INSULATION PIERCING CONNECTORS (IPC) FOR AERIAL APPLICATIONS 0,6/1,0 (1,2) kV.

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Index

1 Scope 3
2 Field of Application 3
3 Replaced Local Standards 3
4 Reference laws and standards 4
4.1 Laws 4
4.2 Standards 5
5 Types of IPC and cables 5
5.1 Local Cables specification 11
6 Design and Construction 12
6.1 General requirements 12
6.2 Body 13
6.3 Electrical contacts 13
6.4 Fitting system 14
6.5 Fuses for type B connectors. 14
7 Tests 15
7.1 Routine test 15
7.2 Sample test 15
7.3 Type Test 16
7.4 Sampling 17
7.5 Acceptance Criteria 18
8 Conditions of supply 19
8.1 Marking 19
8.2 Packing 19
Checklist 20

1 Scope

The scope of this global standard is to provide technical requirements for insulation piercing connectors for aerial application to be used in the distribution networks of Enel Group listed below:

Enel Codensa	*Colombia*
Edesur	*Argentina*
e-distributie Banat	*Romania*
e-distributie Dobrogea	*Romania*
e-distributie Muntenia	*Romania*
e-distribuzione	*Italy*
Endesa Distribución Eléctrica	*Spain*
Enel Distribución Chile	*Chile*
Enel Distribución Perú	*Perú*
Enel Distribuição Ceará	*Brazil*
Enel Distribuição Goiás	*Brazil*
Enel Distribuição Rio	*Brazil*
Enel Distribuição São Paulo	*Brazil*

2 Field of Application

This standard covers the design, manufacture, testing and supply of insulation piercing connectors (IPC) for making connections to aerial bundled cables (ABC) or aerial-insulated cables (AIC) with rated voltage Uo/U (Umax) = 0,6/1,0 (1,2) kV.

3 Replaced Local Standards

This standard replaces all the local standards used up to now by all the Distribution Companies.

- **Codensa:** ET 306
- **Edesur:** DBEE06
- **e-distributie Banat, Dobrogea and Muntenia:** DM 6050 RO
- **e-distribuzione:** DM 6050
- **Enel Distribuição São Paulo:** NTE-8445 e NTE-M-021
- **Endesa Distribución Eléctrica:** 6700129, 6700130, 6700131, 6700132
- **Enel Distribución Chile:** DMC-0009, DMC-0016
- **Enel Distribución Perú:** DNN-ET-084 and LE-1-340-1
- **Enel Distribuição Ceará, Enel Distribuição Goiás and Enel Distribuição Rio:** PM-Br-710.53.0

4 Reference laws and standards

4.1 Laws

Codensa:

- RETIE, Reglamento técnico de Instalaciones Eléctricas.

Edesur:

- Reglamentación AEA 95150 “Instalaciones Eléctricas de Suministro y Medición en Baja Tensión”.
- Reglamentación AEA 95201 “Líneas Eléctricas Exteriores de Baja Tensión”.

e-distributie Banat, Dobrogea, Muntenia:

- PE 106 / 2003 Normativ pentru proiectarea si executarea liniilor electrice aeriene de joasă tensiune

Enel Distribuição São Paulo:

- NR-10 – Segurança em instalações e serviços em eletricidade.

Endesa Distribución Eléctrica:

- R.D 842/2002, de 2 de agosto, por el que aprueba el Reglamento Electrotécnico para Baja tensión.

Enel Distribución Chile:

- NCH Elec 4/2003 – Instalaciones de consumo en baja tensión.

Enel Distribución Perú:

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

Enel Distribuição Ceará:

- NR-10 – Segurança em instalações e serviços em eletricidade.

Enel Distribuição Goiás:

- NR-10 – Segurança em instalações e serviços em eletricidade.

Enel Distribuição Rio:

- NR-10 – Segurança em instalações e serviços em eletricidade.

4.2 Standards

The below-listed reference documents shall be intended in the in-force edition at the contract date (amendments included). Unless otherwise specified, these documents are valid until the new versions replace them.

- EN 50483-1 Test requirements for low voltage aerial bundled cable accessories - Part 1: Generalities
- EN 50483-4 Test requirements for low voltage aerial bundled cable accessories - Part 4: Connectors
- EN 50483-5 Test requirements for low voltage aerial bundled cable accessories - Part 5: Electrical ageing test
- EN 50483-6 Test requirements for low voltage aerial bundled cable accessories - Part 6: Environmental testing

5 Types of IPC and cables

The IPC'S specified in this global standard shall be suitable for installation in low voltage aerial bundled cables or concentric cables (after peeling) with aluminum and copper conductors indicated in standards GSCC009 and some local standards indicated in 5.1

The following types of IPC are defined:

- Type A: *"Single-phase insulation piercing connector."*
- Type B: *"Single phase insulation piercing connector IPC with fuse holder or copper rod."*
- Type C: *"Multi-tap insulation piercing connector with 4 outgoing branch circuits."*

Not bidding construction designs are shown in the following figures.

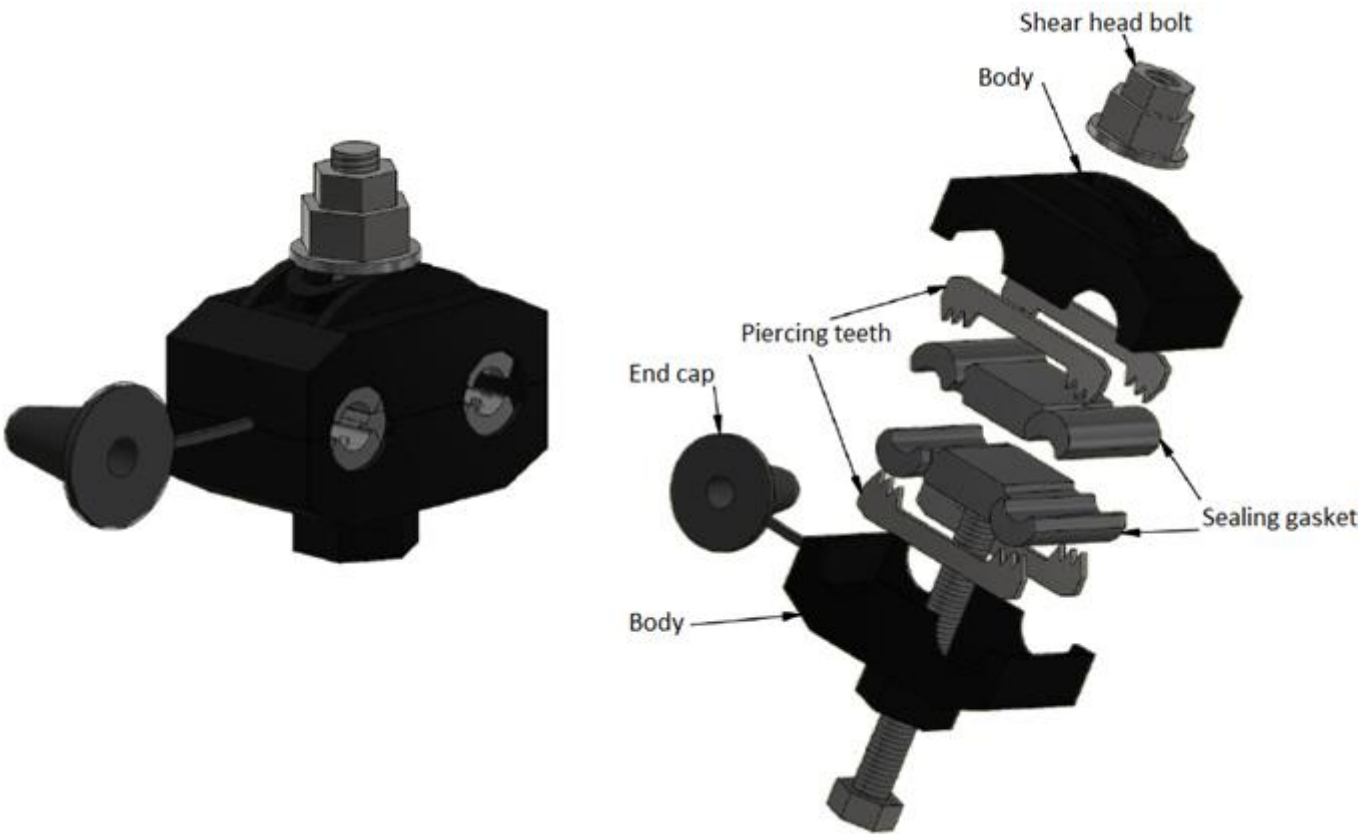

Figure 1 Type A Insulation piercing connector

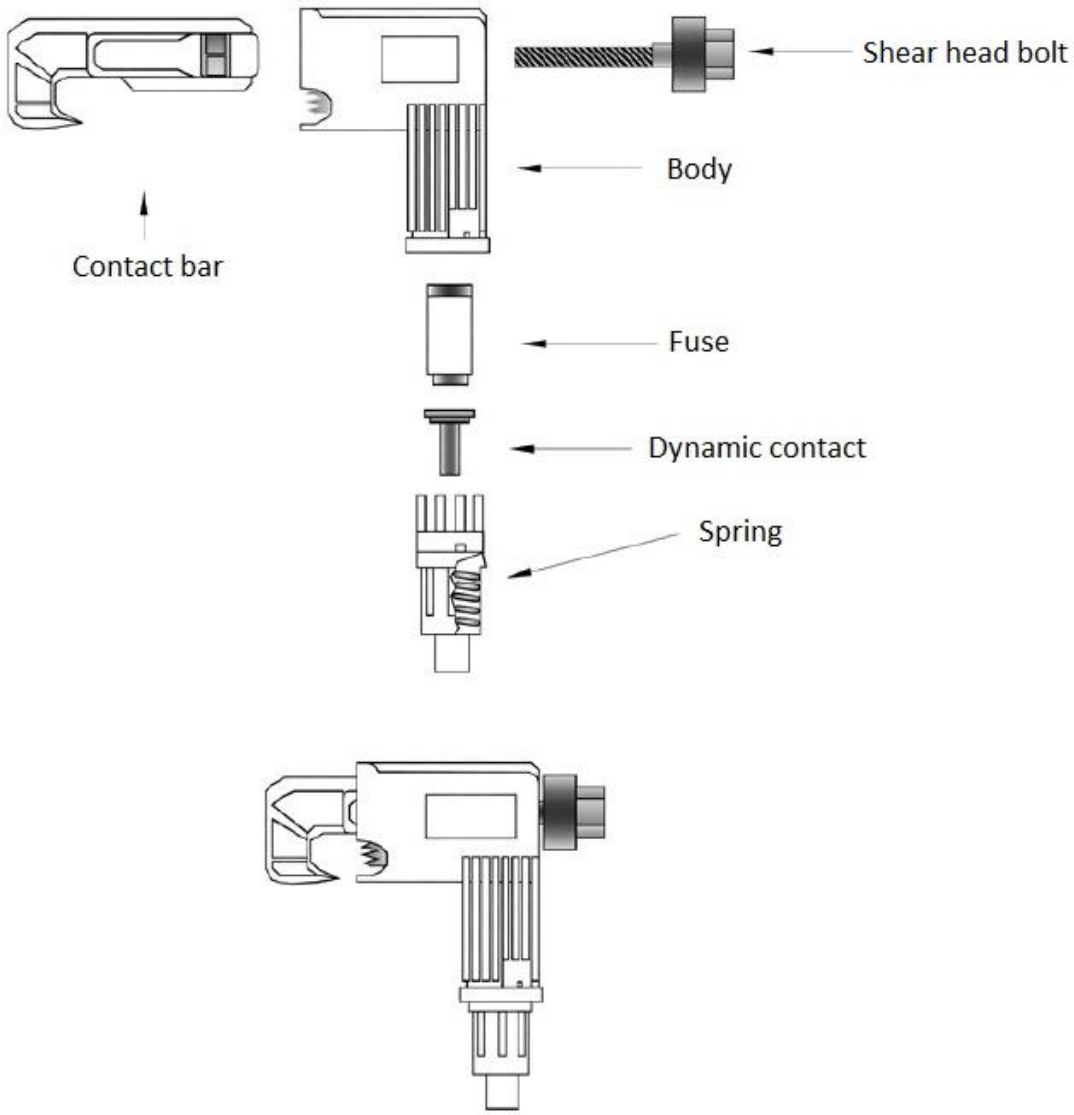

Figure 2 Type B insulation piercing connector

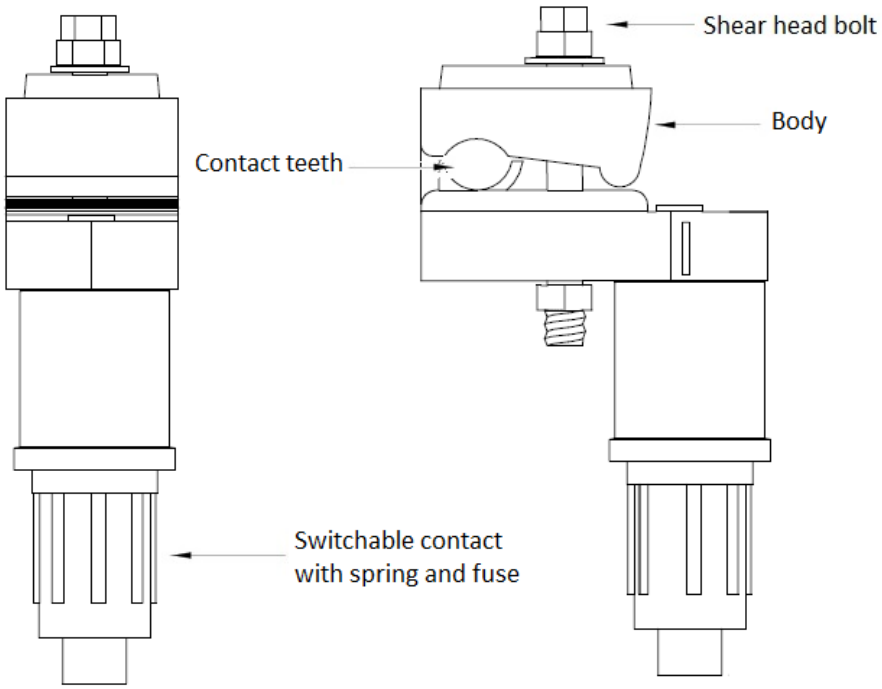

Figure 3 Type B insulation piercing connector

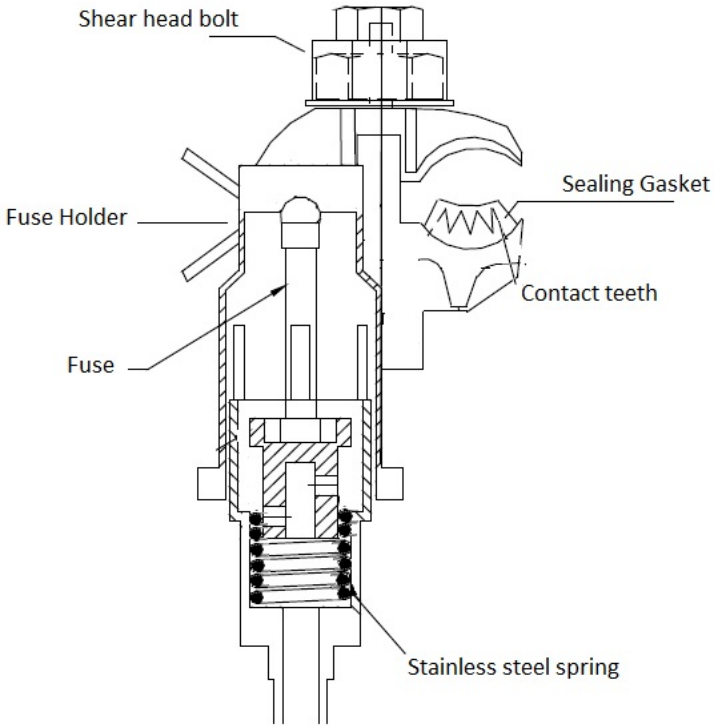

Figure 4 Type B insulation piercing connector

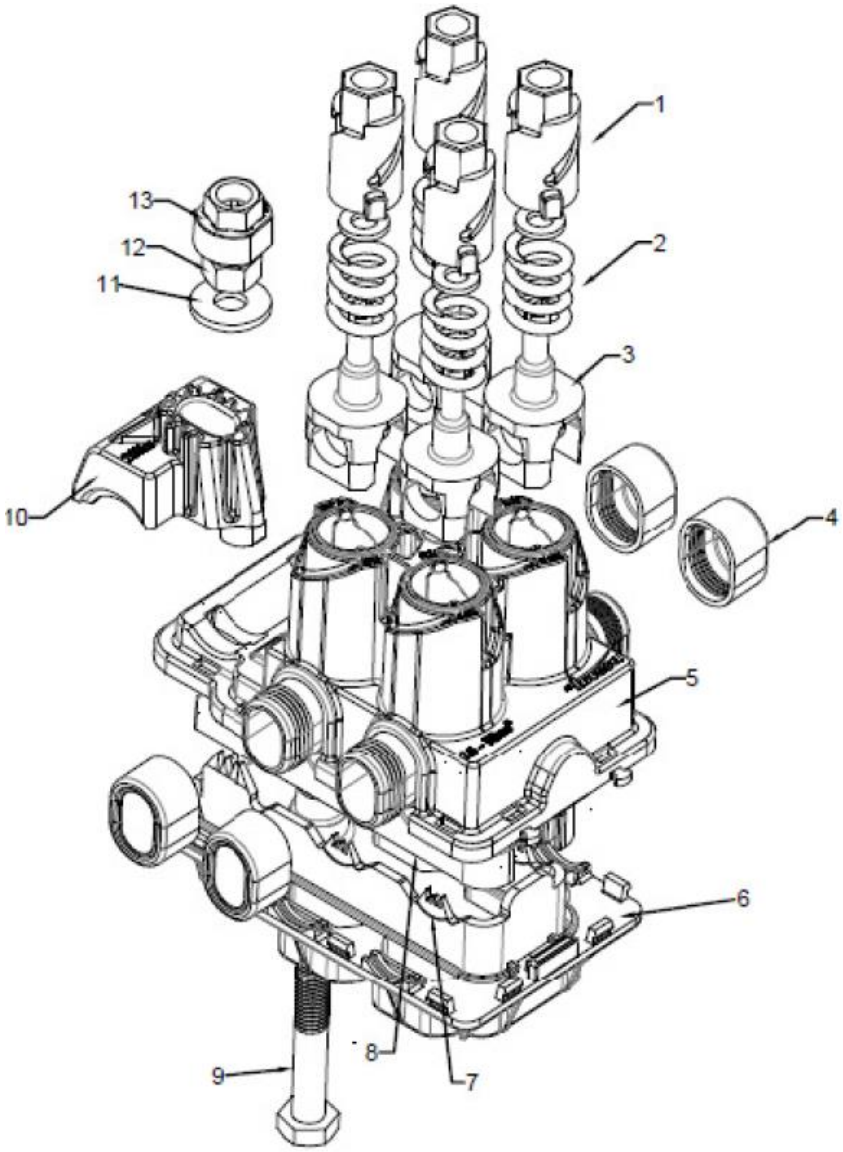

Figure 5 Type C insulation piercing connector

1. Nylon screw
2. Stainless Steel Spring
3. Nylon guide
4. Elastomer cap
5. Nylon body
6. Nylon Base
7. Copper toothed contact
8. Elastomer Sealer
9. Sext Screw M8X1,25 Zinc Plated
10. Nylon cover
11. Galvanized flat washer
12. M8 nut zinc plated
13. Zamak nut limiter

Country Code	Type Code	Country	IPC Type	Main cable	Branch cable
0115-0307	GSCC020/1	AR	Type B	10-95	4-35
270030		CL			
0115-0306	GSCC020/2	AR	Type A	25-95	25-95
329753		BR-SP			
271397		CL			
273992		PE			
T270464	GSCC020/3	BR (RJ/CE/GO)	Type A	35-150	35-150
329761		BR-SP			
271398		CL			
0115-0459	GSCC020/4	AR	Type A	16-95	4-35
T270465		BR (RJ/CE/GO)			
271403		CL			
251379		CO			
160854		ES			
273938		PE			
T270466	GSCC020/5	BR (RJ/CE/GO)	Type A	50-150	6-54.6
270730		ES			
273937	GSCC020/6	PE	Type A	16-95	1,5-6 (**)
275001	GSCC020/7*	IT	Type A	35-70	6-54.6
		RO			
275003	GSCC020/8*	IT	Type A	10-16	6-16
		RO			
329318	GSCC020/9	BR-SP	Type C	50-150	2,5-35

329762	GSCC020/10	BR-SP	Type A	50-120	185-240
329764	GSCC020/11	BR-SP	Type A	6-35	6-35
T270467	GSCC020/12	BR (RJ/CE/GO)	Type A	16-150	1.5-6
T270468	GSCC020/13	BR (RJ/CE/GO)	Type A	25-120	25-120
329752	GSCC020/14	BR-SP	Type A	10-70	50-120
329754					
(*) IPC for Type III and Type IV cables with insulation and sheath from Global standard GSCC009 (**) "Single teeth" piercing system shall be used.					

Table 1

5.1 Local Cables specification

The cables indicated in the following local specifications can be used in the IPC'S specified in this global standard.

- **Latam**: E-BT-003
- **Argentina**: DBEE04, DBEE03, DBEE13

6 Design and Construction

6.1 General requirements

The IPC shall be designed to perform connections between the main cable and a single (or several in case of Type C IPC) branch cables without removing the insulation or outer sheath (if any). The IPC shall first pierce the outer sheath (if any) and the insulation, then make good electrical contact between the main and the branched conductors while simultaneously insulating and sealing the connection. . Only when installed on concentric neutral cables cable preparation shall be done.

The IPC shall be Class 1 according to EN 50483-4 clause 8.1.3.1. The water tightness shall be ensured by appropriate sealing gasket around the teeth made of flexible insulating material and not by grease, gel or paste alone. Such sealing shall be designed appropriately to avoid damage to conductor insulation beyond the piercing point.

The IPC shall be supplied with removable branch cable end caps, which avoid accidental contact with the live part of the branch cable by sealing its cut end. It shall be possible to install from both sides of the connector, with the connector being in its vertical position with the bolt head upwards. The end cap shall be rigid of slide type enabling easy positioning and unloadable after the tap cable is positioned and shall be equipped with a water tightness seal.

Applying grease to protect the contact teeth is allowed as long as it is not visible from the outside of the IPC, in other words, the IPC shall not be dipped in grease. In addition, such grease shall be compatible with the sealing gasket material and shall maintain all its features over time.

The IPC surface shall be smooth and uniform without sharp edges or burrs. Also, it shall be free from all flaws and suitably rounded off. It is thus avoiding damage to the insulation of adjacent cables due to vibration or r movement during operation.

The dropping point of the grease used for protection of the contact teeth or to seal the cap shall be 160 °C according to standard ISO 2176 or ASTM D 566.

The installation of the connector shall be made using a single wrench.

The outgoing circuits from the multi-tap Type C IPC shall be independently and individually connectable/ disconnectable without disturbing the connection to the main cable or branches, by means of bolts with a semi-rotary system, spring system, with insulating perforation contacts. Also shall contemplate the temporary earth connection point with the bracket or the installation of the pin.

For Type A and Type B IPC’s the piercing shall be performed using single bolt for tightening All the metallic elements not considered herein shall be made of stainless steel (AISI 316).

The IPC shall guarantee ingress protection marking at least the same as:

- IP 2X before tightening operation.
- IP4X after tightening operation.

6.2 Body

The body of the IPC shall be made completely of mechanical and weather resistant insulating material with no metallic parts outside the housing, except for the tightening bolt, that in any case, will be insulated at all times from the parties.

The IPC body shall be designed to be stressed exclusively to compression at the time of the tightening operation, maintaining its mechanical characteristics unchanged over time.

A self-extinguish thermoplastic polyester shall be used.

As soon as the sheared-bolt breaks, all the parts of the IPC body shall be stressed to actions less than the elastic or breaking limits of the insulating material.

The insulating material shall be able to withstand the expected mechanical and thermal efforts during operation a range of temperatures from -10°C to 50°C and cables operating at 90 °C during continuums operation and 250 °C during short circuit.

The insulating material shall be UV stabilized and shall satisfy the following requirement

- Water adsorption test (according to ISO 62 or ASTM d 570), measured on a 50x50x3,2 mm sample. The result of the test shall be less than 0,2% after 24 h of immersion in water at 23 °C and not more than 1% unsaturation conditions.

6.3 Electrical contacts

The piercing teeth shall be made of tinned copper or tinned copper alloy with Brinell hardness greater than 100 HB. The minimum thickness of the tinning shall be at least 8 µm.

When the material used is Copper alloy, it shall have a sufficient percentage of Copper so that it does not deteriorate due to corrosion. This percentage will not be less than 58%.

The connectors maximum contact resistance (between the piercing teeth and the cable conductor) shall be designed to be not greater than 30 µΩ. In addition, after performing the thermal tests, such value cannot be greater than 40 µΩ.

For type A connectors the piercing system shall be “double teeth” enough to guarantee property connection according to types of conductors defined in section 5. Unless otherwise stated in table 1, for small section conductors in such case, the "Single teeth" piercing system shall be used.

For type B connectors the contact of the fuse holder with the connector shall be a tinned copper bar with a diameter of not less than 6 mm and the upper contact of the fuse holder shall be connected to the teeth penetrating the cable and shall be in contact with the larger diameter end of the fuse or equivalent (see section 6.5)

6.4 Fitting system

The fitting of the IPC shall be performed with torque limiting screw with shear head to prevent over tightening or under tightening.

Minimum and Maximum torque values at 25 °C shall be clearly specified by the manufacturer and shall not exceed:

- 20 Nm for IPC for main conductor ≤95 mm^2
- 30 Nm for IPC for main conductor between 95 mm^2 and 150 mm^2.

In addition, the manufacturer shall specify the minimum and maximum torque values at -10 °C and 50 °C.

The tightening screw and the shear head bolt shall have hexagonal heads. When several bolts are to be tightened, they shall have the same dimensions.

When the bolt head breaks, it shall be impossible to apply additional tightening torque, but still, disassembling operation of the IPC shall be possible, obtaining access to both main and branch cables.

The screws, nuts and washers shall be made of "*austenitic*" stainless steel (AISI 316).

For type B connectors, the adjustment system for the fuse holder will be bayonet connector type and shall ensure permanent contact pressure under all load conditions and permissible temperatures.

6.5 Fuses for type B connectors.

Argentina:

The fuses for the type B connectors shall be NEOZED fuse system indicated in standards ETGCC N° 657 Rev. 1.

Chile:

Instead of a fuse, a device of equal size will be used for grants the electrical conduction (cooper road) and another that interrupting the supply (insulating fittings) that will enable the connection and disconnection of the load connected to the IPC.

7 Tests

7.1 Routine test

N°	Test	Test Method and Requirement
1	Visual examination	See Clause 6
2	Dimensional and material verification	See Clause 6

Table 2 Routine test

7.2 Sample test

N°	Test	Test Method and Requirement
1	Visual examination	(See Clause 6)
2	Dimensional and material verification IPC body material Material of the screws, nuts, and washers. Tinning thickness measurement	(See Clause 6) - Self-extinguish thermoplastic polyester and resistant to UV radiation. - Austenitic stainless steel (AISI 316). - Thickness of the tinning > 8 µm - Measurement: Brinell hardness > 100 HB
3	Test for mechanical damage to conductors	§8.1.2.1 Standard EN 50483-4
4	Branch cable pull-out test	§8.1.2.2 Standard EN 50483-4
5	Bolt tightening test	§8.1.2.3 Standard EN 50483-4
6	Dielectrical voltage test	§8.1.3.1.3.1 Standard EN 50483-4 applying 6 kV
7	Test for permanent marking	§9.2 Standard EN 50483-1
8	Low temperature assembly test	§8.1.4 Standard EN 50483-4
9	Shear head function test	§8.1.2.4 Standard EN 50483-4

Table 3 Sample test

7.3 Type Test

The samples required should correspond to Table B.5 of Annex B of EN50483-1.

N°	Test	Test Method and Requirement
1	Visual examination	See Clause 6
2	Dimensional and material verification	See Clause 6
3	Test for mechanical damage to the main conductor.	§8.1.2.1 Standard EN 50483-4
4	Branch cable pull-out test	§8.1.2.2 Standard EN 50483-4
5	Connector bolt tightening test	§8.1.2.3 Standard EN 50483-4
6	Shear head function test	§8.1.2.4 Standard EN 50483-4
7	Low temperature impact test	§8.1.2.5 Standard EN 50483-4
8	Dielectrical voltage test and water tightening test	§8.1.3.1.3.1 Standard EN 50483-4 applying 6 kV a.c for class 1
9	Low temperature assembly test	§8.1.4 Standard EN 50483-4
10	Corrosion tests Salt mist test Gas Atmosphere test Immersion test	§8.1.5.1 Standard EN 50483-4 §8.1.5.1.3.1 from Standard EN 50483-4 §8.1.5.1.3.2 Method 2 from standard EN 50483-4 §8.1.5.1.3.3 Method 1 from standard EN 50483-4
11	Climatic ageing test	Method 1 §8.1.5.2.3.1 Standard EN 50483-4
12	Test for permanent marking	§9.2 Standard EN 50483-1
13	Electrical ageing test	§8.1.6 Standard EN 50483-4 for Class A IPC considering values of sub-clauses 6.2 and 6.3 herein.
14	Determination of dropping point	Greater than 160 °C according to standard ISO 2176 or ASTM D 566
15	IP degree	IEC 60529
16	Tinning thickness measurement	Measurement: Brinell hardness > 100 HB and thickness of the tinning > 8 µm.

Table 4 Type test

7.4 Sampling

In order to determine the acceptability of a lot, the prescriptions indicated in the table below shall be used.

The costs of rejected materials and the samples will be charged to the bidder.

Lot size (N)	First Sample			Second Sample		
	n_1	NA_1	NR_1	n_2	NA_2	NR_2
N≤10.000	10	0	2	20	1	2
10.000<N≤30.000	20	0	2	20	2	3
N>30.000	32	1	3	32	2	3

Table 5 Samples and Grade of Acceptance to Each of the Trials

Where:

n_1: First sample size

NA_1: First acceptance number

NR_1: First rejection number

n_2: Second sample size

NA_2: Second acceptance number

NR_2: Second rejection number

The acceptance criteria will be:

- If the number of nonconforming units found in the first sample (n_{d1}) is equal to or less than the first acceptance number (NA_1), the lot shall be considered acceptable.
- If the number of nonconforming units (n_{d1}) found in the first sample is equal to or greater than the first rejection number (NR_1), the lot shall be considered not acceptable.
- If the number of nonconforming units found in the first sample is between the first acceptance and rejection numbers ($NA_1 < n_{d1} < NR_1$), a second sample of the size given by the plan shall be inspected.
- The number of nonconforming units found in the first and second samples shall be accumulated ($n_d = n_{d1} + n_{d2}$).

- If the cumulative number of nonconforming units (n_d) is equal to or less than the second acceptance number (NA_2), the lot shall be considered acceptable.
- If the cumulative number of nonconforming units (n_d) is equal to or greater than the second rejection number (NR_2), the lot shall be considered not acceptable.

7.5 Acceptance Criteria

The routine tests shall be performed at 100% of delivered IPC's.

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 do not vary during further production phases after the test.

The reports of the acceptance tests performed by the Supplier shall be prepared and retained, for possible verification by Enel inspectors.

The Supplier shall be available to repeat the tests in the presence of Enel's Inspector, on a "reduced" sample of the supply lot, defined as follows:

- Routine test: the minimum between a single sampling plan for normal inspection, AQL=1%, Level I, and 1/3 of the total number of delivered IPC's.
- Sample test: 1/2 of the sampling (rounded down to the nearest unit) already adopted for the sample test independently performed by the supplier (Enel inspector can choose to perform the test in lots already tested by the Supplier or on others from the lot).

The negative result of a single test will result in the rejection of the lot or, when possible, in the repetition of the test on all the units, in order to accept only the compliant ones

8 Conditions of supply

Manufacturers of IPC's connectors shall provide appropriate instructions, and information covering general conditions during transport, storage and installation of the connectors.. The documents shall be in the local language of the destination country.

8.1 Marking

The IPC shall contain the following information:

- Manufacturer's trademark or logo
- Enel country code and Type code
- the minimum and maximum cross section for which the unit is suitable
- Date of Manufacture.
- Tightening torque.

8.2 Packing

Each connector will be delivered complete and assembled in individual bags hermetically sealed. Each bag will be printed with the following information:

- manufacturer's trademark or logo;
- Enel country code and Type code
- product code or reference;
- traceability code / batch number;
- the minimum and maximum cross section for which the unit is suitable;
- Tightening torque.
- Date of Manufacture.

Checklist

For Type A IPC

Item	Description	Unit	Required	Offered
1	**GENERAL INFORMATION**			
1.1	Supplier	-	Informative	
1.2	Factory	-	Informative	
1.3	Product code or reference of manufacturer	-	Informative	
2	**MAIN FEATURES**			
2.1	Distribution Company and Country	-	Informative	
2.2	Country Code	-	according to table 1 (e.g.): 271387	
2.3	GS Type Code	-	according to table 1 (e.g.): GSCC020/2	
2.4	Type IPC	-	A	
3	**ELECTRICAL FEATURES**			
3.1	Rated voltage (Un)	[kV]	0.6/1(12)	
3.2	Rated current (InA)	[A]	Informative	
3.3	Dielectrical Voltage test in water	kV	6	
3.4	Connectors contact resistance (before performing the thermal tests)	μΩ	30	
3.5	Connectors contact resistance (after performing the thermal tests)	μΩ	<40	
4	**MECHANICAL FEATURES**			
4.1	IPC body material	-	self-extinguish thermoplastic polyester and resistant to UV radiation	
4.2.1	Minimum and maximum cross-section for the main cable	mm²	(e.g.): 25-95	
4.2.2	Minimum and maximum cross-section for the branch cable	mm²	(e.g.): 25-95	

4.3.1	Maximum tightening torque at 25 °C.	Nm	Do not exceed: - 20 Nm for IPC for main conductor ≤95 mm2 - 30 Nm for IPC for main conductor between 95 mm2 and 150 mm2.	
4.3.2	The minimum and maximum torque values at -10 °C and 50 °C.	NM	Informative	
4.4	Determination of dropping point	°C	160.	
4.5.1	Ingress protection marking guaranteed (IP) (before Installation)	-	IP2X.	
4.5.2	Ingress protection marking guaranteed (IP) (after Installation)	-	IP4X.	
4.6.1	Piercing system ("Single teeth" or “double teeth”)	-	“Single teeth system” only for GSCC020/6.	
4.6.2	Material of the piercing teeth	-	Tinned copper or tinned copper alloy	
4.7.1	Tinning thickness measurement (hardness)	HB	>100 HB	
4.7.2	Tinning thickness measurement (thickness of the tinning)	µm	> 8 µm.	
4.8.1	Material of the screws, nuts, and washers.	-	“Austenitic” stainless steel. (AISI 316)	
4.8.2	Type of construction tightening nut	-	Torque limiting screw with shear head	
4.8.3	Hexagonal heads for the tightening screw and the shear head bolt	-	Yes	
4.9	Tightness Test	-	Class 1 (according to section 8.1.3.1 EN-50483-4)	
5	**Dimensions**			
5.1	Height	(cm)	Informative	
5.2	Width	(cm)	Informative	
5.3	Length	(cm)	Informative	
5.4	weight	(gr)	Informative	

For Type B IPC

Item	Description	Unit	Required	Offered
1	**GENERAL INFORMATION**			
1.1	Supplier	-	Informative	
1.2	Factory	-	Informative	
1.3	Product code or reference of manufacturer	-	Informative	
2	**MAIN FEATURES**			
2.1	Distribution Company and Country	-	Informative	
2.2	Country Code	-	according to table 1 (e.g.): 0115-0307	
2.3	GS Type Code	-	according to table 1 (e.g.): GSCC020/1	
2.4	Type IPC	-	B	
2.5	Type of fuse for use in IPC type B		NEOZED (Argentina) or Conductive Piece (Chile) (according to section 6.5)	
3	**ELECTRICAL FEATURES**			
3.1	Rated voltage (Un)	[kV]	0.6/1(12)	
3.2	Rated current (InA)	[A]	Informative	
3.3	Dielectrical Voltage test in water	kV	6	
3.4	Connectors contact resistance (before performing the thermal tests)	μΩ	30	
3.5	Connectors contact resistance (after performing the thermal tests)	μΩ	<40	
4	**MECHANICAL FEATURES**			
4.1	IPC body material	-	self-extinguish thermoplastic polyester and resistant to UV radiation	
4.2.1	Minimum and maximum cross-section for the main cable	mm²	(e.g.): 25-95	
4.2.2	Minimum and maximum cross-section for the branch cable	mm²	(e.g.): 25-95	

4.3.1	Maximum tightening torque at 25 °C.	Nm	Do not exceed: - 20 Nm for IPC for main conductor ≤95 mm2 - 30 Nm for IPC for main conductor between 95 mm2 and 150 mm2.	
4.3.2	The minimum and maximum torque values at -10 °C and 50 °C.	NM	Informative	
4.4	Determination of dropping point	°C	160.	
4.5.1	Ingress protection marking guaranteed (IP) (before Installation)	-	IP2X.	
4.5.2	Ingress protection marking guaranteed (IP) (after Installation)	-	IP4X.	
4.6.1	Material of the piercing teeth	-	Tinned copper.	
4.6.2	Material of the contact of the fuse holder with the connector	-	Tinned copper.	
4.6.3	Diameter of the contact of the fuse holder with the connector	mm	>6 mm	
4.7.1	Tinning thickness measurement (hardness)	HB	>100 HB	
4.7.2	Tinning thickness measurement (thickness of the tinning)	µm	> 8 µm.	
4.8.1	Material of the screws, nuts, and washers.	-	“Austenitic” stainless steel. (AISI 316)	
4.8.2	Type of construction tightening nut	-	Torque limiting screw with shear head	
4.8.3	Hexagonal heads for the tightening screw and the shear head bolt	-	Yes	
4.9	Tightness Test	-	Class 1 (according to section 8.1.3.1 EN-50483-4)	
5	**Dimensions**			
5.1	Height	(cm)	Informative	
5.2	Width	(cm)	Informative	
5.3	Length	(cm)	Informative	
5.4	weight	(gr)	Informative	

For Type C IPC

Item	Description	Unit	Required	Offered
1	**GENERAL INFORMATION**			
1.1	Supplier	-	Informative	
1.2	Factory	-	Informative	
1.3	Product code or reference of manufacturer	-	Informative	
2	**MAIN FEATURES**			
2.1	Distribution Company and Country	-	Informative	
2.2	Country Code	-	according to table 1 (e.g.): 329318	
2.3	GS Type Code	-	according to table 1 (e.g.): GSCC020/9	
2.4	Type IPC	-	C	
3	**ELECTRICAL FEATURES**			
3.1	Rated voltage (Un)	[kV]	0.6/1(12)	
3.2	Rated current (InA)	[A]	Informative	
3.3	Dielectrical Voltage test in water	kV	6	
3.4	Connectors contact resistance (before performing the thermal tests)	μΩ	30	
3.5	Connectors contact resistance (after performing the thermal tests)	μΩ	<40	
4	**MECHANICAL FEATURES**			
4.1	IPC body material	-	self-extinguish thermoplastic polyester and resistant to UV radiation	
4.2.1	Minimum and maximum cross-section for the main cable	mm^2	(e.g.): 25-95	
4.2.2	Minimum and maximum cross-section for the branch cable	mm^2	(e.g.): 25-95	

4.3.1	Maximum tightening torque at 25 °C.	Nm	Do not exceed: - 20 Nm for IPC for main conductor ≤95 mm2 - 30 Nm for IPC for main conductor between 95 mm2 and 150 mm2.	
4.3.2	The minimum and maximum torque values at -10 °C and 50 °C.	NM	Informative	
4.4	Determination of dropping point	°C	160.	
4.5.1	Ingress protection marking guaranteed (IP) (before Installation)	-	IP2X.	
4.5.2	Ingress protection marking guaranteed (IP) (after Installation)	-	IP4X.	
4.6	Material of the piercing teeth	-	Tinned copper or tinned copper alloy	
4.7.1	Tinning thickness measurement (hardness)	HB	>100 HB	
4.7.2	Tinning thickness measurement (thickness of the tinning)	µm	> 8 µm.	
4.8.1	Material of the screws, nuts, and washers.	-	“Austenitic” stainless steel. (AISI 316)	
4.8.2	Type of construction tightening nut	-	Torque limiting screw with shear head	
4.8.3	Hexagonal heads for the tightening screw and the shear head bolt	-	Yes	
4.9	Tightness Test	-	Class 1 (according to section 8.1.3.1 EN-50483-4)	
5	**Dimensions**			
5.1	Height	(cm)	Informative	
5.2	Width	(cm)	Informative	
5.3	Length	(cm)	Informative	
5.4	weight	(gr)	Informative	

INSULATION PIERCING CONNECTORS

(IPC)

AMENDMENT

Revision	Data	List of modifications
00	07/2019	First emission
Amendment	12/2024	Types D, E, F and G added; Common List Updated

This Amendment of the Global Standard GSCC020 rev. 0 specifies the requirements applicable to Enel Distribucion Group. They are specified in this document with reference to the same paragraph number of GSCC020 rev.0 (22/07/2019).

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5 TYPES OF IPC AND CABLES

The IPC types and cables are the same as those described in the original document, with the addition of the following new IPC types

The following additional IPC types are included:

- **Type D**: "Single-phase insulation piercing connector for A-Zone and B-Zone corrosive areas."
- **Type E**: "Single-phase insulation piercing connector for C-Zone corrosive areas."
- **Type F**: *"Multi-tap insulation piercing connector with 4 outgoing branch circuits."* A-Zone and B-Zone corrosive areas."
- **Type G**: *"Multi-tap insulation piercing connector with 4 outgoing branch circuits." for* C-Zone corrosive areas*."*

Notes on Corrosive Zones:

A-Zone and B-Zone: Defined as low or moderate corrosive environments, typically urban or industrial.

C-Zone: Defined as corrosive environments, including marine areas or industrial zones with high levels of chemical exposure.

6.1 General requirements

The IPC requirements are the same as described in the original document, with the addition of the following general requirements:

- "For connectors that will be installed in environments with high corrosion zones (E and G), the cover must be blue."

6.2 Body

The IPC requirements are the same as described in the original document, with the addition of the following "Body" requirements:

- For Type C, D, E, F and G IPC's the body must be made of polyester or polymeric material.

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6.3 Electrical contacts

The IPC requirements are the same as described in the original document, with the addition of the following "Electrical contacts" requirements:

- For Type C, D, E, F and G IPC's the piercing teeth can be made of tinned copper, tinned copper alloy with Brinell hardness greater than 80 HB. The minimum thickness of the tinning shall be at least 8 µm.
- For type D and E connectors the piercing system shall be "double teeth" enough to guarantee property connection according to types of conductors defined in section 5.

6.4 Fitting system

The IPC requirements are the same as described in the original document, with the addition of the following "Fitting system" requirements:

- For Type D and F IPC's, the screws and washers shall be made of hot-dip galvanized carbon steel or aluminum alloy.
- For Type E and G IPC's, screws, nuts and washers shall be made or stainless steel or aluminum alloy.
- For Type D and F IPC's, the shear head screw must have 13mm hexagonal heads.

7.2 Sample test

Test type N° 2 is updated whit the requirements for connectors D, E,F and G Types.

N°	Test	Test Method and Requirement
2	Dimensional and material verification IPC body material Material of the screws, nuts, and washers. Tinning thickness measurement	(See Clause **Errore. L'origine r iferimento non è stata trovata.**) - Polyester or polymeric material. - hot-dip galvanized carbon steel or aluminum alloy (for D and F Type). - stainless steel or aluminum alloy. (for E and G Type) - Thickness of the tinning > 8 µm - Measurement: Brinell hardness > 80 HB (for D and E Type)

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8 CONDITIONS OF SUPPLY

Manufacturers of IPC connectors must provide appropriate instructions and information covering the general conditions
during transport, storage and installation of the connectors. The documents must be in the local language of the destination country.

8.1 Marking

IPC types D, E, F and G must bear the following information:

- Manufacturer's trademark or logo
- Minimum and maximum cross-section for which the unit is suitable
- Date of manufacture.

8.2 Packaging

Each connector shall be delivered complete and assembled in individual, hermetically sealed bags. Each bag shall be printed with the following information:

- Manufacturer's trademark or logo;
- Country code and Enel type code;
- Product code or reference;
- Traceability code/batch number;
- Minimum and maximum cross-section for which the unit is suitable;
- Tightening torque.
- Date of manufacture.

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Common List for A, B and C Types.

Country Code	Type Code	Country	IPC Type	Main cable	Branch cable
0115-0307	GSCC020/1	AR	Type B	10-95	4-35
270030		CL			
0115-0306	GSCC020/2	AR	Type A	25-95	25-95
329753		BR-SP			
271397		CL			
276661 (Ex-T270464)	GSCC020/3	BR (RJ/CE)	Type A	35-150	35-150
329761		BR-SP			
271398		CL			
0115-0459	GSCC020/4	AR	Type A	16-95	4-35
275694 (Ex - T270465)		BR (RJ/CE)			
271403		CL			
251379		CO			
160854		ES			
276662 (Ex - T270466)	GSCC020/5	BR (RJ/CE)	Type A	50-150	6-54.6
270730		ES			
275001	GSCC020/7(*)	IT	Type A	35-70	6-54.6
275003	GSCC020/8(*)	IT	Type A	10-16	6-16
329318	GSCC020/9	BR-SP	Type C	50-150	2,5-35
990257					
329762	GSCC020/10	BR-SP	Type A	50-120	185-240
329764	GSCC020/11	BR-SP	Type A	6-35	6-35
276672 (Ex-T270467)	GSCC020/12	BR (RJ/CE)	Type A	16-150	1.5-6
275695 (Ex-T270468)	GSCC020/13	BR (RJ/CE)	Type A	25-120	25-120
329752	GSCC020/14	BR-SP	Type A	10-70	50-120
329754					
(*) IPC for Type III and Type IV cables with insulation and sheath from Global standard GSCC009					

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Common List for D, E, F and G Types.

Country Code	Type Code	Country	IPC Type	Main cable	Branch cable
270564	GSCC020/15	BR	Type D	10-25	35-50
270563	GSCC020/16	BR	Type D	25-95	25-95
270565	GSCC020/17	BR	Type D	35-150	35-150
270562	GSCC020/18	BR	Type D	16-95	4-35
270561	GSCC020/19	BR	Type D	50-150	6-54.6
270582	GSCC020/20	BR	Type D	50-120	185-240
270559	GSCC020/21	BR	Type D	6-35	6-35
270579	GSCC020/22	BR	Type D	16-150	1.5-6
270557	GSCC020/23	BR	Type D	25-120	25-120
270556	GSCC020/24	BR	Type D	10-70	50-120
270568	GSCC020/25	BR	Type E	10-25	35-50
270581	GSCC020/26	BR	Type E	25-95	25-95
270567	GSCC020/27	BR	Type E	35-150	35-150
270569	GSCC020/28	BR	Type E	16-95	4-35
270570	GSCC020/29	BR	Type E	50-150	6-54.6
270578	GSCC020/30	BR	Type E	50-120	185-240
270572	GSCC020/31	BR	Type E	6-35	6-35
270577	GSCC020/32	BR	Type E	16-150	1.5-6
270574	GSCC020/33	BR	Type E	25-120	25-120
270575	GSCC020/34	BR	Type E	10-70	50-120
270576	GSCC020/35	BR	Type F	50-150	2,5-35
270588	GSCC020/36	BR	Type G	50-150	2,5-35

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