Distribution Box for aerial application

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1 Scope

This Global Standard provides requirements for the supply of LV distribution boxes for aerial application to be used in the distribution networks of Enel Group listed below:

Enel Codensa	*Colombia*
Enel Distribución Perú	*Perú*
Edesur	*Argentina*
Enel Distribución Chile	*Chile*
Enel Distribuição Ceará	*Brazil*
Enel Distribuição Rio	*Brazil*
Enel Distribuição Goiás	*Brazil*
Enel Distribuição São Paulo	*Brazil*

2 Field of Application

This standard covers the design, manufacture, testing and supply of LV distribution boxes to be used for giving connections through aerial cables to the consumers.

3 Replaced Local Standards

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

- **Enel Codensa**: ET 925 “Caja de borneras para derivación”
- **Enel distribución Perú**: DNN-ET-083c “Cajas poliméricas de derivación y acometidas para zonas de corrosión moderada y severa”
- **Enel Distribuição Ceará**: ET-199/2012 R-03 “Caixa de derivação polimérica”
- **Enel distribución Chile**: EM-0128 Rev.01 “Caja de protección y derivación de empalmes para uso con regleta y conductor concéntrico de aluminio” and DMC-0011 Rev.00 “Conjunto barras fases y neutro trifásica con entrada lateral y salida cable concéntrico aluminio 10 mm^2”
- **Enel Distribuição Rio**: PM-R 199.01.0 “Caixa de Derivação – 160A", PM-R 199.02.0 “Caixa de Derivação – 160ª com barramento trifásico único”
- **Edesur:** DBEE09 Ver.04 “ Caja aislada para distribución de acometidas aéreas con cable concéntrico”, DBAL5890 Rev.01 “Regleta monofásica para acometida domiciliaria” and DBAL5891 Rev.01 “Regleta trifásica para acometida domiciliaria”

4 Reference laws and standards

4.1 Laws

Edesur

- Resolución ENRE N° 401/11
- Resolución ENRE N° 421/11
- AEA 95201 REGLAMENTACION PARA LÍNEAS ELÉCTRICAS AÉREAS EXTERIORES - LÍNEAS DE BAJA TENSIÓN
- AEA 95101 REGLAMENTACIÓN PARA LÍNEAS ELÉCTRICAS EXTERIORES EN GENERAL - INSTALACIONES SUBTERRÁNEAS DE ENERGÍA Y TELECOMUNICACIONES
- AEA 95704 REGLAMENTACIÓN PARA LA SEÑALIZACIÓN DE INSTALACIONESELÉCTRICAS EN LA VÍA PÚBLICA

Enel Codensa

- RETIE, Reglamento Técnico de Instalaciones Eléctricas
- CREG 070 Reglamento de Distribución de Energía Eléctrica

Enel Distribución Perú

- Código Nacional de Electricidad – Suministro – 2011 (CNE)
- Norma Técnica de Calidad de los Servicios Eléctricos (NTCSE)

Enel Distribución Chile

- NCH Elec. 4/2003 Instalaciones de consumo en baja tensión
- - NSEG 5 E.n.71 Reglamento de Instalaciones Eléctricas de Corrientes Fuertes

4.2 Standards

- IEC 60529 Degrees of protection provided by enclosures (IP Code)
- IEC 60662 Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)
- IEC 60664-1 Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests
- IEC 60695-11-10 Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods.
- IEC 61439-1 Low-voltage switchgear and controlgear assemblies - Part 1: General rules
- IEC 61439-5 Low-voltage switchgear and controlgear assemblies - Part 5: Assemblies for power distribution in public networks

- IEC 62208 Empty enclosures for low-voltage switchgear and controlgear assemblies - General requirements
- ISO 2859-0 Sampling procedures for inspection by attributes -- Part 0: Introduction to the ISO 2859 attribute sampling system
- ISO 2859-1 Acceptance sampling procedures based on the allocation of priorities principle (APP) -- Part 1: Guidelines for the APP approach

5 Service conditions

The equipment shall be suitable for satisfactory continuous operation under the following conditions:

Condition	Argentina	Brazil	Colombia	Chile	Peru
Maximum ambient temperature [°C]	45	40	40	40	35
Minimum Temperature [°C]	-10	0	-5	-5	15
Relative Humidity [%]	100	>80	20-100	100	70-99
Maximum altitude above sea level [m]	0	1000	2700	1000	300
Pollution degree (IEC 60664-1)	4				
Wind pressure [N/m^2]	360	700	300	40	386

Table 1 Operating conditions

6 Distribution box general requirements

Rated voltage (U_n)	0,6/1,0 kV
Rated current (I_{nA})	160 A
Rated short-time withstand current (I_{CW})	16 kA @ 0,5 s
Rated impulse withstand voltage (U_{imp})	4,0 kV
Income phase cross-section range	10 – 35 mm^2
Income neutral cross-section range*	10 – 54,6 mm^2
Service line phase cross-section range	1,5 – 25 mm^2
Service line neutral cross-section range*	1,5 – 25 mm^2
No. of outgoing circuits	4 three-phase or 12 single-phase
For Enel Peru neutral is not required (Insulated neutral distribution system)	

Table 2 General requirements

7 Design and manufacture

7.1 Enclosure

The enclosure is fabricated in two part, the main body and the door.

The enclosure shall be suitable for operating under unfavourable weather conditions such as high humidity, intense solar radiation, high pollution and high salinity levels.

In addition, it shall be:

- High impact resistance
- Self-extinguishing
- Non-hygroscopic
- High chemical resistance

The enclosure shall be manufactured with polycarbonate.

The enclosure shall be suitable for the installation of the bus bar system described in 7.2. In addition, it shall be properly designed for one single-phase or three-phase input and provision for 4 three-phase or 12 single-phase outputs. For each incoming and outgoing circuit multi-range cable grommets made from PVC or rubber shall be provided. The cable grommets shall be adaptable for cables with diameters from 8 mm to 30 mm.

The enclosure shall be IP 55 and IK 10.

The surface of the enclosure shall be smooth and uniform without sharp edges or burrs.

The conductive parts inside the enclosure shall not be accessible from the outside when the door is closed.

The colour of the material shall be integrated during the manufacturing process (RAL 7001)

The application of metal inserts, if any, shall be carried out during injection/stamping process of the enclosure. Applying inserts afterwards is not permitted as it could produce cracks or deformation of the enclosure.

A vertical folding door shall be used. The opening of such door shall be at least 120 ° from the closed position.

To avoid the door being closed during operation a blocking system shall be installed. For instance, a hinge system adjusted to stop in a fixed position at least 120 ° from the closed position, see Figure 1.

The door shall be equipped with a spring lock system, that allows the door to be closed pressing firmly on it. Opening is made by rotating the key as indicated in Figure 5. The construction drawings of the lock and the key are indicated in Figure 5 as well.

Unless otherwise indicated, the enclosure shall be suitable for both pole mounting and wall mounting.

For pole mounting the enclosure could be fixed:

1) using ¾'' stainless steel cable ties (type "band it") for round poles.

2) using a central screw (L=11” with 7” thread) with hexagonal bolt (D=1/2”) and plain washers for reinforced vibrated concrete poles (HVH), in Figure 2 a not bidding drawing is shown.

The enclosure shall be equipped in the back with eyelets that allow the cable ties to pass through. Eyelets made with the same material of the enclosure shall be properly centred and produced during the manufacturing process.

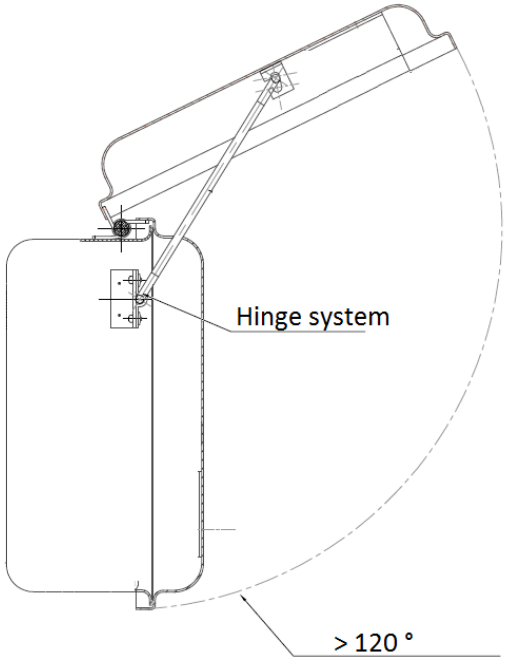

Figure 1 Blocking system to maintain the door open

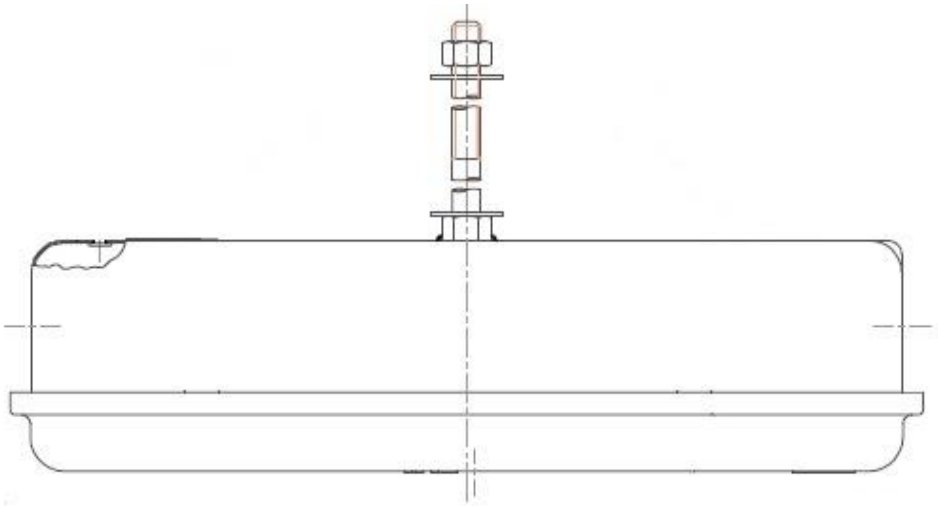

Figure 2 Indicative drawing for H poles installation (Not bidding)

The maximum dimension shall be those indicated in Figure 3

One hole for the incoming circuit shall be provided to arrange cables up to 3x35+54,6 mm^2. For the outgoing circuits cables holes shall be suitable for cables up to 3x25+54,6 mm^2. In Figure 4 a non-binding design indicating the maximum dimensions to consider for such holes is shown. The box shall be suitable for cables described in standards GSCC009 and E-BT-003.

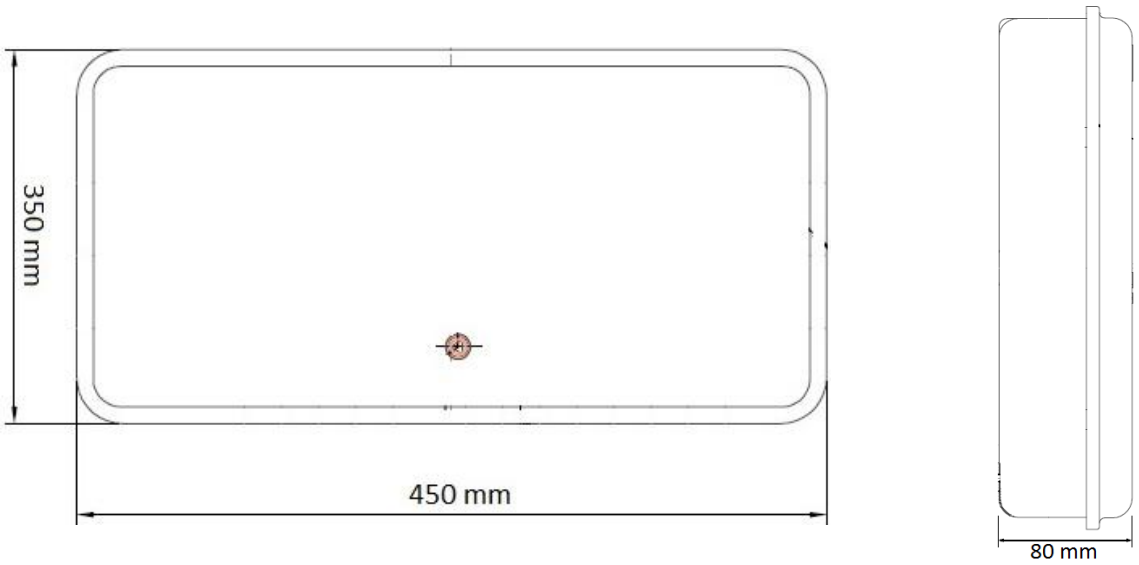

Figure 3 Enclosure Maximum dimensions

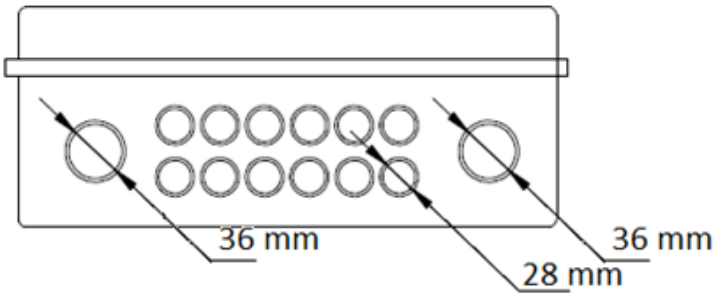

Figure 4 Incoming and outgoing holes maximum dimensions

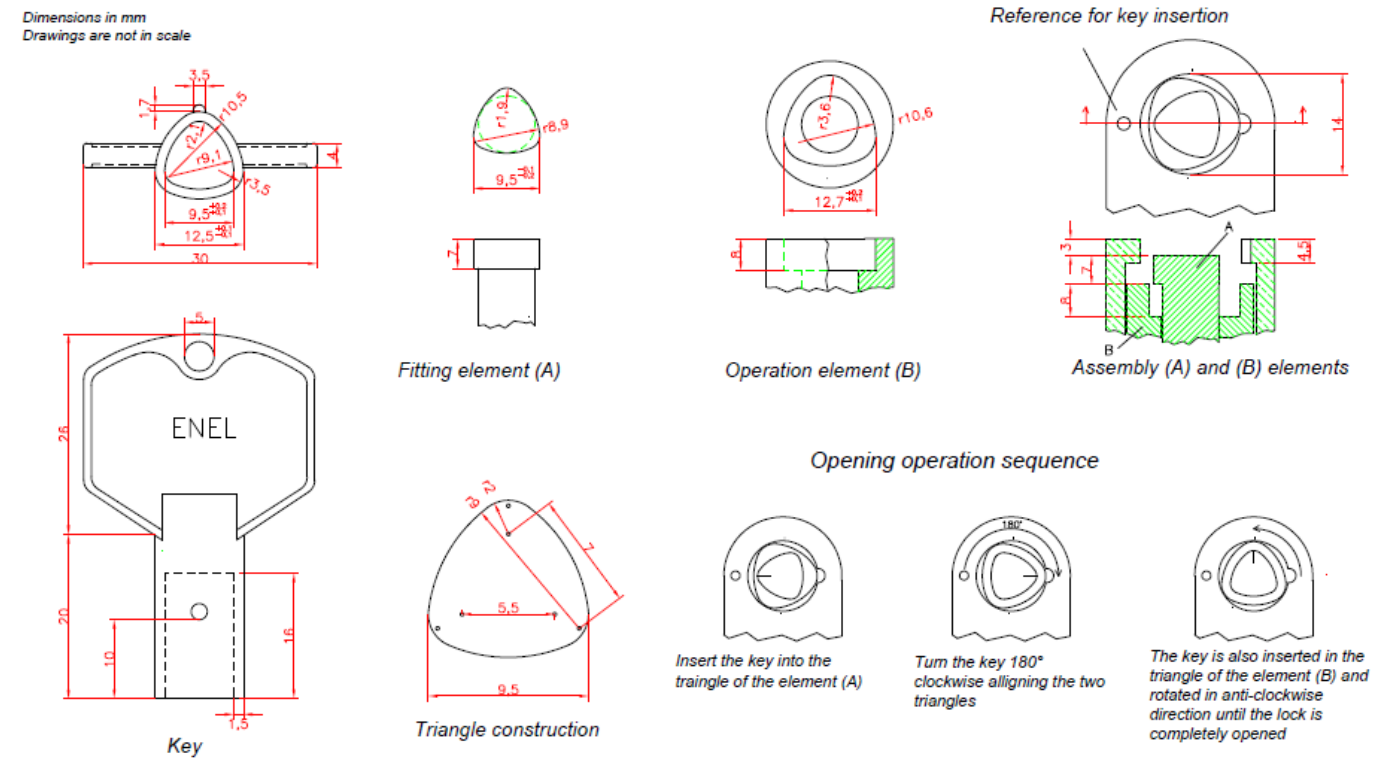

Figure 5 Locking system and key

7.2 Bus Bars and Connections

The bus bar shall be suitable for 1 three-phase income and 4 three-phase or 12 single-phase service cables outputs.[1]

Each bus bar shall have a phase and neutral identifier using different colours.

For **Enel Codensa** the colours shall be in compliance with RETIE paragraph 6.3, i.e. yellow, blue and red.

For **Brazil** the colours shall be in compliance with NBR 5410.

The bus bar system shall be made of copper with minimum conductivity same as 95% IACS at 20 °C. The bus bars shall be tinned with 8 µm minimum thickness.

The bus bars shall be mounted on suitable size support insulators, which shall be tightened to the enclosure.

The bus bars terminals shall be designed with body + bolt-spring-plate system (see Figure 6) or spring action contact (see Figure 7).

The material of the terminals shall be made of brass (58% Cu – 40% Zn – 2% Pb) and tinned with 8 µm minimum thickness.

Terminals where connection is made through the direct contact between a screw and the peeled conductor are not permitted.

The income terminals shall be design to accommodate Class 1 and Class 2 conductors made of aluminium or copper with cross-section from 10 mm^2 to 35 mm^2 for phase terminals and 10 mm^2 to 54,6 mm^2 for neutral terminals.

The outcome terminals shall be design to accommodate Class 1 and Class 2 conductors made of aluminium or copper with cross-section from 1,5 mm^2 to 25 mm^2.

For the spring action terminals the operations shall be:

To connect:

1) Insert cable in the terminal.
2) Click or turn operation to discharge spring

To disconnect:

1) Rotate operation with toll to pull , charge and block the spring
2) Remove the cable.

A transparent cover made of polycarbonate shall be provided. Such cover shall be removable and unmissable.

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[1] Three-phase circuits 4 cores
Single-phase circuits 2 cores

Bolts, nuts, washers, screws shall be made of stainless steel.

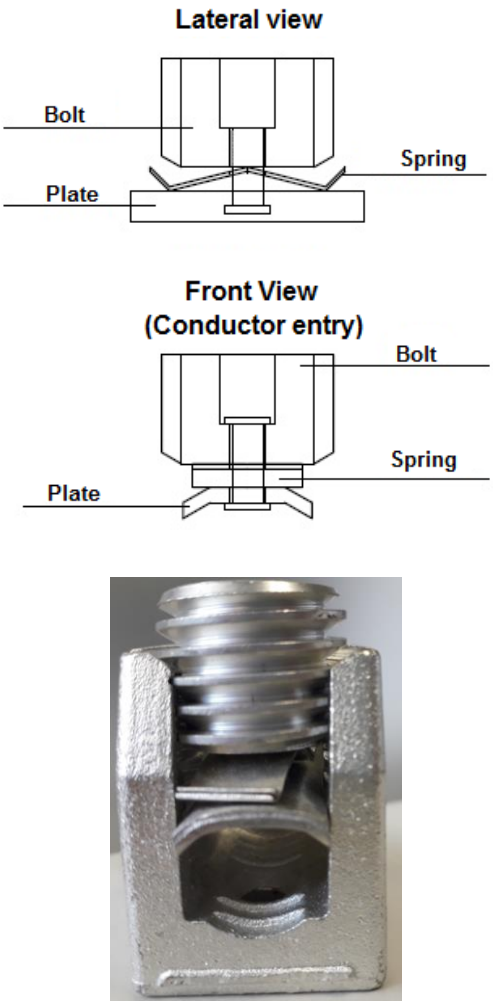

Figure 6 Bolt-spring-plate terminal system

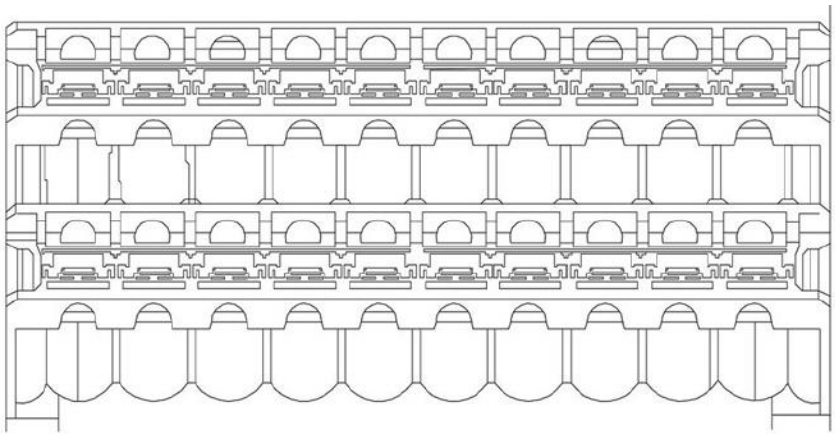

Figure 7 Spring action contact terminal system

8 Tests

8.1 Enclosure type tests

The enclosures under test shall be mounted and installed as in normal use according to the conditions indicated herein.

The following **type test** shall be performed:

N°	Test	Test Method and Requirement
1	Visual examination	
2	Dimensional verification	
3	Axial loads of metal inserts	IEC 62208 sub-clause 9.3
4	Degree of protection against external mechanical impacts (IK code)	IEC 62208 sub-clause 9.7 **(IK 10)**
5	Degree of protection (IP code)	IEC 62208 sub-clause 9.8 **(IP 55 using cable grommets and the minimum cross-sections for income and outcome cables**)
6	Thermal stability	IEC 62208 sub-clause 9.9.1
7	Resistance to normal heat	IEC 62208 sub-clause 9.9.2
8	Resistance to abnormal heat and to fire	IEC 62208 sub-clause 9.9.3
9	Dielectric strength	IEC 62208 sub-clause 9.10
10	Resistance to ultra-violet (UV) radiation	IEC 62208 sub-clause 9.12
11	Resistance to corrosion	Severity test B IEC 62208 sub-clause 9.12
12	Self-extinguishing properties	IEC 60695-11-10 **(V-0)**

8.2 Distribution box type tests

The test described in this clause are intended to verify the compliance of the design of the “complete” system with the requirements stated herein, i.e. the distribution box (enclosure, bus bars, etc.).

N°	Test	Test Method and Requirement
1	Verification of resistance of insulating materials to abnormal heat and fire due to internal electric effects	IEC 61439-1 sub-clause 10.2.3.2
2	Clearances and creepage distances	IEC 61439-1 sub-clause 10.4
3	Power-frequency withstand voltage	IEC 61439-1 sub-clause 10.9.2
4	Verification of temperature rise	IEC 61439-1 sub-clause 10.10 By testing
5	Short-circuit withstand strength	IEC 61439-1 sub-clause 10.11 By testing

8.3 Acceptance Tests

The following acceptance tests shall be performed.

N°	Test	Test Method and Requirement
1	Visual examination	-
2	Dimensional verification	-
3	Installation test	The bus bar shall be mounted within the enclosure. Incoming and outgoing circuits shall be fixed to the bus bar
	Degree of protection (IP code)	IEC 62208 sub-clause 9.8 **(IP 55 using cable grommets and the minimum cross-sections for income and outcome cables**)
	Degree of protection against external mechanical impacts (IK code)	IEC 62208 sub-clause 9.7 **(IK 10)**
	Power-frequency withstand voltage	IEC 61439-1 sub-clause 10.9.2

8.4 Sampling

In order to determine acceptability of a lot, an inspection by attributes following a simple sampling plan shall be performed, in compliance with standard ISO 2859-0 and ISO 2859-1.

Specifically, AQL=1,5%, level II, rejecting any “minor, major or critical” defect in the inspection.

The costs of rejected materials will be charged to the bidder. The approval or rejection of each one of the samples will be according to what is required in standard ISO 2859-1 for each one of the trials. In detail, if a lot doesn't comply with what is

Size of the lot	Numbers of samples	Acceptable Level	Rejection Level
2 - 8	2	0	1
9 - 15	3	0	1
16 - 25	5	0	1
26 - 50	8	0	1
51 - 90	13	0	1
91 - 150	20	1	2
151 - 280	32	1	2
281 - 500	50	2	3
501 - 1200	80	3	4
1201 - 3200	125	5	6
3201 - 10000	200	7	8
>10000	315	10	11

Table 3 Samples and Grade of Acceptance to Each of the Trials

9 Conditions of supply

The installation manual and maintenance manual shall be provided.

The material shall be supplied in cardboard boxes capable of holding its weight.

The supplier shall be certificated with ISO 9001.

10 Marking

The body and the door shall be marked during the manufacturing process with the following information:

a) Supplier Name
b) Rated Current, Rated Voltage, Nominal toque of the terminals (if apply)

c) IP Code

d) Month/Year of production

e) QR code

11 List of components

The list of components included in the global standard is reported in the following table:

Distribution Company (Country)	Country code	Type Code
Enel Distribuição Rio (Brazil) Enel Distribuição Ceará (Brazil) Enel Distribuição Goiás (Brazil) Enel Distribuição São Paulo (Brazil)	T160008	GSCC019/1
Enel Distribución Chile (Chile)	160006	GSCC019/1
Enel Distribución Colombia (Colombia)	T160089	GSCC019/1
Enel Distribución Perú (Perù)	160007	GSCC019/1
Edesur (Argentine)	0112-0568	GSCC019/1

Table 4 Material codes for LV distribution box

12 Check list

Item	Description	Unit	Required	Offered
1	**GENERAL INFORMATION**			
1.1	Supplier	-	Informative	
1.2	Factory	-	Informative	
1.3	Country			
2	**MAIN FEATURES**			
2.1	Distribution Company and Country	-		
2.2	Country Code	-		
2.3	GS Type Code			
2.4	Rated voltage (Un)	[kV]		
2.5	Rated current (InA)	[A]	160	
2.6	Rated short-time withstand current (I_{CW})	[kA]	16 kA @ 0,5 s	
2.7	Rated impulse withstand voltage (U_{imp})	[kV]	4,0	
2.8	Enclosure Material	-	Polycarbonate	
2.9	IP code	-	IP55	
2.10	IK code	-	IK 10	
2.11	Busbar material	-	Cu 8 µm tinned	
2.12	Terminal type	-	Spring action or bolt-spring-plate	
2.13	Terminals material		58% Cu – 40% Zn – 2% Pb 8 µm tinned	
2.14	Income terminals Phase cross-section (min-max) Neutral: cross-section (min-max)	mm^2	 (10-35) (10-54,6)	
2.15	Outcome terminals Phase: cross-section (min-max) Neutral: cross-section (min-max)	mm2	 (1,5-25) (1,5-25)	

Local Section A – Enel Codensa

7 Design and manufacture

Besides the indication of the common section, for Enel Codensa the enclosure shall be suitable for installation as indicated in Figure 8.

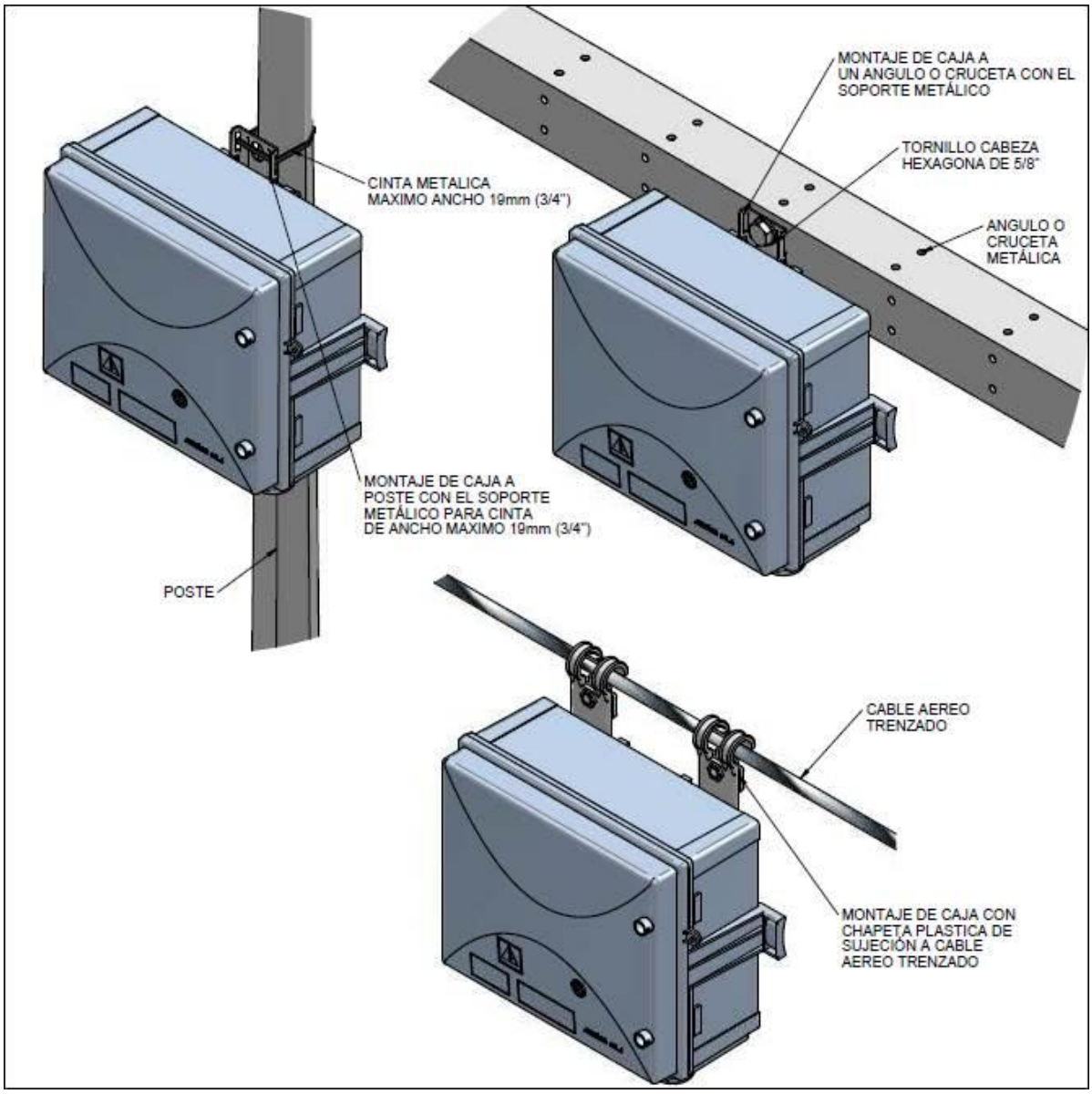

Figure 9 Enel Codensa Types of installation

Suitable holes for anti-tamper seals shall be provided.

9 Conditions of supply

For Enel Codensa is mandatory to provide the Product conformity certificate under RETIE issued by and ONAC organization.