

**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (CP)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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**THE HEAD OF NETWORK COMPONENTS**  
**Fabrizio GASBARRI**

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## 1 DOCUMENT AIMS AND APPLICATION AREA

The aim of this document is to provide technical requirements for the supply of High Voltage Current Transformers of the Enel Group Distribution Companies, listed below:

| Country        | Distribution Company                                                             |
|----------------|----------------------------------------------------------------------------------|
| Argentina (AR) | Edesur                                                                           |
| Brazil (BR)    | Enel Distribuição Rio<br>Enel Distribuição Ceará<br>Enel Distribuição São Paulo  |
| Colombia (CO)  | Enel Colombia                                                                    |
| Italy (IT)     | e-distribuzione                                                                  |
| Peru (PE)      | Enel Distribución Perú                                                           |
| Romania (RO)   | Enel Distributie Banat<br>Enel Distributie Dobrogea<br>Enel Distributie Muntenia |
| Spain (ES)     | e-distribución                                                                   |

Table 1CP

### 1.1 Related Documents to be Implemented at Country Level

Additional prescriptions or integration to the main **Common Part (CP)** are reported in the respective **Local Sections** with the same corresponding clause or sub-clause number, providing the specific requirements of each Enel Group Distribution Company at country level.

Please, note that in case of unclear information or contradictions, the Local Section prevails over the Common Part.

Anyway, each Enel Grids Company can issue, under the supervision of Enel Grids Global Network Components a detailed document, according to the provisions of the present document and in case of specific needs.

## 2 DOCUMENT VERSION MANAGEMENT

| Version | Date       | Main changes description              |
|---------|------------|---------------------------------------|
| 0       | 30/12/2022 | Issuing of Global Enel Grid – GSCT013 |
|         |            |                                       |

## 3 UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

- Global Infrastructure and Networks: Engineering & Construction/Network Components Standardization

Responsible for authorizing the document:

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- Global Infrastructure and Networks: Head of Engineering & Construction unit
- Global Infrastructure and Networks: Head of Health, Safety, Environment and Quality unit.

#### **4 REFERENCES**

- *Code of Ethics of Enel Group.*
- *Enel Human Right Policy.*
- *The Enel Group Zero Tolerance of Corruption (ZTC) Plan.*
- *Organization and management model as per Legislative Decree No. 231/2001.*
- *Enel Global Compliance Program (EGCP).*
- *Integrated Policy for Quality, Health and Safety, Environment, Anti-Bribery, and Information Security*
- *ISO 9001:2015 - Quality Management System – Requirements.*
- *ISO 14001:2015 - Environmental Management System - Requirements with guidance for use.*
- *ISO 45001:2018 - Occupational Health and Safety Management System - Requirements with guidance for use.*
- *ISO 37001:2016 - Anti-bribery Management System - Requirements with guidance for use*

##### **4.1 Enel Grids International Laws**

Here below is reported the list of applicable reference laws applicable for European countries:

- *Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC and amending Regulation (EC) No 1907/2006.*
- *Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).*
- *Commission Directive 98/98/EC, of 15 December 1998 adapting to technical progress for the 25<sup>th</sup> time Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging, and labelling of dangerous substances.*
- *Directive 2008/98/EC of the European Parliament and of the council of 19 November 2008 on waste and repealing certain Directives.*
- *Council Directive 1999/13/EC, of 11 March 1999, on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations.*
- *CE Marking (Directive 2006/42/EC)*

##### **4.2 Enel Grids Country Reference Laws**

###### **4.2.1. Argentina**

- *Ley 19587: - Higiene y seguridad en el trabajo.*
- *Law No. 19587, on Hygiene and Safety at Work and its Regulatory Decree 351/79.*
- *Ley 24051: - Residuos peligrosos*

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**4.2.2. Brazil**

- *NR-10 – Segurança em instalações e serviços em eletricidade.*
- *Resolução ANP nº 36 de 05.12.2008.*

**4.2.3. Colombia**

- *RETIE – Reglamento Técnico de Instalaciones Eléctricas.*
- *Ley 400 de 1997 (Modificada Ley 1229 de 2008).*
- *Decreto 926 del 19 de marzo de 2010.*
- *NSR – 10 (Reglamento Colombiano De Construcción Sismo Resistente).*

**4.2.4. Italy**

- *“D.lgs. n. 81 of the 9 of April 2008 -Testo unico in materia di sicurezza sul lavoro” and subsequent modifications.*
- *Nota Operativa PVR001 – Rev. 2 – Ott. 2012 - Gestione Garanzie dei materiali di ENEL Distribuzione.*
- *GUI 101 “Caratteristiche generali e prescrizioni di impiego del pallet in legno da utilizzare per imballo di trasporto”.*
- *D.lgs. n. 52/1997 n. 52 - Classificazione, imballaggio ed etichettatura delle sostanze pericolose*
- *D.lgs. n. 209/1999 “Attuazione della direttiva 96/59/CE relativa allo smaltimento dei policlorodifenili e dei policlorotrifenili”*
- *D.M. 11/10/2001 “Condizioni per l'utilizzo dei trasformatori contenenti PCB in attesa della decontaminazione o dello smaltimento”.*
- *D.M. 28/04/1997 “Attuazione dell'art. 37, commi 1 e 2, del decreto legislativo 3 febbraio 1997, n. 52, concernente classificazione, imballaggio ed etichettatura delle sostanze pericolose”.*
- *Direttiva 98/98/CE recante venticinquesimo adeguamento al progresso tecnico della direttiva 67/548/CEE del Consiglio concernente il ravvicinamento delle disposizioni legislative, regolamentari ed amministrative relative alla classificazione, all'imballaggio e all'etichettatura delle sostanze pericolose.*
- *“Decreto legislativo 3 dicembre 2010, n. 205 recante Disposizioni di attuazione della direttiva 2008/98/CE del Parlamento europeo e del Consiglio del 19 novembre 2008 relativa ai rifiuti” and subsequent modifications/integrations.*

**4.2.5. Peru**

**4.2.6. Romania**

- *Prescriptia Energetica PE 101/85 – Normativ pentru construcția instalațiilor electrice de conexiuni și transformare cu tensiuni peste 1 kV.*
- *GUI 101RO “Caracteristicile generale și cerințele de utilizare ale paletului de lemn care urmează să fie utilizat pentru ambalarea de transport.*
- *L 319/2006 – Occupational health and safety act, as amended and supplemented.*
- *L 265/2006 - Environmental Protection Act, as amended and supplemented.*

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#### 4.2.7. 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;*
- *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.*
- *Real Decreto 679/2006, de 2 de junio, que regula la gestión de los aceites industriales usados - SIGAUS: Sistema Integrado de Gestión (SIG) de Aceites Usados (AUS), que garantiza la recogida y correcto tratamiento del aceite industrial usado de toda España.*

#### 4.3 Enel Grids International Reference Standards

Reference documents listed below (amendments included) shall be the edition in-force at the contract date.

|                |                                                                                                                                                                                                                            |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IEC 61869-1    | Instrument transformers - Part 1: General Requirements                                                                                                                                                                     |
| IEC 61869-2:   | Instrument transformers - Part 2: Additional Requirement for Current Transformers                                                                                                                                          |
| IEC 60270      | High-voltage test techniques – Partial Discharge Measurements                                                                                                                                                              |
| IEC 60068-3-3  | Environmental testing - Part 3-3: Supporting documentation and guidance - Seismic test methods for equipment                                                                                                               |
| IEC 60071-1    | Insulation co-ordination – Part 1: Definitions, principles, and rules                                                                                                                                                      |
| IEC 60071-2    | Insulation co-ordination - Part 2: Application guidelines                                                                                                                                                                  |
| IEC 60507      | Artificial pollution tests on high-voltage ceramic and glass insulators to be used on A.C. systems                                                                                                                         |
| IEC 60695-2-10 | Fire hazard testing - Part 2-10: Glowing/hot-wire based test methods - Glow-wire apparatus and common test procedure                                                                                                       |
| IEC 62155      | Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1 000 V                                                                                 |
| IEC 60137      | Insulated bushings for alternating voltages above 1000 V                                                                                                                                                                   |
| IEC 61462      | Composite hollow insulators - Pressurized and unpressurized insulators for use in electrical equipment with rated voltage greater than 1 000 V - Definitions, test methods, acceptance criteria and design recommendations |
| IEC 60529      | Degrees of protection provided by enclosures (IP Code)                                                                                                                                                                     |
| IEC 60815      | Guide for the selection and dimensioning of high-voltage insulators for polluted conditions                                                                                                                                |
| IEC 60296      | Fluids for electrotechnical applications - Unused mineral insulating oils for transformers and switchgear.                                                                                                                 |
| IEC 62770      | Fluids for electrotechnical applications - Unused natural esters for transformers and similar electrical equipment.                                                                                                        |
| IEC 61099      | Insulating liquids - Specifications for unused synthetic organic esters for electrical purposes                                                                                                                            |
| IEC 60422      | Mineral insulating oils in electrical equipment - Supervision and maintenance guidance                                                                                                                                     |

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|                  |                                                                                                                                                                                          |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IEC 60599        | Mineral oil impregnated in electrical equipment in service - Guide to the interpretation of dissolved and free gases analysis.                                                           |
| IEC 61198        | Mineral insulating oils - Methods for the determination of 2-furfural and related compounds.                                                                                             |
| IEC 60666        | Detection and determination of specified additives in mineral insulating oils.                                                                                                           |
| IEC 62535        | Insulating liquids - Test method for detection of potentially corrosive sulphur in used and unused insulating oil.                                                                       |
| IEC 60721-2-1    | Classification of environmental conditions - Part 2-1: Environmental conditions appearing in nature - Temperature and humidity.                                                          |
| ---0---          |                                                                                                                                                                                          |
| ISO 12944 series | Paints and varnishes - Corrosion protection of steel structures by protective paint systems.                                                                                             |
| ISO 19840        | Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces. |
| ISO 8501         | Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness.                                                            |
| ISO 2178         | Non-magnetic coatings on magnetic substrates - Measurement of coating thickness - Magnetic method.                                                                                       |
| ISO 14713 -1&2   | Zinc coatings - Guidelines and recommendations for the protection against corrosion of iron and steel in structures -                                                                    |
| ISO 1461         | Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods.                                                                                      |
| ---0---          |                                                                                                                                                                                          |
| ASTM A123        | Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products                                                                                                 |
| ASTM A153        | Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware                                                                                                             |
| ASTM 1275-15     | Standard Test Method for Corrosive Sulphur in Electrical Insulating Liquids                                                                                                              |
| ---0---          |                                                                                                                                                                                          |
| EN 60068-3-3     | Environmental testing - Part 3: Guidance - Seismic test methods for equipment.                                                                                                           |
| ---0---          |                                                                                                                                                                                          |
| IEEE Std. C57.13 | Standard Requirements for Instrument Transformers                                                                                                                                        |
| IEEE Std. 693    | Recommended Practice for Seismic Design of Substations                                                                                                                                   |

When the date of issue is not mentioned in the list above, the date to be taken as reference is that of the standard in force when the present document has been issued.

#### **4.4 Enel Grids Country Reference Standards and other Relevant Documents**

##### **4.4.1. Argentina**

The equipment and/or materials will therefore be designed to operate in a tropical climate and where the atmosphere has medium level contamination, according to table I of the IRAM 2405 and IEC 60815 standards.



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- IRAM 2289 Cables agrupados en haces.
- IRAM 2405 Aisladores para uso en condiciones de contaminación ambiental.
- IRAM 5106 Arandelas de presión comunes.
- IRAM 5107 Arandelas planas redondas.
- IRAM 5139 Tuercas hexagonales con rosca métrica ISO.
- IRAM 5305 Tornillos de cabeza hexagonal totalmente roscados.
- IRAM 9590 Carretes de madera para cables.
- IRAM-DEF D 1054 Carta de colores para pinturas de acabado brillante y mate

#### **4.4.2. Brazil**

- ABNT NBR 5426. Planos de amostragem e procedimentos na inspeção por atributos
- ABNT NBR 6856. Transformador de corrente - especificação e ensaios
- ABNT NBR 15218. Critérios para qualificação e certificação de inspetores de pintura industrial
- SIS 05-5900. Pictorial Surface Preparation Standards for Painting Steel Surfaces
- ABNT NBR 10023. Transformador de corrente com tensão máxima igual ou superior a 72,5 kV - Características Específicas – Padronização
- ABNT NBR 11388. Sistemas de pintura para equipamentos e instalações de subestações elétricas
- Fornecimento de Energia Elétrica – Tensão de Subtransmissão 88/138 kV, da ELETROPAULO
- Especificação Técnica EST-027 – Código de Barras para Equipamentos de Medição, da ELETROPAULO
- ABNT NBR7397. Produto de aço e ferro fundido galvanizado por imersão a quente - determinação da massa do revestimento por unidade de área - método de ensaio
- ABNT NBR7398. Produto de aço ou ferro fundido galvanizado por imersão a quente - verificação da aderência do revestimento - método de ensaio
- ABNT NBR7399. Produto de aço ou ferro fundido galvanizado por imersão a quente - verificação da espessura do revestimento por processo não destrutivo – método de ensaio
- ABNT NBR7400. Galvanização de produtos de aço ou ferro fundido por imersão a quente - verificação da uniformidade do revestimento - método de ensaio
- ABNT NBR 11003. Tintas – Determinação da aderência
- ABNT NBRIEC60529. Graus de proteção providos por invólucros (códigos IP)
- ABNT NBRIEC60694. Especificações comuns para normas de equipamentos de manobra de alta tensão e mecanismos de comando
- ABNT NBR10576. Óleo mineral isolante de equipamentos elétricos - diretrizes para supervisão e manutenção



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- NBR15422. Óleo vegetal isolante para equipamentos elétricos
- ABNT NBR11388. Sistemas de pintura para equipamentos e instalações de subestações elétricas
- ABNT NBR13882. Líquidos isolantes elétricos - determinação do teor de bifenilas policloradas (PCB)
- TES-EM-002 – TC e TP – Distância de Segurança

**4.4.3. Colombia**

- Resolución CREG038 de 2014: Código de Medida
- Reglamento Colombiano de Construcción Sismo Resistente (NSR-10. Norma Sismo Resistente)

**4.4.4. Italia**

**4.4.5. Peru**

**4.4.6. Romania**

The current transformers shall comply with the provisions of the "Official list of measuring instruments subject to mandatory state metrological control" approved by the Order of the Romanian Bureau of Legal Metrology in force and will have the model approval obtained from BRML.

Since current transformers are an integral part of a measurement group classified according to art. 7 of the Electricity Measurement Code, the accuracy class of the measurement windings shall comply with the specific provisions.

**4.4.7. Spain**

- UNE 23727. Ensayos de reacción al fuego de los materiales de construcción. Clasificación de los materiales utilizados en la construcción.
- UNE-EN 60085. Aislamiento eléctrico. Evaluación y designación térmica.
- UNE-EN 60505. Evaluación y calificación de los sistemas de aislamiento eléctrico.

**Note:**

For items not covered by the above-mentioned standards and technical specification, the SUPPLIER may adopt other standards provided that these documents be indicated explicitly in the proposal, which shall be submitted for approval to the purchaser.

## **5 ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY**

Value Chain/Process Area: Networks Management

Macro Process: Materials management

Process: Network components standardization

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## 6 DEFINITIONS AND ACRONYMS

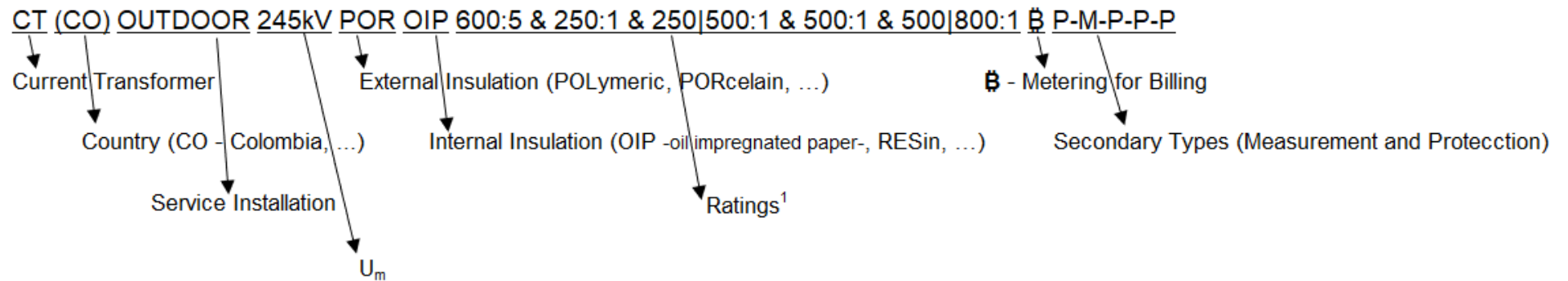
| Acronym and Key Words    | Description                                                                                                                                                                                                                                                                                                                   |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IEC                      | International Electrotechnical Commission.                                                                                                                                                                                                                                                                                    |
| ISO                      | International Organization for Standardization.                                                                                                                                                                                                                                                                               |
| IEEE                     | Institute of Electrical and Electronics Engineers.                                                                                                                                                                                                                                                                            |
| ASTM                     | American Society for Testing and Materials.                                                                                                                                                                                                                                                                                   |
| AQL                      | Acceptable Quality Limit.                                                                                                                                                                                                                                                                                                     |
| IP                       | Ingress Protection.                                                                                                                                                                                                                                                                                                           |
| ABNT                     | Brazilian technical standard association.                                                                                                                                                                                                                                                                                     |
| NBR                      | Brazil's standard.                                                                                                                                                                                                                                                                                                            |
| SIS                      | Swedish institute for standards.                                                                                                                                                                                                                                                                                              |
| NTE                      | Technical local standard of DSO: AES ELETROPAULO                                                                                                                                                                                                                                                                              |
| List of Components       | List of devices intended to provide an easy component selection of technicians                                                                                                                                                                                                                                                |
| Datasheets               | A complete data sheet of a specific component of the standard                                                                                                                                                                                                                                                                 |
| Check List               | A form, associated to the datasheet for these components, to be filled out by the manufacturer as a Technical Offer or specific Supplier-Datasheet.                                                                                                                                                                           |
| Current Transformer (CT) | Instrument transformer designed for use in the measurement or control of current. The current transformer's primary winding, which may be a single turn or bus bar, is connected in series with the load. It is normally used to reduce primary current by a known ratio to within the range of a connected measuring device. |
| Rated Primary current    | Value of the primary current on which the performance of the transformer is based.                                                                                                                                                                                                                                            |
| Rated Secondary current  | Value of the secondary current on which the performance of the transformer is based.                                                                                                                                                                                                                                          |

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**Application Areas**

Perimeter: *Global*  
Staff Function: -  
Service Function: -  
Business Line: *Enel Grids*

Short description adopted for this technical specification (Datasheets & Check List):



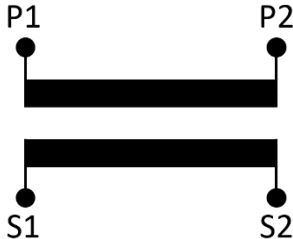
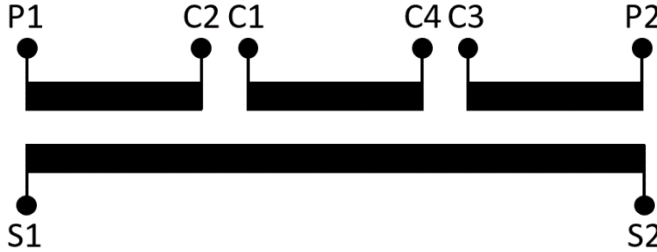
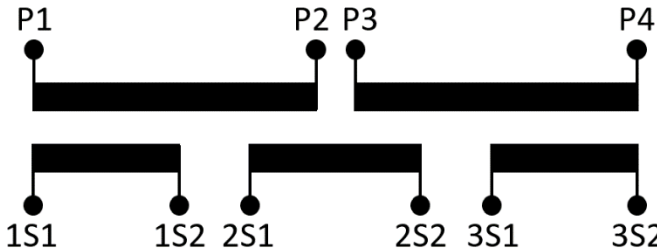
<sup>1</sup> Ratings Symbology

- / Indicates the rated current ratios
- | Indicates the fact that there are several primary currents by changing secondary turns.
- : Indicates the rated current ratio (for CO, BR)
- Indicates current ratios achieved by changing primary turns -series, parallel, both-
- x To join cores with the same rating or several primary currents by changing primary turns -series, parallel, both-
- & To join different cores

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Examples:

| Turns Ratios - Nomenclature | Scheme                                                                               | Description                                                                                                          |
|-----------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| 300/1<br>or<br>1200:5       |    | Current transformer with one primary and one secondary winding.                                                      |
| 100-200-400/5               |   | Current transformer with three primary windings for serial, parallel or mixed connection, and one secondary winding. |
| 3x(300-600)/1               |  | Current transformer with two primary windings for serial or parallel connection and three secondary windings.        |

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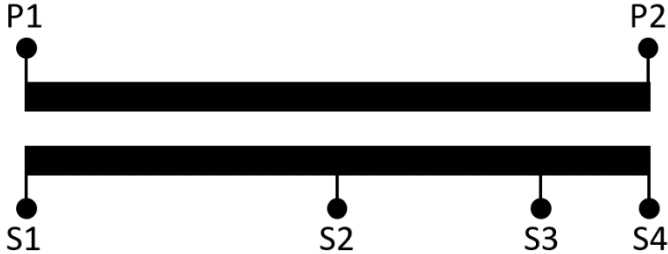
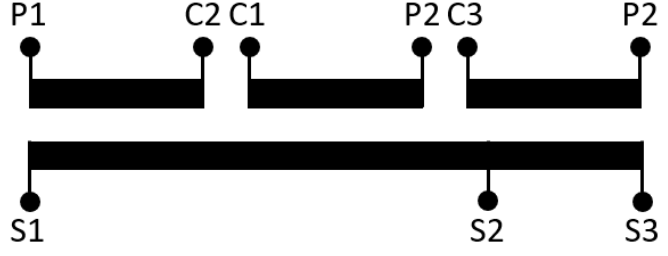
| Turns Ratios - Nomenclature | Scheme                                                                              | Description                                                                                                                                                                                                          |
|-----------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 800 1250 1600:1             |   | Current transformer with one primary and one secondary winding. The different primary currents are obtained by changing connections in the secondary winding.                                                        |
| 200-400-800 1200/5          |  | Current transformer with three primary windings for serial, parallel or mixed connection and having one different primary current obtained by changing the secondary connection. One secondary winding with tapings. |

Table 2CP

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**HV CURRENT TRANSFORMERS (CP)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

## 7 DESCRIPTION (COMMON PART – (CP))

This Common Part (CP) compiles the main common technical characteristics that apply to the components under this technical specification.

This document is structured as follows:

- The “Common Part” with the common requirements for all the Enel Group Distribution Companies.
- The “List of Components” (Annex A) with the Type Code/GS Code for each transformer of the Enel Group Distribution Companies. The “List of Components” corresponding to each Local Section may be revised without revision of this Standard.”
- The “Datasheets” (information at Annex B) with the main ratings and requirements of each transformer type. Datasheets for the required transformers are attached to the Local Sections.
- The “Local Sections” with the specific requirements of each Enel Group Distribution Company for every country.

### 7.1 Document/Section Scope

The scope of this section/part is to define the Common Part to provide the technical standard requirements for the Current Transformers of ENEL GRIDS.

### 7.2 List of Components

For the List of Components, please refer to ANNEX A

### 7.3 Service Conditions

Unless otherwise specified the normal service conditions defined in IEC 61869-1 apply with the exceptions indicated in the following *Table 3CP*.

The Humidity level shall follow the Standard IEC 60721-2-1.

| Country / DSO    | Max Altitude (m)    | Pollution level (IEC 60815)        | RUSCD (mm/kV)               | Seismic Req <sup>(1)</sup> (g) | Network Frequency (Hz) | Ambient Temp. (Min/Max) (°C) | Corrosivity (ISO 12944) |
|------------------|---------------------|------------------------------------|-----------------------------|--------------------------------|------------------------|------------------------------|-------------------------|
| Argentina        | -                   | Medium                             | 34,7                        | -                              | 50                     | -10 / +40                    | C3                      |
| Brazil/Ceará     | -                   | Very Heavy                         | 53,7                        | -                              | 60                     | 0 / +40                      | C5                      |
| Brazil/Rio       | -                   | Very Heavy                         | 53,7                        | -                              | 60                     | 0 / +40                      | C5                      |
| Brazil/São Paulo | -                   | Medium                             | 34,7                        | -                              | 60                     | 0 / +40                      | C3                      |
| Colombia         | 2650 <sup>(2)</sup> | Medium                             | 34,7                        | 0,5                            | 60                     | -10 / +40                    | C3                      |
| Italy            | -                   | Heavy                              | 43,3                        | 0,5                            | 50                     | -25 / +40                    | C4                      |
| Peru             | -                   | Very Heavy                         | 53,7                        | 0,5                            | 60                     | 0 / +40                      | C5                      |
| Romania          | -                   | Heavy                              | 43,3                        | 0,5                            | 50                     | -30 / +40                    | C4                      |
| Spain            | -                   | Heavy<br>Very Heavy <sup>(3)</sup> | 43,3<br>53,7 <sup>(3)</sup> | -                              | 50                     | -25 / +40                    | C4<br>C5 <sup>(3)</sup> |

*Table 3CP*

**Note:**

<sup>(1)</sup> Indications of the specific seismic qualification are given in local sections.

<sup>(2)</sup> The creepage distance of the instrumentation transformers specified for Enel Colombia will have a correction factor according to IEC 60137 ( $k_a$ ), taking 1000 meters above sea level (m.a.s.l.) as a reference.

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<sup>(3)</sup> Balearic and Canary Islands.

## **7.4 Technical Characteristics**

For definitions see IEC-61698-1 and IEC-61698-2 or IEEE Std. C57.13 whenever required in Local Sections.

### **7.4.1. Type of Current Transformers**

This document is applicable for multi-winding inductive current transformers w/o selectable ratio for use with electrical measuring instruments and/or electrical protective devices.

For further details see Local section.

### **7.4.2. Number of Cores and Windings**

See Datasheets.

### **7.4.3. Selectable-Ratio**

Current transformers can have primary reconnection and/or tapped secondary windings. See Datasheets and Local sections for further details.

### **7.4.4. Insulation Levels**

See Datasheets.

### **7.4.5. Rated Output**

See Datasheets.

### **7.4.6. Rated Accuracy Class CT for protection (ALF)**

See Datasheets.

### **7.4.7. Rated Accuracy Class CT for measurement (FS)**

See Datasheets.

### **7.4.8. Standard Values for Rated Primary Current**

See Datasheets.

### **7.4.9. Standard Values for Rated Secondary Current**

The standard values for rated secondary current are 1 A and 5 A.  
For further details see Datasheets.

### **7.4.10. Standard Values for Rated Continuous Thermal Current**

See Datasheets.

### **7.4.11. Rated Short-Time Thermal Current ( $I_{th}$ )**

See Datasheets.

### **7.4.12. Rated DYNAMIC Current ( $I_{dyn}$ )**

See Datasheets.

### **7.4.13. Static withstands load (FR)**

See Datasheets.

### **7.4.14. Installation**

The type of installation can be indoor or outdoor.



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**7.4.15. Temperature Rise**

See IEC-61698-1 and IEC-61698-2 or IEEE Std. C57.13 whenever required in Local Sections.

**7.4.16. Seismic Qualification**

See Local Sections.

**7.5 Construction Characteristics.**

The active part of the instrumentation transformers shall be placed in the metal bodies

For further design details see Local Sections.

**7.5.1. Internal Insulation**

The internal insulating medium of the HV current transformers shall be in liquid and paper or proper resin material for transformers for outdoor installation. Other types of insulation shall be subject to ENEL approval.

Liquid-insulated equipment shall be provided with a metal liquid expansion chamber with metal bellows, in order to absorb thermal contractions and expansions of the liquid.

The insulating liquid used shall be mineral oil naphthenic-based, without inhibitors or additives, free of PCBs and shall comply with the requirements of the IEC-60296 Standard. Absence of corrosive sulfur shall be verified according to ASTM 1275 and IEC 62535.

Alternatively insulating liquids, as natural and synthetic ester, can be specified, according to IEC 62770 or IEC 61099. In such a case, it is possible to reference to IEC 60076-14. Any part of the transformer which is in contact with the insulating liquid shall be compatible with it.

The solid insulation material used shall comply to class "A" of IEC 60085 or higher. The evaluation of the material should be carried out in accordance with the IEC 60641-2.

Further specific requirements are requested in Local Sections.

**7.5.2. External Insulation**

The external materials for the bushings of the Instruments Transformers shall be porcelain or composite material.

Composite insulators shall be made of light grey inorganic composite material, with HTV (High Temperature Vulcanization) or LSR (Liquid Silicone Rubber) silicone rubber, without EPDM or other organic rubber, in accordance with IEC 61462 for mechanical testing and IEC 61109 for dielectric testing and electrical-environmental accelerated ageing test.

Other types of insulation will be subject to ENEL approval.

The creepage distance of the bushings shall be in accordance with the level of pollution requested by ENEL.

For further details see Local Sections.

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### 7.5.3. Overall Dimensions and Layouts

See Local Sections.

### 7.5.4. Metal Surface Treatment

The non-energized metallic surfaces of the Instruments Transformers shall be made of painted iron, hot dip galvanized steel, stainless steel or aluminum.

The external painting of transformers and metallic components made of iron materials, shall use paints and varnishes according to ISO 12944 (standardized paint systems) or powder coating (guaranteed equivalent corrosivity and durability).

For different pollution levels please follow the next table:

| Pollution Levels | Corrosivity | Durability   | Painting Category |
|------------------|-------------|--------------|-------------------|
| Medium           | C3          | Medium       | C3M               |
| Heavy            | C4          | Medium-High  | C4M or C3H        |
| Very Heavy       | C5          | Medium- High | C5M or C4H        |

*Table 4CP*

The thicknesses of galvanized surface shall comply with the provisions of the respective standards (very high contamination) for different sheet thicknesses and environmental conditions.

All painted surfaces shall be prepared by manufacturer with a suitable sandblasting or chemical cleaning (degreasing) treatments, specific for the painting cycle adopted. The effectiveness of surface preparation work shall be assessed using standards from series ISO 8501: "Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness".

The paint shall be free of lead oxides or chromates. The safety and technical data sheets of the painting shall be provided by the Manufacturer.

The color to be used is prescribed in Local Section.

The Coating System/Painting cycle shall be:

- Totally defined in terms of products, typologies, and processes.
- Certified with the reference to tests carried out by independent laboratories, in compliance to ISO 12944, with a clear indication of Corrosivity and Durability levels.

### 7.5.5. Accessories

See Local Sections for details.

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Service Function: -

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**7.5.5.1. Primary Outer Terminals**

See Local Sections.

Terminals shall have clearly distinguishable polarity markings.

**7.5.5.2. Secondary Terminals**

Secondary Terminals (secondary terminal boxes) should be preferably equipped with overvoltage protection devices proposed by the manufacturers, in order to abate the electrocution risks for operators. Enel reserves the right to evaluate the feasibility and suitability of solutions proposed.

Terminals should have clearly distinguishable polarity markings.

See Local Sections.

**7.5.5.3. Grounding Terminals**

The manufacturer shall supply terminals to connect the CTs to the substation ground system. For further details see Local Sections.

**7.5.5.4. CT Support Base**

See Local Sections.

**7.5.5.5. Secondary Terminals Box**

See Local Sections.

**7.5.5.6. Liquid Level Gauge**

See Local Sections.

**7.5.5.7. Overpressure Relief Device**

See Local Sections.

**7.5.5.8. Liquid Sampling Device**

See Local Sections.

**7.5.5.9. Lifting Lugs**

Placed to facilitate lifting of CT.

**7.5.5.10. Rating Plate**

A stainless-steel rating plate in local language shall be included.

This plate shall follow the IEC 61869 Standards, a plate with the connection diagram of the windings shall also be included.

The rating plate with indelible indication shall have also the following information (located on the L.V. side of the tank):

- ENEL code
- Weight (kg), brand and type of insulating liquid

The rating plate on each Current Transformer shall be in local languages of the country of destination of the current transformer.

The rating plates shall be resistant to atmospheric conditions and made of waterproof material.

The connection diagram shall be indelibly printed.

Likewise, the rating plate shall support the service conditions indicated in the section and will be printed with the name of ENEL.

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For further details see Local Sections.

**7.5.5.11. Terminal Markings**

See local sections.

**7.5.5.12. Capacitive Tap**

See local sections.

**7.6 Testing**

**7.6.1. Type Test**

Required tests are indicated in section 7 of IEC 61869-1 and IEC 61869-2.

They are those that shall be carried out only once in the product approval process and which are listed in *Table 5CP* below:

| TYPE TESTS                                                      | Subclause<br>IEC 61869-1<br>IEC 61869-2 |
|-----------------------------------------------------------------|-----------------------------------------|
| Temperature rise test                                           | 7.2.2                                   |
| Impulse voltage withstand test on primary terminals             | 7.2.3                                   |
| Wet test for outdoor type transformers                          | 7.2.4                                   |
| Electromagnetic compatibility test                              | 7.2.5                                   |
| Test for accuracy                                               | 7.2.6                                   |
| Verification test of the degree of protection of the enclosures | 7.2.7                                   |
| Short-time current test                                         | 7.2.201                                 |

*Table 5CP*

For further details see Local Sections.

**7.6.2. Routine/Acceptance test**

Required tests are indicated in section 7 of IEC 61869-1 and IEC 61869-2.

The routine tests shall be performed on each current transformer, and they are listed in the below (*Table 6CP*):

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| <b>ROUTINE TESTS</b>                                                             | <b>Subclause</b><br>IEC 61869-1<br>IEC 61869-2 |
|----------------------------------------------------------------------------------|------------------------------------------------|
| Power-frequency voltage withstand tests on primary terminals                     | 7.3.1                                          |
| Partial discharge measurement                                                    | 7.3.2                                          |
| Power-frequency voltage withstand tests between sections                         | 7.3.3                                          |
| Power-frequency voltage withstand test on secondary terminals                    | 7.3.4                                          |
| Test for accuracy                                                                | 7.3.5                                          |
| Verification of markings                                                         | 7.3.6                                          |
| Enclosure tightness test at ambient temperature                                  | 7.3.7                                          |
| Pressure test for the enclosure, clause                                          | 7.3.8                                          |
| Determination of the secondary winding resistance                                | 7.3.201                                        |
| Determination of the secondary loop time constant                                | 7.3.202                                        |
| Test for rated knee point e.m.f. and exciting current at rated knee point e.m.f. | 7.3.203                                        |
| Inter-turn overvoltage test                                                      | 7.3.204                                        |

*Table 6CP*

For further details see Local Sections.

**7.6.3. Special test**

Required tests are indicated in section 7 of IEC 61869-1 and IEC 61869-2.

These tests shall be exceptionally required in the product approval process, and they are listed in *Table 7CP*, below:

| <b>SPECIAL TESTS</b>                                         | <b>Subclause</b><br>IEC 61869-1<br>IEC 61869-2 |
|--------------------------------------------------------------|------------------------------------------------|
| Chopped impulse voltage withstand test on primary terminals  | 7.4.1                                          |
| Multiple chopped impulse test on primary terminals           | 7.4.2                                          |
| Measurement of capacitance and dielectric dissipation factor | 7.4.3                                          |
| Transmitted overvoltage test                                 | 7.4.4                                          |
| Mechanical tests                                             | 7.4.5                                          |
| Internal arc fault test                                      | 7.4.6                                          |
| Corrosion test                                               | 7.4.9                                          |
| Fire hazard test                                             | 7.4.10                                         |

*Table 7CP*

For further details see Local Sections.

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#### 7.6.4. Sample Tests

In order to monitor the required adequacy of the production series, the manufacturer should define, execute and document the sample test program according to the production quantities (e.g., every 300 units of the same type defined by the same type test reports).

Generally, the recommended sample test is the lightning impulse test on the primary terminals and some other tests are listed in *Table 8CP*, below:

| SAMPLE TESTS                                                                           | Subclause<br>IEC 61869-2 |
|----------------------------------------------------------------------------------------|--------------------------|
| Determination of the remanence factor                                                  | 7.5.1                    |
| Determination of the instrument security factor (FS) of measuring current transformers | 7.5.2                    |

*Table 8CP*

### 7.7 Conditions of Supply

#### 7.7.1. Warranty

The technical guarantee will be five (5) years, counted from the date of delivery to Enel's warehouses.

The expenses involved in any failure that occurs in the Instrument Transformer, due to manufacturing defects, will be fully covered by the manufacturer. At the end of this period of guarantee, there it shall not be rust on more than 1% of the entire painted surface; this compares to a rusting level not above the Ri3 (see ISO 4628-3).

#### 7.7.2. Reception Control

The protocols of the acceptance tests indicated in section 7.6.2 will be delivered with each lot.

#### 7.7.3. Technical Information Required

The technical data sheets are reproducible and shall be properly and completely filled out, signed, stamped, and included for the offer, as well as to keep a proper description of the specific device of every supplier for the TCA process.

The drawings and diagrams of the equipment described in this document will be provided in PDF, AutoCAD and IFC formats, for their subsequent implementation in BIM modeling.

- Guaranteed technical data of the equipment and its components, describing its characteristics, dimensions, performance, and technical operating parameters, in Excel and pdf format.
- Convenient scale plans, plan, elevation, and perspective of the equipment.

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- Descriptive memory of the equipment, construction details, materials used, form of installation, maintenance, possibility of replacement of different components and other specifications.
- Good resolution photographic record of the equipment.
- Additional information that you consider provides an explanation for your design (drawings, details, operating characteristics, dimensions, and weights of the equipment offered).
- Updated original catalog of the equipment offered.

#### **7.7.4. Packaging and Transport**

According to IEC 61869-1, Annex B.

The packaging for the transport of the measuring instruments shall be carried out in a manner suitable for the type of product and the type of transport according to the manufacturer's instructions.

For further details see Local Sections.

It is essential that the transportation, storage, and installation of Instruments Transformers, as well as their operation and maintenance in service, be carried out in accordance with the instructions given by the manufacturer.

Consequently, the manufacturer shall provide timely instructions for the transportation, storage, installation, operation, and maintenance of instrument transformers.

The supplier will carry out the appropriate packaging of the transformers to ensure their protection during transport by sea, land, or air.

In the packaging, filling material will be used to ensure good protection in case the boxes containing the materials suffer blows or damage during the loading and unloading maneuvers.

To protect the materials from moisture, airtight covers or bags containing hygroscopic material should be used.

Each drawer shall have the following information printed:

- Type of material and quantity
- Net and gross weight
- Date

The supplier will be responsible for transporting the transformers to ENEL's warehouses, unless otherwise indicated in the purchase order.

#### **7.7.5. Installation, Operation, Maintenance and Disassembling**

According to IEC 61869-1, Annex B.

For each type of Instruments Transformer, the installation instructions provided by the manufacturer shall include at least the items listed below:

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- Information required for safe unpacking and lifting
- Assembly diagram and marking of the parts
- Instructions for the assembly of measuring transformers, auxiliary and operating devices
- Instructions for connecting conductors, auxiliary circuits, liquid systems, grounding connections and the manufacturer's recommendation of the type of cable to be connected to the secondary terminals
- Provide instructions for inspection and tests to be performed after the instrument transformer has been installed and all connections have been completed.
- Instruction for disassembling

**7.7.6. Technical Conformity Assessment (TCA)**

Technical compliance is issued by Enel and shall be supported by carrying out all the, Type, Routine tests and some Special tests indicated for each type of instrument transformer -.

Type tests and some Special tests are performed once, during the TCA process.

The Enel's Global Standard: GSCG002 - TECHNICAL CONFORMITY ASSESSMENT shall manage the TCA for such components. The detailed documents to be presented to the TCA Dossier and the process to be followed is indicated in the procedure document issued by Enel.



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## 8 ANNEX A – LIST OF COMPONENTS (ENEL CODES)

| GS CODE     | Country Code | COUNTRY | U <sub>m</sub><br>[kV] | LI<br>[kV] | AC<br>[kV] | Freq.<br>[Hz] | I <sub>pr</sub><br>[A] | I <sub>sr</sub><br>[A] | Rated turns ratio<br>(K <sub>r</sub> → I <sub>pr</sub> vs I <sub>sr</sub> ) | Billing<br>(€) | Secondaries Features                                                                                                |
|-------------|--------------|---------|------------------------|------------|------------|---------------|------------------------|------------------------|-----------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------|
| GSCT013/001 | 530266       | SPAIN   | 245                    | 1050       | 460        | 50            | 100                    | 5-5-5-5                | 4x(50-100/5)                                                                | X              | M (10 VA - 0,2S SF <5) M (20 VA - 0,5 SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30)                                    |
| GSCT013/002 | 530216       | SPAIN   | 245                    | 1050       | 460        | 50            | 800                    | 5-5-5-5                | 4x(200-400-800/5)                                                           | X              | M (10 VA - 0,2S SF <5) M (20 VA - 0,5 SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30)                                    |
| GSCT013/003 | 530202       | SPAIN   | 245                    | 1050       | 460        | 50            | 2000                   | 5-5-5-5                | 4x(1000-2000/5)                                                             | X              | M (10 VA - 0,2S SF <5) M (20 VA - 0,5 SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30)                                    |
| GSCT013/004 | 530230       | SPAIN   | 245                    | 1050       | 460        | 50            | 400                    | 5-5-5-5                | 200-400/5 & 3x(1000/5)                                                      | X              | M (20 VA - 0,2S SF <5) M&P (20 VA - 0,5-5P (SF/ALF) SFmin/40) P (20 VA - 5P 40) P (20 VA - 5P 40)                   |
| GSCT013/005 | 530242       | SPAIN   | 245                    | 1050       | 460        | 50            | 800                    | 5-5-5-5                | 400-800/5 & 3x(1000-2000)/5                                                 | X              | M (20 VA - 0,2S SF <5) M&P (30 VA - 0,5-5P (SF/ALF) SFmin/20) P (30 VA - 5P 20) P (30 VA - 5P 20)                   |
| GSCT013/006 | 530236       | SPAIN   | 245                    | 1050       | 460        | 50            | 2000                   | 5-5-5-5                | 4x(1000-2000/5)                                                             | X              | M (20 VA - 0,2S SF <5) M&P (30 VA - 0,5-5P (SF/ALF) SFmin/20) P (30 VA - 5P 20) P (30 VA - 5P 20)                   |
| GSCT013/007 | 530254       | SPAIN   | 245                    | 1050       | 460        | 50            | 400                    | 5-5-5-5-5              | 200-400/5 & 4x(1000/5)                                                      | X              | M (25 VA - 0,2S SF <5) M&P (50 VA - 0,5-5P (SF/ALF) SFmin/40) P (50 VA - 5P 40) P (50 VA - 5P 40) P (50 VA - 5P 40) |
| GSCT013/008 | 530260       | SPAIN   | 245                    | 1050       | 460        | 50            | 800                    | 5-5-5-5-5              | 400-800/5 & 4x(1000-2000)/5                                                 | X              | M (25 VA - 0,2S SF <5) M&P (50 VA - 0,5-5P (SF/ALF) SFmin/20) P (50 VA - 5P 20) P (50 VA - 5P 20) P (50 VA - 5P 20) |
| GSCT013/009 | 530248       | SPAIN   | 245                    | 1050       | 460        | 50            | 2000                   | 5-5-5-5-5              | 5x(1000-2000/5)                                                             | X              | M (25 VA - 0,2S SF <5) M&P (50 VA - 0,5-5P (SF/ALF) SFmin/20) P (50 VA - 5P 20) P (50 VA - 5P 20) P (50 VA - 5P 20) |
| GSCT013/010 | 530286       | SPAIN   | 145                    | 650        | 275        | 50            | 800                    | 5-5-5-5                | 4x(200-400-800/5)                                                           | X              | M (10 VA - 0,2S SF <5) M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30)                                   |
| GSCT013/011 | 530289       | SPAIN   | 145                    | 650        | 275        | 50            | 100                    | 5-5-5-5                | 4x(50-100/5)                                                                | X              | M (10 VA - 0,2S SF <5) M (20 VA - 0,5 SF <10) P (20 VA - 5P 20) P (20 VA - 5P 20)                                   |
| GSCT013/012 | 530292       | SPAIN   | 145                    | 650        | 275        | 50            | 2000                   | 5-5-5-5                | 4x(1000-2000/5)                                                             | X              | M (10 VA - 0,2S SF <5) M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30)                                   |
| GSCT013/013 | 530310       | SPAIN   | 145                    | 650        | 275        | 50            | 800                    | 5-5-5                  | 3x(200-400-800/5)                                                           | -              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30)                                                          |
| GSCT013/014 | 530318       | SPAIN   | 145                    | 650        | 275        | 50            | 2000                   | 5-5-5                  | 3x(1000-2000/5)                                                             | -              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30)                                                          |
| GSCT013/015 | 530412       | SPAIN   | 72,5                   | 325        | 140        | 50            | 2000                   | 5-5-5                  | 3x(1000-2000/5)                                                             | -              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30)                                                          |
| GSCT013/016 | 530351       | SPAIN   | 72,5                   | 325        | 140        | 50            | 2000                   | 5-5-5                  | 3x(1000-2000/5)                                                             | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30)                                                          |
| GSCT013/017 | 530099       | SPAIN   | 72,5                   | 325        | 140        | 50            | 2000                   | 5-5-5                  | 3x(1000-2000/5)                                                             | -              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30)                                                          |
| GSCT013/018 | 530802       | SPAIN   | 72,5                   | 325        | 140        | 50            | 2000                   | 5-5-5                  | 3x(1000-2000/5)                                                             | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30)                                                          |
| GSCT013/019 | 530388       | SPAIN   | 72,5                   | 325        | 140        | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | -              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30)                                                          |
| GSCT013/020 | 530376       | SPAIN   | 72,5                   | 325        | 140        | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30)                                                          |
| GSCT013/021 | 530391       | SPAIN   | 72,5                   | 325        | 140        | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | -              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30)                                                          |
| GSCT013/022 | 530379       | SPAIN   | 72,5                   | 325        | 140        | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30)                                                          |

**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (CP)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

| GS CODE     | Country Code | COUNTRY | U <sub>m</sub><br>[kV] | LI<br>[kV] | AC<br>[kV] | Freq.<br>[Hz] | I <sub>pr</sub><br>[A] | I <sub>sr</sub><br>[A] | Rated turns ratio<br>(K <sub>r</sub> → I <sub>pr</sub> vs I <sub>sr</sub> ) | Billing<br>(€) | Secondaries Features                                       |
|-------------|--------------|---------|------------------------|------------|------------|---------------|------------------------|------------------------|-----------------------------------------------------------------------------|----------------|------------------------------------------------------------|
| GSCT013/023 | 530097       | SPAIN   | 72,5                   | 325        | 140        | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | -              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/024 | 530805       | SPAIN   | 72,5                   | 325        | 140        | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/025 | 530525       | SPAIN   | 72,5                   | 325        | 140        | 50            | 400                    | 5-5-5                  | 3x(200-400/5)                                                               | X              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/026 | 530748       | SPAIN   | 72,5                   | 325        | 140        | 50            | 400                    | 5-5-5                  | 3x(200-400/5)                                                               | -              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/027 | 530520       | SPAIN   | 72,5                   | 325        | 140        | 50            | 400                    | 5-5-5                  | 3x(200-400/5)                                                               | X              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/028 | 530400       | SPAIN   | 72,5                   | 325        | 140        | 50            | 800                    | 5-5-5                  | 3x(400-800/5)                                                               | -              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/029 | 530340       | SPAIN   | 72,5                   | 325        | 140        | 50            | 800                    | 5-5-5                  | 3x(400-800/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (50 VA - 5P 20) |
| GSCT013/030 | 530403       | SPAIN   | 72,5                   | 325        | 140        | 50            | 800                    | 5-5-5                  | 3x(400-800/5)                                                               | -              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/031 | 530343       | SPAIN   | 72,5                   | 325        | 140        | 50            | 800                    | 5-5-5                  | 3x(400-800/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/032 | 530098       | SPAIN   | 72,5                   | 325        | 140        | 50            | 800                    | 5-5-5                  | 3x(400-800/5)                                                               | -              | M (20 VA - 0,5 SF <10) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/033 | 530804       | SPAIN   | 72,5                   | 325        | 140        | 50            | 800                    | 5-5-5                  | 3x(400-800/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/034 | 530463       | SPAIN   | 52                     | 250        | 95         | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/035 | 530464       | SPAIN   | 52                     | 250        | 95         | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/036 | 530466       | SPAIN   | 52                     | 250        | 95         | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/037 | 530468       | SPAIN   | 52                     | 250        | 95         | 50            | 600                    | 5-5-5                  | 3x(300-600/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/038 | 530469       | SPAIN   | 52                     | 250        | 95         | 50            | 600                    | 5-5-5                  | 3x(300-600/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/039 | 530471       | SPAIN   | 52                     | 250        | 95         | 50            | 600                    | 5-5-5                  | 3x(300-600/5)                                                               | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/040 | 530473       | SPAIN   | 52                     | 250        | 95         | 50            | 1500                   | 5-5-5                  | 3x(750-1500/5)                                                              | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/041 | 530474       | SPAIN   | 52                     | 250        | 95         | 50            | 1500                   | 5-5-5                  | 3x(750-1500/5)                                                              | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/042 | 530476       | SPAIN   | 52                     | 250        | 95         | 50            | 1500                   | 5-5-5                  | 3x(750-1500/5)                                                              | X              | M (10 VA - 0,2S SF <5) P (30 VA - 5P 30) P (30 VA - 5P 30) |
| GSCT013/043 | 530497       | SPAIN   | 52                     | 250        | 95         | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | -              | M (15 VA - 0,5 SF <10) P (15 VA - 5P 30) P (15 VA - 5P 30) |
| GSCT013/044 | 530498       | SPAIN   | 52                     | 250        | 95         | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | -              | M (15 VA - 0,5 SF <10) P (15 VA - 5P 30) P (15 VA - 5P 30) |
| GSCT013/045 | 530500       | SPAIN   | 52                     | 250        | 95         | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | -              | M (15 VA - 0,5 SF <10) P (15 VA - 5P 30) P (15 VA - 5P 30) |

**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (CP)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

| GS CODE     | Country Code | COUNTRY | U <sub>m</sub><br>[kV] | LI<br>[kV] | AC<br>[kV] | Freq.<br>[Hz] | I <sub>pr</sub><br>[A] | I <sub>sr</sub><br>[A] | Rated turns ratio<br>(K <sub>r</sub> → I <sub>pr</sub> vs I <sub>sr</sub> ) | Billing<br>(€) | Secondaries Features                                                       |
|-------------|--------------|---------|------------------------|------------|------------|---------------|------------------------|------------------------|-----------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------|
| GSCT013/046 | 530503       | SPAIN   | 52                     | 250        | 95         | 50            | 600                    | 5-5-5                  | 3x(300-600/5)                                                               | -              | M (15 VA - 0,5 SF <10) P (15 VA - 5P 30) P (15 VA - 5P 30)                 |
| GSCT013/047 | 530504       | SPAIN   | 52                     | 250        | 95         | 50            | 600                    | 5-5-5                  | 3x(300-600/5)                                                               | -              | M (15 VA - 0,5 SF <10) P (15 VA - 5P 30) P (15 VA - 5P 30)                 |
| GSCT013/048 | 530506       | SPAIN   | 52                     | 250        | 95         | 50            | 600                    | 5-5-5                  | 3x(300-600/5)                                                               | -              | M (15 VA - 0,5 SF <10) P (15 VA - 5P 30) P (15 VA - 5P 30)                 |
| GSCT013/049 | 530509       | SPAIN   | 52                     | 250        | 95         | 50            | 1500                   | 5-5-5                  | 3x(750-1500/5)                                                              | -              | M (15 VA - 0,5 SF <10) P (15 VA - 5P 30) P (15 VA - 5P 30)                 |
| GSCT013/050 | 530560       | SPAIN   | 52                     | 250        | 95         | 50            | 1500                   | 5-5-5                  | 3x(750-1500/5)                                                              | -              | M (15 VA - 0,5 SF <10) P (15 VA - 5P 30) P (15 VA - 5P 30)                 |
| GSCT013/051 | 530562       | SPAIN   | 52                     | 250        | 95         | 50            | 1500                   | 5-5-5                  | 3x(750-1500/5)                                                              | -              | M (15 VA - 0,5 SF <10) P (15 VA - 5P 30) P (15 VA - 5P 30)                 |
| GSCT013/052 | 653195       | ROMANIA | 123                    | 550        | 230        | 50            | 200                    | 5-5-5                  | 3x(100-200/5)                                                               | X              | M (15 VA - 0,2S SF 15) P (30 VA - 5P 30) P (30 VA - 5P 30)                 |
| GSCT013/053 | 653196       | ROMANIA | 123                    | 550        | 230        | 50            | 300                    | 5-5-5                  | 3x(150-300/5)                                                               | X              | M (15 VA - 0,2S SF 15) P (30 VA - 5P 30) P (30 VA - 5P 30)                 |
| GSCT013/054 | 653192       | ROMANIA | 123                    | 550        | 230        | 50            | 600                    | 5-5-5                  | 3x(300-600/5)                                                               | X              | M (15 VA - 0,2S SF 15) P (30 VA - 5P 30) P (30 VA - 5P 30)                 |
| GSCT013/055 | 653197       | ROMANIA | 123                    | 550        | 230        | 50            | 1200                   | 5-5-5                  | 3x(300-1200/5)                                                              | X              | M (15 VA - 0,2S SF 15) P (30 VA - 5P 30) P (30 VA - 5P 30)                 |
| GSCT013/056 | 533006       | ITALY   | 145                    | 650        | 275        | 50            | 1200                   | 5-5                    | 2x(200-400-800 1200/5)                                                      | X              | M (30&50 VA - 0,2&0,5 SF 10) P (30 VA - 5P 30)                             |
| GSCT013/057 | 533036       | ITALY   | 170                    | 325        | 750        | 50            | 1200                   | 5-5                    | 2x(200-400-800 1200/5)                                                      | X              | M (30&50 VA - 0,2&0,5 SF 10) P (30 VA - 5P 30)                             |
| GSCT013/058 | 533257       | ITALY   | 145                    | 650        | 275        | 50            | 1000                   | 5                      | 200-1000/5                                                                  | X              | M (15 VA - 0,2S SF 10)                                                     |
| GSCT013/059 | 533258       | ITALY   | 170                    | 325        | 750        | 50            | 1000                   | 5                      | 200-1000/5                                                                  | X              | M (15 VA - 0,2S SF 10)                                                     |
| GSCT013/060 | 110805       | PERU    | 72,5                   | 325        | 140        | 60            | 600                    | 1-1-1                  | 3x(300-600/1)                                                               | -              | M (15 VA - 0,5 SF 5) P (15 VA - 5P 20) P (15 VA - 5P 20)                   |
| GSCT013/061 | 531017       | PERU    | 72,5                   | 325        | 140        | 60            | 600                    | 1-1-1-1                | 4x(300x600/1)                                                               | -              | M (15 VA - 0,5 SF 5) P (15 VA - 5P 20) P (15 VA - 5P 20) P (15 VA - 5P 20) |
| GSCT013/062 | 110837       | PERU    | 72,5                   | 325        | 140        | 60            | 2000                   | 1-1-1                  | 3x(2000/1)                                                                  | -              | M (15 VA - 0,5 SF 5) P (15 VA - 5P 20) P (15 VA - 5P 20)                   |
| GSCT013/063 | 531081       | PERU    | 72,5                   | 325        | 140        | 60            | 400                    | 1-1-1-1                | 4x(200x400/1)                                                               | -              | M (15 VA - 0,5 SF 5) P (15 VA - 5P 20) P (15 VA - 5P 20) P (15 VA - 5P 20) |
| GSCT013/064 | 531082       | PERU    | 245                    | 1050       | 460        | 60            | 300                    | 1-1-1-1                | 4x(150x300/1)                                                               | -              | M (15 VA - 0,5 SF 5) P (15 VA - 5P 20) P (15 VA - 5P 20) P (15 VA - 5P 20) |
| GSCT013/065 | 110843       | PERU    | 245                    | 1050       | 460        | 60            | 1200                   | 1-1-1-1                | 4x(600x1200/1)                                                              | X              | M (15 VA - 0,2 SF 5) P (15 VA - 5P 20) P (15 VA - 5P 20) P (15 VA - 5P 20) |
| GSCT013/066 | 110840       | PERU    | 245                    | 1050       | 460        | 60            | 600                    | 1-1-1-1                | 4x(300x600/1)                                                               | X              | M (15 VA - 0,2 SF 5) P (15 VA - 5P 20) P (15 VA - 5P 20) P (15 VA - 5P 20) |
| GSCT013/067 | 110841       | PERU    | 245                    | 1050       | 460        | 60            | 1250                   | 1-1-1-1                | 4x(1250/1)                                                                  | -              | M (15 VA - 0,5 SF 5) P (15 VA - 5P 20) P (15 VA - 5P 20) P (15 VA - 5P 20) |
| GSCT013/068 | 110849       | PERU    | 245                    | 1050       | 460        | 60            | 1250                   | 1-1                    | 2x(1250/1)                                                                  | -              | M (15 VA - 0,5 SF 5) P (15 VA - 5P 20)                                     |

**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (CP)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

| GS CODE     | Country Code | COUNTRY  | U <sub>m</sub><br>[kV] | LI<br>[kV] | AC<br>[kV] | Freq.<br>[Hz] | I <sub>pr</sub><br>[A] | I <sub>sr</sub><br>[A] | Rated turns ratio<br>(K <sub>r</sub> → I <sub>pr</sub> vs I <sub>sr</sub> ) | Billing<br>(€) | Secondaries Features                                                                                  |
|-------------|--------------|----------|------------------------|------------|------------|---------------|------------------------|------------------------|-----------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------|
| GSCT013/069 | 531259       | COLOMBIA | 145                    | 650        | 275        | 60            | 200                    | 1-5-1-1                | 200 400:1 & 150 200:5 & 200 400:1 & 1200:1                                  | X              | P (10 VA - 5P 20) M (15 VA - 0,2S SF 2≤SF≤5) P (10 VA - 5P 20) P (10 VA - 5P 20)                      |
| GSCT013/070 | Pending      | COLOMBIA | 145                    | 650        | 275        | 60            | 300                    | 1-5-1-1                | 800:1 & 300:5 & 300:1 & 1200:1                                              | X              | P (10 VA - 5P 20) M (15 VA - 0,2S SF 2≤SF≤5) P (10 VA - 5P 20) P (10 VA - 5P 20)                      |
| GSCT013/071 | Pending      | COLOMBIA | 145                    | 650        | 275        | 60            | 100                    | 1-5-1-1                | 100 200:1 & 75 100:5 & 150 200:1 & 1200:1                                   | X              | P (10 VA - 5P 20) M (15 VA - 0,2S SF 2≤SF≤5) P (10 VA - 5P 20) P (10 VA - 5P 20)                      |
| GSCT013/072 | Pending      | COLOMBIA | 145                    | 650        | 275        | 60            | 50                     | 5-5-5-5                | 75:5 & 40 50 60:5 & 50 75:5 & 1200:5                                        | X              | P (15 VA - 5P 20) M (15 VA - 0,2S SF 2≤SF≤5) P (15 VA - 5P 20) P (15 VA - 5P 20)                      |
| GSCT013/073 | 111114       | COLOMBIA | 145                    | 650        | 275        | 60            | 200                    | 5-5-5-5                | 200 400:5 & 150 200:5 & 200 400:5 & 1200:5                                  | X              | P (15 VA - 5P 20) M (15 VA - 0,2S SF 2≤SF≤5) P (15 VA - 5P 20) P (15 VA - 5P 20)                      |
| GSCT013/074 | Pending      | COLOMBIA | 145                    | 650        | 275        | 60            | 100                    | 5-5-5-5                | 100 200:5 & 75 100:5 & 100:5 & 1200:5                                       | X              | P (15 VA - 5P 20) M (15 VA - 0,2S SF 2≤SF≤5) P (15 VA - 5P 20) P (15 VA - 5P 20)                      |
| GSCT013/075 | 531197       | COLOMBIA | 145                    | 650        | 275        | 60            | 1200                   | 5-5-5-5                | 1200:5 & 1200:5 & 1200:5 & 1200:5                                           | X              | P (15 VA - 5P 20) M (15 VA - 0,2S SF 2≤SF≤5) P (15 VA - 5P 20) P (15 VA - 5P 20)                      |
| GSCT013/076 | 530109       | COLOMBIA | 145                    | 650        | 275        | 60            | 1400                   | 5-5-5-5                | 1400:5 & 1400:5 & 1400:5 & 1400:5                                           | X              | P (15 VA - 5P 30) M (15 VA - 0,2S SF 2≤SF≤5) P (15 VA - 5P 30) P (15 VA - 5P 30)                      |
| GSCT013/077 | 531230       | COLOMBIA | 145                    | 650        | 275        | 60            | 400                    | 5-5-5-5                | 500:5 & 300 400:5 & 400:5 & 1200:5                                          | X              | P (15 VA - 5P 20) M (10 VA - 0,2S SF 2≤SF≤5) P (15 VA - 5P 20) P (15 VA - 5P 20)                      |
| GSCT013/078 | 531255       | COLOMBIA | 72,5                   | 325        | 140        | 60            | 400                    | 5-5-5-5                | 500:5 & 300 400:5 & 500:5 & 1200:5                                          | X              | P (15 VA - 5P 20) M (10 VA - 0,2S SF 2≤SF≤5) P (15 VA - 5P 20) P (15 VA - 5P 20)                      |
| GSCT013/079 | Pending      | COLOMBIA | 72,5                   | 325        | 140        | 60            | 150                    | 5-5-5-5                | 200:5 & 150 200:5 & 200:5 & 1200:5                                          | X              | P (15 VA - 5P 20) M (10 VA - 0,2S SF 2≤SF≤5) P (15 VA - 5P 20) P (15 VA - 5P 20)                      |
| GSCT013/080 | 530032       | COLOMBIA | 245                    | 1050       | 460        | 60            | 300                    | 5-1-1-1-1              | 600:5 & 250:1 & 250 500:1 & 500:1 & 500 800:1                               | X              | P (30 VA - 5P 20) M (2,5 VA - 0,2S SF 2≤SF≤5) P (30 VA - 5P 20) P (20 VA - 5P 20) P (20 VA - 5P 20)   |
| GSCT013/081 | Pending      | COLOMBIA | 245                    | 1050       | 460        | 60            | 100                    | 5-1-1-1                | 100:5 & 100:1 & 100:1 & 500:1                                               | X              | M (5 VA - 0,2S SF 2<SF<5) P (15 VA - 5P 30) P (15 VA - 5P 30) P (Add Req. VA - Add Req. -)            |
| GSCT013/082 | Pending      | COLOMBIA | 245                    | 1050       | 460        | 60            | 800                    | 1-5-1-1                | 800:1 & 450:5 & 800:1 & 800:1                                               | X              | P (20 VA - 5P 20) M (30 VA - 0,2S SF 2≤SF≤5) P (30 VA - 5P 20) P (30 VA - 5P 20)                      |
| GSCT013/083 | 111113       | COLOMBIA | 245                    | 1050       | 460        | 60            | 200                    | 1-5-1-1                | 200:1 & 200:5 & 200:1 & 800:1                                               | X              | P (30 VA - 5P 20) M (20 VA - 0,2S SF 2≤SF≤5) P (30 VA - 5P 20) P (30 VA - 5P 20)                      |
| GSCT013/084 | 530108       | COLOMBIA | 145                    | 650        | 275        | 60            | 1400                   | 1-1-5-5-5              | 1400:1 & 1400:1 & 1400:5 & 1400:5 & 1400:5                                  | X              | P (2,5 VA - 5P 20) P (2,5 VA - 5P 20) M (2,5 VA - 0,2S SF 2≤SF≤5) P (15 VA - 5P 20) P (15 VA - 5P 20) |
| GSCT013/085 | Pending      | COLOMBIA | 145                    | 650        | 275        | 60            | 2000                   | 5-5-5                  | 2000:5 & 2000:5 & 2000:5                                                    | X              | P (10 VA - 5P 20) M (15 VA - 0,2S SF 2≤SF≤5) P (10 VA - 5P 20)                                        |
| GSCT013/086 | 531266       | COLOMBIA | 145                    | 650        | 275        | 60            | 1200                   | 5-5-5-5                | 600 800 1200:5 & 600 800 1200:5 & 600 800 1200:5 & 600 800 1200:5           | -              | P (30 VA - 5P 30) M (30 VA - 0,5 SF 2≤SF≤5) P (30 VA - 5P 30) P (30 VA - 5P 30)                       |
| GSCT013/087 | 531256       | COLOMBIA | 145                    | 650        | 275        | 60            | 1200                   | 1-1-1-1                | 1200:1 & 1200:1 & 1200:1 & 1200:1                                           | -              | P (10 VA - 5P 20) M (15 VA - 0,5 SF 2≤SF≤5) P (10 VA - 5P 20) P (10 VA - 5P 20)                       |
| GSCT013/088 | 530111       | COLOMBIA | 145                    | 650        | 275        | 60            | 2500                   | 1-1-1-1                | 2500:1 & 2500:1 & 2500:1 & 2500:1                                           | X              | P (10 VA - 5P 20) M (25 VA - 0,2S SF 10) P (10 VA - 5P 20) P (10 VA - 5P 20)                          |
| GSCT013/089 | 530110       | COLOMBIA | 145                    | 650        | 275        | 60            | 1600                   | 1-1-1-1                | 800 1600:1 & 800 1600:1 & 2500:1                                            | X              | P (10 VA - 5P 30) M (25 VA - 0,2S SF 10) P (10 VA - 5P 20) P (10 VA - 5P 20)                          |
| GSCT013/090 | 531186       | COLOMBIA | 500                    | 1550       | 680        | 60            | 300                    | 1-1-1-1                | 600:1 & 600:1 & 600:1 & 1250 2500:1                                         | X              | M (5 VA - 0,2S SF <10) P (5 VA - 5P 20) P (5 VA - 5P 20) P (5 VA - 5P 20)                             |

**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (CP)**

**Application Areas**

Perimeter: *Global*  
Staff Function: -  
Service Function: -  
Business Line: *Enel Grids*

| GS CODE     | Country Code | COUNTRY    | U <sub>m</sub><br>[kV] | LI<br>[kV] | AC<br>[kV] | Freq.<br>[Hz] | I <sub>pr</sub><br>[A] | I <sub>sr</sub><br>[A] | Rated turns ratio<br>(K <sub>r</sub> → I <sub>pr</sub> vs I <sub>sr</sub> ) | Billing<br>(€) | Secondaries Features                                                                                         |
|-------------|--------------|------------|------------------------|------------|------------|---------------|------------------------|------------------------|-----------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------|
| GSCT013/091 | 0102-0286    | ARGENTINA  | 145                    | 230        | 550        | 50            | 300                    | 1                      | 300/1                                                                       | -              | M (30 VA - 0,2 SF 2<SF<5)                                                                                    |
| GSCT013/092 | 0102-1379    | ARGENTINA  | 245                    | 395        | 950        | 50            | 2500                   | 1-1-1-1-1              | 4x2500/1                                                                    | -              | M (30 VA - 0,2 SF 2<SF<5) M (30 VA - 0,2 SF 2≤SF≤5) P (60 VA - 5P 20) P (60 VA - 5P 20) P (60 VA - 5P 20)    |
| GSCT013/093 | 0102-1381    | ARGENTINA  | 145                    | 230        | 550        | 50            | 600                    | 1-1-1                  | 3x600/1                                                                     | -              | M (30 VA - 0,5 SF 2<SF<5) P (10 VA - 5P >130) P (10 VA - 5P >130)                                            |
| GSCT013/094 | 0102-1385    | ARGENTINA  | 145                    | 230        | 550        | 50            | 600                    | 1-1-1                  | 3x600/1                                                                     | -              | M (30 VA - 0,5 SF 2<SF<5) P (10 VA - 5P >130) P (10 VA - 5P >130)                                            |
| GSCT013/095 | 0102-1388    | ARGENTINA  | 245                    | 395        | 950        | 50            | 2500                   | 1-1-1-1-1              | 5x2500/1                                                                    | -              | M (60 VA - 0,2 SF 2<SF<5) M (60 VA - 0,2 SF 2≤SF≤5) P (60 VA - 5P 20) P (60 VA - 5P 20) P (60 VA - 5P 20)    |
| GSCT013/096 | 0102-1443    | ARGENTINA  | 145                    | 230        | 550        | 50            | 2000                   | 1-1-1                  | 3x2000/1                                                                    | -              | M (10 VA - 0,5 SF 2<SF<5) P (20 VA - 5P 20) P (20 VA - 5P 20)                                                |
| GSCT013/097 | 0102-1446    | ARGENTINA  | 245                    | 395        | 950        | 50            | 2000                   | 1-1-1-1-1              | 5x2000/1                                                                    | -              | M (60 VA - 0,5 SF 2<SF<5) M (60 VA - 0,5 SF 2≤SF≤5) P (50 VA - 5P 40) P (50 VA - 5P >40) P (50 VA - 5P >40)  |
| GSCT013/098 | 0102-1502    | ARGENTINA  | 145                    | 230        | 550        | 50            | 1000                   | 1-1-1-1                | 4x1000/1                                                                    | -              | M (10 VA - 0,5 SF 2<SF<5) P (20 VA - 5P 20) P (- VA - TPY (*) -) P (- VA - TPY (*) -)                        |
| GSCT013/099 | 0102-1521    | ARGENTINA  | 145                    | 230        | 550        | 50            | 1500                   | 1-1-1                  | 3x1500/1                                                                    | -              | M (10 VA - 0,5 SF 2<SF<5) P (20 VA - 5P 30) P (20 VA - 5P 30)                                                |
| GSCT013/100 | 0102-1580    | ARGENTINA  | 145                    | 230        | 550        | 50            | 2500                   | 1-1-1-1                | 4x2500/1                                                                    | -              | M (20 VA - 0,2S SF 2<SF<5) P (30 VA - 5P 20) P (30 VA - 5P 20) P (30 VA - 5P 20)                             |
| GSCT013/101 | 0102-1581    | ARGENTINA  | 145                    | 230        | 550        | 50            | 2000                   | 1-1-1-1                | 4x2000/1                                                                    | -              | M (10 VA - 0,2S SF 2<SF<5) M (20 VA - 0,2S SF 2≤SF≤5) P (30 VA - 5P 20) P (30 VA - 5P 20)                    |
| GSCT013/102 | 0102-1583    | ARGENTINA  | 145                    | 230        | 550        | 50            | 200                    | 1-1                    | 2x((100-200)/1)                                                             | -              | M (30 VA - 0,2S SF 2<SF<5) P (30 VA - 5P 20)                                                                 |
| GSCT013/103 | 0102-1632    | ARGENTINA  | 145                    | 230        | 550        | 50            | 750&1000               | 1-1-1-1                | 750/1 & 3x1000/1                                                            | -              | M (20 VA - 0,5 SF 2<SF<5) P (25 VA - 5P 30) P (- VA - TPY (*) -) P (- VA - TPY (*) -)                        |
| GSCT013/104 | 0102-1655    | ARGENTINA  | 145                    | 230        | 550        | 50            | 600                    | 1-1-1-1                | 4x600/1                                                                     | -              | M (10 VA - 0,5 SF 2<SF<5) P (10 VA - 5P >50) P (10 VA - 5P >50) P (10 VA - 5P >50)                           |
| GSCT013/105 | 0102-1656    | ARGENTINA  | 245                    | 395        | 950        | 50            | 2500                   | 1-1-1-1-1              | 5x2500/1                                                                    | -              | M (30 VA - 0,2S SF 2<SF<5) M (30 VA - 0,2S SF 2≤SF≤5) P (60 VA - 5P 20) P (60 VA - 5P 20) P (60 VA - 5P 20)  |
| GSCT013/106 | 0102-1680    | ARGENTINA  | 145                    | 230        | 550        | 50            | 1                      | 1                      | 1/1                                                                         | -              | P (30 VA - 5P 20)                                                                                            |
| GSCT013/107 | 0102-1707    | ARGENTINA  | 145                    | 230        | 550        | 50            | 1000                   | 1-1-1-1                | 41000/1                                                                     | -              | M (20 VA - 0,5 SF 2<SF<5) P (20 VA - 5P 20) P (- VA - TPY (*) -) P (- VA - TPY (*) -)                        |
| GSCT013/108 | 0102-1821    | ARGENTINA  | 145                    | 230        | 550        | 50            | 1200                   | 1-1-1                  | 3x1200/1                                                                    | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 30) P (30 VA - 5P 30)                                                |
| GSCT013/109 | 0102-1822    | ARGENTINA  | 245                    | 395        | 950        | 50            | 2500                   | 1-1-1-1-1              | 5x2500/1                                                                    | X              | M (30 VA - 0,5 SF 2<SF<5) M (30 VA - 0,2S SF 2≤SF≤5) P (60 VA - 5P 40) P (60 VA - 5P >40) P (60 VA - 5P >40) |
| GSCT013/110 | 0102-1867    | ARGENTINA  | 145                    | 230        | 550        | 50            | 1200                   | 1-1-1-1                | 4x1200/1                                                                    | -              | M (10 VA - 0,5 SF 2<SF<5) P (20 VA - 5P 20) P (- VA - TPX (*) -) P (- VA - TPX (*) -)                        |
| GSCT013/111 | 0102-1870    | ARGENTINA  | 145                    | 230        | 550        | 50            | 1000                   | 1-1-1-1                | 4x1000/1                                                                    | -              | M (20 VA - 0,5 SF 2<SF<5) P (20 VA - 5P 20) P (- VA - TPX (*) -) P (- VA - TPX (*) -)                        |
| GSCT013/112 | 0102-1871    | ARGENTINA  | 145                    | 230        | 550        | 50            | 1000                   | 1-1-1-1                | 4x1000/1                                                                    | -              | M (20 VA - 0,5 SF 2<SF<5) P (20 VA - 5P 20) P (- VA - TPY (*) -) P (- VA - TPY (*) -)                        |
| GSCT013/113 | 531921       | BRAZIL/RIO | 72,5                   | 325        | 140        | 60            | 1200                   | 1-1                    | 200 400 +T115:T150600x400 800 1200:1                                        | -              | M (10 VA - 0,5 SF 2<SF<5) P (10 VA - 5P 20)                                                                  |

**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (CP)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

| GS CODE     | Country Code | COUNTRY              | U <sub>m</sub><br>[kV] | LI<br>[kV] | AC<br>[kV] | Freq.<br>[Hz] | I <sub>pr</sub><br>[A] | I <sub>sr</sub><br>[A] | Rated turns ratio<br>(K <sub>r</sub> → I <sub>pr</sub> vs I <sub>sr</sub> ) | Billing<br>(€) | Secondaries Features                                                                                                                  |
|-------------|--------------|----------------------|------------------------|------------|------------|---------------|------------------------|------------------------|-----------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------|
| GSCT013/114 | 531922       | BRAZIL/RIO           | 72,5                   | 325        | 140        | 60            | 300                    | 1-1                    | 100 200 300:1                                                               | -              | M (10 VA - 0,5 SF 2<SF<5) P (10 VA - 5P 20)                                                                                           |
| GSCT013/115 | 531923       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 600                    | 1-1                    | 200 300x400 600:1                                                           | -              | M (10 VA - 0,5 SF 2<SF<5) P (10 VA - 5P 20)                                                                                           |
| GSCT013/116 | 531508       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 1000                   | 1-1                    | 400 500 800 1000:1                                                          | -              | M (10 VA - 0,5 SF 2<SF<5) P (10 VA - 5P 20)                                                                                           |
| GSCT013/117 | 531415       | BRAZIL/RIO           | 72,5                   | 325        | 140        | 60            | 1200                   | 5-5                    | 200 400 600x400 800 1200:5                                                  | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20)                                                                                           |
| GSCT013/118 | 531966       | BRAZIL/RIO           | 72,5                   | 325        | 140        | 60            | 300                    | 5-5                    | 100 200 300:5                                                               | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20)                                                                                           |
| GSCT013/119 | 531924       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 800                    | 5-5                    | 200 300x400 600:5                                                           | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20)                                                                                           |
| GSCT013/120 | 531414       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 1000                   | 5-5                    | 400 500 800 1000:5                                                          | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20)                                                                                           |
| GSCT013/121 | 531507       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 1200                   | 5-5-5                  | 300 400 600x600 800 1200:5                                                  | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20) M (30 VA - 0,2 SF 2≤SF≤5)                                                                 |
| GSCT013/122 | 531455       | BRAZIL/RIO           | 72,5                   | 325        | 140        | 60            | 800                    | 5-5-5                  | 200 300x400 600:5                                                           | -              | M (30 VA - 0,5 SF 2<SF<5) M (30 VA - 0,5 SF 2≤SF≤5) P (30 VA - 5P 20)                                                                 |
| GSCT013/123 | 531553       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 1600                   | 5-5-5                  | 400 800 1600:5                                                              | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20) P (30 VA - 5P 20)                                                                         |
| GSCT013/124 | 531563       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 2000                   | 5-5                    | 1000 2000:5                                                                 | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20)                                                                                           |
| GSCT013/125 | 531346       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 2000                   | 5-5-5                  | 1000 2000:5                                                                 | -              | M (30 VA - 0,5 SF 2<SF<5) M (30 VA - 0,5 SF 2≤SF≤5) P (30 VA - 5P 20)                                                                 |
| GSCT013/126 | 531925       | BRAZIL/RIO           | 72,5                   | 325        | 140        | 60            | 1800                   | 5-5                    | 900 1800:5                                                                  | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20)                                                                                           |
| GSCT013/127 | 531345       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 1600                   | 5-5                    | 400 800 1600:5                                                              | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20)                                                                                           |
| GSCT013/128 | 531926       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 2000                   | 5-5                    | 1000 2000:5                                                                 | -              | M (30 VA - 0,5 SF 2<SF<5) M (30 VA - 0,5 SF 2≤SF≤5)                                                                                   |
| GSCT013/129 | 531564       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 2000                   | 5-5-5-5                | 1000 2000:5                                                                 | -              | M (30 VA - 0,5 SF 2<SF<5) M (30 VA - 0,5 SF 2≤SF≤5) P (30 VA - 5P 20) P (30 VA - 5P 20)                                               |
| GSCT013/130 | 531927       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 2000                   | 5-5-5                  | 1000 2000:5                                                                 | -              | M (30 VA - 0,5 SF 2<SF<5) M (30 VA - 0,5 SF 2≤SF≤5) P (30 VA - 5P 20)                                                                 |
| GSCT013/131 | 531928       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 2000                   | 5-5-5                  | 1000 2000:5                                                                 | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20) P (30 VA - 5P 20)                                                                         |
| GSCT013/132 | 532005       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 2000                   | 5-5-5                  | 1000 2000:5                                                                 | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20) P (30 VA - 5P 20)                                                                         |
| GSCT013/133 | 531942       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 4000                   | 5-5-5                  | 1000 2000 4000:5                                                            | -              | M (30 VA - 0,5 SF 2<SF<5) P (30 VA - 5P 20) P (30 VA - 5P 20)                                                                         |
| GSCT013/134 | 531943       | BRAZIL/RIO           | 145                    | 650        | 275        | 60            | 2000                   | 5-5-5-5-5              | 1000 2000:5                                                                 | -              | P (30 VA - 5P 20) P (30 VA - 5P 20) P (30 VA - 5P 20) P (30 VA - 5P 20) M (30 VA - 0,5 SF 2≤SF≤5)<br>M (1000/2000 VA - 0,2 SF 2≤SF≤5) |
| GSCT013/135 | 313521       | BRAZIL/<br>SAO PAULO | 145                    | 650        | 275        | 60            | 1200                   | 5                      | 1200:5                                                                      | -              | P (200 VA - 10P 20)                                                                                                                   |

**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (CP)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

| GS CODE     | Country Code       | COUNTRY             | U <sub>m</sub><br>[kV] | LI<br>[kV] | AC<br>[kV] | Freq.<br>[Hz] | I <sub>pr</sub><br>[A] | I <sub>sr</sub><br>[A] | Rated turns ratio<br>(K <sub>r</sub> → I <sub>pr</sub> vs I <sub>sr</sub> ) | Billing<br>(€) | Secondaries Features                        |
|-------------|--------------------|---------------------|------------------------|------------|------------|---------------|------------------------|------------------------|-----------------------------------------------------------------------------|----------------|---------------------------------------------|
| GSCT013/136 | C1450D08<br>00250T | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 80                     | 1                      | 40 80:1                                                                     | X              | M (30 VA - 0,2 SF ≤10)                      |
| GSCT013/137 | C1450Q16<br>00500  | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 160                    | 1                      | 40 60 80 120 160:1                                                          | X              | M (50 VA - 0,2 SF ≤10)                      |
| GSCT013/138 | C1450T1.<br>20500T | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 240                    | 1                      | 60 120 240:1                                                                | X              | M (50 VA - 0,2 SF ≤10)                      |
| GSCT013/139 | 313015             | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 1200                   | 5                      | 600 1200:5                                                                  | -              | P (100 VA - 10P 20)                         |
| GSCT013/140 | 313016             | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 1200                   | 5-5                    | 1200:5                                                                      | -              | P (200 VA - 10P 20) M (100 VA - 0,3 SF -)   |
| GSCT013/141 | 313017             | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 2000                   | 5-5                    | 2000:5                                                                      | -              | P (200 VA - 10P 20) M (100 VA - 0,3 SF -)   |
| GSCT013/142 | 313018             | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 2000                   | 5-5                    | 2000:5                                                                      | -              | P (200 VA - 10P 20) P (200 VA - 10P 20)     |
| GSCT013/143 | 313154             | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 1200                   | 5                      | 1200:5                                                                      | -              | P (200 VA - 10P 20)                         |
| GSCT013/144 | 313156             | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 1200                   | 5                      | 1200:5                                                                      | -              | P (100 VA - 10P 20)                         |
| GSCT013/145 | 313157             | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 1200                   | 5                      | 1200:5                                                                      | -              | P (50 VA - 10P 20)                          |
| GSCT013/146 | 313163             | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 3000                   | 5                      | 3000:5                                                                      | X              | M (50 VA - 0,2 SF ≤10)                      |
| GSCT013/147 | 313165             | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 1200                   | 5                      | 1200:5                                                                      | X              | M (100 VA - 0,2 SF ≤10)                     |
| GSCT013/148 | 313166             | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 1200                   | 5                      | 1200:5                                                                      | X              | M (100 VA - 0,2 SF ≤10)                     |
| GSCT013/149 | 313168             | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 1200                   | 5                      | 1200:5                                                                      | -              | P (200 VA - 10P 20)                         |
| GSCT013/150 | C1450C16<br>00500  | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 160                    | 5                      | 40 60 80 120 160:5                                                          | X              | M (50 VA - 0,2 SF ≤10)                      |
| GSCT013/151 | C1450D03<br>00500T | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 30                     | 5                      | 15 30:5                                                                     | X              | M (50 VA - 0,2 SF ≤10)                      |
| GSCT013/152 | C1450D06<br>00500T | BRAZIL/<br>SAOPAULO | 145                    | 650        | 275        | 60            | 60                     | 5                      | 30 60:5                                                                     | X              | M (50 VA - 0,2 SF ≤10)                      |
| GSCT013/153 | 531904             | BRAZIL/CEARA        | 72,5                   | 325        | 140        | 60            | 1200                   | 1-1                    | 200 400 600x400 800 1200:1                                                  | -              | M (10 VA - 0,5 SF 2<SF<5) P (10 VA - 5P 20) |
| GSCT013/154 | 601775             | BRAZIL/CEARA        | 72,5                   | 325        | 140        | 60            | 300                    | 1                      | 300 200 100:1                                                               | -              | M (10 VA - 0,5 SF 2<SF<5)                   |
| GSCT013/155 | 531382             | BRAZIL/CEARA        | 72,5                   | 325        | 140        | 60            | 1200                   | 5-5                    | 200 400 600x400 800 1200:5                                                  | -              | M (15 VA - 0,5 SF 2<SF<5) P (15 VA - 5P 20) |

**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (CP)**
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

| GS CODE     | Country Code      | COUNTRY             | U <sub>m</sub><br>[kV] | LI<br>[kV] | AC<br>[kV] | Freq.<br>[Hz] | I <sub>pr</sub><br>[A] | I <sub>sr</sub><br>[A] | Rated turns ratio<br>(K <sub>r</sub> → I <sub>pr</sub> vs I <sub>sr</sub> ) | Billing<br>(€) | Secondaries Features                                            |
|-------------|-------------------|---------------------|------------------------|------------|------------|---------------|------------------------|------------------------|-----------------------------------------------------------------------------|----------------|-----------------------------------------------------------------|
| GSCT013/156 | 601776            | BRAZIL/CEARA        | 72,5                   | 325        | 140        | 60            | 300                    | 5                      | 300 200 100:5                                                               | -              | M (15 VA - 0,5 SF 2<SF<5)                                       |
| GSCT013/157 | 531427            | BRAZIL/CEARA        | 72,5                   | 325        | 140        | 60            | 2000                   | 5-5                    | 600 800 1000x1200 1600 2000:5                                               | -              | M (15 VA - 0,5 SF 2<SF<5) P (15 VA - 5P 20)                     |
| GSCT013/158 | 531434            | BRAZIL/CEARA        | 72,5                   | 325        | 140        | 60            | 200                    | 5                      | 200 100 50:5                                                                | X              | M (15 VA - 0,2 SF 2<SF<5)                                       |
| GSCT013/159 | C1450D<br>0120125 | BRAZIL/<br>SAOPAULO | 145                    | 650        | 230        | 60            | 60                     | 5                      | 30 60:5                                                                     | -              | M (12,5 VA - 0,3 SF ≤10)                                        |
| GSCT013/160 | C1450D<br>0300500 | BRAZIL/<br>SAOPAULO | 145                    | 650        | 230        | 60            | 150                    | 5                      | 75 150:5                                                                    | -              | M (50 VA - 0,3 SF ≤10)                                          |
| GSCT013/161 | C1450D<br>0600500 | BRAZIL/<br>SAOPAULO | 145                    | 650        | 230        | 60            | 300                    | 5                      | 150 300:5                                                                   | -              | M (50 VA - 0,3 SF ≤10)                                          |
| GSCT013/162 | C1450D<br>1600500 | BRAZIL/<br>SAOPAULO | 145                    | 650        | 230        | 60            | 800                    | 5                      | 400 800:5                                                                   | -              | M (50 VA - 0,3 SF ≤10)                                          |
| GSCT013/163 | 530092            | BRAZIL/CEARA        | 72,5                   | 350        | 140        | 60            | 1200                   | 1-1-1                  | 200 400 800x300 600 1200:1                                                  | X              | M (30 VA - 0,2 SF 2<SF<5) P (30 VA - 5P 20) P (30 VA - 5P 20)   |
| GSCT013/164 | 530121            | BRAZIL/CEARA        | 72,5                   | 350        | 140        | 60            | 2000                   | 5-5-5                  | 2000 1600 1200x1000 800 600:5                                               | X              | M (30 VA - 0,2 SF 2<SF<5) P (100 VA - 5P 20) P (100 VA - 5P 20) |
| GSCT013/165 | 6797170           | BRAZIL/CEARA        | 72,5                   | 350        | 140        | 60            | 300                    | 1                      | 300 200 100:1                                                               | -              | M (10 VA - 0,5 SF 2<SF<5)                                       |
| GSCT013/166 | 6798632           | BRAZIL/CEARA        | 72,5                   | 350        | 140        | 60            | 300                    | 5                      | 300 200 100:5                                                               | -              | M (15 VA - 0,5 SF 2<SF<5)                                       |



**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (CP)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

**9 ANNEX B – DATASHEET AND CHECK LIST (EXAMPLE)**

| COMPONENT ID                                                                  | ENEL                     | Supplier Data |
|-------------------------------------------------------------------------------|--------------------------|---------------|
| Type of Instrument Transformer                                                | CT - Current Transformer | -             |
| Country                                                                       | SPAIN                    | -             |
| GS Code                                                                       | GSCT013/001              | -             |
| Country Code                                                                  | 530266                   | -             |
| Old Country Reference Code                                                    | 6709141                  | -             |
| <b>SERVICE CONDITIONS</b>                                                     |                          |               |
| Installation Conditions                                                       | OUTDOOR                  | -             |
| Service Conditions Type                                                       | Normal                   | -             |
| Temperature category [°C]                                                     | -25/+40                  | -             |
| Daily Average Amb. Temperature [°C]                                           | <35°C                    | -             |
| Altitude [m]                                                                  | <1000                    | -             |
| Seismic Qualification Level [m/s <sup>2</sup> ]                               | -                        | -             |
| RUSCD (Reference Unified Specific Creepage Distance) [mm/kV]                  | 53,7                     | -             |
| <b>ELECTRICAL RATINGS</b>                                                     |                          |               |
| Highest voltage for equipment (U <sub>m</sub> ) [kV]                          | 245                      | -             |
| Rated lightning impulse withstand voltage [kV]                                | 1050                     | -             |
| Rated power frequency withstand voltage [kV]                                  | 460                      | -             |
| Rated frequency (f <sub>R</sub> ) [Hz]                                        | 50                       | -             |
| Metering for Billing (B)                                                      | YES                      | -             |
| Rated primary current (I <sub>pr</sub> ) [A]                                  | 100                      | -             |
| Rated secondary current (I <sub>sr</sub> ) [A]                                | 5-5-5-5                  | -             |
| Rated turns ratio (K <sub>r</sub> = I <sub>pr</sub> / I <sub>sr</sub> ) [A/A] | 4x(50-100/5)             | -             |
| Primary Serie/Parallel settings                                               | YES                      | -             |
| Secondary Conection settings                                                  | NO                       | -             |
| Rated continuous thermal current (I <sub>cth</sub> ) [%]                      | 120% I <sub>pr</sub>     | -             |
| Rated short-time thermal current (I <sub>th</sub> ) [kA]                      | 40                       | -             |
| Rated dynamic current (I <sub>dyn</sub> ) [kA]                                | 100                      | -             |
| Number of Cores [nr.]                                                         | 4                        | -             |

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

|                                                             |             |   |
|-------------------------------------------------------------|-------------|---|
| <b>Core 1</b>                                               |             |   |
| Function                                                    | Measurement | - |
| Primary Current (Ip) for ratios purpose - Core 1 [A]        | 50-100      | - |
| Rated secondary current (Isr) [A]                           | 5           | - |
| Rated output (Sr) [VA]                                      | 10          | - |
| Accuracy class                                              | 0,2S        | - |
| Instrument Security Factor (SF)/Accuracy Limit Factor (ALF) | <5/-        | - |
| Secondary winding resistance (R <sub>ct</sub> )             | -           | - |
| Secondary reactance at industrial frequency                 | -           | - |
| <b>Core 2</b>                                               |             |   |
| Function                                                    | Measurement | - |
| Primary Current (Ip) for ratios purpose - Core 2 [A]        | 50-100      | - |
| Rated secondary current (Isr) [A]                           | 5           | - |
| Rated output (Sr) [VA]                                      | 20          | - |
| Accuracy class                                              | 0,5         | - |
| Instrument Security Factor (SF)/Accuracy Limit Factor (ALF) | <5/-        | - |
| Secondary winding resistance (R <sub>ct</sub> )             | -           | - |
| Secondary reactance at industrial frequency                 | -           | - |
| <b>Core 3</b>                                               |             |   |
| Function                                                    | Protection  | - |
| Primary Current (Ip) for ratios purpose - Core 3 [A]        | 50-100      | - |
| Rated secondary current (Isr) [A]                           | 5           | - |
| Rated output (Sr) [VA]                                      | 30          | - |
| Accuracy class                                              | 5P          | - |
| Instrument Security Factor (SF)/Accuracy Limit Factor (ALF) | -/30        | - |
| Secondary winding resistance (R <sub>ct</sub> )             | -           | - |
| Secondary reactance at industrial frequency                 | -           | - |
| <b>Core 4</b>                                               |             |   |
| Function                                                    | Protection  | - |
| Primary Current (Ip) for ratios purpose - Core 4 [A]        | 50-100      | - |
| Rated secondary current (Isr) [A]                           | 5           | - |

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

|                                                               |                                      |                             |   |
|---------------------------------------------------------------|--------------------------------------|-----------------------------|---|
| Rated output (S <sub>r</sub> )                                | [VA]                                 | 30                          | - |
| Accuracy class                                                |                                      | 5P                          | - |
| Instrument Security Factor (SF)/Accuracy Limit Factor (ALF)   |                                      | -/30                        | - |
| Secondary winding resistance (R <sub>ct</sub> )               |                                      | -                           | - |
| Secondary reactance at industrial frequency                   |                                      | -                           | - |
| <i>Core 5</i>                                                 |                                      |                             |   |
| Function                                                      |                                      | -                           | - |
| Primary Current (I <sub>p</sub> ) for ratios purpose - Core 5 | [A]                                  | -                           | - |
| Rated secondary current (I <sub>sr</sub> )                    | [A]                                  | -                           | - |
| Rated output (S <sub>r</sub> )                                | [VA]                                 | -                           | - |
| Accuracy class                                                |                                      | -                           | - |
| Instrument Security Factor (SF)/Accuracy Limit Factor (ALF)   |                                      | -                           | - |
| Secondary winding resistance (R <sub>ct</sub> )               |                                      | -                           | - |
| Secondary reactance at industrial frequency                   |                                      | -                           | - |
| <i>Core 6</i>                                                 |                                      |                             |   |
| Function                                                      |                                      | -                           | - |
| Primary Current (I <sub>p</sub> ) for ratios purpose - Core 6 | [A]                                  | -                           | - |
| Rated secondary current (I <sub>sr</sub> )                    | [A]                                  | -                           | - |
| Rated output (S <sub>r</sub> )                                | [VA]                                 | -                           | - |
| Accuracy class                                                |                                      | -                           | - |
| Instrument Security Factor (SF)/Accuracy Limit Factor (ALF)   |                                      | -                           | - |
| Secondary winding resistance (R <sub>ct</sub> )               |                                      | -                           | - |
| Secondary reactance at industrial frequency                   |                                      | -                           | - |
| <b>COMPONENT GENERAL REQUIREMENTS</b>                         |                                      |                             |   |
| External Insulation                                           | [POLymeric, RESin, PORcelain, OTHer] | POL                         | - |
| Internal Insulation                                           | [OIP, RESin, SF6, OTHers]            | OIP                         | - |
| Arc Distance                                                  | [mm]                                 | To be indicated by supplier | - |
| Creepage Distance (ka=1 according to IEC 60137)               | [mm]                                 | minimum 7.596 mm            | - |
| Overall Dimensions (hxxwxl)                                   | [mm]                                 | 3600x-x- max.               | - |
| Fixing holes - Diameter                                       | [mm]                                 | 20                          | - |
| Fixing holes - Distances (wxl)                                | [mm]                                 | maximum 500x500             | - |

**Subject: E&C – GSCT013**  
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Perimeter: *Global*

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Business Line: *Enel Grids*

|                                                        |                                                  |                                         |   |
|--------------------------------------------------------|--------------------------------------------------|-----------------------------------------|---|
| Total Weight                                           | [kg]                                             | To be indicated by supplier             | - |
| Internal Insulation Class                              | [Oil, Cycloaliphatic Resin, SF <sub>6</sub> GAS] | Oil                                     | - |
| Internal Insulation (Type & Manufacturer)              |                                                  | To be indicated by supplier             | - |
| Internal Insulation Weight or Volume                   | [kg] or [liters]                                 | To be indicated by supplier             | - |
| Oil Level Indicator/Gas Pressure indicator             | [YES, NO, NA]                                    | To be indicated by supplier             | - |
| Pressure Relief system                                 | [YES, NO, NA]                                    | To be indicated by supplier             | - |
| Oil Sampling device                                    | [YES, NO, NA]                                    | YES                                     | - |
| Primary Terminal Type                                  |                                                  | Al or tined/silvered Cu cylinder        | - |
| Secondary Terminal Type                                |                                                  | M8 Bolts&Nuts or DIN 10 mm <sup>2</sup> | - |
| Earthing Terminal Type                                 |                                                  | M12                                     | - |
| <b>MECHANICAL REQUIREMENTS</b>                         |                                                  |                                         |   |
| Static withstands test load (Fr)                       | [N]                                              | 2500                                    | - |
| Specific Horizontal force applied (in a specific area) | [N]                                              | -                                       | - |
| Specific Vertical force applied (in a specific area)   | [N]                                              | -                                       | - |
| <b>ADDITIONAL REQUIREMENTS/COMMENTS</b>                |                                                  |                                         |   |
|                                                        |                                                  |                                         |   |
| <b>DRAWINGS (OVERALL/DETAILED INDICATIONS)</b>         |                                                  |                                         |   |
|                                                        |                                                  |                                         |   |

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

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## **ANNEX LOCAL SECTION ARGENTINA (AR)**

### **7.1 Document/Section Scope**

The scope of this Local Section is to integrate the Common Part to provide the technical standard requirements for the current transformers of Edesur transmission network.

The purpose of this document is to establish the conditions that current transformers shall satisfy for their construction and testing, intended for measurement and/or protection, from 33 kV to 220 kV. The transformers that are the subject of this Technical Specification are installed in the Transformer Substations of the Edesur transmission network. This document applies to Enel Grids Argentina. In accordance with all applicable laws, regulations, and corporate governance standards, including the provisions related to the stock market or the separation of assets, which in any case prevail over the provisions contained in this document.

### **7.2 List of Components**

See ANNEX A.

### **7.3 Service Conditions**

They are used in permanent service and with variable load.

The installation can be inside or outside.

The climate is hot and humid, unfavourable for the conservation of insulating materials.

The external temperature in the shade varies between -5 °C and 40 °C and the humidity of the air frequently reaches saturation values.

The equipment and/or materials shall therefore be designed to operate in a tropical climate and where an atmosphere has a medium level contamination, according to the IEC 60815-1 standards; 60815-2; 60815-3 and 60815-4, "Selection and sizing of high-voltage insulators intended for use in polluted conditions - Part 1, 2, 3 and 4.

Insulating oil in transformers shall not contain PCBs (polychlorinated biphenyls), PCTs (polychlorinated triphenyls) and PBBs (polybrominated biphenyls).

Waste substances and articles that contain or are contaminated with the aforementioned fluids, labelled as Y10 in Law 24051 on "Hazardous Waste", Chapter XI, Article 64, Annex 1, as a Category subject to Control, are not accepted as insulating liquids of the transformers acquired by Edesur, regardless of their mode of use.

### **7.4 Technical Characteristics**

For definitions IEC 61869-1, IEC 61869-2 apply.

#### **7.4.1. Type of Current Transformers**

See Datasheets.

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**7.4.2. Number of Cores and Windings**

See Datasheets.

**7.4.3. Selectable-Ratio**

See Datasheets.

**7.4.4. Insulation Levels**

See Datasheets.

**7.4.5. Rated Output**

See Datasheets.

**7.4.6. Rated Accuracy Class CT for protection (ALF)**

See Datasheets.

**7.4.7. Rated Accuracy Class CT for measurement (FS)**

See Datasheets.

**7.4.8. Standard Values for Rated Primary Current**

See Datasheets.

**7.4.9. Standard Values for Rated Secondary Current**

See Datasheets.

**7.4.10. Standard Values for Rated Continuous Thermal Current**

See Datasheets.

**7.4.11. Rated Short-Time Thermal Current ( $I_{th}$ )**

See Datasheets.

**7.4.12. Rated DYNAMIC Current ( $I_{dyn}$ )**

See Datasheets.

**7.4.13. Static withstands load ( $F_R$ )**

See Datasheets.

**7.4.14. Installation**

**7.4.15. Temperature Rise**

See IEC-61698-1 and IEC-61698-2.

**7.4.16. Seismic Qualification**

A seismic certification is required for the severity level AF5 according to IEC 60068-3-3, for CT and support assembled.

The seismic certification can be based on the calculations according to the above-mentioned standard.

**7.5 Construction Characteristics**

The transformers must be insulated in oil or ester, in addition for 33 kV they can be encapsulated in cast synthetic resin (cycloaliphatic epoxy), with non-hygroscopic and self-extinguishing characteristics.

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Staff Function: -

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Devices with the same characteristics, as well as parts with the same denomination included in the construction of the transformers, must be interchangeable with each other, in such a way that a reserve set can be used without distinction, regardless of the place where it shall be installed.

All the parts in which it is necessary to avoid oxidation or corrosion must be made with pieces of stainless steel, bronze, aluminium, or suitable alloys or have anticorrosive protection of ferrous surfaces by zinc plating, according to the equivalent method.

#### **7.5.1. Internal Insulation**

The internal insulating liquid used (oil or ester) shall comply with the requirements indicated in the Data Sheet included in Annex B.

In case of mineral oil use, it shall be free of polychlorinated biphenyls (PCBs) and meet the requirements of the IEC 60296 Standard.

In case of ester use, it shall meet the requirements of the IEC 62770 Standard.

#### **7.5.2. External Insulation**

Each external bushing shall be built in a single piece, that is, without glued joints; Insulators are only allowed to be joined through metal flanges. They shall meet the requirements of IEC 62155 "Hollow pressurized and unpressurized ceramic and glass bushings for use in electrical equipment with rated voltages greater than 1000 V". It should preferably have a capacitive tap for measuring the dissipation factor ( $\tan \delta$ ).

#### **7.5.3. Overall Dimensions and Layout**

#### **7.5.4. Metal Surface Treatment**

#### **7.5.5. Accessories**

##### **7.5.5.1. Primary outer Terminals**

They shall be of the cylindrical bolt type, copper or bronze, preferably with one of the dimensions indicated in the corresponding guaranteed data sheets. They shall be identified by stainless steel or bronze plates, riveted and with the inscription in low relief.

Current transformers shall have a clear and clearly visible identification of their terminals, using the letters "P1" and "P2" (or K and L).

In addition, the "A" terminal and its counterpart, and the "P1" (or K) terminal and its counterpart shall be marked with a clearly visible dot.

##### **7.5.5.2. Secondary Terminals**

They shall be made up of screws of suitable length, diameter and materials. Each terminal shall have at least 2 (two) washers and 2 (two) nuts, also bronze.



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Perimeter: *Global*

Staff Function: -

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The transformers shall carry a clear and clearly visible identification of these terminals, using the letters S1 and S2 for current transformers.

The terminals shall be separated enough so that the eyelet connectors of the interconnection cables with the substation have a distance of at least 3 mm.

The different cores shall be numbered correlatively, so the measurement cores shall be designated with the first numbers and the protection ones with the following.

For example, the terminals of a current transformer should bear the following markings: 1S1, 1S2 (one measurement core), 2S1, 2S2, 3S1, 3S2 (two protection cores).

**7.5.5.3. Grounding Terminals**

Current transformers shall have a safety grounding terminal to which they are connected: the tank, the metallic base, the rating plate and any other identification plate when applicable.

It should be located in such a way that once the transformer is installed it is easily visible from ground level. The dimensions of the terminals shall be suitable for connecting copper bars or cables of the following sections:

| RATING VOLTAGE<br>(kV) | COPPER IRON (mm) |        | CABLE SECTION<br>(mm <sup>2</sup> ) |
|------------------------|------------------|--------|-------------------------------------|
|                        | SAFETY           | DUTY   |                                     |
| 33                     | 25 x 5           | 25 x 5 | 1 x 120                             |
| 132                    | 25 x 5           | 25 x 5 | 1 x 120                             |
| 220                    | 25 x 5           | 40 x 5 | 1 x 240                             |

*Table 1AR*

**7.5.5.4. CT Support Base**

**7.5.5.5. Secondary Terminals Box**

The box shall have a degree of mechanical protection IP 54. To open or close the lid that covers it, the use of any type of special tool shall not be required.

The box shall have a through grounding terminal on one of its sides and the terminal block shall be provided with a link-type copper plate with a minimum section of 70 mm<sup>2</sup>, for each secondary winding, so that it can be connected to the aforementioned grounding terminal. For current transformer it shall be located on the P terminal side. Any departure as requested is subject to Edesur's approval.

**7.5.5.6. Liquid Level Gauge**

Fluid-insulated transformers shall have a level indicator at the top that allows reading it with the naked eye, from a distance of approximately 9 meters. The transparent

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Staff Function: -

Service Function: -

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window shall be made of glass or polycarbonate; any other type of material is subject to the approval of Edesur. Said window is mechanically fixed, not glued. In case of using cork float, it shall be protected on the surface in such a way that it does not lose its buoyancy.

**7.5.5.7. Overpressure Relief Device**

A hermetic closing device (membrane or bellows) to compensate the volume variations of the insulating oil of the Transformer (if applicable) shall be a metallic bellows or a synthetic rubber membrane with or without internal reinforcement of synthetic fabric impregnated with the same rubber. Any other system is subject to Edesur's approval.

**7.5.5.8. Liquid Sampling Device**

Liquid-insulated transformers shall have a plug for filling and another that allows emptying. Likewise, liquid-insulated transformers shall have a means for taking oil samples, consisting of a valve or a quick coupling and finally a closing plug that prevents possible liquid leaks, or another similar device that fulfills the function required.

**7.5.5.9. Lifting Lugs**

**7.5.5.10. Rating Plate**

In addition to the data required in the corresponding specifications, the following shall be indicated on the same rating plate or on others:

- The manufacturing CT model and serial number
- The diagram of the primary and secondary windings. This sheet shall be located close to the terminal block, so that the diagram can be easily compared with the actual layout of the terminals
- The electrical resistance of the secondary winding(s) referred to 75°C
- The dissipation factor ( $\tan \delta$ ) maximum admissible in service
- The sentence: "Contains PCB-free mineral oil", with the following table:

|      |
|------|
| 30   |
| 1270 |

*Table 2AR*

**7.5.5.11. Terminal Marking**

In accordance with IEC 61869-2.

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Staff Function: -

Service Function: -

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Transformers that have double ratio, both shall be achieved by varying the location of mobile plates.

In no case should the connection plates of each relationship overlap the indications that the corresponding primary terminals had engraved. In the case of an unused plate (for one of the ratios), it should be located in the transformer itself.

The ratio shall be indicated with numbers and letters at least 20 mm high, painted on two opposite sides of the appliance and not covered by the rating plate.

This requirement does not replace the indication of the transformation ratio that shall appear on the rating plate

**7.5.5.12. Capacitive Tap**

In current transformers where its design allows it, the magnetic core and the internal screens shall be at earth potential, not connected internally to the tank, but rather coming out of it through external insulators and jumpers that allow their connection to the safety ground, in normal operation. These bridges shall be removable, made of copper, and the insulators shall withstand a non-permanent voltage of 10 kV at industrial frequency for the purposes of carrying out tests to verify the dissipation factor ( $\text{tg } \delta$ ).

**7.6 Testing**

**7.6.1. Type Tests**

According to clause 7.6.1 Common Part; in addition the following tests shall be performed:

- Chopped impulse test
- Measurement of capacity and dielectric dissipation factor ( $\text{tg } \delta$ )
- Multiple impulse voltage test applied, with chopped wave, on the primary winding
- Determination of the error in limit conditions
- Determination of the construction factor.

**7.6.2. Routine/Acceptance Tests**

According to clause 7.6.2 Common Part.

In addition the following tests shall be performed:

- Verification of the physical-chemical characteristics, chromatography and absence of PCBs of the insulating oil, according to ASTM D 4059 "Standard Test Method for Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography".

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Staff Function: -

Service Function: -

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**7.6.3. Special Tests**

**7.6.4. Sample Tests**

**7.7 Conditions of Supply**

**7.7.1. Warranty**

**7.7.2. Reception Control**

**7.7.3. Technical Information Required**

**7.7.4. Packaging and Transport**

**7.7.5. Installation, Operation, Maintenance and Disassembling**

Manual for installation, operation, maintenance, and disassembling shall be provided in Spanish.

**7.7.6. Technical Conformity Assessment (TCA)**

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**HV CURRENT TRANSFORMERS (BR)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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## **ANNEX LOCAL SECTION BRAZIL (BR)**

### **7.1 Document/Section Scope**

The scope of this Local Section is to integrate the Common Part to provide the technical standard requirements for the current transformers of Enel Distribuição Rio, Enel Distribuição Ceará and Enel Distribuição São Paulo.

This document applies to Brazilian Distribution Infrastructures and Networks.

### **7.2 List of Components**

See ANNEX A.

### **7.3 Service Conditions**

The TC shall be single phase, for outdoor use and immersed in insulating mineral oil as per ABNT NBR 10576 or immersed in insulating vegetable oil as per NBR15422:2015. The electrical system to which the current transformers shall be connected is solidly grounded.

### **7.4 Technical Characteristics**

For definitions IEC 61869-1, IEC 61869-2 and ABNT NBR 6856 apply.

#### **7.4.1. Type of Current Transformers**

Current transformers intended to be connected to HV grid for measuring and protection scope.

#### **7.4.2. Number of Cores and Windings**

See Datasheets.

#### **7.4.3. Selectable-Ratio**

See Datasheets.

#### **7.4.4. Insulation Levels**

See Datasheets.

#### **7.4.5. Rated Output**

See Datasheets.

#### **7.4.6. Rated Accuracy Class CT for protection (ALF)**

See Datasheets.

#### **7.4.7. Rated Accuracy Class CT for measurement (FS)**

See Datasheets.

#### **7.4.8. Standard Values for Rated Primary Current**

See Datasheets.

#### **7.4.9. Standard Values for Rated Secondary Current**

See Datasheets.

#### **7.4.10. Standard Values for Rated Continuous Thermal Current**

See Datasheets.

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**HV CURRENT TRANSFORMERS (BR)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

**7.4.11. Rated Short-Time Thermal Current ( $I_{th}$ )**

See Datasheets.

**7.4.12. Rated DYNAMIC Current ( $I_{dyn}$ )**

See Datasheets.

**7.4.13. Static withstands load ( $F_R$ )**

See Datasheets.

**7.4.14. Installation**

**7.4.15. Temperature Rise**

See IEC-61698-1 and IEC-61698-2.

**7.4.16. Seismic Qualification**

**7.5 Construction Characteristics**

**7.5.1. Internal Insulation**

Equipment insulated in oil and ester shall be provided with a fluid expansion chamber with metal bellows, in order to absorb thermal contractions and expansions of the fluid. The oil used shall be without inhibitors or additives, be free of polychlorinated biphenyls (PCBs) and shall meet the requirements of the IEC 60296 Standard. Its main characteristics shall be indicated, its typical composition, indicating the percentage of aromatics, isoparaffins and naphthenics.

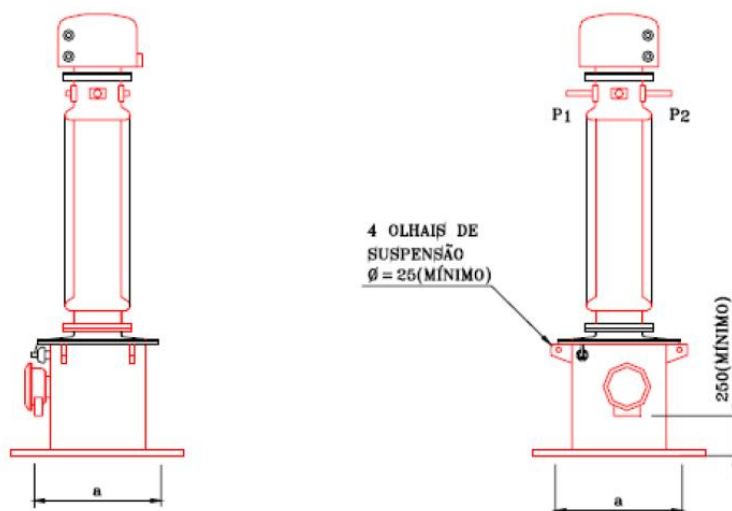
The ester used shall meet the requirements of the IEC 62770 Standard.

**7.5.2. External Insulation**

The external insulation of the instrumentation transformers shall be porcelain, resin, or silicone rubber. Creepage distance of the bushings shall be in accordance with the pollution level indicated in *Table 3CP* (par. 7.3, Common Part).

The active part of the current transformers shall be located in the metal bodies (upper or lower, as the case may be). Design with active part located inside the porcelain shall not be accepted.

**7.5.3. Overall Dimensions and Layout**



Current Transformers BR 72,5 kV types C1, C2, C3 and C4

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**HV CURRENT TRANSFORMERS (BR)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

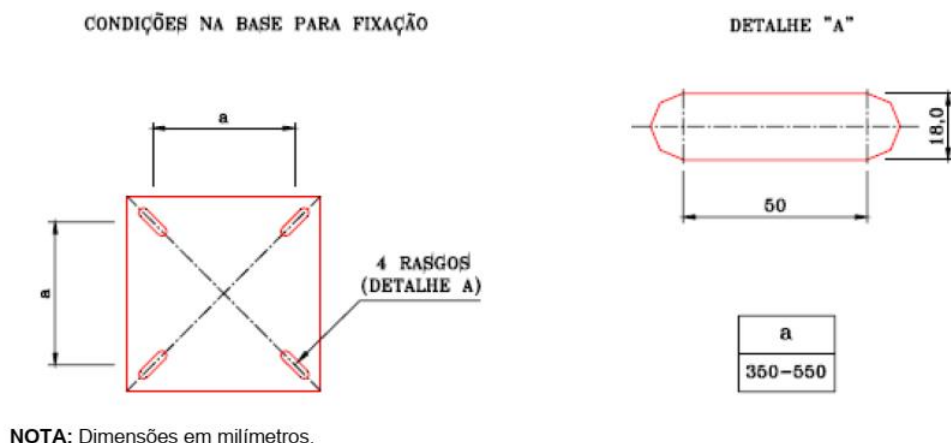


Figure 1BR

#### 7.5.4. Metal Surface Treatment

Painting and galvanization shall be suitable for the environmental conditions indicated in *Table 3CP* (par 7.3, Common Part). Thickness of galvanization shall be conformed to the following table:

| Tipo de Tanque                       | Pintura Interna | Pintura Externa |             |                 |                     |        |
|--------------------------------------|-----------------|-----------------|-------------|-----------------|---------------------|--------|
|                                      |                 | Metalização     | Wash-primer | Epoxi-poliamina | Tinta de acabamento | Total  |
| Aço galvanizado com zinco (à quente) | 30 µm           | 80 µm           | 10-15 µm    | 70 µm           | 70 µm               | 230 µm |

Table 1BR

The non-energized metal surfaces of current transformers shall be made of steel and/or hot dip galvanized or painted.

Moreover, all De-energized metal surfaces, such as tanks, secondary terminal boxes and other components, shall meet the following requirements:

- all welds shall be performed in such a way as to ensure complete fusion with the base metal.
- welds shall not be cracked, discontinuous and corrosion-free.
- elimination of all weld spatter, slag and burrs.
- sharp edges and corners shall be rounded.
- degreasing of all plates and supports.
- blasting with clean sand or shot, free of salts, moisture, oil or any other foreign component.

The blasting shall completely eliminate rust and rolling scale, reaching the Sa 3 degree of SIS 05 5900-67. The blast profile shall be between 40 and 60 µm.



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- g) thermal spraying of all sheets and supports immediately after blasting. The zinc layer shall meet the requirements of ISO-R 2063/1971 with a minimum layer thickness of 80  $\mu\text{m}$  (Zn 80)

At the stage of performing the painting, the CT's supplier shall keep in his plant, full-time, a qualified industrial paint inspector, according to ABNT NBR 15218.

The qualified inspector shall record, in a painting report, all the results of the steps and observations performed, as well as fill out a report of nonconformities. The paint shall meet the NBR 11388 standard. The finishing paint shall be light grey, MUNSELL notation 6.5. Every surface to be energized should be red, according to MUNSELL 5R4/14.

### 7.5.5. Accessories

#### 7.5.1.1 Primary Outer Terminals

The primary terminals can be made of aluminium, tinned copper or silver. The terminal type can be the flat bar type (2N) or (4N) as shown in Figure 1 and suitable to withstand thermal and mechanical stresses according to NBR 10023.

Terminals shall have clearly distinct terminal and polarity markings. The supplier shall inform in his proposal the characteristics of the terminals of the offered equipment.

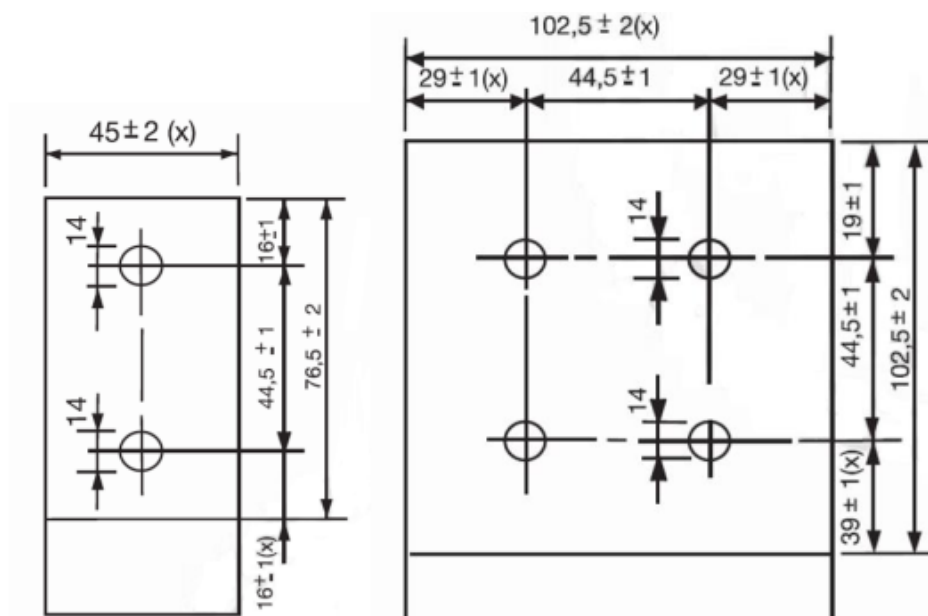


Figure 2BR

#### 7.5.1.2 Secondary Terminals

The secondary terminals shall be phosphorous bronze and shall be connected to the terminals located inside a box. This box should be suitable for outdoor use, with

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protection grade IP65 according to IEC 60529, and allow external cable connections from the bottom or side of the box.

All terminals shall be eyelet type and clearly marked. The terminals of the secondary winding shall be protected by weatherproof housing with devices for sealing seal placement, with a hole of 50 mm in diameter and area required for connection of 2" bushings and washers.

Current transformers shall have a separate connection box for all metering cores to be sealed by the purchaser. The supplier shall provide an antifraud terminal block with a plate made of transparent insulating material, installed on top of the terminals with a place where affix a seal, subject to customer approval.

#### **7.5.1.3 Grounding Terminals**

The manufacturer shall provide terminals to connect the current transformers to the grounding system substation. The connections to the ground mesh shall be made through a copper cable with a section between 70 and 240 mm<sup>2</sup> or a 3x40 mm copper plate. The housing grounding terminal shall be provided with a connector from 35 mm<sup>2</sup> to 150 mm<sup>2</sup> copper cable.

#### **7.5.1.4 CT Support Base**

The supplier shall provide all necessary technical information to design the support base to fix the CT structure, as well as the bolts, nuts and adjustment washers, necessary for this purpose.

The minimum distances between live parts on primary side and support base of the transformer shall ensure the safety distance as specified in the publication "Electric Power Supply - Sub transmission Voltage 88/138 kV" of ELETROPAULO.

The minimum distance from the bottom of the secondary terminal box to the mounting base shall be 300 mm. If the manufacturer's design does not meet this item, a subbase shall be provided for the specified minimum distance.

Fixing base shall respect the dimensions indicated in the following picture:

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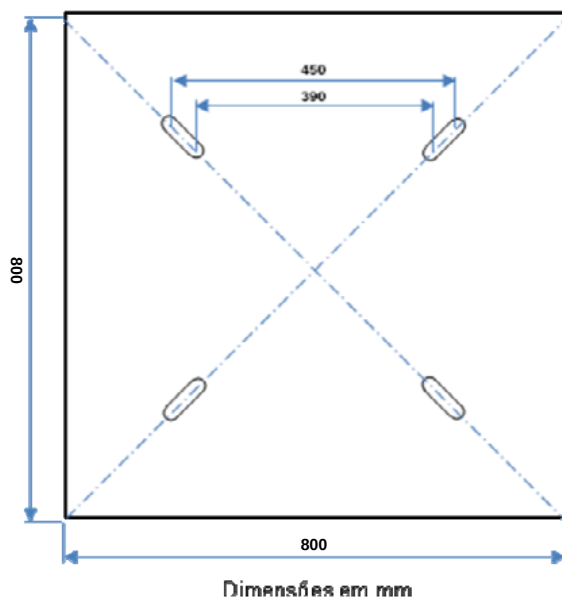
**Application Areas**

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Service Function: -

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*Figure 3BR*

**7.5.1.5 Secondary Terminals Box**

**7.5.1.6 Liquid level Gauge**

The device for checking the liquid level shall indicate whether the liquid level is within the operating range, during operation and shall be clearly readable from ground.

**7.5.1.7 Overpressure Relief Device**

The mechanical protective action can be performed by liquid expansion chamber.

CT shall be designed in such a way that if an internal failure occurs in the main insulation, any overpressure originating in the internal part can be only released upwards, avoiding the breakage and projection of the porcelain.

**7.5.1.8 Liquid Sampling Device**

CT shall be equipped with a following valves:

- Drain valve with a hermetic liquid sampling device.
- A valve for oil filling in the upper part of CT.

**Note:**

For CT hermetically sealed the two above mentioned valves are not requested.

**7.5.1.9 Lifting Lugs**

Placed to facilitate lifting of CT.

**7.5.1.10 Rating Plate**

Rating plate shall be made of stainless steel, in Portuguese and all information shall be marked in an indelible manner.

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In addition to the markings defined in IEC 61869-1 and IEC 61869-2, the following minimum information shall be indicated in the rating plate:

- Placa de identificação conforme norma ABNT NBR 6856
- Placa com o diagrama de conexão dos enrolamentos
- Placa de aviso, com o seguinte texto: **"Atenção! Não deixe o circuito secundário aberto."**

NOTA: Para Enel SP devem ser fornecidas placas de identificação com código de barras no padrão EAN 128, conforme imagens abaixo.



Figure 4BR

Every CT shall have an identification plate (according to NBR-10023) and a connection plate made of stainless steel, placed in a clear visible position, with at least the following information, permanently engraved:

- expressão "TRANSFORMADOR DE CORRENTE".
- nome do fabricante.
- ano de fabricação (ANO).
- número de série (Nº).
- tipo ou modelo (TIPO).
- número do manual de instruções (MANUAL).
- uso: para interior ou para exterior (USO).
- corrente(s) primária(s) e secundária(s) nominal(is) ( $I_p$ – $I_s$ ) em A e relação(ões) nominal(is) ( $R_n$ ).
- tensão máxima do equipamento ( $U_{max}$ ), em kV.
- nível de isolamento (NI \_\_\_/\_\_\_/\_\_\_), em kV.
- frequência nominal ( $f$ ), em Hz.

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- l) fator térmico nominal ( $F_t$ ).
- m) exatidão: classe e carga (EXATIDÃO).
- n) corrente suportável nominal de curta duração e tempo de duração ( $I_t/t$ ), em kA/s.
- o) valor de crista nominal da corrente suportável ( $I_d$ ), em kA.
- p) massa total ( $M_{total}$ ), em kg.
- q) tipo e massa do líquido isolante, em kg;
- r) norma e ano da sua edição (NORMA/ANO);
- s) diagrama de ligações;
- t) encomenda (ENCOM) - Número e data do pedido de compra;
- u) código do material, código de barras, logotipo e número patrimonial, conforme Especificação Técnica EST-027.

#### **7.5.1.11 Terminal Markings**

All terminals shall be permanently marked according to as ABTN NBR-6856.

#### **7.5.1.12 Capacitive Tap**

### **7.6 Testing**

#### **7.6.1. Type Tests**

They are those that will be carried out only once in the product approval process.

All the tests declared on Common Part clause 7.6.1 shall be done in accordance with ABNT NBR 6856.

#### **7.6.2. Routine/Acceptance Tests**

These tests shall be performed on each unit and in accordance with ABTN NBR 6856.

In addition to the tests detailed on clause 7.6.2 Common Part, the following tests shall be performed:

- Measure of the paint thickness according to par. 7.5.4.
- Insulating oil or ester test, according to Regulamento Técnico ANP N° 36/2008 or IEC IEC 62770.
- Measurement of capacitance and dielectric dissipation factor.

#### **7.6.3. Special Tests**

These tests shall be required exceptionally in the product approval process and shall be performed according to ABTN NBR 6856.

According to clause 7.6.3 Common Part; in addition the following tests shall be performed:

- Test for vegetable oil, according to Standard IEC 62770.
- Mechanical bending tests on fixing support.
- Opend-Circuit Voltage Test (Ensaio de tensão de circuito aberto).

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Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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#### **7.6.4. Sample Tests**

### **7.7 Conditions of Supply**

#### **7.7.1. Warranty**

Minimum life expectancy shall be 33 years.

#### **7.7.2. Reception Control**

#### **7.7.3. Technical Information Required**

#### **7.7.4. Packaging and Transport**

The supplier will carry out the appropriate packaging of the current transformers to ensure their protection during transport by sea, land or air. In the packaging, padding material will be used to ensure good protection in the event that the boxes containing the materials are hit or damaged during loading and unloading maneuvers.

To protect materials from moisture, airtight covers or bags containing hygroscopic material shall be used.

Each drawer shall have the following information printed on it:

- Type of material and quantity
- Net and gross weight
- Date

The supplier will be responsible for transporting the transformers to ENEL's warehouses, unless otherwise indicated in the purchase order.

Each package shall contain only one unit. Packaging shall be suitable to support operations like normal loading, unloading and eventual stacking of different packages.

Each package shall include facilities to lift it by means of belts.

For export maritime transport, the manufacturer shall obtain the approval of the packaging by the transport companies before dispatching the equipment from the factory.

All packaging shall contain all necessary details about identification and handling, clearly and indelibly, related to the contents and the Purchase Order.

The type of packaging and its identification shall be submitted for the client's or his representative approval before dispatch from the factory. If not all of the specified conditions are complied the request for dispatching may be rejected.

The SUPPLIER shall issue a Packing list for all the supplied equipment and components. A copy shall accompany the invoice, a second copy shall be placed inside the packaging and a Third copy shall be protected with plastic casing on the outside of the package, indicating only the materials of the package.

After the inspection, a copy of the packing list shall be issued for checking and approval by the purchaser, before dispatching.

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

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### **7.7.5. Installation, Operation, Maintenance and Disassembling**

Manual for installation, operation, maintenance, and disassembling shall be provided in Portuguese.

The instruction manual shall contain at least the following items:

- General Index.
- Provide an overview of the equipment and all its components along with their operating principle.
- Indicate the basics of the equipment and its components related to the activities like "commissioning, operation and maintenance", such as:
  - Information that characterizes and identifies the equipment, such as: manufacturer, serial number, type, code, model, lot, Purchase order, etc., including alternatives from other accepted manufacturers in the project.
  - Design characteristic of equipment and accessories, such as: weight, dimensions, fixing point, illustrative drawings, materials, etc.
  - Electrical characteristics of the main equipment and its components such as: voltage, current, frequency, diagrams electrical schematics, interconnection and block diagram, points connection, etc.
- Any and all necessary graphics.
- Drawings:
  - All final and revised drawings as manufactured, including drawings and technical characteristics of all gaskets used.
- Test reports:
  - All test results requested in this specification.
- Spare Parts:
  - A material list containing the list of parts or components of the equipment, recommended as a spare part and the one supplied with the equipment, duly specified, indicating its basic characteristics, reference number and its location on the equipment.
- Instructions for assembly:
  - Assembly of equipment and accessories.
  - Lifting and movement of the parts.
- Instructions for commissioning and operation:
  - Recommendations for commissioning.
  - Permissible Long and short duration overload.
  - Inspections and verifications.
  - Adjustments and measurements.

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- Cleaning and lubrication.
  - Tests.
- Instructions for maintenance:
  - Recommendations for transport and storage.
  - Recommendations for disassembly and assembly.
  - Torques table for all flanges.
  - Preventive maintenance.
  - Equipment and instruments required for maintenance.
  - Tests and verifications.
  - Maintenance frequency.
  - Cleaning.
  - Care to be taken with painting and retouching instructions.
- Photos of the equipment during the manufacturing process.
- Copy of the Packing list.

#### **7.7.6. Technical Conformity Assessment (TCA)**



**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (CO)**

**Application Areas**

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Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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**Application Areas**

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## **ANNEX LOCAL SECTION COLOMBIA (CO)**

### **7.1 Document/Section Scope**

The scope of this Local Section is to integrate the Common Part to provide the technical standard requirements for the current transformers of Enel Colombia.

### **7.2 List of Components**

See ANNEX A.

### **7.3 Service Conditions**

### **7.4 Technical Characteristics**

For definitions IEC 61869-1, IEC 61869-2 apply.

See Datasheets.

#### **7.4.1. Type of Current Transformers**

See Datasheets.

#### **7.4.2. Number of Cores and Windings**

See Datasheets.

#### **7.4.3. Selectable-Ratio**

See Datasheets.

#### **7.4.4. Insulation Levels**

See Datasheets.

#### **7.4.5. Rated Output**

See Datasheets.

#### **7.4.6. Rated Accuracy Class CT for protection (ALF)**

See Datasheets.

#### **7.4.7. Rated Accuracy Class CT for measurement (FS)**

See Datasheets.

#### **7.4.8. Standard Values for Rated Primary Current**

See Datasheets.

#### **7.4.9. Standard Values for Rated Secondary Current**

See Datasheets.

#### **7.4.10. Standard Values for Rated Continuous Thermal Current**

See Datasheets.

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**7.4.11. Rated Short-Time Thermal Current ( $I_{th}$ )**

See Datasheets.

**7.4.12. Rated DYNAMIC Current ( $I_{dyn}$ )**

See Datasheets.

The dynamic current specified for the current transformers will be equal to 2,6 times.

**7.4.13. Static withstands load ( $F_R$ )**

See Datasheets.

**7.4.14. Installation**

**7.4.15. Temperature Rise**

See IEC 61698-1 and IEC 61698-2.

**7.4.16. Seismic Qualification**

The equipment supplied to Enel Colombia shall comply with the seismic requirements indicated in the Colombian standard NSR 10.

**7.5 Construction Characteristics**

**7.5.1. Internal Insulation**

The internal insulation of HV current transformers shall be oil, ester, paper or resin or some composite material. In case of indoor application, the insulation will preferably be resin or oil/paper. Other types of insulation will be subject to customer approval.

Equipment insulated in oil and ester shall be provided with a fluid expansion chamber with metal bellows, in order to absorb thermal contractions and expansions of the fluid. The oil used shall be without inhibitors or additives, be free of polychlorinated biphenyls (PCBs) and shall meet the requirements of the IEC 60296 Standard. Its main characteristics shall be indicated, its typical composition, indicating the percentage of aromatics, isoparaffins and naphthenics.

The ester used shall meet the requirements of the IEC 62770 Standard.

**7.5.2. External Insulation**

The external insulation of the current transformers shall be porcelain, resin, or silicone rubber.

The active part of the current transformers shall be located in the metallic bodies (upper or lower, as appropriate). Designs with the active part located inside the porcelain will not be accepted.

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

### 7.5.3. Overall Dimensions and Layout

#### 7.5.4. Metal Surface Treatment

Painting and galvanization shall be suitable for the environmental conditions indicated in Common Part, clause 7.3, *Table 3CP*. The thicknesses of the galvanized parts shall comply with Annex B for the different thicknesses of sheets and environmental conditions. The non-energized metallic surfaces of the current transformers shall be made of steel hot-dip galvanized and/or painted or aluminum, as indicated in Annex B. The painting and galvanization processes described in this specification shall not be applied to the composite material insulators of current transformers.

#### 7.5.5. Accessories

##### 7.5.5.1. Primary Outer Terminals

The primary terminals of the current transformers shall be made of aluminum, tinned or silver-plated copper. The type of terminal can be plate (4N) or cylinder without wire, as indicated in Annex B. Terminals shall have clearly distinguishable terminal and polarity markings. The supplier shall inform in his proposal the characteristics of the terminals of the offered equipment.

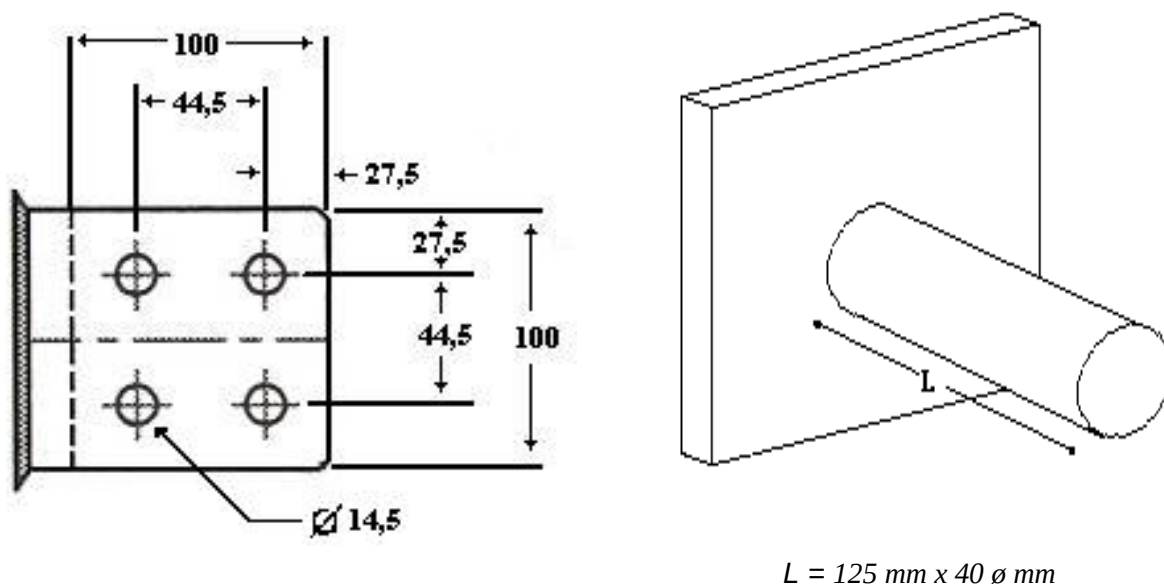


Figure 1CO

##### 7.5.5.2. Secondary Terminals

In case of outdoor application, the secondary terminals shall be made of phosphor bronze, and they shall be wired to terminal blocks located inside a box. This box shall

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

be suitable for outdoor use, with a protection degree IP54, according to the IEC standard, and shall allow external cable connections from below or laterally. Secondary terminals shall have clearly distinguishable terminal and polarity markings.

**7.5.5.3. Grounding Terminals**

The manufacturer shall supply terminals to connect the current transformers to the substation ground system. The connections to the ground mesh shall be cable type made of tinned copper with a section between 70 and 240 mm<sup>2</sup>, or copper plate type with a section of 3 x 40 mm.

**7.5.5.4. CT Support Base**

**7.5.5.5. Secondary Terminals Box**

**7.5.5.6. Liquid Level Gauge**

This element shall have a maximum and minimum level indication and shall be easily readable for an operator standing on the floor.

**7.5.5.7. Overpressure Relief Device**

**7.5.5.8. Liquid Sampling Device**

The current transformer shall have a pad lockable device to take liquid samples.

**7.5.5.9. Lifting Lugs**

**7.5.5.10. Rating Plate**

A stainless steel or aluminum rating plate shall be included in Spanish. This rating plate shall comply with the provisions of IEC 61869-1 & IEC 61869-2 standards. Moreover, a plate shall be included with the winding connection diagram. A stainless steel or aluminum warning plate shall also be included, with the following text:

- *"¡Atención! No dejar los secundarios en circuito abierto"*

**7.5.5.11. Terminal Marking**

In accordance with IEC 61869-2.

**7.5.5.12. Capacitive Tap**

**7.6 Testing**

All current transformers included in the supply shall be tested by the manufacturer, in the presence of the client or his representative.

The manufacturer of current transformers shall submit test protocols applied to the bushings used in their equipment.

The test method and acceptance criteria of the bushings will be described in the IEC 62155 or 61462 standard. If any current transformer does not meet any of the specified tests, the manufacturer shall take the necessary actions to detect the failures and correct them. Once the necessary corrections have been

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put in place, the manufacturer shall repeat all the tests to demonstrate that the said transformer fully complies with the specifications. All such events shall be recorded in a failure test report. Once all the acceptance tests have been carried out, the manufacturer shall deliver a complete and certified report of the same. This report will be submitted for final approval to the client.

#### **7.6.1.Type Tests**

According to clause 7.6.1 Common Part.

#### **7.6.2. Routine/Acceptance Tests**

According to clause 7.6.2 Common Part.

The routine tests indicated in the IEC standard, and those indicated below, will be part of the acceptance tests:

- Leakage or hermeticity test
- Capacitance and power factor of the dielectric
- CT magnetization curves
- Verification of painting and galvanizing.

#### **7.6.3. Special Tests**

#### **7.6.4. Sample Tests**

### **7.7 Conditions of Supply**

#### **7.7.1. Warranty**

#### **7.7.2. Reception Control**

#### **7.7.3. Technical Information Required**

#### **7.7.4. Packaging and Transport**

#### **7.7.5. Installation, Operation, Maintenance and Disassembling**

Manual for installation, operation, maintenance, and disassembling shall be provided in Spanish. Each current transformer and its accessories shall be packed appropriately for sea and land transportation, in order to prevent damages (blows, corrosion, moisture absorption, etc.) and theft.

Each package shall just contain one unit.

The packaging shall be adequate to support the normal operations of loading, unloading, and the eventual stacking of one package on top of another. Each of the packages shall include facilities to lift it by means of straps.

For export maritime transport, the manufacturer shall obtain the approval of the packaging by the transport companies before dispatching the equipment from the factory.

All packages shall bear the necessary identification and handling details, clearly and indelibly, both of their content and of the details of the purchase order especially of the recipient company.

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---

The type of packaging and its identification shall be submitted for the client's or his representative approval before dispatch from the factory. If not all of the specified conditions are complied, the request for dispatching may be rejected.

**7.7.6. Technical Conformity Assessment (TCA)**

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**HV CURRENT TRANSFORMERS (IT)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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**Application Areas**

Perimeter: *Global*

Staff Function: -

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---

## **ANNEX LOCAL SECTION ITALY (IT)**

### **7.1 Document/Section Scope**

The scope of this Local Section is to integrate the Common Part to provide the technical standard requirements for the current transformers of e-distribuzione.

### **7.2 List of Components**

See ANNEX A.

### **7.3 Service Conditions**

### **7.4 Technical Characteristics**

For definitions IEC 61869-1, IEC 61869-2 apply.

#### **7.4.1. Type of Current Transformers**

Current transformers intended to be connected to HV grid for measuring and protection scope with  $U_m$  145kV or 170 kV.

#### **7.4.2. Number of Cores and Windings**

See Datasheets.

#### **7.4.3. Selectable-Ratio**

See Datasheets.

#### **7.4.4. Insulation Levels**

See Datasheets.

#### **7.4.5. Rated Output**

See Datasheets.

#### **7.4.6. Rated Accuracy Class CT for protection (ALF)**

See Datasheets.

#### **7.4.7. Rated Accuracy Class CT for measurement (FS)**

See Datasheets.

#### **7.4.8. Standard Values for Rated Primary Current**

See Datasheets.

#### **7.4.9. Standard Values for Rated Secondary Current**

See Datasheets.

#### **7.4.10. Standard Values for Rated Continuous Thermal Current**

See Datasheets.

#### **7.4.11. Rated Short-Time Thermal Current ( $I_{th}$ )**

See Datasheets.

#### **7.4.12. Rated DYNAMIC Current ( $I_{dyn}$ )**

See Datasheets.

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**7.4.13. Static withstands load ( $F_R$ )**

See Datasheets.

**7.4.14. Installation**

**7.4.15. Temperature Rise**

See IEC-61698-1 and IEC-61698-2.

**7.4.16. Seismic Qualification**

A seismic certification is required for the severity level AF5 according to IEC 60068-3-3, for CT and support assembled.

The seismic certification can be based on the calculations according to the above-mentioned standard.

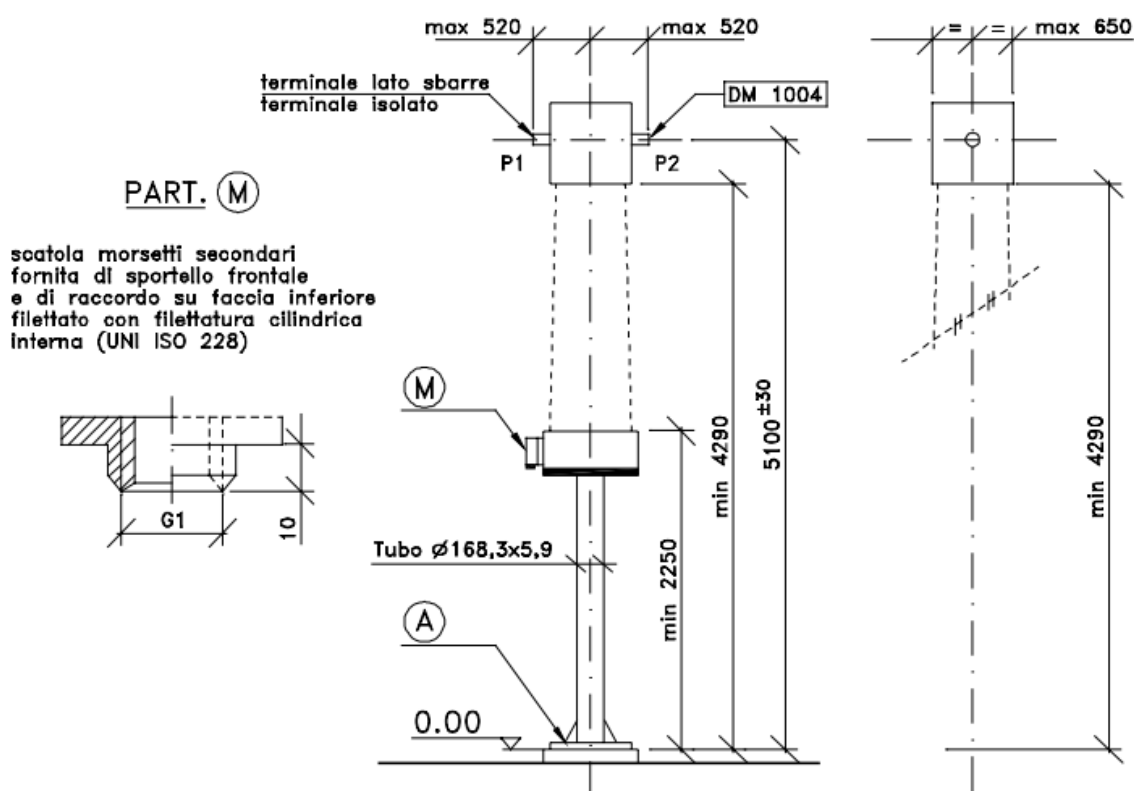
**7.5 Construction Characteristics**

**7.5.1. Internal Insulation**

**7.5.2. External Insulation**

Insulators shall be made exclusively of light grey inorganic composite material, with HTV (Hight Temperature Vulcanization) or LSR (Liquid Silicone Rubber) silicone rubber, without EPDM or other organic rubber, in accordance with IEC 61462 for mechanical testing and IEC 61109 for dielectric testing and electrical-environmental accelerated ageing test.

**7.5.3. Overall Dimensions and Layout**



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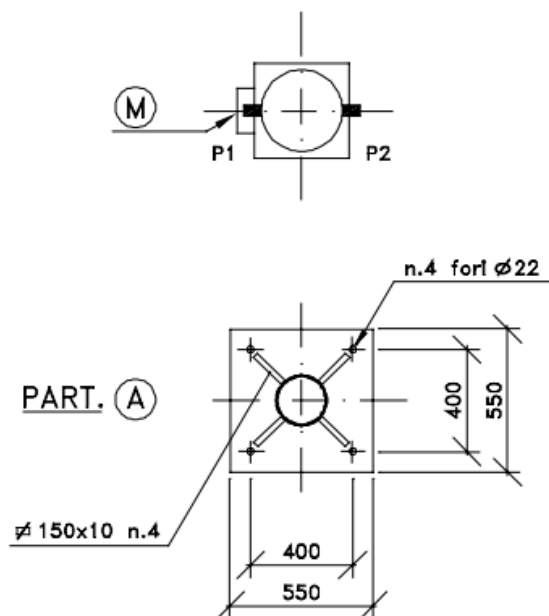
**Application Areas**

Perimeter: *Global*

Staff Function: -

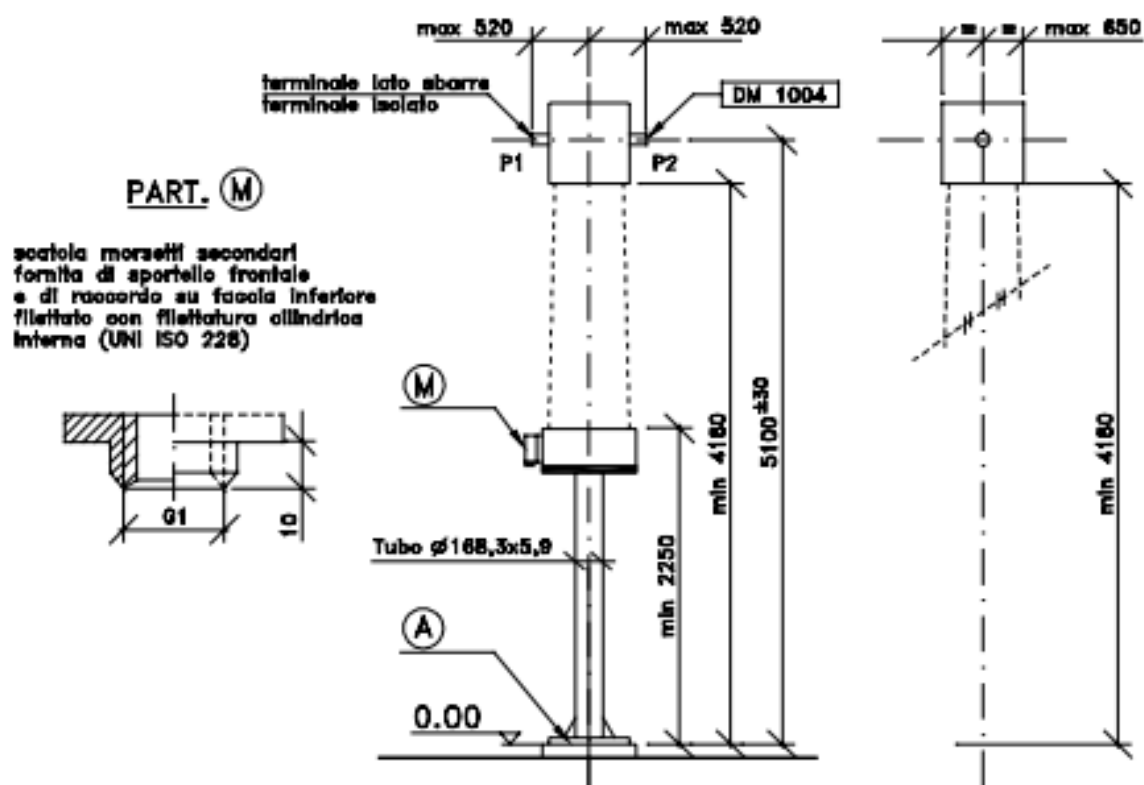
Service Function: -

Business Line: *Enel Grids*



- per la costruzione del sostegno: Prescrizioni ENEL S 6501

Figure 1IT (Current Transformer -  $U_m$  170 kV)



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**HV CURRENT TRANSFORMERS (IT)**

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Service Function: -  
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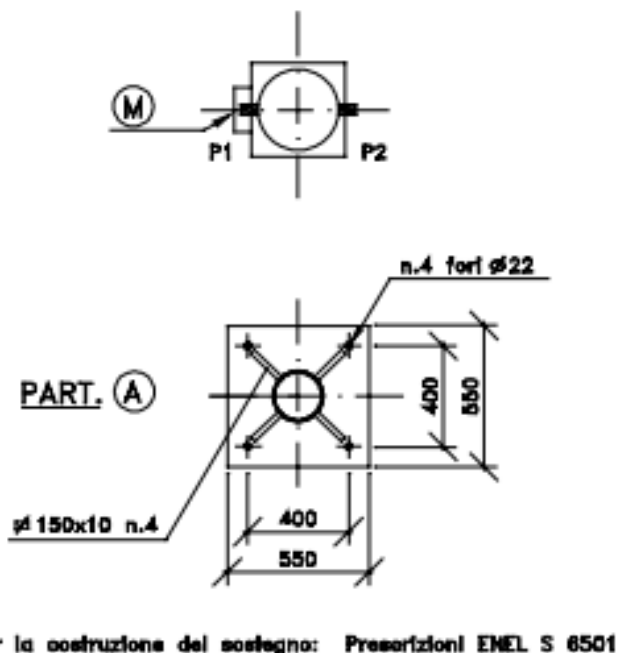


Figure 2IT (Current Transformer  $U_m$  145 kV)

**7.5.4. Metal Surface Treatment**

All parts made of iron that come into direct contact with the atmosphere shall be hot-dip galvanized (EN ISO 1461); bolts with  $\varnothing < 8$  mm, nuts, and screws for assembling of the electrical and mechanical components shall be made of stainless steel AISI 304 or higher quality.

**7.5.5. Accessories**

**7.5.5.1. Primary outer Terminals**

CT's primary outer terminal features are detailed in the following picture:

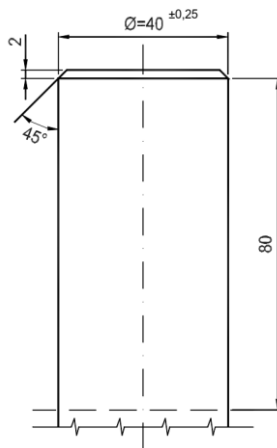


Figure 3IT (Primary Terminal)

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Service Function: -

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Material can be aluminum, aluminum alloy, copper, or copper alloy.

All materials used shall be resistant or made corrosion resistant. Outer terminal made of copper or copper alloy shall be properly treated, to connect with aluminum or aluminum alloy fittings. For mechanical load IEC 61869 shall be applied.

**7.5.5.2. Secondary Terminals**

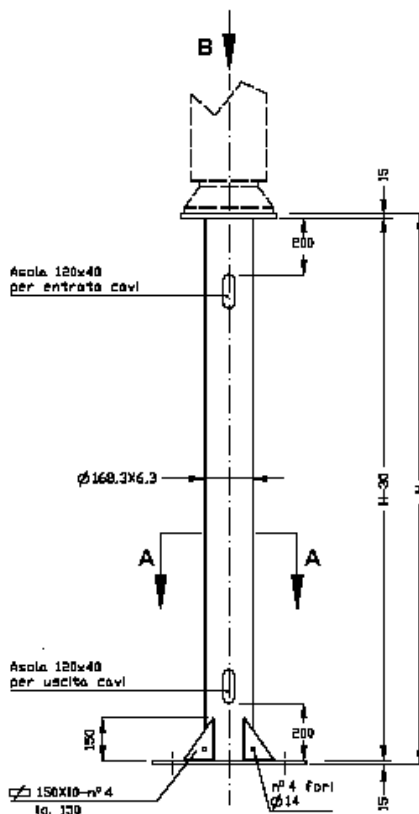
Secondary terminals shall be suitable for connecting cable lugs M6/M8, or with cage clamps (screw clamps) up to 16mm<sup>2</sup>.

**7.5.5.3. Grounding Terminals**

For transformer grounding a 14 mm hole shall be provided in a suitable position to allow easy connection, equipped with a stainless steel M12 bolt included in the supply. For grounding connection of secondary winding, a bolt shall be provided inside secondary terminals box and suitable to connect cable lugs with M6/M8. This connection shall be directly connected to above-mentioned transformer grounding connection.

**7.5.5.4. CT Support Base**

Every current transformer shall be supplied with his own support, adjustable in height to obtain a suitable height to connect CT's primary outer terminal with HV connection lead. For details see the following drawing:



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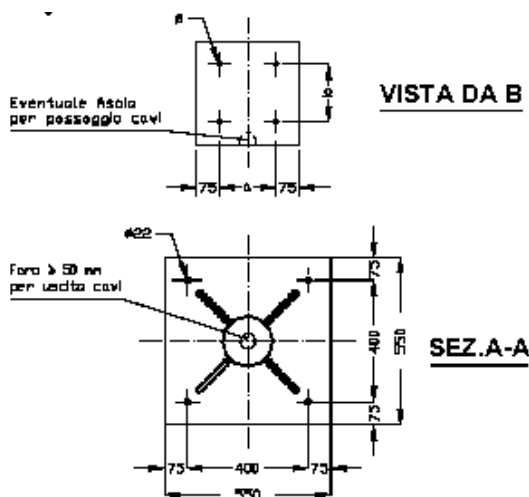


Figure 4IT

With reference to the above drawing, the following manufacturing details shall be implemented:

- Provide suitable loops for entry and exit of cables, equipped with special metal closures and waterproof material resistant to corrosion from weathering and suitable to be drilled on-site for the placement of cable glands.
- Provide the hole for the cable outlet at the bottom of the base plate at the inner circumference of the tube which will limit the maximum size allowed.
- If necessary, to facilitate the passage of cables from the component to the cable entry of the support, a buttonhole shall be placed on the upper plate.
- The materials to be used for manufacturing foot (tubes) are of S355JR UNI EN 10025 quality.
- The materials to be used for manufacturing of gusset plates are of S275JR UNI EN 10025 quality.
- Welding will be done with electrodes E52 quality class 3 according to UNI 5132-74 or with automatic/semi-automatic qualified procedure.
- Manufacturing tolerances on dimensions of semi-finished products (diameter of tubes and similar) according to UNI EN 10216 -2005.
- Manufacturing tolerances on overall dimensions:  $\pm 2\text{mm}$
- Manufacturing tolerances on interaxle spacing and drilling pitches, and in general on geometric dimensions of all coupling elements with other components:  $\pm 1\text{mm}$
- Machining tolerances on planarity:  $\pm 1/100$
- Machining tolerances on holes:  $\pm 1\text{mm}$
- Hot dip galvanization according to EN ISO 1461

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Staff Function: -

Service Function: -

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**7.5.5.5. Secondary Terminals Box**

It shall be located in an easy position to allow connections and have the following features:

- be equipped with a front door and fully sealable (the various fastening systems such as hinges, screws, etc., shall not be accessible from the outside, or alternatively be sealable).
- be equipped with a fitting as indicated in the FIG.1 and FIG.2 ("*particolare M*"), or alternatively with a 27 mm hole (suitable for fastening G1 pipe threaded with a ring nut), however positioned at the bottom part.
- have a protection degree not lower than IP 44 (IEC 60529).
- be equipped with a ground collector connected directly to CT's earthing point.
- be fitted with an aeration system to prevent condensation and corrosion. Openings shall be fitted with anti-insect screens.
- have, inside, indelibly reported, the connection diagrams of the sections, primary and secondary windings.

**7.5.5.6. Liquid Level Gauge**

The device for checking the liquid level shall indicate whether the liquid level is within the operating range, during operation and shall be clearly readable from the ground.

**7.5.5.7. Overpressure Relief Device**

The mechanical protective action can be performed by liquid expansion conservator.

**7.5.5.8. Liquid sampling device**

**7.5.5.9. Lifting Lugs**

Placed to facilitate lifting of CT.

**7.5.5.10. Rating Plate**

In accordance with IEC 61869-1 & IEC 61869-2. Rating plate shall be supplied in Italian language and all information shall be marked in an indelible manner. Material shall be aluminium.

**7.5.5.11. Terminal Marking**

In accordance with IEC 61869-2.

**7.5.5.12. Capacitive Tap**

**7.6 Testing**

**7.6.1. Type Tests**

**7.6.2. Routine/Acceptance Tests**

**7.6.3. Special Tests**

**7.6.4. Sample Tests**

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**HV CURRENT TRANSFORMERS (IT)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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## **7.7 Conditions of Supply**

### **7.7.1. Warranty**

### **7.7.2. Reception Control**

### **7.7.3. Technical information Required**

### **7.7.4. Packaging and Transport**

### **7.7.5. Installation, Operation, Maintenance and Disassembling**

Manual for installation, operation, maintenance, and disassembling shall be provided in Italian.

### **7.7.6. Technical Conformity Assessment (TCA)**



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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (PE)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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## **ANNEX LOCAL SECTION PERU (PE)**

### **7.1 Document/Section Scope**

The scope of this Local Section is to integrate the Common Part to provide the technical standard requirements for the current transformers of Infrastructure and Networks of Enel Distribución Perú S.A.A.

### **7.2 List of Components**

See ANNEX A.

### **7.3 Service Conditions**

The equipment of this specification will be designed for an installation at a maximum height above sea level of 1000 m and severe environmental pollution and a marine environment.

### **7.4 Technical Characteristics**

For definitions IEC 61869-1, IEC 61869-2 apply.

See Datasheets.

#### **7.4.1. Type of Current Transformers**

See Datasheets.

#### **7.4.2. Number of Cores and Windings**

See Datasheets.

#### **7.4.3. Selectable-Ratio**

See Datasheets.

#### **7.4.4. Insulation Levels**

See Datasheets.

#### **7.4.5. Rated Output**

See Datasheets.

#### **7.4.6. Rated Accuracy Class CT for protection (ALF)**

See Datasheets.

#### **7.4.7. Rated Accuracy Class CT for measurement (FS)**

See Datasheets.

#### **7.4.8. Standard Values for Rated Primary Current**

See Datasheets.

#### **7.4.9. Standard Values for Rated Secondary Current**

See Datasheets.

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**HV CURRENT TRANSFORMERS (PE)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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**7.4.10. Standard Values for Rated Continuous Thermal Current**

See Datasheets.

**7.4.11. Rated Short-Time Thermal Current ( $I_{th}$ )**

See Datasheets.

**7.4.12. Rated DYNAMIC Current ( $I_{dyn}$ )**

See Datasheets.

**7.4.13. Static withstands load ( $F_R$ )**

See Datasheets.

**7.4.14. Installation**

**7.4.15. Temperature Rise**

See IEC 61698-1 and IEC 61698-2.

**7.4.16. Seismic Qualification**

Seismic conditions with a horizontal acceleration of 0.5g.

**7.5 Construction Characteristics**

**7.5.1. Internal Insulation**

The internal insulating of HV current transformers shall be oil, ester and paper for transformers for outdoor installation and epoxy resin for transformers for indoor installation. Other types of insulation will be submitted to the approval of ENEL.

Equipment insulated in oil or ester shall be provided with a fluid expansion chamber with a metal bellows, in order to absorb thermal contractions and expansions of the fluid. The oil used shall be naphthenic-based, without inhibitors or additives, free of PCBs and shall meet the requirements of the IEC 60296 Standard.

The ester used shall meet the requirements of the IEC 62770 Standard.

**7.5.2. External Insulation**

The external insulation of the CTs shall be porcelain or silicone rubber for external installation and epoxy resin or silicone rubber for internal installation. Other types of insulation will be submitted to ENEL's approval. The creepage distance of the insulators shall be in accordance with the level of pollution requested by ENEL.

The active part of the current transformers shall be located in the metallic bodies (upper or lower, as appropriate). Designs with the active part located inside the porcelain will not be accepted.

**7.5.3. Overall Dimensions and Layout**

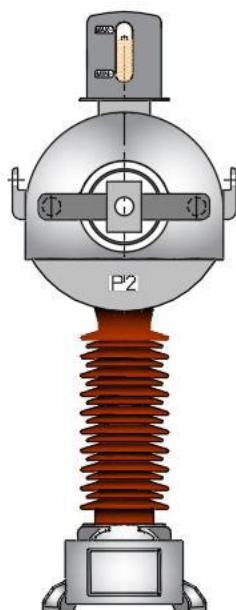
**Subject: E&C – GSCT013**  
**HV CURRENT TRANSFORMERS (PE)**

**Application Areas**

Perimeter: *Global*  
Staff Function: -  
Service Function: -  
Business Line: *Enel Grids*



*Figure 1PE (Bushing type design of Instrument Transformer)*



*Figure 2PE (Outdoor Current Transformer)*

#### **7.5.4. Metal Surface Treatment**

Painting and galvanization shall be suitable for the environmental conditions indicated in clause 7.3, *Table 3CP* (Common Part).

The thicknesses of the galvanized parts shall comply with Annex B for the different thicknesses of sheets and environmental conditions. The non-energized metallic surfaces of the current transformers shall be made of steel hot-dip galvanized and/or painted or aluminum, as indicated in Annex B. The painting and galvanization processes described in this specification shall not be applied to the composite material insulators of current transformers.

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**HV CURRENT TRANSFORMERS (PE)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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## **7.5.5. Accessories**

### **7.5.5.1. Primary Outer Terminals**

The primary terminals of the CTs for outdoor installation shall be made of silver aluminum. The terminal shall be plate type (NEMA 4N).

The distances between terminal holes shall be 44,5 mm x 44,5 mm according to NEMA 4N.

In case of current transformers for indoor installation, the terminals shall be flat, silver-plated copper material; a specific distance between terminal holes is not required. Terminals shall have clearly distinguishable polarity markings.

### **7.5.5.2. Secondary Terminals**

In case of CTs for outdoor use, the secondary terminals shall be made of phosphor bronze, and they shall be wired to terminal blocks located inside a box. This box shall be suitable for outdoor use, with an IP55 degree of protection and will allow external cable connections from below.

In the case of indoor installation transformers, the secondary terminal box will allow external cable connections laterally. Secondary terminals shall have clearly distinguishable terminal and polarity markings.

The manufacturer will include short-circuiting terminals in the terminal box where the current signal cables from the measurement and protection cores will be connected.

### **7.5.5.3. Grounding Terminals**

The manufacturer shall supply terminals to connect the CTs to the ground system of the substation. The connections to the ground mesh shall be plate type with a section of 3 x 40 mm.

### **7.5.5.4. CT Support Base**

### **7.5.5.5. Secondary Terminals Box**

An MCB thermomagnetic switch with auxiliary contact for signaling will be installed in the LV junction box of the outdoor type of instrument transformers; the secondary voltage output of the instrument transformer will be connected to the MCB.

### **7.5.5.6. Liquid Level Gauge**

This element shall have a maximum and minimum level indication and be easy to read for an operator standing on the floor through a UV-resistant visor.

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**Application Areas**

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Staff Function: -

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Business Line: *Enel Grids*

**7.5.5.7. Overpressure Relief Device**

**7.5.5.8. Liquid Sampling Device**

The current transformer shall have a device to be able to take samples of the liquid, which shall be adequately ensured, preserving the tightness of the equipment. Its location should be in the base below that team.

**7.5.5.9. Lifting Lugs**

**7.5.5.10. Rating Plate**

A stainless steel or aluminum rating plate in Spanish language, shall be included. This rating plate shall comply with what is indicated in the IEC 61869 Standards, a plate with the winding connection diagram shall also be included.

For Current Transformers, a stainless steel or aluminum warning plate shall also be included, with the following text, in Spanish:

- *"¡Atención! No dejar los secundarios en circuito abierto"*

The rating plate with indelible indication shall have the following characteristics (located on the LV side of the tank):

- *Nombre del fabricante y marca por la cual pueda ser identificado.*
- *Año de fabricación, número de serie y tipo de designación.*
- *Frecuencia Nominal.*
- *Tensión más alta del equipo.*
- *Nivel de aislamiento nominal.*
- *Potencia nominal continua.*
- *Tensiones.*
- *Corrientes.*
- *Temperatura ambiente considerada para el diseño.*
- *Peso (kg), marca y tipo de aceite.*
- *Peso de la parte activa (kg).*
- *Peso total (kg).*
- *Normas de fabricación*

The nameplate bearing each transformer will have indelibly printed the technical data in Spanish and the connection diagram. Likewise, the rating plate shall support the service conditions indicated in the section and will have the name of ENEL printed on it.

**7.5.5.11. Terminal Marking**

In accordance with IEC 61869-2.

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**Application Areas**

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Staff Function: -

Service Function: -

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**7.5.5.12. Capacitive Tap**

**7.6 Testing**

**7.6.1. Type Tests**

According to clause 7.6.1 Common Part.

**7.6.2. Routine/Acceptance Tests**

They are those that will be carried out at the time of receiving a new batch of equipment.

According to clause 7.6.2 Common Part; in addition the following tests shall be performed:

- Measure of the paint thickness and adherence, ASTM 3359 (for tank and rating plate, if applicable).
- Insulating oil or ester test, according to IEC 60296 or IEC 62770.

**7.6.3. Special Tests**

These tests will be required exceptionally in the product approval process.

According to clause 7.6.3 Common Part; in addition the following tests shall be performed:

- Test for vegetable oil, according to Standard IEC 62770
- Mechanical bending tests on fixing support

**7.6.4. Sample Tests**

**7.7 Conditions of Supply**

**7.7.1. Warranty**

**7.7.2. Reception Control**

**7.7.3. Technical information Required**

**7.7.4. Packaging and Transport**

It is essential that the transport, storage and installation of current transformers, as well as their operation and maintenance in service, be carried out in accordance with the instructions given by the manufacturer. Consequently, the manufacturer shall provide timely instructions for the transportation, storage, installation, operation and maintenance of current transformers.

The supplier will carry out the appropriate packaging of the current transformers to ensure their protection during transport by sea, land or air. In the packaging, padding material will be used to ensure good protection in the event that the boxes containing the materials are hit or damaged during loading and unloading maneuvers.

To protect materials from moisture, airtight covers or bags containing hygroscopic material shall be used.

Each drawer shall have the following information printed on it:

- Type of material and quantity
- Net and gross weight
- Date

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Staff Function: -

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---

The supplier will be responsible for transporting the transformers to ENEL's warehouses, unless otherwise indicated in the purchase order.

For each type of current transformer, the installation instructions provided by the manufacturer shall include at least the items listed below:

- Information required for safe unpacking and lifting
- Diagram of assembly and marking of the parts
- Instructions for the assembly of current transformers, auxiliary and operating devices
- Instructions for connecting conductors, auxiliary circuits, liquid systems, connections to earth and the manufacturer's recommendation for the type of cable to be connected to the secondary terminals

Provide instructions for inspection and testing to be performed after the current transformer has been installed and all connections have been completed

**7.7.5. Installation, Operation, Maintenance and Disassembling**

Manual for installation, operation, maintenance, and disassembling shall be provided in Spanish.

**7.7.6. Technical Conformity Assessment (TCA)**



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Service Function: -

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## **ANNEX LOCAL SECTION ROMANIA (RO)**

### **7.1 Document/Section Scope**

The scope of this Local Section is to integrate the Common Part to provide the technical standard requirements for the current transformers of Enel Distribuție Banat, Enel Distribuție Dobrogea and Enel Distribuție Muntenia.

### **7.2 List of Components**

See ANNEX A.

### **7.3 Service Conditions**

### **7.4 Technical Characteristics**

For definitions IEC 61869-1, IEC 61869-2 apply.

#### **7.4.1. Type of Current Transformers**

Single-phase current transformers with three secondary winding located at the bottom part of the unit, intended to be connected to HV grid for measuring and protection scope with  $U_m$  123kV.

#### **7.4.2. Number of Cores and Windings**

See Datasheets.

#### **7.4.3. Selectable-Ratio**

See Datasheets.

#### **7.4.4. Insulation Levels**

See Datasheets.

#### **7.4.5. Rated Output**

See Datasheets.

#### **7.4.6. Rated Accuracy Class CT for protection (ALF)**

See Datasheets.

#### **7.4.7. Rated Accuracy Class CT for measurement (FS)**

See Datasheets.

#### **7.4.8. Standard Values for Rated Primary Current**

See Datasheets.

#### **7.4.9. Standard Values for Rated Secondary Current**

See Datasheets.

#### **7.4.10. Standard Values for Rated Continuous Thermal Current**

See Datasheets.

#### **7.4.11. Rated Short-Time Thermal Current ( $I_{th}$ )**

See Datasheets.

#### **7.4.12. Rated DYNAMIC Current ( $I_{dyn}$ )**

See Datasheets.

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Staff Function: -

Service Function: -

Business Line: *Enel Grids*

**7.4.13. Static withstands load ( $F_R$ )**

See Datasheets.

**7.4.14. Installation**

**7.4.15. Temperature Rise**

See IEC-61698-1 and IEC-61698-2.

**7.4.16. Seismic Qualification**

A seismic certification is required for the severity level AF5 according to IEC 60068-3-3, for CT and support assembled.

The seismic certification can be based on the calculations according to the above-mentioned standard.

**7.5 Construction Characteristics.**

The interchangeability of components of the same type supplied separately shall be ensured.

The seals between the metal parts and between the metal and porcelain parts shall be made of rubber resistant to petroleum products, the ozone and ultraviolet.

All places where inspections, adjustments, etc. are required during operation will be easily accessible.

All connections and contacts shall have the appropriate section to ensure the passage of electrical current, both in normal operation and in degraded mode.

The equipment shall be manufactured to minimize the risk of explosion and/or firing.

To prevent oil leaks, sealing rings shall not be affected by the oil or the polluting environment. Ensure that constant oil pressure is maintained if the specified temperature range is exceeded.

All equipment shall have a suitable correct weight for lifting and handling.

**7.5.1. Internal Insulation**

The internal insulating fluid shall be biodegradable and compatible with the environment. The absence of PCB shall be guaranteed. The manufacturer shall demonstrate that the oil used does not contain PCB.

**7.5.2. External Insulation**

Insulators shall be porcelain or light grey inorganic composite material, with HTV (High Temperature Vulcanization) or LSR (Liquid Silicone Rubber) silicone rubber, without EPDM or other organic rubber, in accordance with IEC 61462 for mechanical testing and IEC 61109 for dielectric testing and the electrical-environmental accelerated ageing test.

The external insulation shall be made of one piece. The shape of the sheds and the length of the total escape line of the insulator shall guarantee the strength of the surface insulation to the salinity and voltage values indicated in the prescribed environmental conditions.

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**HV CURRENT TRANSFORMERS (RO)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

**7.5.3. Overall Dimensions and Layout**

**7.5.4. Metal Surface Treatment**

All parts made of iron that come into direct contact with the atmosphere shall be hot-dip galvanized (EN ISO 1461); bolts with  $\varnothing < 8$  mm, nuts, and screws for assembling of the electrical and mechanical components shall be made of stainless steel AISI 304 or higher quality.

**7.5.5. Accessories**

**7.5.5.1. Primary Outer Terminals**

Material can be aluminum, aluminum alloy, copper, or copper alloy.

All materials used shall be resistant or made corrosion resistant. Outer terminal made of copper or copper alloy shall be properly treated to connect with aluminum or aluminum alloy fittings.

For mechanical load IEC 61869 applied.

Changing of primary winding connection shall be achieved by means of latches fixed to terminals or insulating supports located on the head of the current transformer.

**7.5.5.2. Secondary Terminals**

The secondary terminals shall be suitable for connecting cables with a 4-10 mm<sup>2</sup> section.

**7.5.5.3. Grounding Terminals**

Current transformers shall be equipped with earth clamps, terminals, or screws for grounding connections.

All earthing terminals shall be visibly marked and painted in black.

**7.5.5.4. CT Support Base**

**7.5.5.5. Secondary Terminals Box**

It shall be located in an easy position to allow connections and have the following features:

- Protection degree IP 54 (IEC 60529).
- Measures shall be taken to avoid condensation and corrosion. Appropriate ventilation holes equipped with insect screens shall be provided. The cover of the closing device shall be provided with sealing option.
- All iron material in contact with the atmosphere shall be hot galvanized according to EN ISO 1461. Bolts shall be of stainless or hot galvanized steel. External protective coatings are not required for stainless steel parts.
- Gland plates for input cables.
- On the inside of the secondary terminal box cover an internal wiring diagram label with primary and secondary terminals marking shall be provided.

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**HV CURRENT TRANSFORMERS (RO)**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

**7.5.5.6. Liquid Level Gauge**

The device for checking the liquid level shall indicate whether the liquid level is within the operating range, during operation and shall be clearly readable from the ground.

**7.5.5.7. Overpressure Relief Device**

The mechanical protective action can be performed by the liquid expansion conservator.

**7.5.5.8. Liquid Sampling Device**

CT shall be equipped with an oil fill-drain and a harvest plug.

**7.5.5.9. Lifting Lugs**

Placed to facilitate lifting of CT.

**7.5.5.10. Rating Plate**

The rating plate shall be made in accordance with IEC 61869-1 & IEC 61869-2.

Rating plate shall be supplied in Romanian and all information shall be marked in an indelible manner. Plate, fixed bolts, screws, and nuts shall be made of non-corrosive material.

Material shall be aluminium. The plate shall be preferably fixed to the bottom part of CT so that it can be read safely with CT in operation.

**7.5.5.11. Terminal Marking**

Terminal marking shall be in accordance with IEC 61869-2.

**7.5.5.12. Capacitive Tap**

CT shall be furnished with a suitable device to measure capacitance and  $\tan \delta$ .

**7.6 Testing**

The measurement transformers shall have all tests and checks in accordance with the standards in force.

General certificates issued for a wide range of basic parameters shall not be considered valid.

Measurement transformers shall be subjected to type and individual tests in test laboratories not belonging to the manufacturer/supplier. Certificates of all tests carried out shall be required.

**7.6.1. Type Tests**

**7.6.2. Routine/Acceptance Tests**

**7.6.3. Special Tests**

**7.6.4. Sample Tests**

**7.7 Conditions of Supply**

**7.7.1. Warranty**

**7.7.2. Reception Control**

**7.7.3. Technical Information Required**

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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#### **7.7.4. Packaging and Transport**

Equipment shall be prepared for delivery so that it can be handled easily and also to prevent any damage during transport.

Each transformer will be packaged alone in a box or a pallet. A properly installed shock recorder shall be provided to record shocks during transport. Manufacturer shall provide a report of the shock recorder after delivery of the equipment.

Each package shall be marked with indelible paint that will not be wiped off in the rain or discoloured due to solar radiation, and the following information shall be indicated:

- The manufacturing plant.
- The type of CT (i.e. "110kV 2x150/5/5/5A current measurement transformer")
- The ENEL code and the serial number, shall be clearly visible in relation to the other information and with a height of at least 20 mm.
- The weight.
- The position of the centre of gravity.
- The warning signs for fragile product.
- The order number of the package within the supply.

Transport shall be done by rail or road. During transport, the package shall be fixed securely to the truck without overlapping with other objects.

The manufacturer shall take special measures to protect the insulation during transport, storage, and installation so as to avoid moisture absorption before putting the CT in operation.

#### **7.7.5. Installation, Operation, Maintenance and Disassembling**

CT delivery shall be carried out in accordance with the Law no.319/2006 (Health and Safety at work).

Manual for installation, operation, maintenance, and disassembling shall be provided in Romanian.

#### **7.7.6. Technical Conformity Assessment (TCA)**

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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## **ANNEX LOCAL SECTION SPAIN (ES)**

### **7.1 Document/Section Scope**

The scope of this Local Section is to integrate the Common Part to provide the technical standard requirements for the current transformers of e-distribución.

### **7.2 List of Components**

See ANNEX A.

### **7.3 Service Conditions**

### **7.4 Technical Characteristics**

For definitions IEC 61869-1, IEC 61869-2 apply.

#### **7.4.1. Type of Current Transformers**

Single phase current transformers with independent secondary windings, intended to be connected to HV grid for measuring and protection for indoor and outdoor use. Preferably, selectable ratio shall be implemented on primary windings. Burden e accuracy class shall be guaranteed at any transformer ratio.

#### **7.4.2. Number of Cores and Windings**

See Datasheets.

#### **7.4.3. Selectable-Ratio**

See Datasheets.

#### **7.4.4. Insulation Levels**

See Datasheets.

#### **7.4.5. Rated Output**

See Datasheets.

#### **7.4.6. Rated Accuracy Class CT for protection (ALF)**

See Datasheets.

#### **7.4.7. Rated Accuracy Class CT for measurement (FS)**

See Datasheets.

#### **7.4.8. Standard Values for Rated Primary Current**

See Datasheets.

#### **7.4.9. Standard Values for Rated Secondary Current**

See Datasheets.

#### **7.4.10. Standard Values for Rated Continuous Thermal Current**

See Datasheets.

#### **7.4.11. Rated Short-Time Thermal Current ( $I_{th}$ )**

See Datasheets.

#### **7.4.12. Rated DYNAMIC Current ( $I_{dyn}$ )**

See Datasheets.



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Staff Function: -

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**7.4.13. Static withstands load ( $F_R$ )**

See Datasheets.

**7.4.14. Installation**

**7.4.15. Temperature Rise**

See IEC-61698-1 and IEC-61698-2.

**7.4.16. Seismic Qualification**

**7.5 Construction Characteristics.**

**7.5.1. Internal Insulation**

**7.5.2. External Insulation**

Insulators shall be made exclusively of light grey inorganic composite material, with HTV (Hight Temperature Vulcanization) or LSR (Liquid Silicone Rubber) silicone rubber, without EPDM or other organic rubber, in accordance with IEC 61462 for mechanical testing and IEC 61109 for dielectric testing and electrical-environmental accelerated ageing test.

For current transformers for indoor application external insulation shall be fireproof synthetic resin, M1 class (UNE 23727). When subjected to an ignition source the performance shall correspond to an equivalent FV1 (UNE 53315) category, according to UNE-EN 60085 and UNE-EN 60505.

**7.5.3. Overall Dimensions and Layout**

Dimensions according to below drawings. Only interchangeable dimensions are shown in the below pictures, and they are both mandatory, without prejudging the actual shape of CT.

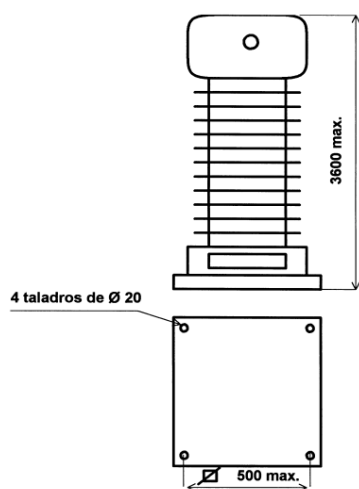


Figure 1ES (220 kV)

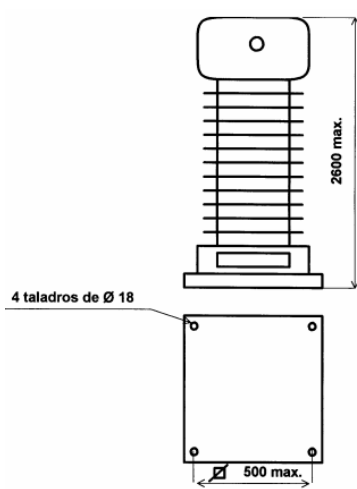


Figure 2ES (110-132 kV)

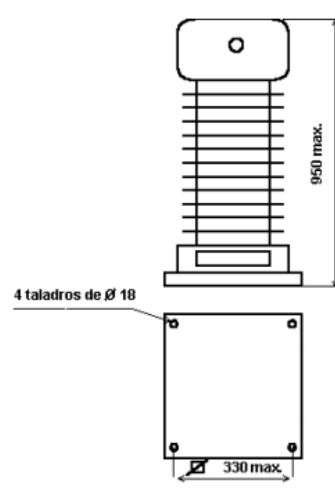


Figure 3ES (55-66 kV)

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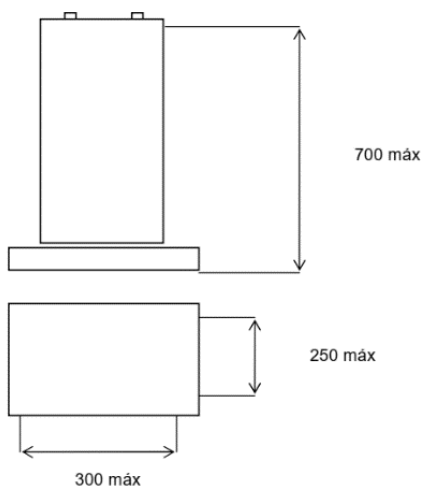


Figure 4ES (55-66 kV Indoor)

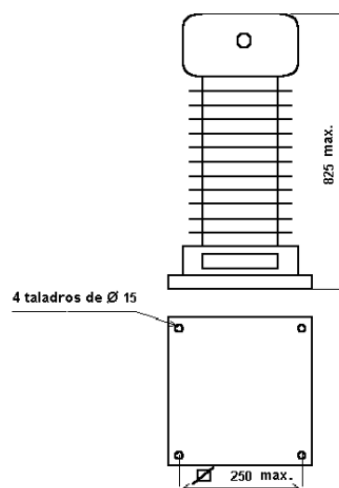


Figure 5ES (45 kV)

**7.5.4. Metal Surface Treatment**

**7.5.5. Accessories**

**7.5.5.1. Primary Outer Terminals**

Material can be aluminum, tinned or silvered copper. The outer terminal shall be cylindrical type.

**7.5.5.2. Secondary Terminals**

Secondary terminals shall be suitable for connecting cable lugs preferably M8, or screw clamps DIN type, suitable to connect a 10 mm<sup>2</sup> copper conductor.

**7.5.5.3. Grounding Terminals**

For transformer grounding a 14 mm hole shall be provided in a suitable position to allow easy connection, equipped with a stainless steel M12 bolt included in the supply and identified in a permanent manner.

**7.5.5.4. CT Support Base**

**7.5.5.5. Secondary Terminals Box**

Secondary terminal boxes shall be placed on the same side of the correspondent primary terminal P1.

It shall be located in an easy position to allow connections and have the following features:

- in the lower part of the terminal box there shall be four outlet holes for diameters  $\phi$  21mm (one per secondary), three of them blocked by a plug and the fourth fitted with cable entry washers, the position of this one can be swapped.
- shall be equipped with vents protected against the entry of insects and be fitted with an aeration system to prevent condensation and corrosion. Openings shall be fitted with anti-insect screens.

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Staff Function: -

Service Function: -

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- shall earthed though the grounding terminal without affecting the secondary terminals.
- there will be no internal devices for earthing the terminals, which is to be done externally.
- A M8 earthing terminal of the same characteristics as the rest of the standard colour terminal strip for the earthing of the cable screens shall be available to connect the terminal box to the secondary terminals. It shall allow the connection of four cables from the different screens.

**7.5.5.6. Liquid level gauge**

The device for checking the liquid level shall indicate whether the liquid level is within the operating range, during operation and shall be clearly readable from ground.

**7.5.5.7. Overpressure Relief Device**

The mechanical protective action can be performed by liquid expansion conservator.

CT shall be designed in such a way that if an internal failure occurs in the main insulation, any overpressure originating in the internal part can be only released upwards, avoiding the breakage and projection of the porcelain.

**7.5.5.8. Liquid Sampling device**

CT shall be equipped with a liquid sampling device plug-in type or similar.

**7.5.5.9. Lifting Lugs**

Placed to facilitate lifting of CT.

**7.5.5.10. Rating Plate**

Rating plate shall be supplied in Spanish language and all information shall be marked in an indelible manner.

In addition to the markings defined in IEC 61869-1 and IEC 61869-2, the following minimum information shall be indicated in the rating plate:

- Transformer ratios
- Burden, accuracy class, security factor, limit factor and function of each winding.
- Connection scheme

**7.5.5.11. Terminal Markings**

All terminals shall mark as indicated in the following drawings:

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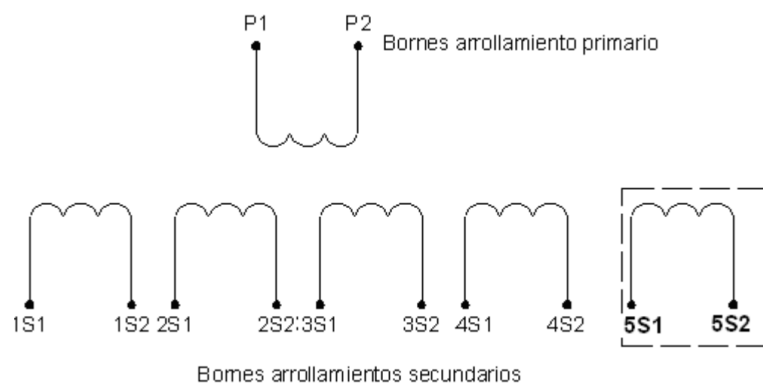
**Application Areas**

Perimeter: *Global*

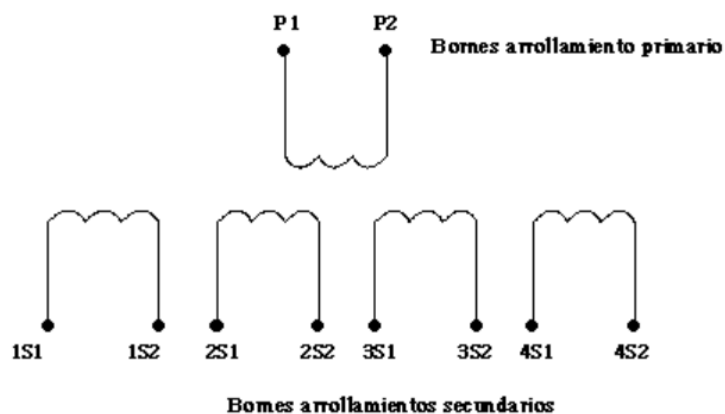
Staff Function: -

Service Function: -

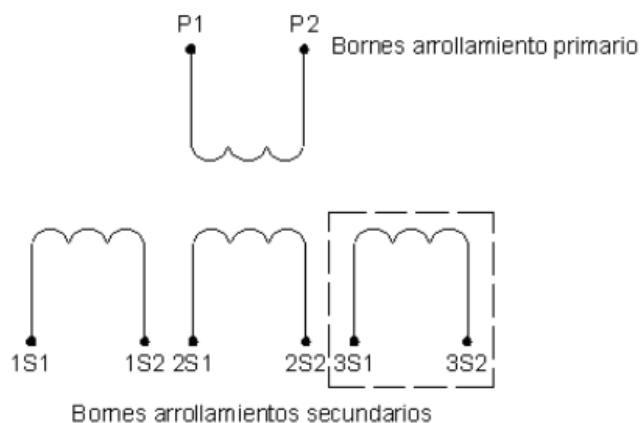
Business Line: *Enel Grids*



*Figure 6ES (245kV)*



*Figure 7ES (110-132 kV)*



*Figure 8ES (45-55-66 kV)*

**7.5.5.12. Capacitive Tap**

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

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## **7.6 Testing**

Requirements for partial discharge are not applicable for current transformers with  $U_m < 72,5\text{kV}$ .

### **7.6.1. Type Tests**

These tests shall be performed for each type of current transformer. Manufacturer can be avoided tests showing the same tests performed on a similar transformer. This shall be agreed between manufacturer and purchaser.

In addition to the tests specified at par. 7.6.1. the following additional tests shall be performed as Type Test:

- Mechanical tests according to subclause 7.4.5 of IEC 61689-1&2

**Note:**

For indoor application the following tests shall not be performed:

- *Wet test for outdoor type transformers*
- *Enclosure tightness test at ambient temperature*
- *Pressure test for the enclosure*

**Note:**

For current transformers with nominal voltages 45, 55 e 66kV for outdoor use, in addition to the test specified at par. 7.6.1 of Common Part, the following test shall be performed:

- *Measurement of capacitance and dielectric dissipation factor shall be performed.*

### **7.6.2. Routine/Acceptance Tests**

### **7.6.3. Special Tests**

These tests shall be carried out only in case of agreement between manufacturer and purchaser.

**Note:**

For current transformers for indoor application only the following tests shall be performed:

- *Chopped impulse voltage withstand test on primary terminals.*
- *Multiple chopped impulse test on primary terminals.*

### **7.6.4. Sample Tests**

## **7.7 Conditions of Supply**

### **7.7.1. Warranty**

### **7.7.2. Reception Control**

### **7.7.3. Technical Information Required**

### **7.7.4. Packaging and Transport**

### **7.7.5. Installation, Operation, Maintenance and Disassembling**

Manual for installation, operation, maintenance, and disassembling shall be provided in Spanish.

### **7.7.6. Technical Conformity Assessment (TCA)**