans for inspection lot by lot, tabulated according to acceptable quality limit (AQL)"*
 - *UNE 211605 "Climatic ageing test of cable covering materials"*
 - *ISO 868 "Plastics and ebonite. Determination of indentation hardness using a durometer (Shore hardness)"*
 - *IEC 60243-1 "Dielectric strength of insulating materials. Test methods. Part 1: Industrial frequency testing (ratified by AENOR in October 2013)"*
 - *IEC 60695-2-11 "Fire hazard testing. Part 2-11: Glow wire test method. Flammability tests for finished products"*
 - *IEC 60811-403 "Electrical and fibre optic cables. Test methods for non-metallic materials. Part 403: Miscellaneous tests. Ozone resistance tests on elastomeric compounds"*
 - *IEC 60811-501 "Electrical and fibre-optic cables. Test methods for non-metallic materials. Part 501: Mechanical tests. Tests to determine the mechanical properties of insulation and sheathing mixtures"*
 - *HD 605 "Electrical Cables. Additional test methods"*
 - *ABNT NBR 6535 - Signalling of Aerial Power Transmission Lines with a View to the Safety of Aerial Inspection;*
 - *ABNT NBR 7276 - Warning Signs on Aerial Power Transmission Lines;*
 - *EA 0058 - Protection conduits against electrocution of birdlife on overhead power distribution lines.*

7.2.4.Replaced local standards

- Spain:

BNA001 4ª EDICION

- Colombia:

ET-AT-927 RECUBRIMIENTOS PARA SALIDAS DE TRANSFORMADORES

- Romania:

FT-239_MAT_-Teci_electroizolante_LEA_MT-M

- Peru:

MAT-OYM-NDS-18-206-ESP_0

MAT-OYM-NDS-18-213-ESP_0

- Brazil:

MAT-PMCB-EeA-21-2044-EDBR (PM-Br 780.06.1)

MAT-PMCB-EeA-21-2045-EDBR (PM-Br 550.02.1)

PM-R 2271 R-00

PM-Br 722.54.0

PM-Br 722.60,0

PM-Br 220.11.1

- Chile:

ESP-0237 REV. 1

7.3 SERVICE CONDITIONS

7.3.1. General service conditions

As per IEC 60721-2-1.

7.3.2. Specific service conditions

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

7.4 TECHNICAL CHARACTERISTICS

7.4.1. Protection types and equipment

The material defined to protect bird life covered in this specification can be divided into two types depending on the function as described in Table 5.

TYPE	DESCRIPTION
I	Guards to protect birds from direct contact with power lines.
II	Guards to protect animals from direct contact with station equipment.

Table 5

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

The function of Type I guards is to insulate the connection between conductor and support, to avoid the electrocution caused by direct contact of the bird.

The function of Type II guards is to insulate the connection between conductor and station equipment (e.g., transformers), to avoid the electrocution caused by direct contact of the bird.

The equipment and protections, adopted along the line and for the station equipment, are illustrated in Figure 1 and Figure 2.



Figure 1 *Insulating sleeves Type I.*

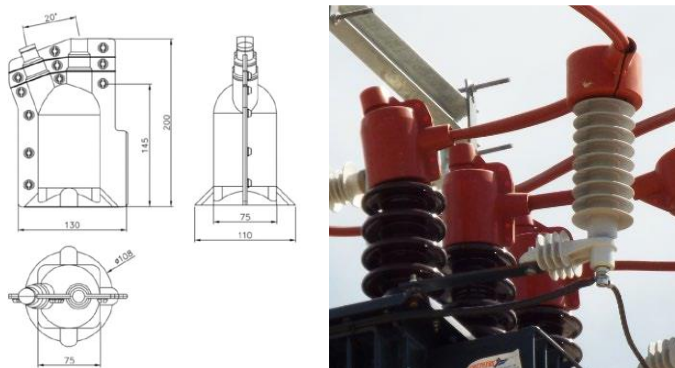


Figure 2 *Distribution transformer bushing protection Type II.*

Note: Figures are for illustrative purposes only.

7.5 CONSTRUCTION CHARACTERISTICS

Birds face two threat factors related to the presence of power lines: the risk of electrocution and the risk of collision against overhead cables. Electrocution is one of the anthropogenic causes of mortality for many bird species, especially those with a medium to large wingspan. Medium-voltage (MV) power lines are responsible for the vast majority of electrocution episodes in birds, which can occur when two parts of a bird's body touch two conducting elements or a conductor and a grounded structure (e.g. the pole crossarm). The latter is the case that occurs most frequently.

The materials described in this technical specification are designed to avoid these episodes.

7.5.1.Type I

Type I components are designed to insulate the connection between the conductor and the elements from the overhead lines in order to avoid electrocution caused by direct contact with the bird.

These liners, designed in such a way that they can be re-opened after being closed without the use of additional non-reusable materials (ex tapes), are intended for the insulation of uninsulated electrical conductors and all other connecting elements of the conductor. They are installed in the area where the conductor is attached to the pole. Their design must ensure their position in the event of adverse environmental conditions.

Generally, they are made of a polymer material that can withstand environmental conditions and UV radiation. To facilitate the drainage of water accumulated inside them, especially in wet areas, they have a perforated or partially open underside. The design shall avoid the access of small birds.

As there are many different configurations, the material is best described in the local section.

7.5.2.Type II

The function of Type II guards is to insulate the connection between conductor and station equipment, to avoid the electrocution caused by direct contact of the bird. Type II components include enclosures used in primary substations to cover the exposed parts of devices such as:

- Power transformers (in accordance with GST-001);
- Busbars;
- Surge arresters;
- Others.

The surfaces of the materials from which these components are made must be smooth and of as uniform a thickness as possible, free of bubbles and burrs, sharp projections, cracks and inclusions.

It must not allow rainwater to accumulate inside. See local section for a better description of the material.

7.6 MARKING AND DESIGNATION

7.6.1.Designation

Each electrically material must be marked with the following wording:

- The name of the manufacturer
- The name and product code given by the manufacturer
- The maximum system voltage in which an insulating sleeve can be used
- Date of manufacture (month/year)
- Serial and batch number
- For conductor linings: Maximum conductor cross-section to which the insulating sleeve can be applied

7.6.2.Marking

The marking must be indelible, easily legible and carried out by engraving or in relief above the surface of the outer sheath in a continuous way.

7.7 TESTING

7.7.1.Type test

Type tests shall be performed before supplying the material covered by this standard in order to demonstrate satisfactory performance characteristics to meet the intended application.

When the design, materials or manufacturing process are changed (which might affect the performance characteristics of the material), the relevant type tests shall be repeated.

7.7.1.1. List of type tests for Type I and Type II

Description of the trials	Section
Material testing:	
Hardness test	a)
Tensile strength and elongation at break testing	b)*
Tear strength test	c)
Flammability test	d)
Dielectric strength test	e)*
Climatic ageing test	f)
Ozone resistance test	g)
Tests on the complete lining:	
Verification of constructive characteristics	h)
Shape and dimensions	i)
Appearance and finish	j)
Marking	k)
Low temperature mechanical test	l)
Mechanical testing of the lining	m)
Dielectric test and measurement of leakage current	n)
(*) Pay attention to the acceptance criteria described for each country.	

a) Hardness testing

Test to determine the penetration hardness of the material used to manufacture coatings.

Procedure

A sample of the material used in the linings to be tested must be available, with the appropriate size, shape and thickness according to the method for measuring hardness, as indicated in Standard ISO 868. The ambient temperature during the tests must be measured and recorded, as well as the hardness of the samples in accordance with the provisions of this standard, using a type A Shore hardness tester.

Acceptance Criteria

The hardness of each sample must not be less than 50 (Shore A).

b) Tensile strength and elongation at break test

Tests to determine the maximum tensile load borne by the material used to manufacture the coatings and the increase in length produced at break.

Procedure

The test shall be carried out in accordance with the provisions of Standard IEC 60811-501 on 5 samples of the material used for the manufacture of the linings.

Acceptance Criteria

The minimum breaking strain of all tested specimens shall be 4 N/mm² (For Peru 10 N/mm²).

The minimum elongation at break of all specimens tested shall be 200% (For Peru 300%, for Chile 250%).

c) Tear strength test

Test to determine the tear strength of the material used in the manufacture of linings.

Procedure

This test shall be carried out in accordance with section 2.2.2.2 of Standard HD 605, on 3 samples of the material used.

Acceptance Criteria

The minimum tear strength allowed for all samples tested shall be 10 N/mm.

d) Flammability test

Test to verify the ignition behavior and self-extinguishing properties of the lining material.

Procedure

The test shall be carried out in accordance with the provisions of Standard IEC 60695-2-11 on a sample of the material used for the manufacture of the linings. The test temperature shall be 650 °C.

Acceptance Criteria

Conformity shall be verified according to chapter 10 of the IEC 60695-2-11 Standard.

e) Dielectric strength test

Test to determine the maximum voltage that the insulating material used for the manufacture of linings can withstand without perforation.

Procedure

This test shall be carried out on 5 samples of 60 mm x 60 mm according to paragraph 10.2 Test for 20 s steps of EN 60243-1. The test medium shall be liquid (transformer oil) and equal electrodes of 25 mm diameter shall be used.

Acceptance Criteria

The test is considered passed if the dielectric strength value is greater than 18 kV/mm (For Peru 13kV/mm).

f) Climatic ageing test

Test to evaluate the behaviour of the material used for the manufacture of linings subjected over a long period of time to the action of solar radiation and weathering (humidity, water spray, cold and heat).

Procedure

This test shall be carried out in accordance with Standard UNE 211605 on 1 sample of lining from which 5 specimens of 6 cm x 6 cm shall be obtained. To carry out the test, the following shall be considered:

- Energy radiation: 43 W/m².
- Number of climatic cycles: 6.
- Temperature of the enclosure for phases 3 and 4 of the climatic cycle: (70±3) °C.

Acceptance Criteria

The test is considered to have been passed if the characteristics of hardness and dielectric strength do not vary by more than 15% with respect to the initial value, guaranteeing in any case compliance with the minimum values initially required.

The specimens on which these tests are carried out shall be taken from the area exposed to radiation.

g) Ozone resistance test

Type test to assess the resistance of the lining material to surface cracking caused by ozone.

Procedure

The test shall be carried out on a lining sample in accordance with Standard IEC 60811-403 and under the following conditions:

- Temperature: (25±2) °C.
- Ozone concentration: 250±25 ppm.
- Exposure time: 30 h.

Acceptance Criteria

The test is considered satisfactory if the lining does not show any appreciable crack in the visual inspection carried out at the end of the test.

h) Verification of constructive characteristics

Compliance with the constructive characteristics indicated in Local sections must be verified.

i) Shape and dimensions

The shape of the cladding and water evacuation system must be checked by visual inspection and comparison with the product drawings provided by the manufacturer.

The dimensions of the sample must also be checked by comparison with the product drawings provided by the manufacturer. The specified tolerances must be taken into account. For dimensional measurements, the test sample must not be subjected to mechanical stress.

j) Appearance and finish

The appearance and finish of the test sample must be verified by visual inspection.

k) Marking

The markings must remain legible after wiping them successively with a cloth soaked in soapy water for 1 min. and then with a cloth soaked in isopropyl alcohol for 1 min.

I) Low temperature mechanical test

Test to assess the cold mechanical impact resistance of linings.

Procedure

A lining shall be tested using the apparatus shown in Figure 1.

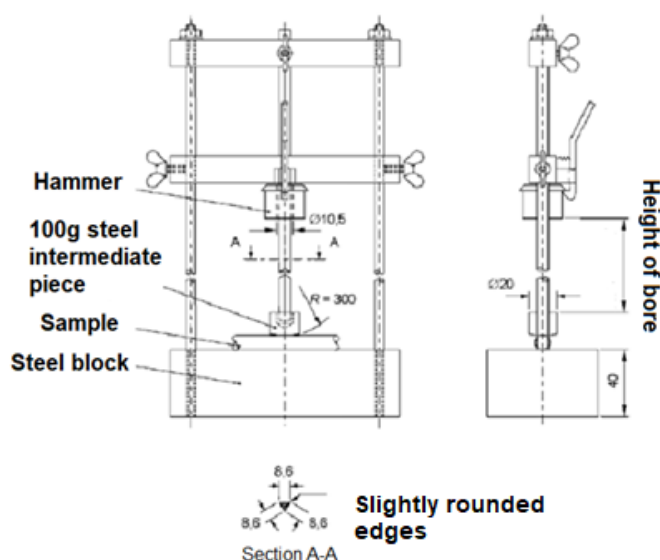


Figure 3 Impact test apparatus.

The test apparatus shall be placed on a block of foam rubber or elastic rubber material and, together with the sample, shall be placed in a refrigerator at the test temperature $-25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.

When the sample has reached the specified temperature, or after 2 h, whichever is longer, it shall be placed on the steel base in the position shown in the figure. The hammer is dropped on the weakest point or part of the lining but never within 5 mm of the edge. The energy to be applied in this test shall be 20 J, therefore, the mass of the hammer shall be $6,8\text{ kg} \pm 1\text{ per cent}$ and it shall be dropped from a height of $300\text{ mm} \pm 1\text{ per cent}$.

After the test, the lining is allowed to reach approximately room temperature and is then examined.

Acceptance Criteria

The sample shall be rejected if it shows any sign of cracking or fracture.

m) Mechanical testing of the lining

Test intended to verify the guarantee offered by the lining sealing system.

Procedure

A tensile test shall be carried out using a universal machine. For this purpose, two slings or straps shall be passed through the openings of the linings and fixed in the jaws of this machine. A force of 50 N shall then be exerted between the jaws.

Acceptance Criteria

The lining shall be considered to have passed the test if, when this tensile stress is applied, the lining latch mechanism is not damaged and the lining does not open.

n) Dielectric test and measurement of leakage current

Electrical test to be carried out taking into account the following.

Conditioning

The test sample shall be cleaned with isopropyl alcohol and air dried for at least 15 min before being subjected to the dielectric test.

It shall then be subjected to pre-test conditioning for moisture absorption by immersing the sample in distilled water at room temperature for not less than 30 min. Afterwards, it shall be removed from the water and the surface liquid shall be dried with a clean absorbent cloth.

The test enclosure shall be maintained at normal atmospheric conditions (18-28 °C, 45-75 % relative humidity).

Test set-up

The lining to be tested shall be installed simulating service conditions, covering the elements for which it has been designed (metallic conductors, clamps, suspension clamps, insulators, transformer terminals, etc.) and following the instructions provided by the manufacturer. If the same lining is designed to cover different live elements, it shall be tested with each of them; in cases where the element to be covered has a range of several sizes, it shall be tested with the largest size. In this way, a given lining will be valid for the type and reference of the elements with which it has been tested. The extension of the validity of the tests for other elements to be covered in medium voltage networks shall be the subject of an agreement between the manufacturer and ENEL.

The test position of the lining must coincide with the usual position in service. The assembly shall be carried out in such a way that the test voltage is applied to the live element in service conditions, with the surface of the lining susceptible to contact connected to earth through a metallic electrode.

The metal electrode shall consist of a tinned copper braided mesh which shall enclose the entire surface of the shell to be tested. The distance between the mesh and the entry mouth of the conductor shall be 50 mm or more. This distance shall be extended beyond 50 mm if necessary to avoid contouring between the conductor and the mesh itself, this extension being the minimum necessary to avoid contouring.

The mesh shall be wound around the openings leading to the lining, making the necessary turns to cover these openings completely and respecting the above-mentioned distance. In the central body of the lining, the mesh shall be crossed over, wrapping around the lining, so that the overlap of the crossing is centered on the body; the mesh shall be crossed as many times as possible to cover the largest possible area (see figure 2 for guidance).

The metal braid shall be at least 1,5 mm thick and 20 mm wide. The length shall be such as is necessary to encircle the lining as described above.

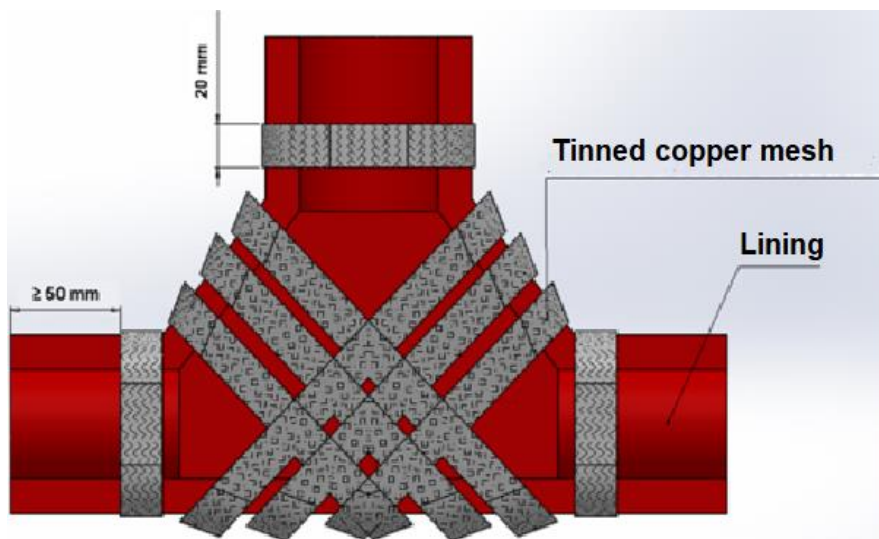
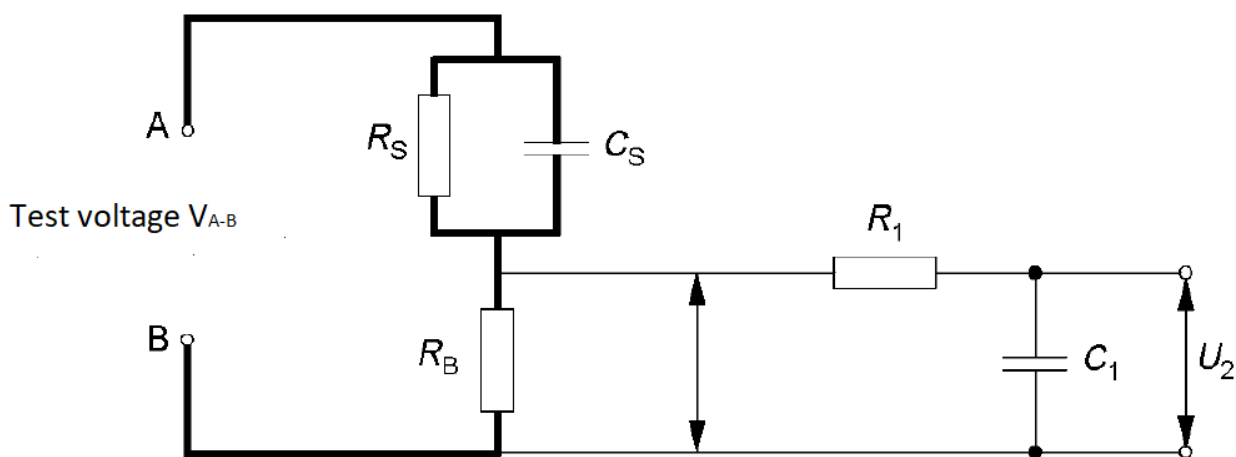


Figure 4 Example of arrangement of the metal electrode on the liner.

The grounding of this electrode must be done through the measuring quadrupole defined in figure 6:

Figure 5 Measuring quadrupole.



$$R_S = 1500 \, \Omega$$

$$R_B = 500 \, \Omega$$

$$C_S = 0,22 \, \mu F$$

$$R_S = 10 \, k\Omega$$

$$C_1 = 0,022 \, \mu F$$

$$U_2 = \text{Rising voltage}$$

The test voltage can take on 2 different values:

- $1 \leq U_{max} \leq 24$

$$V_{A-B} = \frac{24}{\sqrt{3}} = 13,86 \, \text{kV}$$

- $24 \leq U_{max} \leq 36,2$

$$V_{A-B} = \frac{36}{\sqrt{3}} = 20,785 \text{ kV}$$

NOTE: U_{max} is indicated in table 4.

Performance of the test

The test voltage to be applied shall be the single voltage to be applied for 1 min simulating actual service conditions. The leakage current through the metal electrode shall be measured.

Acceptance Criteria

There shall be no arc piercing, arc striking or contouring, and the value of the measured leakage current shall be less than 2 mA.

7.7.2.Acceptance tests

The aim of the Acceptance Tests is to verify the conformity of the products to the standards defined in this document and to the prototype approved during the TCA, whose characteristics and type test results are set out in the TCA Dossier which must be made available to the Inspector (Enel or Appointee) during the FAT.

Acceptance tests must be performed before the delivery and must be carried out at the Supplier's plants or laboratory approved by Enel.

The acceptance tests depending on the type of material and the corresponding sampling are listed in the following Table 6.

n°	Test	Type		Description / Note
		I	II	
1	Visual inspection	X	X	Visual verification of compliance with the requirements set out in paragraphs 7.5. & 8 and with the approved prototype during the TCA process (see TCA dossier).
2	Verification of Marking	X	X	Visual verification of the presence and conformity of markings with the requirements of Section 7.6. and the approved prototype during the TCA process (see TCA dossier)
3	Verification of Accessories	X	X	Verification of the presence, conformity and completeness of any accessory kits if any included in the approved prototype during the TCA process (see TCA dossier)
4	Packaging & Barcode	X	X	Verification of compliance with the specifications referred to in the contract, if any, and with the approved prototype during the TCA process (see TCA dossier).
5	Documentary verification	X	X	Verification of certificates of origin of raw materials.

Table 6 Acceptance tests list.

7.7.2.1. *During the acceptance tests performed autonomously by the supplier:*

The supplier must perform all tests listed in Table 6 with the following sampling criteria, **15% of the lot with a minimum of 3 pieces and a maximum of 15 pieces** considering that:

- The quantities are always referred to each type of material code prepared for testing;
- The acceptance number will be always 0, and the rejection number will be always 1;
- The costs of rejected materials will be charged to the supplier.

The reports of the tests carried out shall be made available in case of repetition of the acceptance tests at the presence of an Inspector (Enel or Appointee).

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

- The tests are performed as required by the relevant technical specifications and technical standards;
- The sampling plans adopted by the Supplier are in compliance with the aforementioned ones;

- The performed test results are properly recorded;
- The supplier demonstrates that the components/materials features don't vary during further production phases after the test.

In this case, the Dielectric Test (n°5) must be performed only on 1 sample for each material code, but, in case of a negative result, repeated on 2 further samples.

7.7.2.2. During the repetition of the acceptance tests at the presence of the Enel or designated inspector:

In this case all the test listed in Table 6 shall be carried out on a sample chosen randomly from the lot already successfully tested by the supplier with the following reduced sampling criteria, **10% of the lot with a minimum of 2 pieces and a maximum of 10 pieces** considering that:

- The quantities are always referred to each type of material code prepared for testing;
- The acceptance number will be always 0, and the rejection number will be always 1;
- The costs of rejected materials will be charged to the supplier.

In this case, the Dielectric Test (n°5) must be performed only on 1 sample for each material code, but, in case of a negative result, repeated on 1 further sample.

7.8 TECHNICAL CONFORMITY ASSESSMENT

7.8.1. 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.

7.8.2. Acknowledgement of TCA for previous revision of the standard.

Products with TCA in force under the ENEL local standards will be recognized as homologated material for the present technical specification.

Enel, therefore, reserves the right to check that the conditions of supply, the type codes, the country codes etc. shall comply with the requirements of this technical specification.

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

8. LOCAL SECTION

LOCAL SECTION A – ENDESA DISTRIBUCIÓN ELÉCTRICA (Spain)

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
300019	Insulation kit for GS1-GS2 suspension assembly and conductor up to 16mm diameter, suitable for conductors up to 119AL 1/28-A20 SA (LARL 145 E).	– 1 Clamp cover; – 3 m of conductor lining; – Auxiliary accessories. 	The class of the linings, according to the rated voltage of the network, must be of Class 0, according to EA 0058 and must be designed in such a way that: • They must have a water evacuation system that avoids its accumulation inside. • They must remain in the same position under all reasonably foreseeable environmental conditions, avoiding the accumulation of water in the interior and avoiding movement due to the effects of wind, movement of the conductor, etc. wind, movement of the driver, etc. • Its dimensions are adjusted as much as possible to the parts to be covered. Temperature range of application The linings must be able to be used in a temperature range between -25°C and 105°C. The linings must be accompanied by the manufacturer's installation instructions, as well as the elements, accessories or devices that allow their correct installation according to these instructions. The kits must include at least 3 m of conductor sheathing per phase in the case of suspension or 5 m of sheathing in the case of anchor.
300025	Insulation kit for GS3 suspension and conductor up to 18mm diameter, suitable for conductors up to 147AL 1/34-A20 SA (LARL 180).	– 1 Clamp cover; – 3 m of conductor lining; – Auxiliary accessories. 	
300100	Insulation kit for GA1-GA2 dead-end assembly and conductor up to 16mm diameter, suitable for conductors up to 119AL 1/28-A20 SA (LARL 145 E).	– 2 Clamp cover; – 5 m of conductor lining; – Auxiliary accessories. 	

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
300023	Insulation kit for GA3 dead-end assembly and conductor up to 18mm diameter, suitable for conductors up to 147AL 1/34-A20 SA (LARL 180).	– 2 Clamp covers; – 5 m of conductive lining; – Auxiliary accessories. 	The class of the linings, according to the rated voltage of the network, must be of Class 0, according to EA 0058 and must be designed in such a way that: • They must have a water evacuation system that avoids its accumulation inside. • They must remain in the same position under all reasonably foreseeable environmental conditions, avoiding the accumulation of water in the interior and avoiding movement due to the effects of wind, movement of the conductor, etc. wind, movement of the driver, etc. • Its dimensions are adjusted as much as possible to the parts to be covered. Temperature range of application The linings must be able to be used in a temperature range between -25°C and 105°C. The linings must be accompanied by the manufacturer's installation instructions, as well as the elements, accessories or devices that allow their correct installation according to these instructions. The kits must include at least 3 m of conductor sheathing per phase in the case of suspension or 5 m of sheathing in the case of anchor.
300018	Insulation kit, rigid insulator and conductor up to 14 mm Ø, suitable for conductors up to 94AL 1/22-ST1A (LA 110).	– 1 Staple covers; – 3 m of conductor lining; – Auxiliary accessories.  	
300013	Conductor cover up to 16 mm diameter, suitable for conductors up to 119AL 1/28-A20 SA (LARL 145 E).		

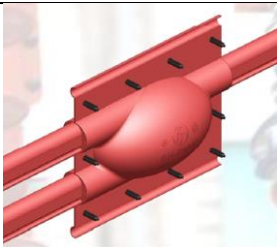
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
300012	Conductor cover up to 18 mm diameter, suitable for conductors up to 147AL 1/34-A20 SA (LARL 180).		The class of the linings, according to the rated voltage of the network, must be of Class 0, according to EA 0058 and must be designed in such a way that: - They must have a water evacuation system that avoids its accumulation inside. - They must remain in the same position under all reasonably foreseeable environmental conditions, avoiding the accumulation of water in the interior and avoiding movement due to the effects of wind, movement of the conductor, etc. wind, movement of the driver, etc. - Its dimensions are adjusted as much as possible to the parts to be covered. Temperature range of application The linings must be able to be used in a temperature range between -25°C and 105°C. The linings must be accompanied by the manufacturer's installation instructions, as well as the elements, accessories or devices that allow their correct installation according to these instructions. The kits must include at least 3 m of conductor sheathing per phase in the case of suspension or 5 m of sheathing in the case of anchor.
300002	Conical tapping lining. Conductor up to 18 mm diameter, suitable for conductors up to 147AL 1/34-A20 SA (LARL 180).		
300041	Conductor cover up to 12 mm diameter, suitable for conductors up to 47AL 1/8-ST1A (LA 56).		

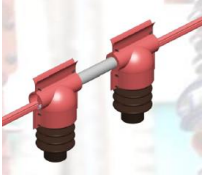
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
300030	Insulation kit, M.V. cable terminations		
300034	Insulation kit, cut out fuse basis	1 or 2 units per phase, depending on design. 	
300027	Insulation kit for GS1 suspension assembly and conductor up to 12 mm diameter, suitable for conductors up to 47AL 1/8-ST1A (LA 56).	– 1 Clamp cover; – 3 m of conductor lining; – Auxiliary accessories. 	

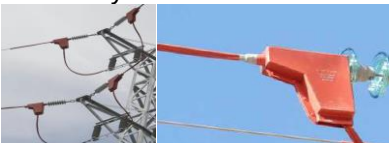
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
300026	Insulation kit for GA1 dead-end assembly and conductor up to 12 mm diameter for conductors up to 47AL 1/8-ST1A (LA 56).	– 2 Staple covers; – 5 m of conductive lining; – Auxiliary accessories. 	
300048	Insulation kit for RGDAT sensor plate, suitable for sensors from 47-AL 1/8-ST1A (LA 56) to 147-AL 1/34-ST1A (LA 180). Terminal Standard NNZ015.		
300046	Insulation kit for connection conductor to IS (longitudinal connection)		

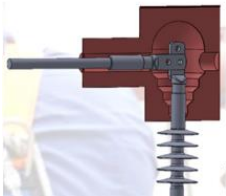
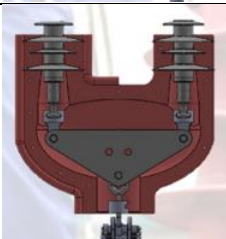
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
300049	Insulation kit for connection conductor to IS (angle connection)		
300059	Insulation kit for double yoke plate 300x85.		
860001	Wedge connector cover. Conductor up to 14 mm Ø		

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type II			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
300040	Insulation kit for, M.V. bushings for pole-mounted transformers up to 160 kVA.		
300029	Insulation kit for, lightning arrester terminals		
300028	Insulation kit, for single-pole disconnectors [Please consult single pole disconnectors specification]		
300039	Insulation kit, expulsion fuses, disconnecting switches [Please check expulsion fuses disconnecting switches specification]		
Note: Figures are for illustrative purposes only.			

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

LOCAL SECTION B – e-distributie (Romania)

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
686116	Electro-insulating sheath 1000 mm long for normal rod, single/double support connections in alignment/neck	 	For mounting on the insulator, the sheathing shall have a cut-out on the outer edges, in the median or marginal plane, depending on the type of connections it protects. The outer closing edges of the sheath shall be provided with circular holes, with a maximum diameter of 4,5 mm, to close and secure the sheath to the insulator and the conductor by means of clamps. Each sheath shall be provided with the necessary number of clamps for its assembly. The clamps supplied shall be made of electrically insulating material, with a service life equal to that of the electrically insulating sheath. The length of the collars shall be a minimum of 9 cm. Main technical characteristics: • wall thickness: maximum 3,5 mm • informative mass: maximum 1 kg/ml • nominal voltage of use: 20kV • test dielectric strength: min 22 kV • ambient temperature of use: - 30°C+ 70°C • storage and transport temperature: - 15°C+ 40°C • climatic conditions: N2 temperate continental.
686117	Electro-insulating sheath 1000 mm long for rotating beacon, single/double stretch connections on support insulators	 	
686118	Electro-insulating sheathing, for single/double stretch connections on support insulators, length 500 mm	 	
686119	Electro-insulating sheath, for single/double stretch connections on support insulators/insulator chain, length 3000 mm	 	
* For Romania, the electrically insulating sheaths will be made of PVC (polymer) material, will have a one-piece structure with a high degree of maneuverability and an almost cylindrical cross-section with closure at the generators by the two outer edges, one I-shaped and the other U-shaped, to ensure good protection of the conductor at both the bottom and top (Figure 1).			
Note: Figures are for illustrative purposes only.			

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

LOCAL SECTION C – Enel distribución (Perú)

Type I

MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
270453	ANTI BIRD PROTECTIVE COVER FOR AIRWAYS. INSULATOR LINE POST. 20 kV.		The design shall allow for the removal and reuse of the sheath. It must be able to be installed on bare copper or greased aluminum alloy conductors, fixed online post insulators and with the following characteristics: • 4 to 20 mm diameter conductors. • Porcelain 56.2 and polymeric insulators with various types of collars. Use in 10 y 20 kV. • Must be a non-marking insulating material. • Rated for temperatures from 0 C to 105 C. • Shall be impact and abrasion resistant. • Must not spread flame. • Must be chemically resistant to grease from conductors. • Must be chemically resistant to fungi. In addition, it must have the following characteristics. • Minimum dimensions: 600 mm long and 1.5 mm thick. • Minimum dielectric strength: 130 kV/cm. • Thermal resistance: 105 °C • Tensile strength: 10 Mpa • Elongation: 300 %. • Flexible material, shall not be rigid The material must be supplied with four UV-resistant straps to be used as fasteners or with any other system that ensures its correct fixing to the conductor.

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
270452	PROTECTIVE COVERING FOR OVERHEAD LINES 50 TO 150 mm ² 10 kV and 20 kV		It is used as a sheath for bare conductors in 10 kV y 20 kV overhead lines, placed continuously wrapping the conductor along the span. The sheath shall permit to be installed hot (energized line) and using a tool that can be operated manually or automatically. This tool shall be included in the supply in the quantity of 4 units. The presentation is rolls on reels or spools, 30 metres in length. The cross-sections of bare overhead conductors to be protected are from 50 to 150 mm².
270451	PROTECTIVE COVERING FOR OVERHEAD LINES 180 TO 240 mm ² 20 kV		It is used as a sheath for bare conductors in 10 kV y 20 kV overhead lines, placed continuously wrapping the conductor along the span. The sheath shall permit to be installed hot (energized line) and using a tool that can be operated manually or automatically. This tool shall be included in the supply in the quantity of 4 units. The presentation is rolls on reels or spools, at least 30 metres in length. The cross-sections of bare overhead conductors to be protected are from 180 to 240 mm².
Note: Figures are for illustrative purposes only.			

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

LOCAL SECTION D – Enel Distribuição (Brasile)

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
251901 [Enel Ceará, Goiás e Rio]	Bracket and live line clip protection; Voltage class: 15/25 kV;		Applicable spiral cable (mm ²): 50 to 185; Applicable diameter (mm): 13,7 to 26,9;
329705 [Enel São Paulo]	Bracket and live line clip protection; Voltage class: 25 kV;		Applicable spiral cable (mm ²): 70; Applicable diameter (mm): 17,5 to 20,1;
329701 [Enel São Paulo]	Bracket and live line clip protection; Voltage class: 25 kV;		Applicable spiral cable (mm ²): 185 to 300; Applicable diameter (mm): 23,3 to 31,5;
250041 [Enel Ceará Goiás e Rio]	Bracket and live line clip protection; Voltage class: 36 kV;		Applicable spiral cable (mm ²): 95 to 300; Applicable diameter (mm): 26,8 to 40;

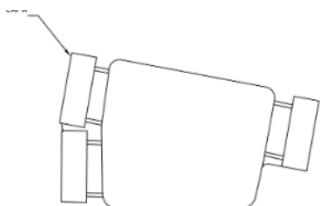
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
275133	Protective cover of wedge connector with bracket. Only used in networks with a voltage up to 15 Kv.	 	Main (MCM/AWG):1/0; Bypass (MCM/AWG): 1/0; Bracket (mm): ‘-‘;
274702	Protective cover of wedge connector with bracket. Only used in networks with a voltage up to 15 kV.		Main (MCM/AWG): 336.4; Bypass (MCM/AWG): 1/0 – 336.4; Bracket (mm): “-“;
600449 (6792144)	Protective cover of wedge connector with bracket. Only used in networks with a voltage up to 15 kV.		Main (MCM/AWG):1/0; Bypass (MCM/AWG): ‘-‘; Bracket (mm):59;
164564	Protective cover of wedge connector with bracket. Only used in networks with a voltage up to 15 kV.		Main (MCM/AWG):336.4; Bypass (MCM/AWG): “-“; Bracket (mm): 77.5;

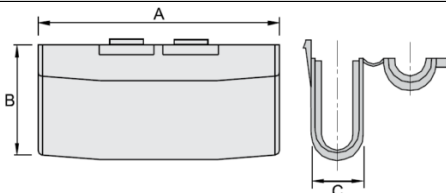
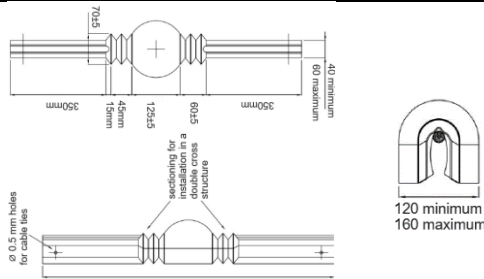
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type I																																	
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT																														
329619	Low-voltage wedge connector cover	 <table><thead><tr><th>CÓDIGOS</th><th>Indicado para os conectores</th><th colspan="3">DIMENSÕES (mm)</th></tr><tr><th></th><th></th><th>A</th><th>B</th><th>C</th></tr></thead><tbody><tr><td>329619</td><td>caDc série azul (200/300/350)</td><td>151</td><td>57</td><td>35</td></tr><tr><td>T270372</td><td>cDcr-I-ci / cDcr-VII-VmB</td><td>65</td><td>29</td><td>16,5</td></tr><tr><td>6792558</td><td>cDcr-II-Vd</td><td>53</td><td>26</td><td>16</td></tr><tr><td>6792559</td><td>cDcr-III-Vm / cDcr-IV-az / cDcr-V-am</td><td>51</td><td>23</td><td>12,5</td></tr></tbody></table> 	CÓDIGOS	Indicado para os conectores	DIMENSÕES (mm)					A	B	C	329619	caDc série azul (200/300/350)	151	57	35	T270372	cDcr-I-ci / cDcr-VII-VmB	65	29	16,5	6792558	cDcr-II-Vd	53	26	16	6792559	cDcr-III-Vm / cDcr-IV-az / cDcr-V-am	51	23	12,5	Suitable for connectors: caDc série azul (200/300/350); Dimensions [mm]: A=151; B=57; C=35;
CÓDIGOS	Indicado para os conectores		DIMENSÕES (mm)																														
			A	B	C																												
329619	caDc série azul (200/300/350)		151	57	35																												
T270372	cDcr-I-ci / cDcr-VII-VmB	65	29	16,5																													
6792558	cDcr-II-Vd	53	26	16																													
6792559	cDcr-III-Vm / cDcr-IV-az / cDcr-V-am	51	23	12,5																													
252863 (6792558)	Low-voltage wedge connector cover	Suitable for connectors: cDcr-I-ci / cDcr-VII-VmB; Dimensions [mm]: A=65; B=29; C=16,5;																															
252634 (T270372)	Low-voltage wedge connector cover	Suitable for connectors: cDcr-II-Vd; Dimensions [mm]: A=53; B=26; C=16;																															
6792559	Low-voltage wedge connector cover	Suitable for connectors: cDcr-III-Vm / cDcr-IV-az / cDcr-V-am; Dimensions [mm]: A=51; B=23; C=12.5;																															
300927 [Enel Rio]	Insulating pin cover	 	The material can be applied to conductors with a diameter between 6.35 mm and 16.90 mm.																														

Application Areas

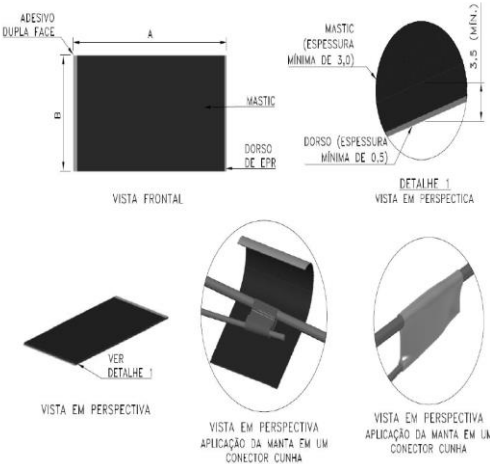
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type I

Type I																																																							
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT																																																				
275897* [Enel Ceará e Rio]	Lining of connectors and splices for 25 kV voltage level networks.		Each code shall have the respective dimensions:																																																				
337907* [Enel São Paulo]	Lining of connectors and splices for 25 kV voltage level networks.		<table><tr><th rowspan="2">Item</th><th colspan="3">Espessura mínima (mm)</th><th rowspan="2">A</th><th rowspan="2">B</th><th rowspan="2">Capacidade de Isolação (kV)</th><th rowspan="2">Código (CE e RJ)</th><th rowspan="2">Código (SP)</th></tr><tr><th>Mastic</th><th>Dorso</th><th>Total</th></tr><tr><td>1</td><td rowspan="4">3,00</td><td rowspan="4">0,76</td><td rowspan="4">3,76</td><td>400</td><td>210±2</td><td>25</td><td>275897</td><td>-</td></tr><tr><td>2</td><td>140</td><td>200±2</td><td>25</td><td>-</td><td>337907</td></tr><tr><td>3</td><td>400</td><td>200±2</td><td>25</td><td>-</td><td>337908</td></tr><tr><td>4</td><td>550</td><td>200±2</td><td>25</td><td>-</td><td>337909</td></tr><tr><td>5</td><td></td><td>1,20</td><td>4,20</td><td>550</td><td>550±2</td><td>34,5</td><td>270421</td><td>337910</td></tr></table>					Item	Espessura mínima (mm)			A	B	Capacidade de Isolação (kV)	Código (CE e RJ)	Código (SP)	Mastic	Dorso	Total	1	3,00	0,76	3,76	400	210±2	25	275897	-	2	140	200±2	25	-	337907	3	400	200±2	25	-	337908	4	550	200±2	25	-	337909	5		1,20	4,20	550	550±2	34,5	270421	337910
Item	Espessura mínima (mm)								A	B	Capacidade de Isolação (kV)						Código (CE e RJ)	Código (SP)																																					
	Mastic							Dorso				Total																																											
1	3,00							0,76	3,76	400	210±2	25	275897	-																																									
2		140	200±2	25	-	337907																																																	
3		400	200±2	25	-	337908																																																	
4		550	200±2	25	-	337909																																																	
5		1,20	4,20	550	550±2	34,5	270421	337910																																															
337908* [Enel São Paulo]	Lining of connectors and splices for 25 kV voltage level networks.																																																						
337909* [Enel São Paulo]	Lining of connectors and splices for 25 kV voltage level networks.																																																						
337910* [Enel São Paulo]	Lining of connectors and splices for 34,5 kV voltage level networks.																																																						
270421* [Enel Ceará e Rio]	Lining of connectors and splices for 34,5 kV voltage level networks.																																																						

* For Brazil, the covers consist of an EPR rubber backing covered with a layer of thermally stable sealing mastic.

* For Brazil, the covers consist of an EPR rubber backing covered with a layer of thermally stable sealing mastic.

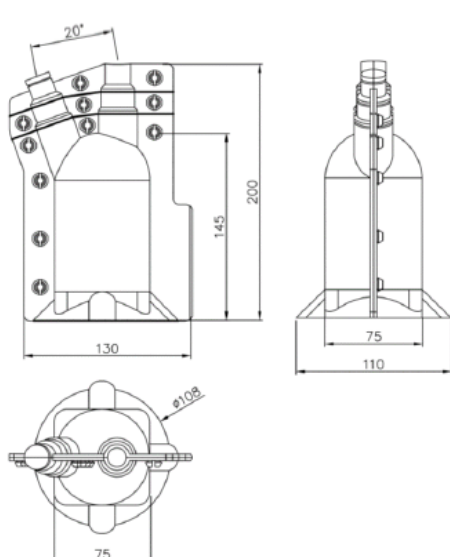
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type II			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
275620 [Enel Ceará, Rio, e Goiás]	Distribution transformer bushing protection for voltage class 15 kV.		• Use: On distribution transformer bushings in accordance with GST-001, to protect the connections. • The surfaces of the material must be smooth and of uniform thickness, free of blisters and burrs, sharp protrusions, cracks, inclusions and cutting edges. • The protector must have a minimum thickness of 2 mm and be manufactured in gray or black. • The protector must not allow rainwater to accumulate inside.
986739 [Enel São Paulo]	Distribution transformer bushing protection for voltage class 15 kV.		
270301	Distribution transformer bushing protection for voltage class 36 kV.		
Note: Figures are for illustrative purposes only.			



Material Specification code: GRI-GRI-MAT-E&C-0027

Version no. 0 dated 10/2023

Subject: GSCC030 PROTECTIVE DEVICES TO AVOID THE RISK OF ELECTROCUTION OF BIRDS

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

LOCAL SECTION E – Enel Codensa (Colombia)

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
860196	FLEXIBLE cover for CABLE 2/0-605 AWG 36KV		
860190	FLEXIBLE cover for CABLE desn2/0-605AWG 17.5 kV		

**Material Specification code: GRI-GRI-MAT-E&C-0027**

Version no. 0 dated 10/2023

Subject: GSCC030 PROTECTIVE DEVICES TO AVOID THE RISK OF ELECTROCUTION OF BIRDS**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type II			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
201220	Heat shrink cover for busbar MT 50 MM, for electrical networks from 17.5 kV to 36 kV.		The tape shall be easily removable in case it is necessary to remove it to modify a connection on the medium voltage busbar. When applying the tape, ensure that the area covered by the tape is completely sealed.
201221	Heat shrink cover for busbar MT 25 MM, for electrical networks from 17.5 kV to 36 kV.		
860189	Heat shrink cover for busbar MT-15kV		

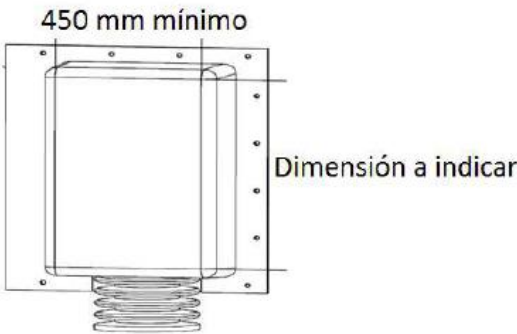
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type II			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
860193	SHUNT CONNECTION COVER. BUSBAR 400MM, for electrical networks from 17.5 kV to 36 kV.	Figure 1 	Covers for busbar tapping connections (tubular/leaf) to cables or similar elements shall allow for cover heights from 400 mm to 600 mm. Separate references are available for each height, which can be specified. Dimensionally they shall cover a range of two connectors up to four connectors in series (approx. 450 mm wide) and shall cover a range of two to four connectors in series (approx. 450 mm wide). (approx. 450 mm wide) and shall allow installation with nominal voltages from 17,5 kV to 36 kV. Figure 1 shows the approximate dimensions of these elements, as well as the tolerances to be considered for the covers. The cover must be able to protect both the connectors and the exposed part of the busbar between the connection points.

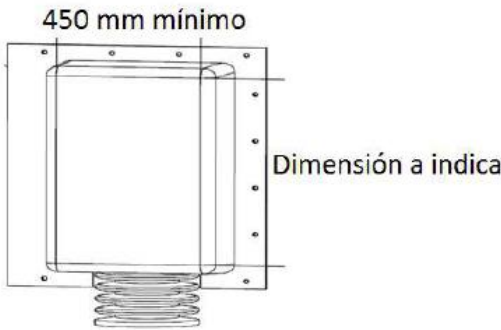
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type II			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
860195	COVER FOR DERIVATION BUSBAR 600 MM, para redes eléctricas de 17,5 kV a 36 kV.	Figure 1 	Covers for busbar tapping connections (tubular/leaf) to cables or similar elements shall allow for cover heights from 400 mm to 600 mm. Separate references are available for each height, which can be specified. Dimensionally they shall cover a range of two connectors up to four connectors in series (approx. 450 mm wide) and shall cover a range of two to four connectors in series (approx. 450 mm wide). (approx. 450 mm wide) and shall allow installation with nominal voltages from 17,5 kV to 36 kV. Figure 1 shows the approximate dimensions of these elements, as well as the tolerances to be considered for the covers. The cover must be able to cover both the connectors and the exposed part of the busbar between the connection points.
Note: Figures are for illustrative purposes only.			

Application Areas

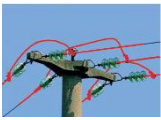
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

LOCAL SECTION F – E-distribuzione (Italia)

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
270033	Insulation kit for rigid insulator and conductor up to 16,5 mm Ø, suitable for conductors up to 150 mm ² cross section.	 1 insulator head cover; 3 m of conductor lining; - Auxiliary accessories.	
270032	Insulation kit for tie chain and conductor up to 16,5 mm diameter, suitable for conductors up to 150 mm ² cross section.	  2 Clamp cover; 5 m of conductor lining; - Auxiliary accessories.	
270031	Insulation kit for tension clamp		
270030	Insulation for conductor up to 16,5 mm diameter, suitable for conductors up to 150mm ² cross section		The presentation is rolls on reels or spools, 30 metres in length.
Note: Figures are for illustrative purposes only.			

Application Areas

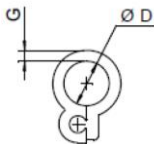
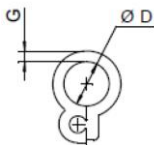
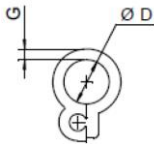
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

LOCAL SECTION G – Enel Distribución Chile

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
270176	Protective conductor sheath [diam int 11mm]	 	<u>Testing</u> For all applications, the pipe must conform to the tests defined in ASTM D 1050-05: • Geometrical analysis • Industrial frequency stress resistance • Industrial frequency stress contouring • Ozone resistance
270187	Protective conductor sheath [diam int 22mm]	 	In addition, the following conditions must be met: • Voltage class 25kV • The material must be delivered in rolls of 50 metres. • Resistance to environmental ageing factors. • Protection against UV exposure • Hardness of 75 shore A • Elongation at break of 250%. • Markings: manufacturer's trademark or logo, model, month/year of production, batch.
270186	Protective conductor sheath [diam int 30mm]	 	<u>Reception test:</u> Visual inspection: general observation of material characteristics and random dimensional analysis.

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
270185 (*)	Rigid Insulator Coating 35kV		Size: Rigid: 1.9 m approx.
270175 (*)	Flexible insulator cladding 12kV		Size: Flexible: 0.5 m approx. Flexible blanket-type silicone protectors must comply with the requirements of ASTM D1048-14, taking into account that they are defined as covers for voltages of 12kV (class 1 for phase-to-ground voltage of 7kV) and 23kV (class 2 for phase-to-ground voltage of 17kV).
270184 (*)	Flexible insulator cladding 23kV		
(*)The inside diameter of the protector must allow the use of bare conductors, must be between 15 and 30 mm to fit any conductor cross-section, and must be suitable for any type of conductor.			

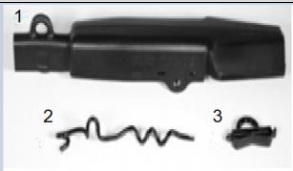
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type I			
MATERIAL CODE	DESCRIPTION	ELEMENTS OF THE KIT	COMMENT
270183	Protector final red 16-24m - Cond. $\leq 240\text{mm}^2$	 1: Main body • UV-resistant • Low-temperature impact resistant • Quick installation without special tools 2: Preformed tie • Ensures the cover stays on the snap-on hardware • Proven helical design • All dielectrics • Proven PVC material for long service life 3. Locking pin: • Prevents the sheath cover from lifting off the conductor and hardware 4. • Adds redundant support to hold the cover firmly on the conductor	The device is made of linear low-density polyethylene and must meet at least the following specifications: • Colour: grey or black • Marks: manufacturer (brand or logo), model, month/year of manufacture, batch • Length $\approx 750\text{ mm}$ • Discrete appearance • Covers a wide range of conductors and fastening hardware • Long service life without material deterioration • Dielectric strength greater than 25.8kV • Easily installed by hand or with a pole • Includes pigtail and locking block for fixing to the grid • Permanent fastening to the conductor-insulator assembly must be ensured by a suitable fastening mechanism. 
270182	Protector final red 25-33mm		
Note: Figures are for illustrative purposes only.			

9. DESCRIPTION OF EVIDENCE

9.1 CHECK LIST TYPE I

Item	Description	Unit	Required
1	GENERAL INFORMATION		
1.1	Supplier	-	
1.2	CUI		
1.3	Qualified for FELC16		YES
1.4	Factory Address	-	Qualified Factory Address
2	MAIN FEATURES		
2.1	Global Standard		GSCC030
2.2	Country code	-	According to country
2.3	"Key" Type Code		GSCC030/X
2.4	Nominal Voltage Uo/U (Umax)	[kV]	
2.5	Type I or Type II	-	Type I
2.6	Disposition		
3	DESCRIPTION		
3.1	Material	-	
3.2	Element to be protected		
3.3	Kit elements	-	
4	DESIGN		
4.1	Drawing or photo		

9.2 CHECK LIST TYPE II

Item	Description	Unit	Required
1	GENERAL INFORMATION		
1.1	Supplier	-	
1.2	CUI		
1.3	Qualified for FELC16		YES
1.4	Factory Address	-	Qualified Factory Address
2	MAIN FEATURES		
2.1	Global Standard		GSCC030
2.2	Country code	-	According to country
2.3	"Key" Type Code		GSCC030/X
2.4	Nominal Voltage Uo/U (Umax)	[kV]	
2.5	Type I or Type II	-	Type II
2.6	Disposition		
3	DESCRIPTION		
3.1	Material	-	
3.2	Element to be protected		
3.3	Kit elements	-	
4	DESIGN		
4.1	Drawing or photo		