



Fluor Baruffi

IMPIANTO DI RETE PER L'AMPLIAMENTO 132 kV DELLA CABINA PRIMARIA TRESIGALLO

COSTRUZIONE 3° STALLO LINEA IN CAVO
UBICATO NEL COMUNE DI TRESIGNANA(FE)

PROCEDURA AUTORIZZATIVA (Atto e/o Decreto Regionale o Provinciale) N° - DEL -

PROGETTO DEFINITIVO

		<i>Fluor Baruffi</i>	<i>Fluor Baruffi</i>	<i>Fluor Baruffi</i>	
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RICHIEDENTE SOLAR PV 18 s.r.l. Piazza Castello, 19 20121 - Milano (MI) FIRMA PER BENESTARE					TIPOLOGIA IMPIANTO CAPOFILA / POTENZA IN IMMISSIONE IMPIANTO FOTOVOLTAICO POTENZA IN IMMISSIONE 21,00 MW IMPIANTO CP 132/15 kV TRESIGALLO
INGEGNERIA & COSTRUZIONI BRULLI trasmissione IL DIRETTORE E RESPONSABILE TECNICO <i>Fluor Baruffi</i> FIRMA PER BENESTARE					TITOLO CARATTERISTICHE DEI COMPONENTI OPERA DI RETE
GESTORE RETE ELETTRICA FIRMA PER BENESTARE					LIVELLO PROG. P D CODICE RINTRACCIABILITA' 392211454 TIPO DOCUMENTO E 15 N° ELABORATO 508471A FOGLIO / DI 131/252
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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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HV CURRENT TRANSFORMERS (CP)

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Business Line: *Enel Grids*

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 Enel Distribuição Ceará Enel Distribuição São Paulo
Colombia (CO)	Enel Colombia
Italy (IT)	e-distribuzione
Peru (PE)	Enel Distribución Perú
Romania (RO)	Enel Distributie Banat Enel Distributie Dobrogea 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:

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

Application Areas

Perimeter: *Global*
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Business Line: *Enel Grids*

- 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 25th 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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Service Function: -

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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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Service Function: -

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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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Staff Function: -

Service Function: -

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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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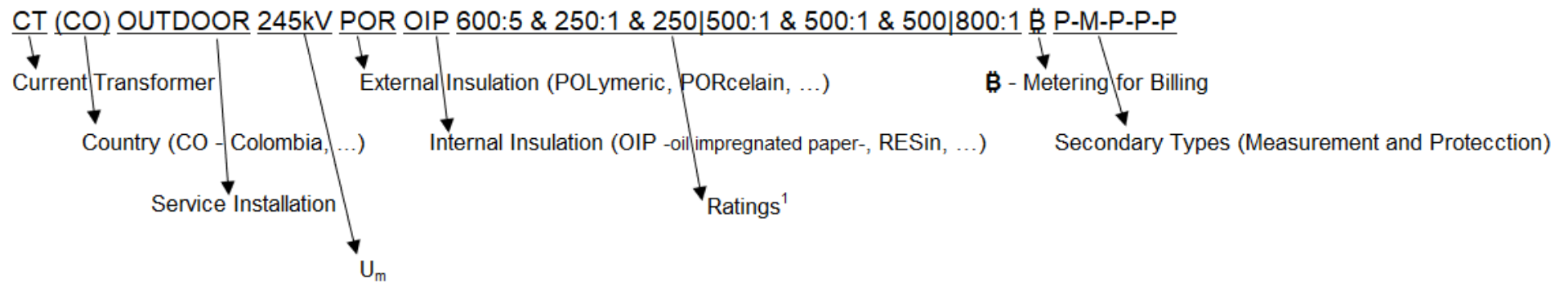
Perimeter: *Global*

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



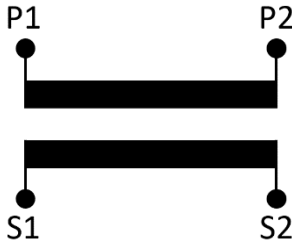
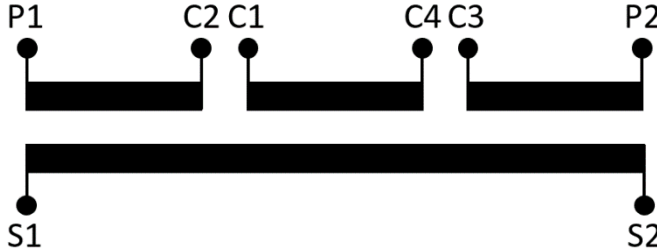
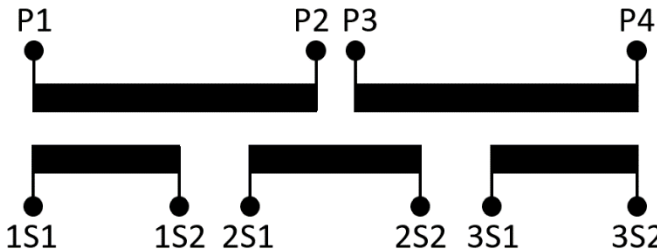
¹ Ratings Symbology

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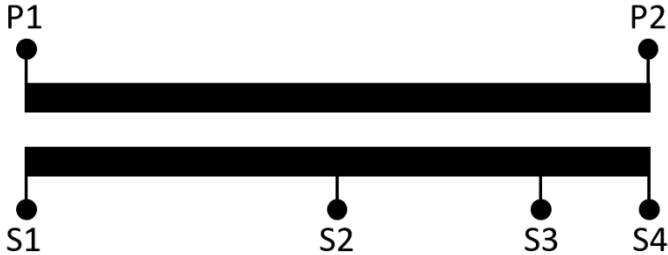
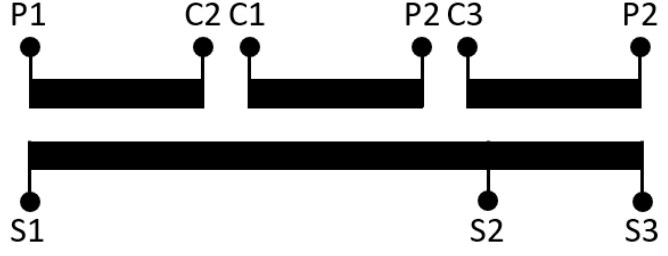
Turns Ratios - Nomenclature	Scheme	Description
800 1250 1600:1		Current transformer with one primary and one secondary winding. The different primary currents are obtained by changing connections in the secondary winding.
200-400-800 1200/5		Current transformer with three primary windings for serial,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

Perimeter: *Global*

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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 ⁽¹⁾ (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 ⁽²⁾	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 Very Heavy ⁽³⁾	43,3 53,7 ⁽³⁾	-	50	-25 / +40	C4 C5 ⁽³⁾

Table 3CP

Note:

⁽¹⁾ Indications of the specific seismic qualification are given in local sections.

⁽²⁾ 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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Staff Function: -

Service Function: -

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⁽³⁾ 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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Application Areas

Perimeter: *Global*

Staff Function: -

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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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Staff Function: -

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 IEC 61869-1 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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ROUTINE TESTS	Subclause IEC 61869-1 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:

SPECIAL TESTS	Subclause IEC 61869-1 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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Perimeter: *Global*

Staff Function: -

Service Function: -

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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 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 _m [kV]	LI [kV]	AC [kV]	Freq. [Hz]	I _{pr} [A]	I _{sr} [A]	Rated turns ratio (K _r → I _{pr} vs I _{sr})	Billing (€)	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)

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Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

GS CODE	Country Code	COUNTRY	U _m [kV]	LI [kV]	AC [kV]	Freq. [Hz]	I _{pr} [A]	I _{sr} [A]	Rated turns ratio (K _r → I _{pr} vs I _{sr})	Billing (€)	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 _m [kV]	LI [kV]	AC [kV]	Freq. [Hz]	I _{pr} [A]	I _{sr} [A]	Rated turns ratio (K _r → I _{pr} vs I _{sr})	Billing (€)	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 _m [kV]	LI [kV]	AC [kV]	Freq. [Hz]	I _{pr} [A]	I _{sr} [A]	Rated turns ratio (K _r → I _{pr} vs I _{sr})	Billing (€)	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 _m [kV]	LI [kV]	AC [kV]	Freq. [Hz]	I _{pr} [A]	I _{sr} [A]	Rated turns ratio (K _r → I _{pr} vs I _{sr})	Billing (€)	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 _m [kV]	LI [kV]	AC [kV]	Freq. [Hz]	I _{pr} [A]	I _{sr} [A]	Rated turns ratio (K _r → I _{pr} vs I _{sr})	Billing (€)	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)
GSCT013/135	313521	BRAZIL/ SAOPAULO	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 _m [kV]	LI [kV]	AC [kV]	Freq. [Hz]	I _{pr} [A]	I _{sr} [A]	Rated turns ratio (K _r → I _{pr} vs I _{sr})	Billing (€)	Secondaries Features
GSCT013/136	C1450D08 00250T	BRAZIL/ SAOPAULO	145	650	275	60	80	1	40 80:1	X	M (30 VA - 0,2 SF ≤10)
GSCT013/137	C1450Q16 00500	BRAZIL/ SAOPAULO	145	650	275	60	160	1	40 60 80 120 160:1	X	M (50 VA - 0,2 SF ≤10)
GSCT013/138	C1450T1. 20500T	BRAZIL/ SAOPAULO	145	650	275	60	240	1	60 120 240:1	X	M (50 VA - 0,2 SF ≤10)
GSCT013/139	313015	BRAZIL/ SAOPAULO	145	650	275	60	1200	5	600 1200:5	-	P (100 VA - 10P 20)
GSCT013/140	313016	BRAZIL/ 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/ 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/ SAOPAULO	145	650	275	60	2000	5-5	2000:5	-	P (200 VA - 10P 20) P (200 VA - 10P 20)
GSCT013/143	313154	BRAZIL/ SAOPAULO	145	650	275	60	1200	5	1200:5	-	P (200 VA - 10P 20)
GSCT013/144	313156	BRAZIL/ SAOPAULO	145	650	275	60	1200	5	1200:5	-	P (100 VA - 10P 20)
GSCT013/145	313157	BRAZIL/ SAOPAULO	145	650	275	60	1200	5	1200:5	-	P (50 VA - 10P 20)
GSCT013/146	313163	BRAZIL/ SAOPAULO	145	650	275	60	3000	5	3000:5	X	M (50 VA - 0,2 SF ≤10)
GSCT013/147	313165	BRAZIL/ SAOPAULO	145	650	275	60	1200	5	1200:5	X	M (100 VA - 0,2 SF ≤10)
GSCT013/148	313166	BRAZIL/ SAOPAULO	145	650	275	60	1200	5	1200:5	X	M (100 VA - 0,2 SF ≤10)
GSCT013/149	313168	BRAZIL/ SAOPAULO	145	650	275	60	1200	5	1200:5	-	P (200 VA - 10P 20)
GSCT013/150	C1450C16 00500	BRAZIL/ SAOPAULO	145	650	275	60	160	5	40 60 80 120 160:5	X	M (50 VA - 0,2 SF ≤10)
GSCT013/151	C1450D03 00500T	BRAZIL/ SAOPAULO	145	650	275	60	30	5	15 30:5	X	M (50 VA - 0,2 SF ≤10)
GSCT013/152	C1450D06 00500T	BRAZIL/ 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 _m [kV]	LI [kV]	AC [kV]	Freq. [Hz]	I _{pr} [A]	I _{sr} [A]	Rated turns ratio (K _r → I _{pr} vs I _{sr})	Billing (€)	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 0120125	BRAZIL/ SAOPAULO	145	650	230	60	60	5	30 60:5	-	M (12,5 VA - 0,3 SF ≤10)
GSCT013/160	C1450D 0300500	BRAZIL/ SAOPAULO	145	650	230	60	150	5	75 150:5	-	M (50 VA - 0,3 SF ≤10)
GSCT013/161	C1450D 0600500	BRAZIL/ SAOPAULO	145	650	230	60	300	5	150 300:5	-	M (50 VA - 0,3 SF ≤10)
GSCT013/162	C1450D 1600500	BRAZIL/ 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	-
SERVICE CONDITIONS		
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 ²]	-	-
RUSCD (Reference Unified Specific Creepage Distance) [mm/kV]	53,7	-
ELECTRICAL RATINGS		
Highest voltage for equipment (U _m) [kV]	245	-
Rated lightning impulse withstand voltage [kV]	1050	-
Rated power frequency withstand voltage [kV]	460	-
Rated frequency (f _R) [Hz]	50	-
Metering for Billing (B)	YES	-
Rated primary current (I _{pr}) [A]	100	-
Rated secondary current (I _{sr}) [A]	5-5-5-5	-
Rated turns ratio (K _r = I _{pr} / I _{sr}) [A/A]	4x(50-100/5)	-
Primary Serie/Parallel settings	YES	-
Secondary Conection settings	NO	-
Rated continuous thermal current (I _{cth}) [%]	120% I _{pr}	-
Rated short-time thermal current (I _{th}) [kA]	40	-
Rated dynamic current (I _{dyn}) [kA]	100	-
Number of Cores [nr.]	4	-

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

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

Core 1		
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 _{ct})	-	-
Secondary reactance at industrial frequency	-	-
Core 2		
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 _{ct})	-	-
Secondary reactance at industrial frequency	-	-
Core 3		
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 _{ct})	-	-
Secondary reactance at industrial frequency	-	-
Core 4		
Function	Protection	-
Primary Current (Ip) for ratios purpose - Core 4 [A]	50-100	-
Rated secondary current (Isr) [A]	5	-

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

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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

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

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

Total Weight	[kg]	To be indicated by supplier	-
Internal Insulation Class	[Oil, Cycloaliphatic Resin, SF ₆ 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 ²	-
Earthing Terminal Type		M12	-
MECHANICAL REQUIREMENTS			
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]	-	-
ADDITIONAL REQUIREMENTS/COMMENTS			
DRAWINGS (OVERALL/DETAILED INDICATIONS)			

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

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

CONTENS

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

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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.

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

Application Areas

Perimeter: *Global*
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.

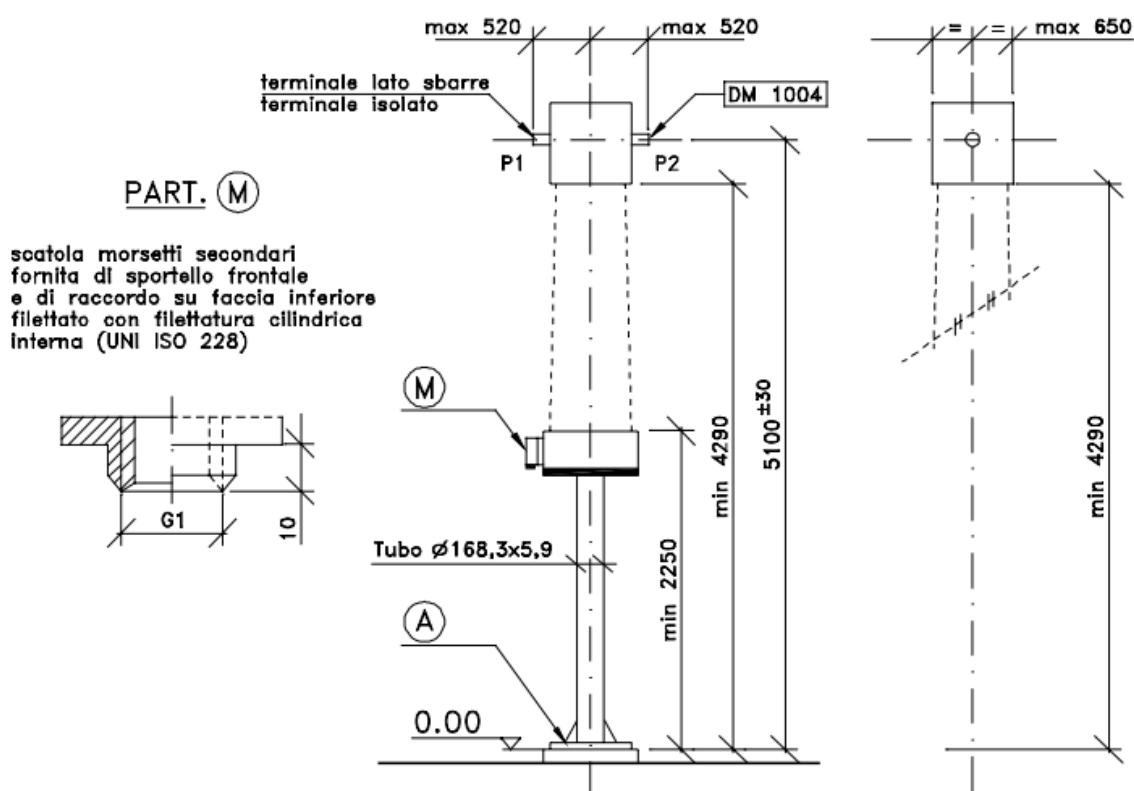
7.5 Construction Characteristics

7.5.1. Internal Insulation

7.5.2. External Insulation

Insulators shall be made exclusively 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.

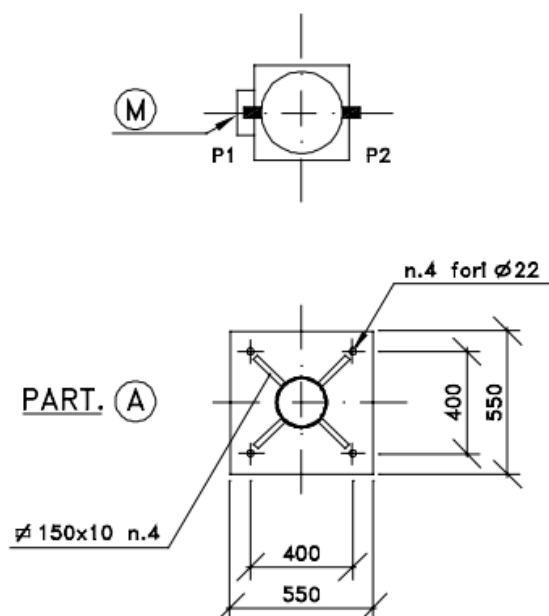
7.5.3. Overall Dimensions and Layout



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

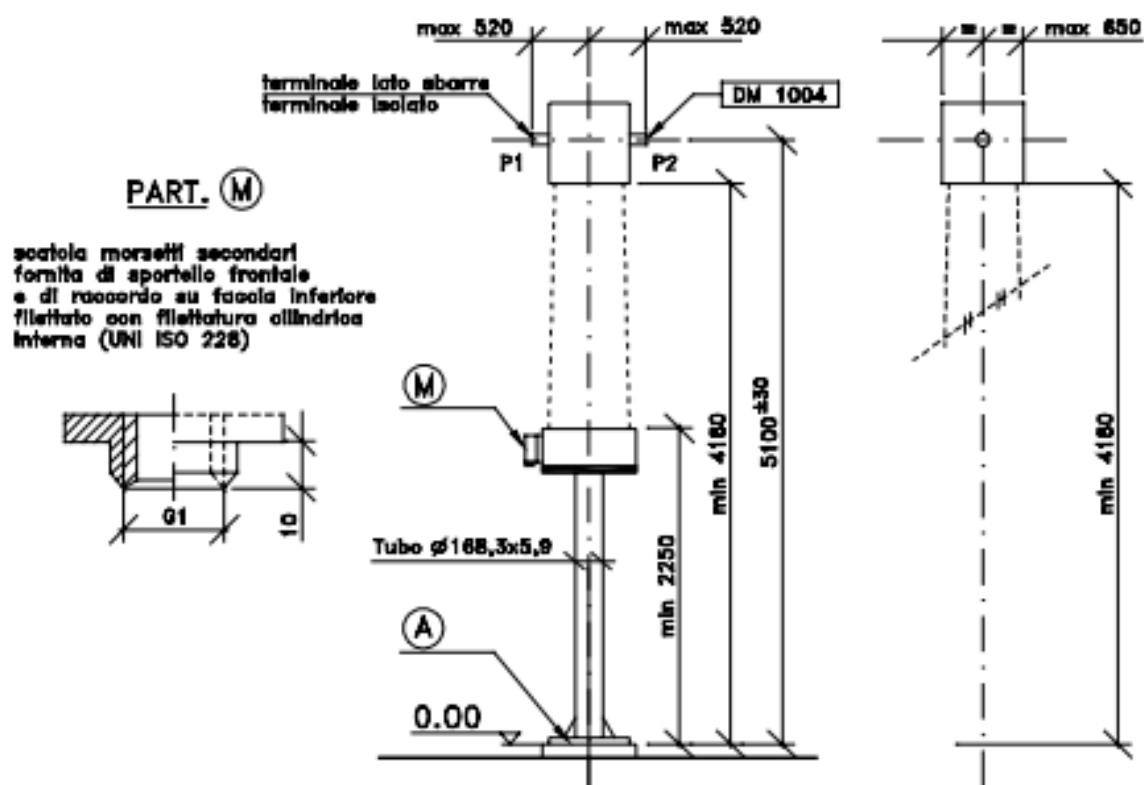
Application Areas

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)



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

Application Areas

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

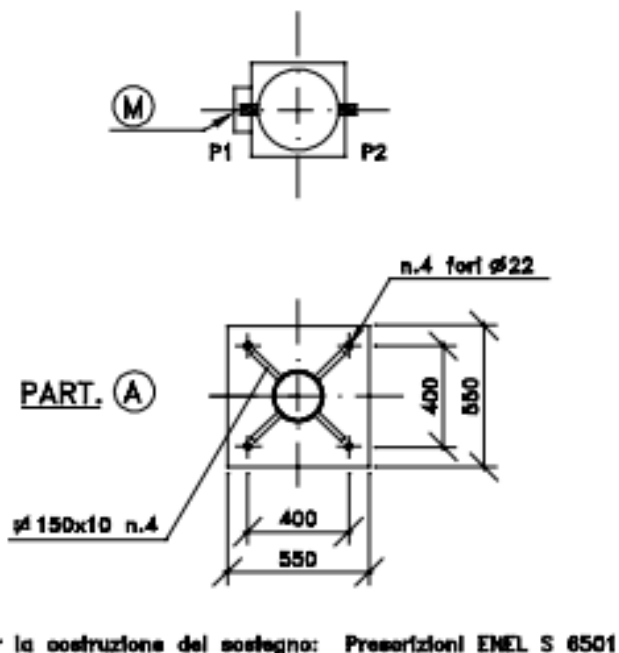


Figure 2IT (Current Transformer U_m 145 kV)

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:

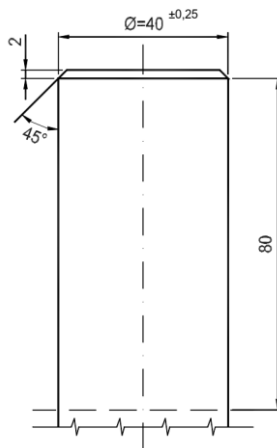


Figure 3IT (Primary Terminal)

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

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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

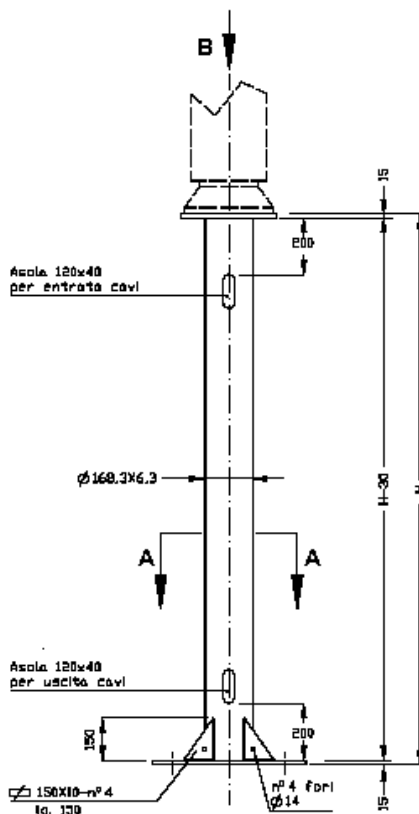
Secondary terminals shall be suitable for connecting cable lugs M6/M8, or with cage clamps (screw clamps) up to 16mm².

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:



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

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

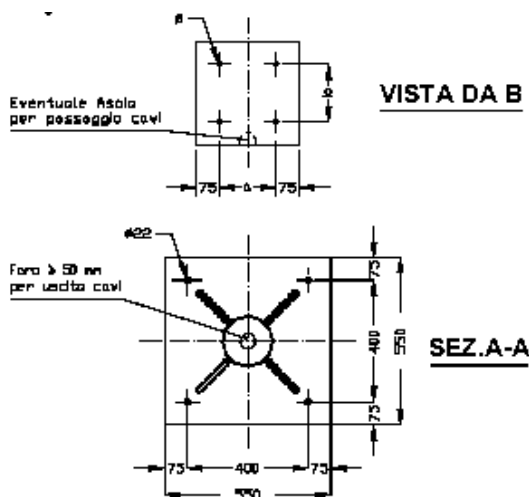


Figure 4IT

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

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

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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

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

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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)

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

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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)

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (CP)
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*
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Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE 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

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (CP)
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

1 DOCUMENT AIMS AND APPLICATION AREA

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

Country	Distribution Company
Argentina (AR)	Edesur
Brazil (BR)	Enel Distribuição Rio Enel Distribuição Ceará Enel Distribuição São Paulo
Colombia (CO)	Enel Colombia
Italy (IT)	e-distribuzione
Peru (PE)	Enel Distribución Perú
Romania (RO)	Enel Distributie Banat Enel Distributie Dobrogea 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
01	30/06/2023	Issuing of Global E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS

3 UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (CP)

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

- Enel Grids: Engineering & Construction/Network Components Unit

Responsible for authorizing the document:

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

4 REFERENCES

- *Integrated Policy for Quality, Health and Safety, Environment, Anti-Bribery, and Information Security.*
- *Stop Work Policy.*
- *GSCG002 - TECHNICAL CONFORMITY ASSESSMENT (Enel's Global Standard).*

Group Pillar 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).*

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 25th 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

3.2.1. 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*

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (CP)
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*
3.2.2. Brazil

- *NR-10 – Segurança em instalações e serviços em eletricidade.*
- *RESOLUÇÃO ANP Nº 900, DE 18 DE NOVEMBRO DE 2022 - DOU DE 23-11-2022.*
- *RESOLUÇÃO ANP Nº 834, DE 26 DE NOVEMBRO DE 2020*

3.2.3. 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).*

3.2.4. 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.*

3.2.5. Peru
3.2.6. 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.*

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (CP)
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

- *L 265/2006 - Environmental Protection Act, as amended and supplemented.*

3.2.7. 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 61869-5:	Instrument transformers - Part 5: Additional Requirement for Capacitor Voltage 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

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (CP)
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

IEC 60422	Mineral insulating oils in electrical equipment - Supervision and maintenance guidance
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.
---O---	
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.
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.
ISO 27001	Information Security Management System – Requirements.
ISO/IEC 17000	Conformity assessment – Vocabulary and general principles
ISO/IEC 17020	General criteria for the operation of various types of bodies performing inspection
ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories
ISO/IEC 17050-1	Conformity assessment - Supplier's declaration of conformity - Part 1: General requirements (ISO/IEC 17050-1:2004, corrected version 2007-06-15)
ISO/IEC 17050-2	Conformity assessment - Supplier's declaration of conformity - Part 2: Supporting documentation (ISO/IEC 17050-2:2004)
ISO/IEC 17065	Conformity assessment – Requirements for bodies certifying products, processes and services

---O---

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (CP)
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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
---O---	
EN 60068-3-3	Environmental testing - Part 3: Guidance - Seismic test methods for equipment.
---O---	
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

3.4.1. 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.

- 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

3.4.2. Brazil

- ABNT NBR 5426. Planos de amostragem e procedimentos na inspeção por atributos.
- ABNT NBR 6855. Transformador de potencial indutivo - especificação e ensaios.
- ABNT NBR 7397. Produto de aço e ferro fundido galvanizado por imersão a quente - determinação da massa do revestimento por unidade de área - método de ensaio.
- ABNT NBR 7398. Produto de aço ou ferro fundido galvanizado por imersão a quente - verificação da aderência do revestimento - método de ensaio.
- ABNT NBR 7399. Produto de aço ou ferro fundido galvanizado por imersão a quente - verificação da espessura do revestimento por processo não destrutivo – método de ensaio.

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (CP)
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

- ABNT NBR 7400. Galvanização de produtos de aço ou ferro fundido por imersão a quente - verificação da uniformidade do revestimento - método de ensaio.
- ABNT NBR 10576. Óleo mineral isolante de equipamentos elétricos - diretrizes para supervisão e manutenção.
- ABNT NBR 11003. Tintas – Determinação da aderência.
- ABNT NBR 11388. Sistemas de pintura para equipamentos e instalações de subestações elétricas.
- ABNT NBR 13882. Líquidos isolantes elétricos - determinação do teor de bifenilas policloradas (PCB).
- ABNT NBR 15218. Critérios para qualificação e certificação de inspetores de pintura industrial.
- ABNT NBR 15422. Óleo vegetal isolante para equipamentos elétricos.
- ABNT NBR IEC 60270: Técnicas de ensaios elétricos de alta-tensão - Medição de descargas parciais.
- ABNT NBR IEC 60529. Graus de proteção providos por invólucros (códigos IP).
- ABNT NBR IEC 62271-1. Manobra e comando de alta tensão – Parte 1: Especificações comuns para equipamentos de manobra e comando em corrente alternada.
- 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.
- TES-EM-002 – TC e TP – Distância de Segurança.

3.4.3. Colombia

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

3.4.4. Italia
3.4.5. Peru
3.4.6. Romania

The capacitor voltage 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 capacitor voltage 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.

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (CP)
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*
3.4.7. 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: Engineering and Construction

Macro Process: Devices and Components Development

Process: Standard Catalog Management

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.
IRAM	Argentinian technical standard and certification institute.
ABNT	Brazilian technical standard association.
NBR	Brazilian 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	Document containing the data 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.
Capacitor Voltage Transformer (CVT)	Voltage transformer comprising a capacitor divider unit and an electromagnetic unit so designed and interconnected that the secondary voltage of the electromagnetic unit is substantially proportional to the primary voltage, and differs in phase from it by an angle which is approximately zero for an appropriate direction of the connections.

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (CP)

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

Acronym and Key Words	Description
Rated Primary Voltage	Value of the primary voltage on which the performance of the transformer is based.
Rated Secondary Voltage	Value of the secondary voltage on which the performance of the transformer is based.

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (CP)

Application Areas

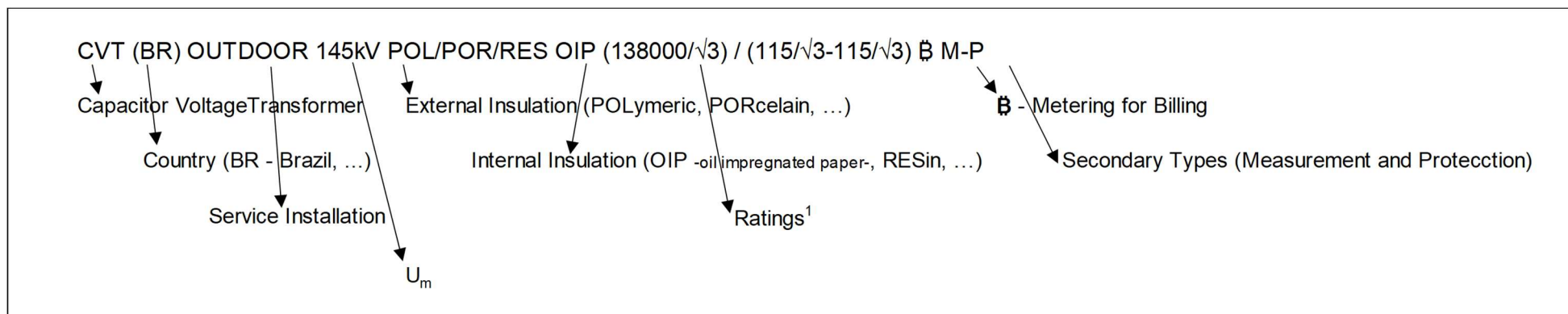
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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



¹ 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

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE 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 standard 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 Capacitor Voltage 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 ⁽¹⁾ (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 ⁽²⁾	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 Very Heavy ⁽³⁾	43,3 53,7 ⁽³⁾	-	50	-25 / +40	C4 C5 ⁽³⁾

Table 2CP

Note:

⁽¹⁾ Indications of the specific seismic qualification are given in local sections.

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⁽²⁾ 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.

⁽³⁾ Balearic and Canary Islands.

7.4 TECHNICAL CHARACTERISTICS

For definitions see IEC-61698-1 and IEC-61698-5 or IEEE Std. C57.13 whenever required in Local Sections.

6.4.1. Type of Capacitor Voltage Transformers

This document is applicable for single-phase capacitor voltage transformers connected between line and ground for system voltages $U_m \geq 72,5$ kV at power frequencies from 15 Hz to 100 Hz. They are intended to supply a low voltage for measurement, control and protective functions

See Datasheets.

6.4.2. Number of Cores and Windings

See Datasheets.

6.4.3. Rated Insulation Levels

See Datasheets.

6.4.4. Rated Output

See Datasheets.

6.4.5. Rated Accuracy Class CVT

See Datasheets.

6.4.6. Rated Primary Voltage U_{Pr}

See Datasheets.

6.4.7. Rated Secondary Voltage U_{Sr}

See Datasheets.

6.4.8. Rated Voltage Factor F_V

See Datasheets.

6.4.9. Rated Capacitance of a Capacitor C_r

See Datasheets.

6.4.10. High Voltage Capacitor C_1

See Datasheets.

6.4.11. Intermediate Voltage Capacitor C_2

See Datasheets.

6.4.12. Static Withstand Load (F_R)

See Datasheets.

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6.4.13. Installation

See Datasheets.

6.4.14. Temperature Rise

See IEC-61698-1 and IEC-61698-5 or IEEE Std. C57.13 whenever required in Local Sections.

6.4.15. Seismic Qualification

See Local Sections.

6.4.16. Ferro-resonance

See Local Sections.

6.4.17. Requirements For Transient Response

See Local Sections.

6.4.18. Short Circuit Withstand Capability and Secondary Current

See Local Sections.

6.4.19. Drain Coil's Technical Parameters

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.

6.5.1. Internal Insulation

The internal insulating medium of the HV voltage 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.

6.5.2. External Insulation

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

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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.

6.5.3. Overall Dimensions and Layouts

See Local Sections.

6.5.4. 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 3CP

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.

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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.

6.5.5. Accessories

See Local Sections for details.

6.5.5.1. Primary Outer Terminals

See Local Sections.

Terminals shall have clearly distinguishable polarity markings.

6.5.5.2. 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.

6.5.5.3. Grounding Terminals

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

6.5.5.4. CVT Support Base

See Local Sections.

6.5.5.5. Secondary Terminals Box

See Local Sections.

6.5.5.6. Liquid Level Gauge

See Local Sections.

6.5.5.7. Overpressure Relief Device

See Local Sections.

6.5.5.8. Liquid Sampling Device

See Local Sections.

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6.5.5.9. Lifting Lugs

Placed to facilitate lifting of CVT.

6.5.5.10. 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 voltage transformer shall be in local languages of the country of destination of the voltage 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.

For further details see Local Sections.

6.5.5.11. Terminal Markings

See local sections.

6.5.5.12. Capacitive Tap

See local sections.

6.5.5.13. Capacitor Voltage Divider

See local sections.

6.5.5.14. Electromagnetic Unit

See local sections.

6.5.5.15. Carrier-Frequency Accessories & High Frequency Signals Characteristics

See Local Sections.

7.6 TESTING
6.6.1. Type Test

Required tests are indicated in section 7 of IEC 61869-1 and IEC 61869-5.

They are those that shall be carried out only once in the product approval process and which are listed in *Table 4CP* below:

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TYPE TESTS	Subclause IEC 61869-1 IEC 61869-5
Temperature rise test	7.2.2
Chopped Impulse Test	7.4.1
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
Enclosure tightness test at ambient temperature	7.2.8
Short-circuit withstand capability test	7.2.502
Ferro-resonance test	7.2.503
Transient response test (for protective capacitive transformers)	7.2.504
Type tests for carrier frequency accessories	7.2.505

Table 4CP

In addition to the above tests, a compliance check to the specification requirements shall be done.

For further details see Local Sections.

6.6.2. Routine/Acceptance test

Required tests are indicated in section 7 of IEC 61869-1 and IEC 61869-5.

The routine tests shall be performed on each voltage transformer, and they are listed in the below (*Table 5CP*):

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ROUTINE TESTS	Subclause IEC 61869-1 IEC 61869-5
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
Capacitance and $\tan\delta$ measurement at power frequency	7.2.501
Enclosure tightness test at ambient temperature	7.3.7.2
Ferro-resonance check	7.3.501
Routine tests for carrier frequency accessories	7.3.502
Visual and Dimensional checks (including VT base support)	-
Painting check	-

Table 5CP

In addition to the above tests the checking of the correspondence with the approved prototype shall be done.

For further details see Local Sections.

6.6.3. Special test

Required tests are indicated in section 7 of IEC 61869-1 and IEC 61869-3.

These tests shall be exceptionally required in the product approval process, and they are listed in *Table 6CP*, below:

SPECIAL TESTS	Subclause IEC 61869-1 IEC 61869-5
Transmitted overvoltage test	7.4.4
Mechanical tests	7.4.5
Corrosion test	7.4.9
Fire hazard test	7.4.10
Determination of the temperature coefficient (TC)	7.4.501
Tightness design test of capacitor units	7.4.502

Table 6CP

For further details see Local Sections.

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6.6.4. 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 7CP*, below:

SAMPLE TESTS	Subclause IEC 61869-1
Lightning impulse test on the primary terminals	Annex D

Table 7CP

7.7 CONDITIONS OF SUPPLY
6.7.1. 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).

6.7.2. Reception Control

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

6.7.3. 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.

6.7.4. 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.

6.7.5. 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

6.7.6. 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 for the TCA Dossier and the process to be followed is indicated in the procedure document issued by Enel.

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ANNEX A – LIST OF COMPONENTS (ENEL CODES)

GS CODE	Country Code	COUNTRY	Highest Voltage (Um) [kV]	Power Frequency Voltage primary winding (AC) [kV]	Lightning Impulse (LI) [kV]	Rated Frequency [Hz]	Rated primary voltage (UPr) [V]	Rated secondary voltage (USr) [V]	Rated voltage ratio (Kv = Upr / Usr)	Metering for Billing (€)	Secondaries Features
GSCT015/001	531944	BRAZIL	145	275	650	60	138000/√3	115/√3-115/√3	(138000/√3) / (115/√3-115/√3)	X	M (50 VA - 0,2) P (50 VA - 3P)
GSCT015/002	536721	ITALY	145	275	650	50	132000/√3	100/√3	(132000/√3) / (100/√3)	X	M&P (30 VA - 0VA - 30VA / 0,2 - 3PT1)
GSCT015/003	536731	ITALY	170	325	750	50	150000/√3	100/√3	(150000/√3) / (100/√3)	X	M&P (30 VA - 0VA - 30VA / 0,2 - 3PT1)
GSCT015/004	531086	PERU	72,5	140	325	60	60000/√3	110/√3-110/√3	(60000/√3) / (110/√3-110/√3)	X	M (20 VA - 0,2) P (20 VA - 3P)
GSCT015/005	530996	PERU	245	460	1050	60	220000/√3	200/√3	(220000/√3) / (200/√3)	X	M (50 VA - 0,2)
GSCT015/006	531044	PERU	245	460	1050	60	220000/√3	110/√3-110/√3	(220000/√3) / (110/√3-110/√3)	X	M (30 VA - 0,2) P (30 VA - 3P)
GSCT015/007	653201	ROMANIA	123	230	550	50	110000/√3	100/√3-100/√3-100	(110000/√3) / (100/√3-100/√3-100)	X	M (50 VA - 0,2) P (100 VA - 0,5-3P) P (100 VA - 3P)
GSCT015/008	530586	SPAIN	145	275	650	50	110000/√3	110/√3-110/3	(110000/√3) / (110/√3-110/3)	-	M&P (75 VA - 0,5-3P) P (10 VA - 6P)
GSCT015/009	530589	SPAIN	145	275	650	50	110000/√3	110/√3-110/√3	(110000/√3) / (110/√3-110/√3)	-	M&P (30 VA - 0,5-3P) P (30 VA - 0,5-3P)
GSCT015/010	530580	SPAIN	145	275	650	50	132000/√3	110/√3-110/3	(132000/√3) / (110/√3-110/3)	-	M&P (75 VA - 0,5-3P) P (10 VA - 6P)
GSCT015/011	530595	SPAIN	145	275	650	50	132000/√3	110/√3-110/√3	(132000/√3) / (110/√3-110/√3)	-	M&P (30 VA - 0,5-3P) P (30 VA - 0,5-3P)
GSCT015/012	530607	SPAIN	72,5	140	325	50	55000/√3	110/√3-110/3	(55000/√3) / (110/√3-110/3)	-	M&P (75 VA - 0,5-3P) P (10 VA - 6P)
GSCT015/013	530619	SPAIN	72,5	140	325	50	55000/√3	110/√3-110/√3	(55000/√3) / (110/√3-110/√3)	-	M&P (30 VA - 0,5-3P) P (30 VA - 0,5-3P)
GSCT015/014	530604	SPAIN	72,5	140	325	50	66000/√3	110/√3-110/3	(66000/√3) / (110/√3-110/3)	-	M&P (75 VA - 0,5-3P) P (10 VA - 6P)
GSCT015/015	530613	SPAIN	72,5	140	325	50	66000/√3	110/√3-110/√3	(66000/√3) / (110/√3-110/√3)	-	M&P (30 VA - 0,5-3P) P (30 VA - 0,5-3P)
GSCT015/016	531259	COLOMBIA	145	650	275	60	115000/√3	115-115-115/√3	(115000/√3) / (115-115-115/√3)	-	P (10 VA - 3P) M (10 VA - 0,2) P (10 VA - 3P)
GSCT015/017	Pending	ARGENTINA	145	550	230	50	132000/√3	110/√3	(132000/√3) / (110/√3)	-	M&P (200 VA - 0,5)
GSCT015/018	Pending	ARGENTINA	145	550	230	50	132000/√3	110/√3-110/√3	(132000/√3) / (110/√3-110/√3)	X	M (50 VA - 0,2) P (100 VA - 3P)
GSCT015/019	Pending	ARGENTINA	245	950	395	50	220000/√3	110/√3-110/√3	(220000/√3) / (110/√3-110/√3)	-	M (200 VA - 0,5) P (200 VA - 5P)
GSCT015/020	Pending	ARGENTINA	245	950	395	50	220000/√3	110/√3-110/√3	(220000/√3) / (110/√3-110/√3)	-	M (10 VA - 0,5) P (20 VA - 3P)
GSCT015/021	Pending	ARGENTINA	145	550	230	50	132000/√3	110/√3-110/√3	(132000/√3) / (110/√3-110/√3)	-	M (10 VA - 0,5) P (10 VA - 3P)
GSCT015/022	Pending	ARGENTINA	145	550	230	50	132000/√3	110/√3-110/√3	(132000/√3) / (110/√3-110/√3)	X	M (50 VA - 0,2) P (50 VA - 0,5 3P)
GSCT015/023	Pending	ARGENTINA	245	950	395	50	220000/√3	110/√3-110/√3	(220000/√3) / (110/√3-110/√3)	X	M (20 VA - 0,2) M (200 VA - 0,5)

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Version no. 01 dated 30/12/2022

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GSCT015/024	Pending	ARGENTINA	145	550	230	50	$132000/\sqrt{3}$	$110/\sqrt{3}$	$(132000/\sqrt{3}) / (110/\sqrt{3})$	-	M&P (300 VA - 0,5)
GSCT015/025	Pending	ARGENTINA	145	550	230	50	$132000/\sqrt{3}$	$110/\sqrt{3}-110/\sqrt{3}$	$(132000/\sqrt{3}) / (110/\sqrt{3}-110/\sqrt{3})$	X	M (300 VA - 0,2) P (300 VA - 3P)
GSCT015/026	Pending	ARGENTINA	245	950	395	50	$220000/\sqrt{3}$	$110/\sqrt{3}$	$(220000/\sqrt{3}) / (110/\sqrt{3})$	-	M&P (100 VA - 0,5 - 3P)
GSCT015/027	Pending	ARGENTINA	145	550	230	50	$132000/\sqrt{3}$	$110/\sqrt{3}-110/\sqrt{3}$	$(132000/\sqrt{3}) / (110/\sqrt{3}-110/\sqrt{3})$	-	M (200 VA - 0,5) M&P (50 VA - 0,5 3P)



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ANNEX B – DATASHEET AND CHECK LIST (EXAMPLE)

COMPONENT ID	ENEL REQUIREMENT	SUPPLIER DATA
Type of Instrument Transformer	CVT - Capacitor Voltage Transformer	
Country		
GS Code		
Country Code		
Old Country Reference Code		
SERVICE CONDITIONS		
Installation Conditions		
Service Conditions Type		
Temperature category [°C]		
Daily Average Amb. Temperature [°C]		
Altitude (maximum) [m]		
Seismic Qualification Level according to IEC 60068-3-3		
RUSCD (Reference Unified Specific Creepage Distance) [mm/kV]		
ELECTRICAL RATINGS		

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Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*
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

The CVT shall be single phase, for outdoor use and immersed in insulating mineral oil.

7.4 TECHNICAL CHARACTERISTICS

For definitions IEC 61869-1, IEC 61869-5 apply.

7.4.1. Type Of Capacitor Voltage Transformers

Capacitor Voltage 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. Rated Insulation Levels

See Datasheets.

7.4.4. Rated Output

See Datasheets.

7.4.5. Rated Accuracy Class CVT

See Datasheets.

7.4.6. Rated Primary Voltage U_{pr}

See Datasheets.

7.4.7. Rated Secondary Voltage U_{sr}

See Datasheets.

7.4.8. Rated Voltage Factor F_v

See Datasheets.

7.4.9. Rated Capacitance of a Capacitor C_r

See Datasheets.

7.4.10. High Voltage Capacitor C_1

See Datasheets.

7.4.11. Intermediate Voltage Capacitor C_2

See Datasheets

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Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*
7.4.12. Static Withstand Load (F_R)

See Datasheets.

7.4.13. Installation

The type of installation can be indoor or outdoor.

See Datasheets.

7.4.14. Temperature Rise

See IEC-61698-1 and IEC-61698-5.

7.4.15. Seismic Qualification

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

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

7.4.16. Ferro-resonance

According to IEC 61869-5.

7.4.17. Requirements For Transient Response

According to IEC 61869-5.

7.4.18. Short Circuit Withstand Capability and Secondary Current

According to IEC 61869-5.

7.4.19. Drain Coil's Technical Parameters
7.5 CONSTRUCTION CHARACTERISTICS
7.5.1. Internal Insulation
7.5.2. External Insulation

Insulators shall comply to IEC 62217, and they are made of exclusively 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. The Tracking and erosion test shall be performed on the complete bushing according to IEC 62217 Annex B (multiple stress 5000 hours).

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

- A: Terminale AT
- N: Terminale di terra
- a-n: Terminali secondari
- T: Terminale per onde convogliate
- T-N: Connessioni di messa a terra

n. 4 fori filettati M16 con
n. 4 viti per accoppiamento
con flangia di spessore $15 \div 20$

scatola morsetti secondari
fornita di sportello frontale
e di raccordo su faccia inferiore
filettata con filettatura cilindrica
interna (UNI ISO 228)

SCHEMA DI MONTAGGIO

Y61-LY66-LV51

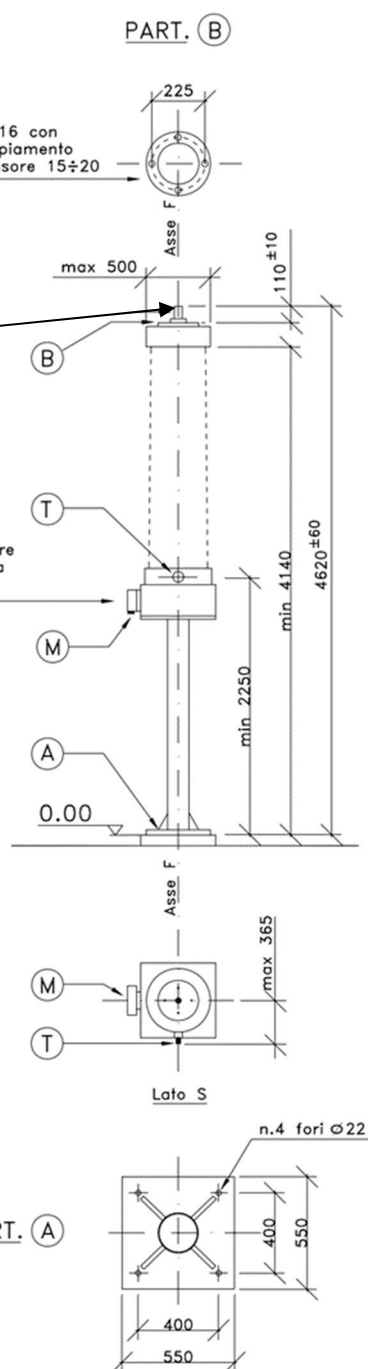
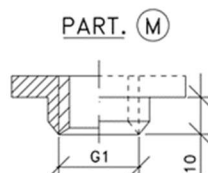


Figure 1IT (CVT U_m 145 kV)

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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.

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (IT)
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*
7.5.5. Accessories
7.5.5.1. Primary Outer Terminals

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

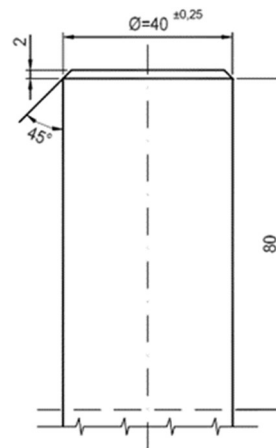


Figure 3IT (Primary Terminal)

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 6mm².

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.

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (IT)**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

7.5.5.4. CVT Support Base

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

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (IT)
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

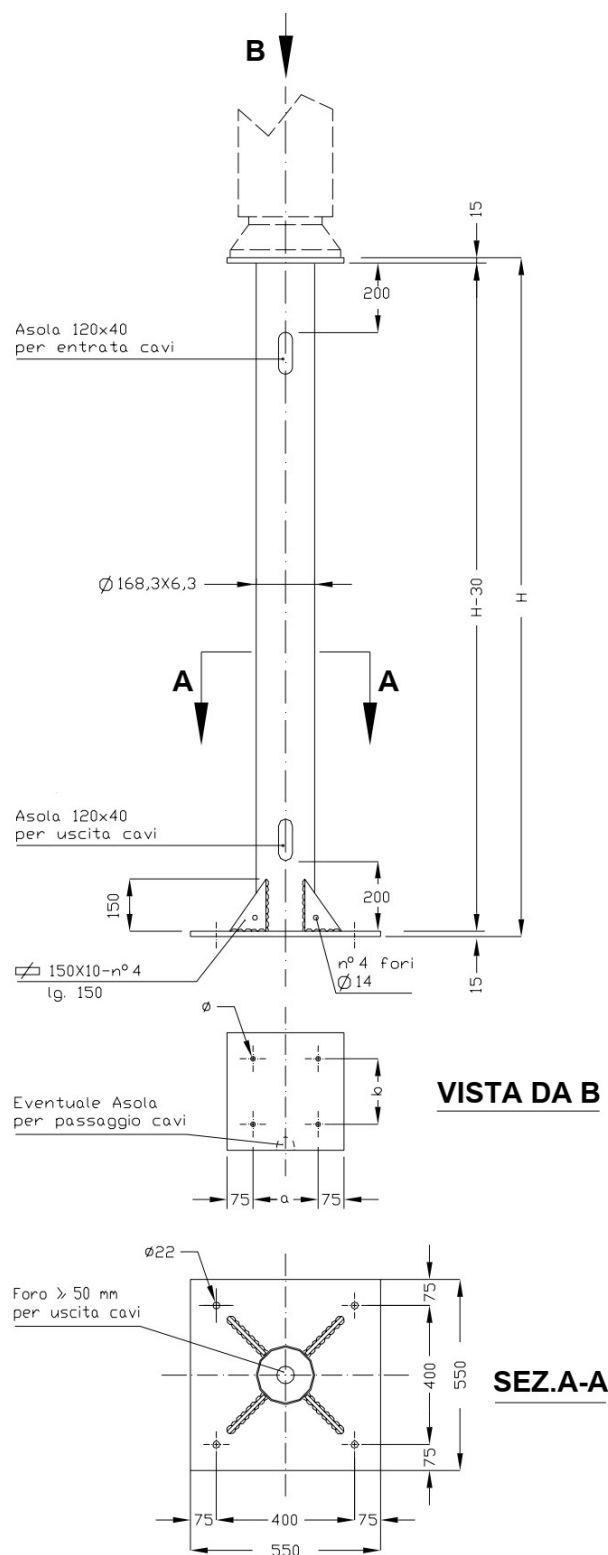
Business Line: *Enel Grids*


Figure 4IT

Subject: E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS (IT)**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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.

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).

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Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

- be equipped with a fitting as indicated in the Figura 1IT and Figura 2IT (*"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 CVT'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 must be clearly readable from ground.

7.5.5.7. Overpressure Relief Device

The mechanical protective action can be performed by liquid expansion conservator. The conservator shall be watertight to the external environment and designed to exclude condensation and stagnation of water, to prevent damages at low temperatures.

7.5.5.8. Liquid Sampling Device
7.5.5.9. Lifting Lugs

Placed to facilitate lifting of CVT.

7.5.5.10. Rating Plate

In accordance with IEC 61869-1 & IEC 61869-5. Rating plate shall be supplied in Italian language and all information shall be marked in an indelible manner. Material shall be aluminum.

7.5.5.11. Terminal Marking

All terminals shall be permanently marked according to IEC 61689-5.

7.5.5.12. Capacitive Tap
7.5.5.13. Capacitor Voltage Divider

The capacitor divider shall be sealed and not allow any contact of the insulating liquid with the atmosphere. The internal insulation can be either mixed (paper and polypropylene film) or single type polypropylene film; however, it shall be immersed in an insulating liquid.

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Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*
7.5.5.14. Electromagnetic Unit

The electromagnetic unit shall be tight at a constant volume in the full temperature working range and shall be equipped with an oil level indicator.

7.5.5.15. Carrier-Frequency Accessories & High Frequency Signals Characteristics

Line-trap is not included in the scope of supply. However, the CVTs shall be designed to support and connect a Line-Trap. For the assembly and connection of any Line-Trap accessories, the manufacturer shall supply 4 threaded holes (several screws supplied) on the upper flange for fastening the line trap (see drawing LY 61 for further details). The CVT shall be supplied with the low voltage terminal connected to the ground firmly and safely. This connection will preferably be made by means of a bar and in any case with an equivalent copper section not less than 40 mm²; it must also be easily removable (for example by screws) in case of connection to a line trap.

Drain coil is not included in the scope of supply. However, the CVTs shall be designed to connect a drain coil. For this scope a low voltage terminal (T) for the connection of the tuning device shall be supplied (see drawing LY 66 for further details). This terminal shall be nickel-plated copper alloy with dimensions M12 x 30

7.6 TESTING
7.6.1. Type Tests
7.6.2. Routine/Acceptance Tests
7.6.3. Special Tests

In addition to the mechanical tests required by IEC 61869-1 on the primary terminal, an additional mechanical test of the CVT's upper flange shall be performed as indicated below:

Horizontal and vertical forces shall be applied contemporarily at a height of 600mm above the CVT's upper flange for 60 sec (see Common List for specific force values).

The instrument transformer shall be considered to have passed the test if there is no evidence of damage (deformation, rupture or leakage).

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Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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**

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

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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1 SCOPE OF THE DOCUMENT

The aim of this document is to define the technical requirements for the different technologies of high capacity concentric stranded bare conductors to be used in the high voltage overhead lines of the Enel Group Distributions Companies, listed below:

e-distribuzione

Italy

The document also includes the tests to be satisfied by the supplier.

2 LIST OF COMPONENTS

The list of components includes the following types of technologies of high capacity bare conductors selected for the high voltage lines of Enel Group Distribution Companies:

GS Type	Type Technology	Material Core	Material Outside core wires
Type I	Aluminum Conductor PMC Core	Polymer Matrix Composite Core (single or multi-wires)	Fully annealed Aluminum or thermal resistant aluminum Alloy wires
Type II	Aluminum Conductor MMC Core	Metal Matrix Composite Core wires	Thermal resistance Aluminum Alloy wires
Type III	ACSS/TW	Zn95Al5 Coated Steel wires	Aluminum fully annealed trapezoidal wires
Type IV	GAP	Al Clad Steel Core wires	Thermal resistance Aluminum Alloy trapezoidal & round wires

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These technologies can carry electricity at higher temperature than a conventional conductor keeping sag, then it can be increased their ampacity (they are known as HTLS conductors, High Temperature Low Sag). This characteristic makes of the High Capacity Conductors a very suitable alternative for repowering a line or for spans with special requirements. The Annex 1 attaches a table with a list of cross-sections of the different technologies which are suggested to cover the complete range for the different Enel Group Distribution Companies.

It is recommended a study for each project in order to confirm the chosen conductor cross section or to propose the most appropriate one in terms of technical and economical requirements. This type of study should consider the required ampacity, the ambient conditions (temperature, sun radiation, wind speed, etc.) and the characteristics from the line (actual towers, distances, etc.).

3 REFERENCE STANDARDS

- EN 50182 Conductors for overhead lines. Round wire concentric lay stranded conductors
- EN 61232 Aluminum-clad steel wires for electrical purposes (IEC 1232)
- EN 62004 Thermal-resistant aluminum alloy wire for overhead line conductor (IEC 62004)
- EN 50540 Conductors for overhead lines. Aluminum conductors steel supported (ACSS)
- EN 62420 Concentric lay stranded overhead electrical conductors containing one or more gap(s) (IEC 62420)
- IEC 61284:1997 Overhead lines- Requirements and tests for fittings.
- EN 10244-2 Steel wire and wire products. Non-ferrous metallic coatings on steel wire. Zinc or zinc alloy coatings.
- ASTM B502: Standard Specification for Aluminum Clad Steel Core Wire for aluminum conductors
- ASTM B609: Standard specification for Aluminum 1350 wire, annealed and intermediate tempers, for electrical purposes
- ASTM B803: Standard specification for High_Strength Zinc-5% Aluminum-Mischmetal Alloy-Coated Steel Core wire for aluminum and aluminum-alloy conductors, steel reinforced.
- ASTM B856: Standard Specification for Concentric-Lay-Stranded Aluminum Conductors Steel Suported (ACSS)
- ASTM B857: Standard Specification for Shaped Wire Compact Concentric-Lay-Stranded Aluminum Conductors Steel Suported (ACSS/TW)
- ASTM B941 Standard Specification for Heat Resistant Aluminum-Zirconium Alloy Wire for Electrical Purposes
- ASTM B958 Standard draft specification for Extra-High_and Ultra-High Strength Zinc-5% Aluminum-Mischmetal Alloy-Coated Steel Core wire for aluminum and aluminum-alloy conductors, steel reinforced.
- ASTM B976: Standard Specification for Fiber Reinforced Aluminum Matrix Composite (AMC) Core Wire for Aluminum Conductors, Composite Reinforced (ACCR)
- ASTM B978: Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Composite Reinforced (ACCR)
- ASTM B987 Standard Specification for Carbon Fiber Composite Cores
- IEC 60121 Recommendation for commercial annealed aluminum electrical conductor wire
- EN 50326 Conductors for overhead lines. Characteristics of greases
- IEC 60468 Method of measurement of resistivity of metallic materials
- UNE-207009:2019 Herrajes y elementos de fijación y empalme para líneas eléctricas aéreas de alta tension.

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4 SERVICE CONDITIONS

The selected conductors have all of them an appropriate behavior against pollution adverse conditions due to its technical characteristics.

In case of extreme conditions, it will be useful to analyze the site with each supplier in order to have a better estimation for the expected life of the conductor.

5 TECHNICAL CHARACTERISTICS

5.1 Conductors with composite core (PMC & MMC)

This chapter describes the aluminum conductors (annealed or thermal resistant) with composite core.

This composite core can be polymer matrix composite or metal matrix composite

The polymer matrix composite core can be formed by a single wire or multiple wires stranded and it's protected by glass fiber or aluminum tube.

Attached are the proposed technologies:

GS Type	Type Technology	Type Denomination	Material Core	Material Outside core wires
Type I	Aluminum Conductor PMC Core	PMC-I	Carbon fiber in epoxy resin matrix protected by glass fiber	Aluminum fully annealed T wires
		PMC-II	Carbon fiber in epoxy resin matrix (single wire) protected by aluminum	Aluminum fully annealed or thermal resistant aluminum zirconium alloy T or Z wires
		PMC-III	Carbon fiber in epoxy resin matrix (multiple wires) protected by aluminum	Aluminum fully annealed or thermal resistant aluminum zirconium alloy T or Z wires
Type II	Aluminum Conductor MMC Core	MMC	Aluminum oxide fibers embedded in aluminum	Thermal resistant aluminum zirconium alloy round or T wires

5.1.1 Aluminium Conductor Polymer matrix composite Core (GS Type I)

Note: Describes the materials included in the different proposed technologies (PMC)

5.1.1.1. Polymer Matrix Composite core

Core made of carbon fibers embedded in high-temperature epoxy resin matrix.

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This core can be protected in different ways:

- Glass fibers to improve flexibility and toughness. It also prevents galvanic corrosion (PMC-I).
- Aluminum, which prevents thermal-oxidation and mechanic and chemical damage. Core protected by aluminum could be formed by one single wire (PMC-II) or multiple wires stranded inside the aluminum protection (PMC-III). The multiple wires core distribute the breakage risk from one to more elements, furthermore a multiple wires core is more flexible compared to a single wire core.

5.1.1.2. *Annealed Aluminum Trapezoidal Wires*

Conductive layers are formed by fully annealed aluminum trapezoidal wires, aluminum AL0 or 1350-O, which keeps his characteristics at high temperature and also improves conductivity and fatigue resistance.

Reference Standard for the material: EN 50540¹ and/or ASTM B609².

The different layers of aluminum wires are twisted around the composite core alternatively in one direction and another such that the outer layer rotates clockwise.

5.1.1.3. *Thermal resistance Aluminum Alloy Trapezoidal, Z-shape or round Wires*

Conductive layers are formed by Zirconium-Aluminum alloy. Zirconium confers a better mechanical behaviour at higher operating temperatures and prevents the aluminum from becoming annealed when operating at high temperatures.

Reference Standard for the material: IEC 62004 and/or ASTM B941.

The different layers of aluminum wires are twisted around the core alternatively in one direction and another such that the outer layer rotates clockwise.

¹ Chapter 5.

² After stranding, the trapezoidal aluminum wires shall conform to the requirements of ASTM B609 except for the shape and the diameter tolerance.

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5.1.2 Aluminum Conductor Metal matrix composite Core (GS Type II)

Note: It is described the only option included in the standard (MMC)

5.1.2.1. Aluminum Matrix Composite Core Wires

The core is formed by round wires made of Aluminum oxide continuous fibres embedded in pure aluminum. It is a very high strength material with a very low thermal expansion coefficient.

5.1.2.2. Thermal resistance Aluminum Alloy Trapezoidal or round Wires

Conductive layers wires are formed by Aluminum-Zirconium alloy. Zirconium confers a better mechanical behaviour at higher operating temperatures and prevents the aluminum from becoming annealed when operating at high temperatures.

Reference Standard for the material: IEC 62004 and/or ASTM B941.

The different layers of aluminum wires are twisted around the core alternatively in one direction and another such that the outer layer rotates clockwise.

5.2 Conductor ACSS/TW (GS Type III)

Reference Standard for the conductor: EN50540 and/or ASTM B857.

5.2.1 Aluminum-Zinc Coated Steel Core Wires³

The core is formed by round wires made of steel coated with Aluminum-Zinc alloy (95% Zinc-5% Aluminum), with an excellent mechanical behaviour at high temperature (steel type EHST).

Reference Standard for the material: EN 50540.

³ ACCS conductor core can be designed with different materials. It has been chosen this one because of his good behavior at high temperature.

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5.2.2 Annealed Aluminum Trapezoidal Wires

Conductive layers trapezoidal wires are formed by fully annealed aluminum, type AL0 or 1350-O, which doesn't lose its properties at high temperatures and improves conductivity and fatigue resistance. Alternatively, it may be used round wires if it is more convenient.

Reference Standard for the material: EN 50540⁴ and/or ASTM B609⁵.

The different layers of aluminum wires are twisted around the core composite alternatively in one direction and another such that the outer layer rotates clockwise.

5.3 Conductor GAP GZTACSR (GS Type IV)

Reference Standard for the conductor: IEC 62420.

5.3.1 Aluminum clad Steel Core Wires

The core is formed by round wires made of Aluminum steel coated, for a better behavior before corrosion (steel type 14EHSA).

Reference Standard for the material: EN50540 and/or ASTM B502.

5.3.2 Thermal resistance Aluminum alloy Trapezoidal wires

Conductive layer wires are formed by Aluminum-Zirconium alloy (aluminum alloy type AT3). Zirconium confers an excellent mechanical behaviour at higher operating temperatures and prevents the aluminum from becoming annealed when operating at high temperatures. It can be used aluminum alloy type AT1, with less thermal resistance, then the conductor is known as GTACSR and it has an inferior maximum continuous operating temperature.

Reference Standard for the material: IEC 62004 and/or ASTM B941.

⁴ Chapter 5.

⁵ After stranding, the trapezoidal aluminum wires shall conform to the requirements of ASTM B609 except for the shape and the diameter tolerance.

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The first layer will be formed with trapezoidal wires, creating a gap which will be filled with high thermal resistance grease.

The other layers could be made of round or trapezoidal wires and they are twisted around the core alternatively in one direction and another such that the outer layer rotates clockwise

6 CONSTRUCTION CHARACTERISTICS

High capacity bare conductors work at very high temperatures, for that reason the design of accessories (specially clamps and dead-ends) must be prepared to withstand high temperatures.

On the other hand, these conductors sometimes are made of materials not used in conventional conductors, such as composites. The accessories must be specific for every particular material.

As a consequence, this type of conductor must be treated with all their accessories as a whole system.

Regarding accessories, the reference standard is IEC-61284:1997 and paragraph 6.1.101 from UNE-207009:2019

7 TESTING

7.1 Type test

Type test shall be carried out over the conductor in order to verify its main characteristics, which depend on its design.

Each manufacturer shall make this test once to obtain the technical assessment for each conductor, and they should be repeated only when the design or manufacturing process has been modified.

7.2 Sample test

Sample test shall be carried out over final product samples to guarantee the quality of the conductors and compliance with the requirements of this standard.

7.2.1 Sample size

Sample test will carried out over in at least 10% of the reels, being tested all the wires.

If the supplier demonstrates ability to exceed the requirements, the sample can be reduced even until 10% of wires, although the size of the sample must assure the quality control of the batch.

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7.3 Test description

See Annex 2.

8 SUPPLY REQUIREMENTS

8.1 Conductor packing

The conductor shall be properly protected against damage which may occur in ordinary handling and shipping.

The reels must support the conductor weight without deformations. The reel design shall respect the minimum bend radio and it will allow cranes to manipulate them.

The reel diameter will be at least 30 times the conductor diameter or 60 times the core diameter, the maximum of both values. In the case of composite core conductors, the reel diameter shall be at least 50 times the conductor or 150 times the core diameter, the maximum of both values.

For more sensitive conductors, such as fully annealed aluminum designs, it is recommended a special care: protection inside the reel, use of staves, paper between layers of conductors or similar...

Both ends of the conductor shall be secured to the spools and they will remain accessible, preventing accidental unrolling.

8.2 Conductor marking

Each reel shall be identified with a indelible and easily legible plate on the external face and in the inside, with the name of the final Enel Group distribution company. The plate shall include:

- Manufacturer name
- Conductor type
- Gross mass, net mass and tare
- Conductor length in meters
- Order number
- Reel number
- Serial number
- Manufacturing year
- Direction of rotation of the reel (with an arrow)
- Unwinding direction (if the reel is packed)

Note: The manufacturer shall use length measurement equipment with an accuracy of $\pm 1\%$

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ANNEX 1 – COMPLETE LIST OF COMPONENTS WITH SUGGESTED CROSS-SECTIONS

- Data for complete conductor

GS Type Code	Standard	Type	Code Words	Size (mm ²)	Outside diameter (mm)	Mass (kg/km)	Rated strength (kN)	DC resistance (W/km)	Grease
GSCH007/001	N/A	Type I (PMC-I) ACCC	ROVINJ	217,3	17,1	576	60,4	0,1487	No
GSCH007/002			LINNET	245,9	18,29	655	60,4	0,1319	
GSCH007/003			CASABLANCA	313,3	20,5	834	85,7	0,1024	
GSCH007/004			LISBON	349,6	21,79	931	85,7	0,0916	
GSCH007/005			DOVE	408,6	23,55	1083	101,7	0,0771	
GSCH007/006			GROSBEAK	468,1	25,15	1245	112	0,0672	
GSCH007/007			WARSAW	567,8	27,72	1519	130,2	0,0553	
GSCH007/008			DRAKE	590,6	28,14	1565	153,8	0,0536	
GSCH007/009			HAMBURGO	606,7	28,63	1627	130,2	0,0514	
GSCH007/010			SAN ANTONIO	822,4	33,4	2211	162,1	0,0375	
GSCH007/015	N/A	Type I (PMC-II) ACCS	AMPERE	216,5	17,1	573	71,5	0,145	No
GSCH007/016			KIRCHHOFF	247	18,3	655	77,6	0,1263	
GSCH007/017			LENZ	311,1	20,5	824	101,4	0,1007	
GSCH007/018			FARADAY	350,2	21,8	931	103,8	0,0882	
GSCH007/019			MAXWELL	408,3	23,54	1084	124,3	0,076	
GSCH007/020			VOLTA	467,9	25,14	1243	139,2	0,0661	

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GS Type Code	Standard	Type	Code Words	Size (mm ²)	Outside diameter (mm)	Mass (kg/km)	Rated strength (kN)	DC resistance (W/km)	Grease
GSCH007/021			WHEATSTONE	568,5	27,71	1518	173	0,0549	
GSCH007/022			PACINOTTI	585,5	28,12	1562	182,3	0,0535	
GSCH007/023	N/A	Type I (PMC-II) ACPR LoSag	186-AT1/28	224,7	18	591	65,5	0,1506	No
GSCH007/024			289-AT1/38	339,5	21,8	898	94,9	0,102	
GSCH007/025			377-AT1/64	465,6	25,4	1219	139,4	0,0738	
GSCH007/026			459-AT1/64	548,1	27,7	1450	152,6	0,0611	
GSCH007/027			574-AT1/64	662,7	30,4	1769	170,8	0,0494	
GSCH007/028	N/A	Type I (PMC-II) T-ACCS	THOMSON	232,8	18	604	86,5	0,1502	No
GSCH007/029			OHM	340,1	21,8	895	108,9	0,0983	
GSCH007/030			FERRARIS	460,8	25,4	1220	136	0,071	
GSCH007/031			HENRY	544,1	27,6	1452	157,7	0,0601	
GSCH007/032			MARCONI	658,2	30,4	1770	172,4	0,0485	
GSCH007/070	N/A	Type I (PMC-III) ACCM	CURIE	301,3	20,5	801	85	0,1074	No
GSCH007/071			GALVANI	341,2	21,8	910	91,4	0,0937	
GSCH007/072			FERMI	393,1	23,5	1057	99,6	0,0806	
GSCH007/073			HACK	464,4	25,1	1232	135,4	0,0701	
GSCH007/074			PLANCK	464,2	25,4	1231	134,2	0,0701	
GSCH007/075			DIRAC	546,8	27,6	1467	148,8	0,0588	
GSCH007/076			MEUCCI	583,4	28,2	1543	184	0,0572	

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GS Type Code	Standard	Type	Code Words	Size (mm ²)	Outside diameter (mm)	Mass (kg/km)	Rated strength (kN)	DC resistance (W/km)	Grease
GSCH007/077			GAUSS	666,4	30,3	1776	197,3	0,0495	
GSCH007/040	N/A	Type II ACCR/TW	297-T16	175	17,2	501	53,8	0,1826	No
GSCH007/042			HAWK 477TW	281	20	801	85,148	0,1134	
GSCH007/043			OSWEGO	390	23,6	1111	115,017	0,0814	
GSCH007/044			WABASH	449	25,2	1280	139,09	0,0705	
GSCH007/045			CURLEW 1033 TW	590	28,8	1672	158,706	0,0531	
GSCH007/061	EN 50540 ASTM B857	Type III ACSS/TW	ACSS/TW-198	197,9	16,82	686	64	0,161	No
GSCH007/062			ACSS/TW-280	280,9	20,04	974	88,2	0,1134	
GSCH007/063			ACSS/TW-364	364	22,62	1215	97,3	0,0853	
GSCH007/064			ACSS/TW-455	454,9	25,24	1519	119,8	0,683	
GSCH007/065			ACSS/TW-546	546	27,53	1822	143,8	0,0569	
GSCH007/081	IEC 62420	Type IV GAP GZTACSR	GZTACSR-186	186,47	16,8	634	60,55	0,1794	Yes
GSCH007/082			GZTACSR-293	292,95	22	1000	96,76	0,1146	
GSCH007/083			GZTACSR-385	384,5	25,24	1273	113,21	0,0856	
GSCH007/084			GZTACSR-462	462,1	27,6	1521	135,2	0,0711	
GSCH007/085			GZTACSR-553	553,25	30,47	1828	164,53	0,0595	

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- Data for core and for envelope wires

GS Type Code	Type	Code Words	Conductor Core				Conductor envelope			
			Material	Description	Cross section (mm²)	Standard core	Material	Description	Cross section (mm²)	Standard envelope
GSCH007/001	Type I (PMC-I) ACCC	ROVINJ	Polymeric Matrix Composite (PMC-I)	Hybrid carbon and glass fiber composite	28	N/A	Aluminum fully annealed AL0/1350-O	Trapezoidal wires	187,8	EN50540 ASTM B609
GSCH007/002		LINNET			28				218,1	
GSCH007/003		CASABLANCA			39,7				273,6	
GSCH007/004		LISBON			39,7				309,9	
GSCH007/005		DOVE			47,1				361,5	
GSCH007/006		GROSBEAK			51,9				416,2	
GSCH007/007		WARSAW			60,3				507,5	
GSCH007/008		DRAKE			71,3				519,7	
GSCH007/009		HAMBURGO			60,3				546,4	
GSCH007/010		SAN ANTONIO			75,1				747,3	
GSCH007/015	Type I (PMC-II) ACCS	AMPERE	Polymeric Matrix Composite (PMC-II)	Carbon fibers in polymeric matrix coated with aluminum tube	46,2	N/A		Trapezoidal or z-shaped wires	170,3	EN50540
GSCH007/016		KIRCHHOFF			48,6				198,4	
GSCH007/017		LENZ			59,6				251,5	
GSCH007/018		FARADAY			59,6				290,6	
GSCH007/019		MAXWELL			68,8				339,5	
GSCH007/020		VOLTA			74,8				393,1	
GSCH007/021		WHEATSTONE			89,5				479	
GSCH007/022		PACINOTTI			93,4				492,2	
GSCH007/023		186-AT1/28			38,6	N/A		Z-shape wires	185,9	

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			Conductor Core				Conductor envelope			
GS Type Code	Type	Code Words	Material	Description	Cross section (mm²)	Standard core	Material	Description	Cross section (mm²)	Standard envelope
GSCH007/024	Type I (PMC-II) ACPR LoSag	289-AT1/38			50,6		Thermal resistance Al Zr Alloy AT1		289	IEC 62004 ASTM B941
GSCH007/025		377-AT1/64			88,7				376,8	
GSCH007/026		459-AT1/64			88,7				459,4	
GSCH007/027		574-AT1/64			88,7				574	
GSCH007/028	Type I (PMC-II) T-ACCS	THOMSON			65,7	N/A		Trapezoidal or Z-shaped wires	167,1	IEC 62004
GSCH007/029		OHM			71,8				268,3	
GSCH007/030		FERRARIS			79,4				381,3	
GSCH007/031		HENRY			87,8				456,3	
GSCH007/032		MARCONI			84,4				573,8	
GSCH007/070	Type I (PMC-III) ACCM	CURIE	Polymeric Matrix Composite Multiwire (PMC-III)	Carbon fiber in epoxy resin matrix (multiple wires) protected by aluminum	54,4	N/A	Thermal resistance Al Zr Alloy AT1	Trapezoidal or Z-shaped wires	246,9	IEC 62004
GSCH007/071		GALVANI			54,4				286,8	
GSCH007/072		FERMI			54,4				338,8	
GSCH007/073		HACK			77,6				386,8	
GSCH007/074		PLANCK			77,6				386,6	
GSCH007/075		DIRAC			77,6				469,2	
GSCH007/076		MEUCCI			109				474,3	
GSCH007/077		GAUSS			109				557,4	
GSCH007/040	Type II ACCR/TW	297-T16	Metal Matrix	Aluminum oxide fibers within pure Aluminum wires	25	ASTM B976	Thermal resistance Al	Round wires	150	IEC 62004 ASTM B941
GSCH007/042		HAWK 477TW			39			Trapezoidal wires	242	
GSCH007/043		OSWEGO			53				337	

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GS Type Code	Type	Code Words	Conductor Core				Conductor envelope			
			Material	Description	Cross section (mm²)	Standard core	Material	Description	Cross section (mm²)	Standard envelope
GSCH007/044		WABASH	Composite (MMC)		62		Zr Alloy AT3		387	
GSCH007/045		CURLEW 1033 TW			67				523	
GSCH007/061	Type III ACSS/TW	ACSS/TW-198	Al-Zn coated steel wires	EHST wires (Zn95Al5 coated steel)	27,7	EN50540	Aluminum fully annealed AL0/1350-O	Trapezoidal wires	170,2	EN50540 ASTM B609
GSCH007/062		ACSS/TW-280			39,3				241,6	
GSCH007/063		ACSS/TW-364			41,8				322,2	
GSCH007/064		ACSS/TW-455			52,2				402,7	
GSCH007/065		ACSS/TW-546			62,6				483,4	
GSCH007/081	Type IV GAP GZTACSR	GZTACSR-186	Al Clad Steel wires	14EHSA steel wires	23,1	EN50540 ASTM B502	Thermal resistance Al Zr Alloy AT3	Trapezoidal & round wires	163,37	IEC62004 ASTM B941
GSCH007/082		GZTACSR-293			37,17				255,78	
GSCH007/083		GZTACSR-385			40				344,5	
GSCH007/084		GZTACSR-462			47,81				414,3	
GSCH007/085		GZTACSR-553			58,07				495,18	

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ANNEX 2 – TESTING LIST

- Test for GS Type I Conductors

GSCH007 Type I		Type Test	Sample Test	Standard/paragraph
Conductor	Surface condition	X	X	EN 50540 p. 6.4.1 & 5.3
	Conductor diameter	X	X	EN 50540 p. 6.4.2 & 5.4
	Lay inalterability	X	X	EN 50540 p. 6.4.3 & 5.2.4
	Lay ratio and direction ratio	X	X	EN 50540 p. 6.4.4 & 5.2
	Number and type wire	X	X	EN 50540 p. 6.4.5
	Aluminum cross section	X	X	EN 50540 p. 6.4.6
	Mass per unit length	X	X	EN 50540 p. 6.4.7
	Resistivity (DC)	X	-	EN 50540 p. 6.4.8 & IEC 60468
	Stress-strain curve	X	-	EN 50540 p. 6.4.9 & Annex A
	Tensile test	X	-	EN 50540 p. 6.4.10
	Laying test	X	-	EN 50540 p. 6.4.11 & Annex C
Aluminum Wires	Appearance	X	X	EN 50540 / ASTM B609*
	Diameter	X	X	EN 50540 / ASTM B609*
	Strength	X	X	EN 50540 / ASTM B609*
	Elongation	X	X	EN 50540 / ASTM B609*
	Resistivity	X	X	EN 50540 / ASTM B193*
	Cross-section	X	X	EN 50540*
	Wrapping test	X	X	ISO 7802*
Heat resistant Aluminum-Zr Wires	Welding	X	-	IEC 50182 p. 6.5.3*
	Condition	X	X	EN 62004 p. 7.3.1* / ASTM B941
	Diameter	X	X	EN 62004 p. 7.3.2* / ASTM B941
	Strength	X	X	EN 62004 p. 7.3.3* / ASTM B941
	Elongation	X	X	EN 62004 p. 7.3.4* / ASTM B941
	Resistivity	X	X	EN 62004 p. 7.3.5* / ASTM B941
	Thermal resistance	X	X	EN 62004 p. 7.3.6* / ASTM B941
PMC Composite core	Wrapping test	X	X	EN 62004 p. 7.3.7 & ISO 7802* / ASTM B941
	Appearance	X	X	ASTM B987 method a
	Dimension	X	X	ASTM B987 method b
	Tensile test	X	X	ASTM B987 method c
	Glass transition temperature test	X	X	ASTM B987 method d
	Density	X	-	ASTM B987 method e
	Bending test	X	-	ASTM B987 method f
	Dye penetrant testing after bending test	X	-	ASTM B987 method g
	Tensile test after bending test	X	-	ASTM B987 method h
	Heat exposure test	X	-	ASTM B987 method i
	Heat/stress test	X	-	ASTM B987 method j
	Galvanic protection barrier layer thickness	X	-	ASTM B987 method k

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- Test for GS Type II Conductors

GSCH007 Type II		Type Test	Sample Test	Standard/paragraph
Conductor	Surface condition	X	X	EN 50540 p. 6.4.1 & 5.3
	Conductor diameter	X	X	EN 50540 p. 6.4.2 & 5.4
	Lay inalterability	X	X	EN 50540 p. 6.4.3 & 5.2.4
	Lay ratio and direction ratio	X	X	EN 50540 p. 6.4.4 & 5.2
	Number and type wire	X	X	EN 50540 p. 6.4.5
	Aluminum cross section	X	X	EN 50540 p. 6.4.6
	Mass per unit length	X	X	EN 50540 p. 6.4.7
	Resistivity (DC)	X	-	EN 50540 p. 6.4.8 & IEC 60468
	Stress-strain curve	X	-	EN 50540 p. 6.4.9 & Annex A
	Tensile test	X	-	EN 50540 p. 6.4.10
	Laying test	X	-	EN 50540 p. 6.4.11 & Annex C
Heat resistant Aluminum-Zr Wires	Condition	X	X	EN 62004 p. 7.3.1 / ASTM B941
	Diameter	X	X	EN 62004 p. 7.3.2 / ASTM B941
	Strength	X	X	EN 62004 p. 7.3.3 / ASTM B941
	Elongation	X	X	EN 62004 p. 7.3.4 / ASTM B941
	Resistivity	X	X	EN 62004 p. 7.3.5 / ASTM B941
	Thermal resistance	X	X	EN 62004 p. 7.3.6 / ASTM B941
	Wrapping test	X	X	EN 62004 p. 7.3.7 & ISO 7802 / ASTM B941
MMC Composite core	Appearance	X	X	ASTM B976
	Dimension	X	X	ASTM B976
	Mass per unit length	X	X	ASTM B976
	Strength	X	X	ASTM B976

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- Test for GS Type III Conductors

GSCH007 Type III		Type Test	Sample Test	Standard/paragraph
Conductor	Surface condition	X	X	EN 50540 p. 6.4.1 & 5.3
	Conductor diameter	X	X	EN 50540 p. 6.4.2 & 5.4
	Lay inalterability	X	X	EN 50540 p. 6.4.3 & 5.2.4
	Lay ratio and direction ratio	X	X	EN 50540 p. 6.4.4 & 5.2
	Number and type wire	X	X	EN 50540 p. 6.4.5
	Aluminum cross section	X	X	EN 50540 p. 6.4.6
	Mass per unit length	X	X	EN 50540 p. 6.4.7
	Resistivity (DC)	X	-	EN 50540 p. 6.4.8 & IEC 60468
	Stress-strain curve	X	-	EN 50540 p. 6.4.9 & Annex A
	Tensile test	X	-	EN 50540 p. 6.4.10
	Laying test	X	-	EN 50540 p. 6.4.11 & Annex C
Aluminum Wires	Appearance	X	X	EN 50540 / ASTM B609
	Diameter	X	X	EN 50540 / ASTM B609
	Strength	X	X	EN 50540 / ASTM B609
	Elongation	X	X	EN 50540 / ASTM B609
	Resistivity	X	X	EN 50540 / ASTM B193
	Cross-section	X	X	EN 50540
	Wrapping test	X	X	ISO 7802
	Welding	X	-	IEC 50182 p. 6.5.3
Aluminum -Zinc Coated Steel Wires	Diameter	X	X	EN 50540 p.6.5.2
	Strength	X	X	EN 50540 p.6.5.2
	Elongation or torsion	X	X	EN 50540 p.6.5.2
	Zinc mass	X	X	EN 50540 p.6.5.2
	Zinc immersion test	X	X	EN 50540 p.6.5.2
	Zinc coating adhesion test	X	X	EN 50540 p.6.5.2

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- Test for GS Type IV Conductors

GSCH007 Type IV		Type Test	Sample Test	Standard/paragraph
Conductor	Surface condition	X	X	EN 50540 p. 6.4.1 & 5.3
	Conductor diameter	X	X	EN 50540 p. 6.4.2 & 5.4
	Lay inalterability	X	X	EN 50540 p. 6.4.3 & 5.2.4
	Lay ratio and direction ratio	X	X	EN 50540 p. 6.4.4 & 5.2
	Number and type wire	X	X	EN 50540 p. 6.4.5
	Aluminum cross section	X	X	EN 50540 p. 6.4.6
	Mass per unit length	X	X	EN 50540 p. 6.4.7
	Resistivity (DC)	X	-	EN 50540 p. 6.4.8 & IEC 60468
	Stress-strain curve	X	-	EN 50540 p. 6.4.9 & Annex A
	Tensile test	X	-	EN 50540 p. 6.4.10
	Laying test	X	-	EN 50540 p. 6.4.11 & Annex C
	Gaps	X	-	EN 62420 p. 6.2.3
	Creep curve	X	-	EN 62420 p. 6.2.6
Heat resistant Aluminum-Zr Wires	Condition	X	X	EN 62004 p. 7.3.1 / ASTM B941
	Diameter	X	X	EN 62004 p. 7.3.2 / ASTM B941
	Strength	X	X	EN 62004 p. 7.3.3 / ASTM B941
	Elongation	X	X	EN 62004 p. 7.3.4 / ASTM B941
	Resistivity	X	X	EN 62004 p. 7.3.5 / ASTM B941
	Thermal resistance	X	X	EN 62004 p. 7.3.6 / ASTM B941
	Wrapping test	X	X	EN 62004 p. 7.3.7 & ISO 7802 / ASTM B941
Aluminum Cladded Steel Wires	Condition	X	X	EN 50540 p.6.5.2 & EN 61232 p. 6.2 & 4.2
	Diameter	X	X	EN 50540 p.6.5.2 & EN 61232 p. 6.2 & 4.4
	Strength	X	X	EN 50540 p.6.5.2 & EN 61232 p. 6.3.1
	Elongation	X	X	EN 50540 p.6.5.2 & EN 61232 p. 6.3.2
	Torsion	X	X	EN 50540 p.6.5.2 & EN 61232 p. 6.3.3
	Aluminum thickness	X	X	EN 50540 p.6.5.2 & EN 61232 p. 6.3.4
	Resistivity	X	X	EN 50540 p.6.5.2 & EN 61232 p. 6.3.5
	Tensile test at 1% elongation	X	X	EN 50540 p.6.5.2 & EN 61232 p. 6.3.6

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ANNEX 3- OPERATING TEMPERATURES AND AMPACITY RELATED

Maximum permissible temperatures

GS Type	Type Denomination	Maximum continuous operating temperature (°C)	Maximum emergency temperature (°C)
Type I	PMC-I	180	200
	PMC-II	150	180
	PMC-III	150	180
Type II	MMC	210	240
Type III	ACSS/TW	210	250
Type IV	GAP	210	240

Ampacity at usual and maximum operating temperature:

GS Type Code	Type	Size (mm ²)	Code Words	Ampacity @ usual operation T (75°C)	Max. Cont. T	Ampacity @ T max cont.
GSCH007/001	ACCC	217,3	ROVINJ	448	180	880
GSCH007/002	ACCC	245,9	LINNET	602	180	1014
GSCH007/003	ACCC	313,3	CASABLANCA	564	180	1120
GSCH007/004	ACCC	349,6	LISBON	611	180	1226
GSCH007/005	ACCC	408,6	DOVE	826	180	1410
GSCH007/006	ACCC	468,1	GROSBEAK	898	180	1537
GSCH007/007	ACCC	567,8	WARSAW	824	180	1673
GSCH007/008	ACCC	590,6	DRAKE	1036	180	1786
GSCH007/009	ACCC	606,7	HAMBURGO	1061	180	1834
GSCH007/010	ACCC	822,4	SAN ANTONIO	1302	180	2408
GSCH007/015	ACCS	216,5	AMPERE	454	150	773
GSCH007/016	ACCS	247	KIRCHHOFF	495	150	845
GSCH007/017	ACCS	311,1	LENZ	570	150	980
GSCH007/018	ACCS	350,2	FARADAY	618	150	1066
GSCH007/019	ACCS	408,3	MAXWELL	678	150	1175
GSCH007/020	ACCS	467,9	VOLTA	739	150	1284
GSCH007/021	ACCS	568,5	WHEATSTONE	829	150	1449
GSCH007/022	ACCS	585,5	PACINOTTI	842	150	1473
GSCH007/023	ACPR-Lo Sag	224,7	186-AT1/28	450	150	820
GSCH007/024	ACPR-Lo Sag	339,5	289-AT1/38	540	150	1040
GSCH007/025	ACPR-Lo Sag	465,6	377-AT1/64	658	150	1270
GSCH007/026	ACPR-Lo Sag	548,1	459-AT1/64	750	150	1430
GSCH007/027	ACPR-Lo Sag	662,7	574-AT1/64	875	150	1625
GSCH007/028	T-ACCS	232,8	THOMSON	452	150	771

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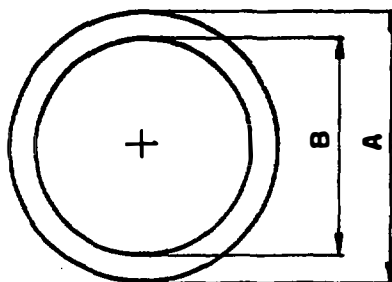
GS Type Code	Type	Size (mm ²)	Code Words	Ampacity @ usual operation T (75°C)	Max. Cont. T	Ampacity @ T max cont.
GSCH007/029	T-ACCS	340,1	OHM	586	150	1010
GSCH007/030	T-ACCS	460,8	FERRARIS	714	150	1243
GSCH007/031	T-ACCS	544,1	HENRY	791	150	1382
GSCH007/032	T-ACCS	658,2	MARCONI	898	150	1578
GSCH007/070	ACCM	54,4	CURIE	552	150	948
GSCH007/071	ACCM	54,4	GALVANI	600	150	1035
GSCH007/072	ACCM	54,4	FERMI	659	150	1141
GSCH007/073	ACCM	77,6	HACK	717	150	1247
GSCH007/074	ACCM	77,6	PLANCK	719	150	1251
GSCH007/075	ACCM	77,6	DIRAC	799	150	1397
GSCH007/076	ACCM	109	MEUCCI	814	150	1425
GSCH007/077	ACCM	109	GAUSS	890	150	1564
GSCH007/040	ACCR	175	297-T16	402	210	863
GSCH007/042	ACCR/TW	281	HAWK 477TW	530	210	1148
GSCH007/043	ACCR/TW	390	OSWEGO	650	210	1427
GSCH007/044	ACCR/TW	449	WABASH	709	210	1564
GSCH007/045	ACCR/TW	590	CURLEW 1033 TW	841	210	1885
GSCH007/061	ACSS/TW	197,9	ACSS/TW-198		210	
GSCH007/062	ACSS/TW	280,9	ACSS/TW-280		210	
GSCH007/063	ACSS/TW	364	ACSS/TW-364		210	
GSCH007/064	ACSS/TW	454,9	ACSS/TW-455		210	
GSCH007/065	ACSS/TW	546	ACSS/TW-546		210	
GSCH007/081	GAP GZTACSR	186,47	G(Z)TACSR-186	440	210	860
GSCH007/082	GAP GZTACSR	292,95	G(Z)TACSR-293	540	210	1180
GSCH007/083	GAP GZTACSR	384,5	G(Z)TACSR-385	640	210	1420
GSCH007/084	GAP GZTACSR	462,1	G(Z)TACSR-462	720	210	1610
GSCH007/085	GAP GZTACSR	553,25	G(Z)TACSR-553	800	210	1750

Conditions: 40 °C ambient temperature, wind 0,61m/s, elevation 0m, sun radiation 1033W/m², emissivity and absorption, 0,5

CONDUTTORI RIGIDI DI LEGA DI ALLUMINIO PER CONNESSIONI

31 57 A

LC 1050

Marzo 1973
Ed. 1 - 1/3

DIMENSIONI (mm)		A	40	70	100	100	150
		B	30	60	90	86	140
TOLLERANZE (mm) (UNI 3879)	SUL DIAMETRO ESTERNO	±0,5	±0,8	±1,0	±1,0	±1,3	
	SULLO SPESSORE	±0,5	±0,5	±0,5	±0,7	±0,5	
SEZIONE TEORICA (mm ²)		549,8	1021,0	1492,2	2045,1	2277,6	
PESO TEORICO (kg/m)		1,48	2,76	4,03	5,52	6,15	
RESISTENZA ELETTRICA A 20°C (Ω/km)		0,05911	0,03183	0,02178	0,01589	0,01427	
MOMENTO D' INERZIA (cm ⁴)		8,59	54,24	168,8	222,4	599,3	
MODULO DI ELASTICITA' (kg/mm ²)		6 700					
COEFFICIENTE DI DILATAZIONE (1/°C)		23 · 10 ⁻⁶					

31 57 A

LC 1050

Marzo 1973
Ed. 1 - 2/3

MATRICOLA	TIPO	DIMENSIONI (mm)			PESO TEORICO (kg)
		A	B	LUNGHEZZA (*)	
31 57 02	1050/1	40	30	1500 ⁺⁴	2.22
31 57 03	1050/2			2200 ⁺⁴	3.26
31 57 04	1050/4			2600 ⁺⁴	3.85
31 57 09	1050/7			3600 ⁺⁴	5.33
31 57 10	1050/9			3900 ⁺⁴	5.77
31 57 13	1050/11			5600 ⁺⁶	8.29
31 57 14	1050/13			6300 ⁺⁶	9.32
		70	60		
31 57 55	1050/41	100	90	1200 ⁺⁴	4.84
31 57 59	1050/43			3200 ⁺⁴	12.90
31 57 62	1050/46			4600 ⁺⁶	18.54
31 57 63	1050/48			5300 ⁺⁶	21.36
31 57 64	1050/49			5600 ⁺⁶	22.57
31 57 68	1050/53			9100 ⁺⁶	36.68
31 57 70	1050/55			10100 ⁺⁶	40.70
31 57 72	1050/58			10700 ⁺⁶	43.12
31 57 73	1050/59			11000 ⁺⁶	44.33
31 57 75	1050/60			12400 ⁺⁶	49.98

MATRICOLA	TIPO	DIMENSIONI (mm)			PESO TEORICO (kg)
		A	B	LUNGHEZZA (*)	
31 57 42	1050/73	100	86	5500 ⁺⁶	30.36
31 57 44	1050/76			8100 ⁺⁶	44.72
31 57 47	1050/84			11100 ⁺⁶	61.28
31 57 48	1050/86			11700 ⁺⁶	64.59
31 57 82	1050/92	150	140	3950 ⁺⁵	24.29
31 57 85	1050/96			8000 ⁺⁸	49.20
31 57 86	1050/97			9500 ⁺⁸	58.42
31 57 88	1050/99			14000 ⁺⁸	86.10

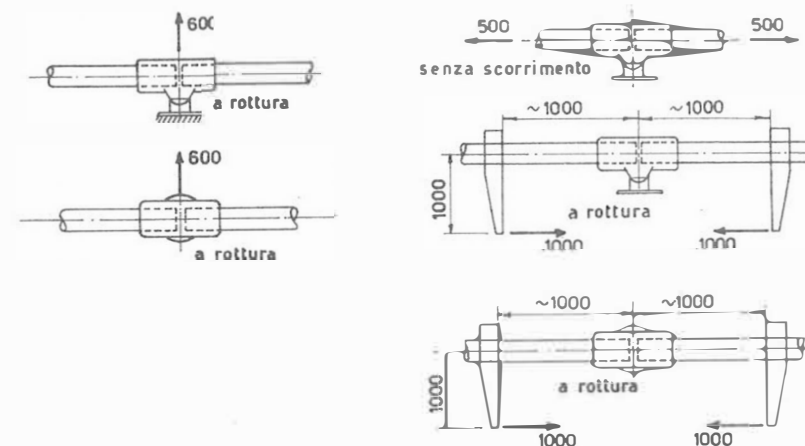
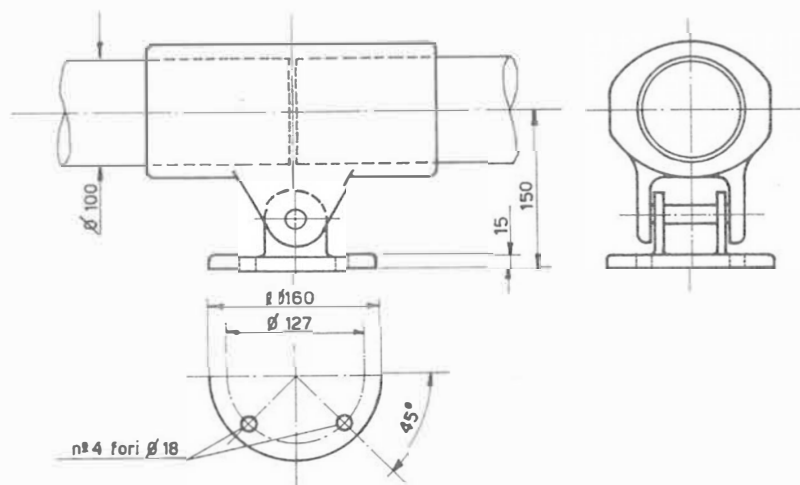
(*) Unitamente alla lunghezza nominale è indicata la tolleranza ammessa in eccesso;
in conformità alla tabella UNI 3879 non è ammessa tolleranza in difetto.

- 1 - Materiale : Lega Alluminio-Magnesio-Silicio primaria da lavorazione plastica
P-Al Mg Si-UNI 3569-66-Stato TA 16.
- 2 - Prescrizioni per la fornitura ed il collaudo : Norme CEI 7-4
- 3 - L'Unità di misura con la quale deve essere espressa la quantità del materiale è il
numero di esemplari (n)

MORSETTO PORTANTE CON CERNIERA PER GIUNZIONE DIRITTA
TUBO LEGA AL $\varnothing 100$ - TUBO LEGA AL $\varnothing 100$

20 64 D
LM 1035
Novembre 1984
Ed. 2 - 1/1

SCHEMI DI PROVA MECCANICA
(carichi in daN)



TIPO	CORRENTE NOMINALE [A]	TUBO \varnothing (mm)	MATRICOLA
M 1035 / 1	2000	100/86	20 64 33
M 1035 / 2	3150	100/80	20 64 32

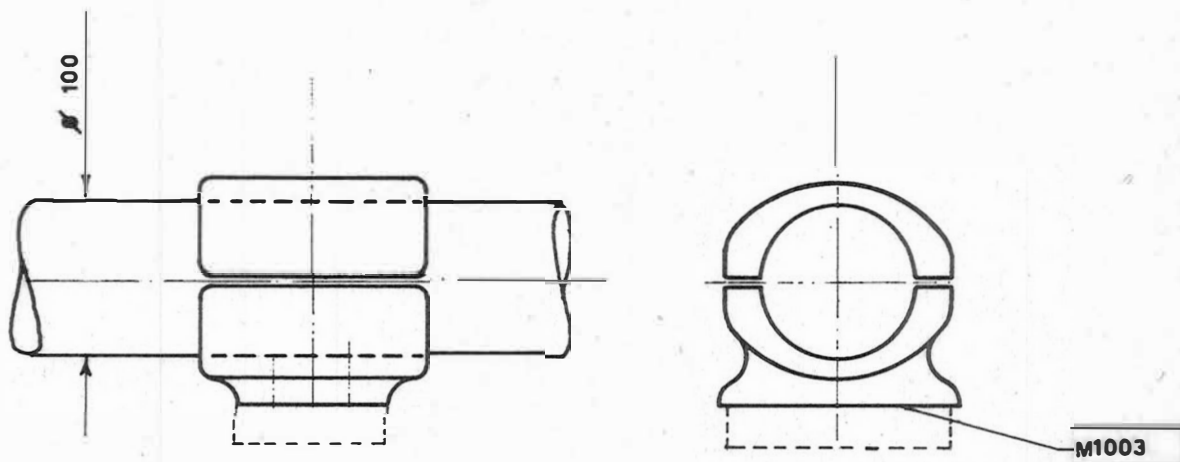
- 1 - Materiale: lega di alluminio. Bulloni di serraggio in acciaio inossidabile o lega di alluminio. Perno in acciaio inossidabile. Flangia in lega di alluminio o in ghisa o acciaio zincato a caldo.
- 2 - Corrente nominale 2000A, o 3150A, corrente di breve durata (1s) 50kA.
- 3 - Il morsetto deve consentire l'oscillazione dell'asse del conduttore di un angolo di 3° in tutte le direzioni senza dar luogo a momenti sull'isolatore.
- 4 - Su ciascun esemplare dovrà essere marcata la sigla o il marchio di fabbrica della ditta fornitrice, il diametro del conduttore e la coppia di serraggio dei bulloni.
- 5 - Prescrizioni: per la costruzione LM2007, per la fornitura LM2011, per il collaudo LM2002.
- 6 - Livello di radiodisturbo ammesso: 75dB a 270kV.
- 7 - Unità di misura: numero esemplari (n).

Esempio di designazione abbreviato: MORPORCER GD T100/80 AUE

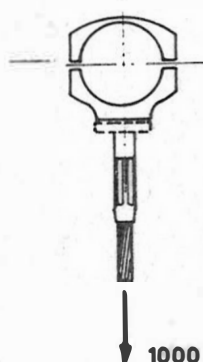
MORSETTO PER COLLEGAMENTO TUBO LEGA AL Ø 100
PASSANTE - PIASTRA A 4 FORI

LM 1037

Novembre 1984
Ed. 3 - 1/1

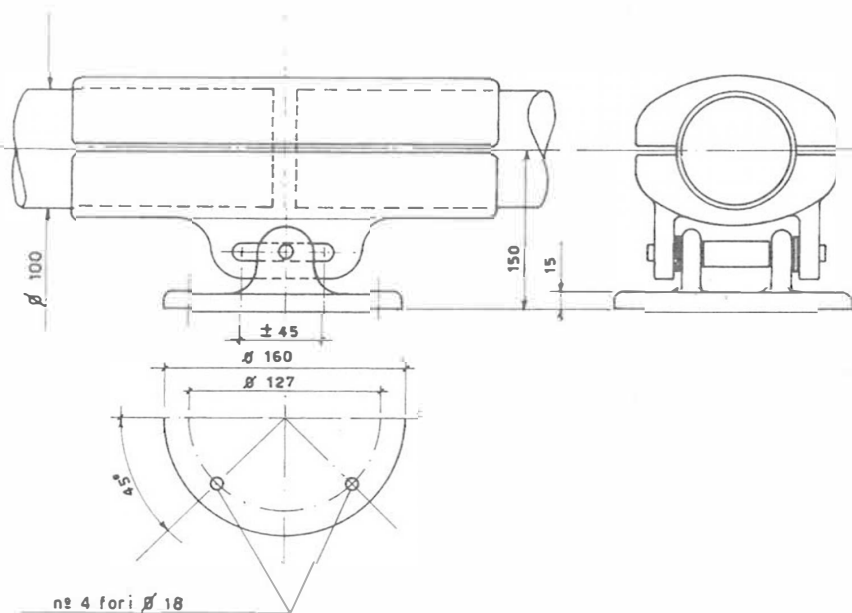


SCHEMI DI PROVA MECCANICA
(carichi di rottura in daN)

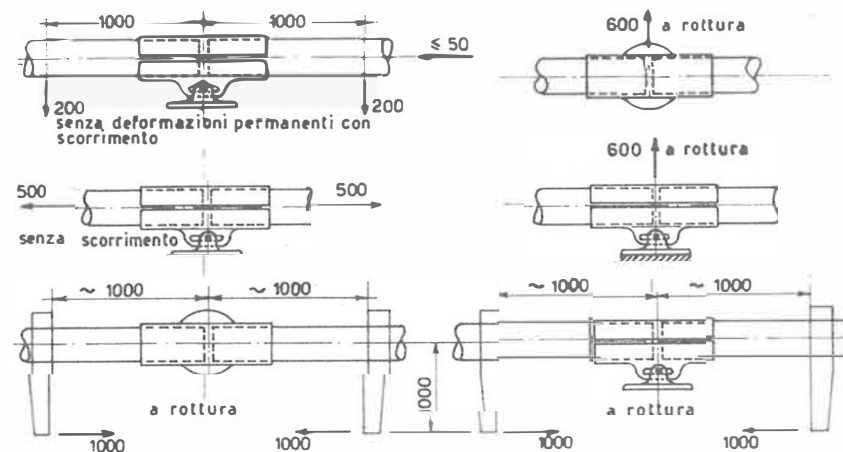


MATRICOLA	20 08 42
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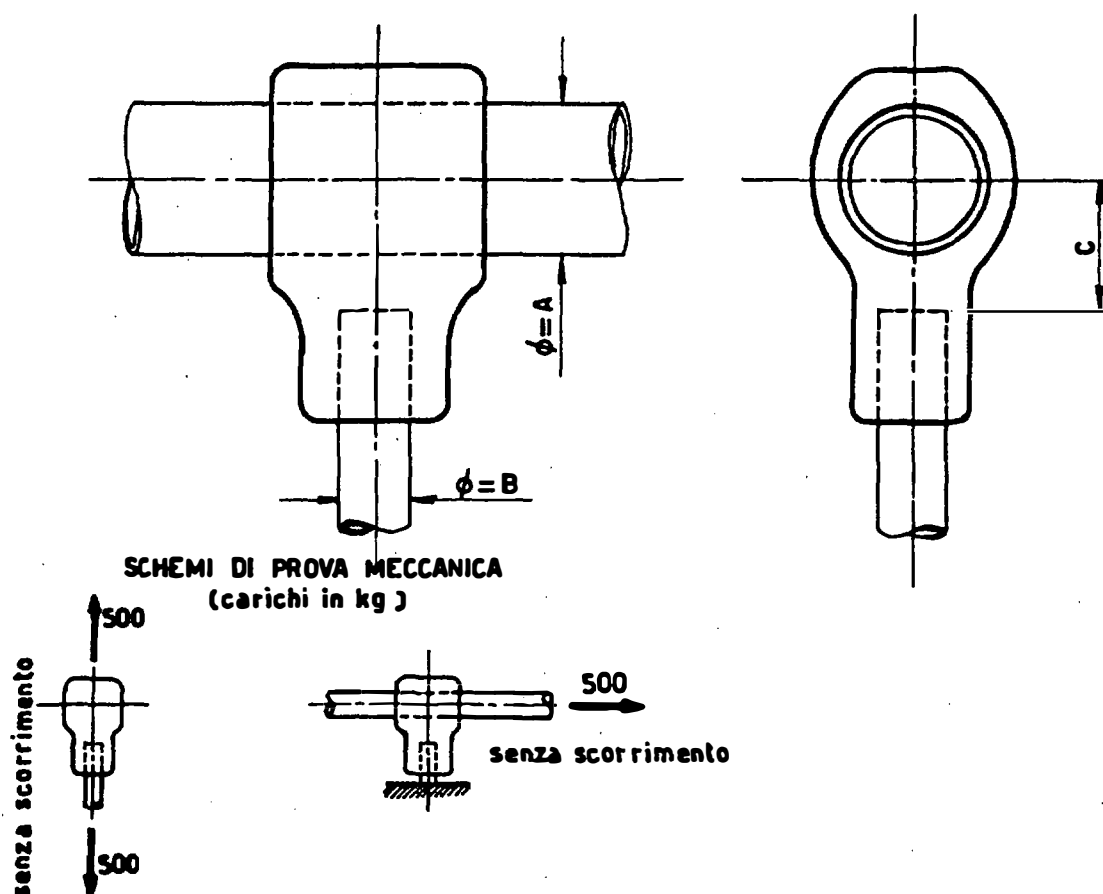
- 1 - Materiale: lega di alluminio. Bulloni di serraggio in acciaio inossidabile o lega di alluminio.
- 2 - Corrente nominale 2000A, corrente di breve durata (1s) 31,5kA
- 3 - Su ciascun esemplare dovrà essere marcata la sigla o il marchio di fabbrica della ditta fornitrice, il diametro del conduttore e la coppia di serraggio dei bulloni.
- 4 - Prescrizioni: per la costruzione LM2007, per la fornitura LM2011, per il collaudo LM2002.
- 5 - Livello di radiodisturbo ammesso: 75dB a 155kV.
- 6 - Unità di misura: numero esemplari (n).



MATRICOLA 20 64 40

SCHEMI DI PROVA MECCANICA
(carichi di rottura in daN)

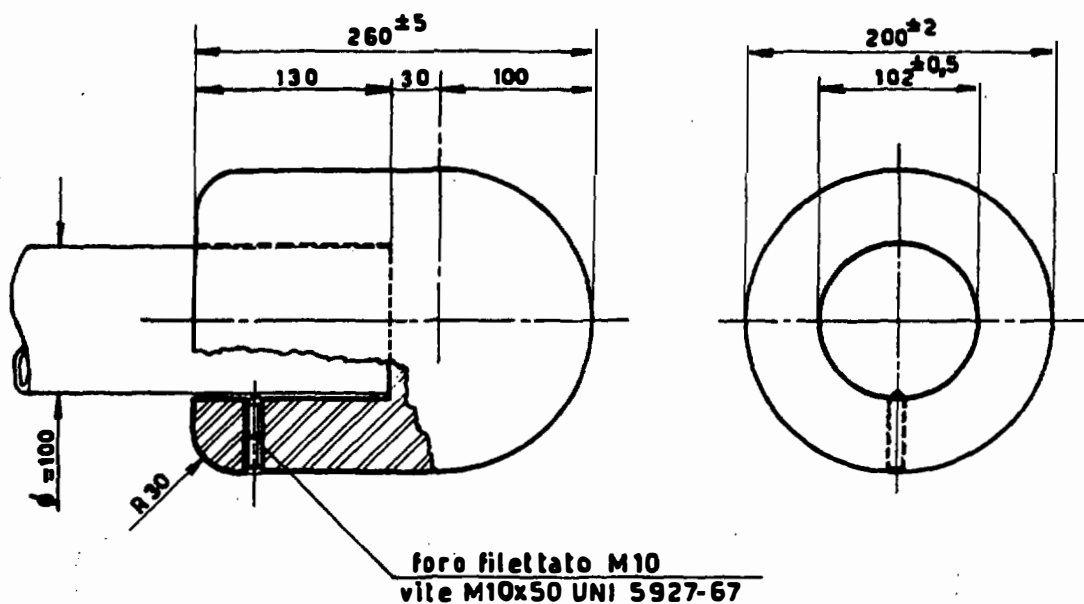
- 1 - Materiale: lega di alluminio. Bulloni di serraggio in acciaio inossidabile o lega di alluminio. Perno in acciaio inossidabile. Flangia in lega di alluminio o in ghisa o in acciaio zincato a caldo.
- 2 - Corrente nominale 2500A, corrente di breve durata (1s) 31,5kA.
- 3 - Il morsetto deve consentire l'oscillazione dell'asse dei conduttori di un angolo di 3° in tutte le direzioni senza dar luogo a momenti sull'isolatore.
- 4 - Su ciascun esemplare dovrà essere marcata la sigla o il marchio di fabbrica della ditta fornitrice, il diametro del conduttore e la coppia di serraggio dei bulloni.
- 5 - Prescrizioni: per la costruzione LM2007, per la fornitura LM2011, per il collaudo LM2002.
- 6 - Livello di radiodisturbo ammesso: 75dB a 159 kV.
- 7 - Unità di misura: numero esemplari (n).

SCHEMI DI PROVA MECCANICA
(carichi in kg)

MATRICOLA	TIPO	DIMENSIONI (mm)			CLASSE
		A	B	C	PROVA TERMICA
20 27 41	1086/1	100	40	90	D
20 27 40	1086/2	40	40	65	D

- 1 - Materiale: alluminio o lega di alluminio. Bulloni in acciaio inossidabile o in lega di alluminio.
- 2 - Livello di radiodisturbo ammesso: 75 dB a 105 kV.
- 3 - Su ciascun esemplare dovrà essere marcata la classe di appartenenza e la sigla o il marchio di fabbrica della ditta fornitrice.
- 4 - Prescrizioni: per la costruzione Norme CEI 7 - 9 e prescrizioni ENEL M 2006; per il collaudo Norme CEI 7 - 9, con l'eccezione delle prove di tipo che saranno invece eseguite secondo le prescrizioni ENEL M 2001.
- 5 - L'unità di misura con la quale deve essere espressa la quantità del materiale è il numero di esemplari (n).

Esempio di designazione abbreviata: M O R S T T 100 P A S S / T 40 D U E



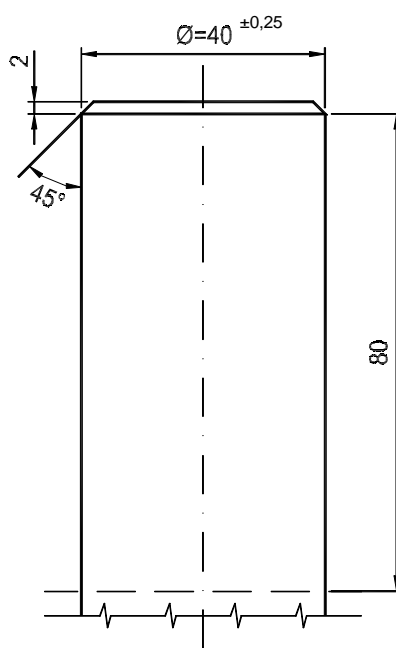
MATRICOLA

21 14 02

- 1 - Peso (kg) : 40 ± 3 .
- 2 - Materiale ghisa zincata a caldo. Vite in acciaio zincato a caldo.
- 3 - Livello di radiodisturbo ammesso: 75 dB a 270 kV.
- 4 - Su ciascun esemplare dovrà essere marcata la sigla o il marchio di fabbrica della ditta fornitrice.
- 5 - Prescrizioni: per la costruzione Norme CEI 7 - 9 e prescrizioni ENEL M2006; per il collaudo Norme CEI 7 - 9, con l'eccezione delle prove di tipo che saranno invece eseguite secondo le prescrizioni ENEL M 2001.
- 6 - L'unità di misura con la quale deve essere espressa la quantità del materiale è il numero di esemplari (n).

Designazione abbreviata: CONTRAPP PER TUB 100 40 KGUE

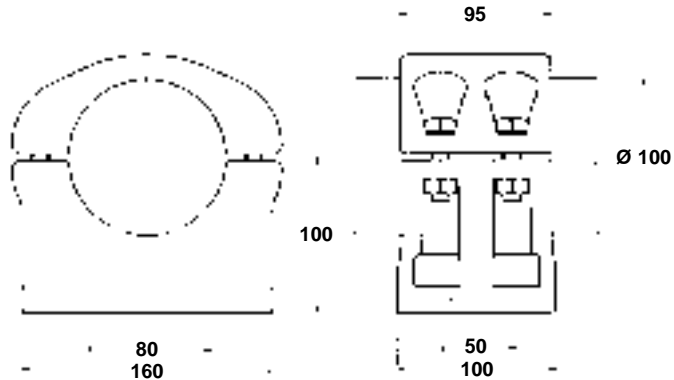
Riferimento: C 1050



Materiale:

- alluminio o lega di alluminio
- rame o lega di rame

N.B.: tutti i materiali impiegati devono essere resistenti o resi resistenti alla corrosione. Gli attacchi a codolo realizzati in rame o lega di rame, devono essere adeguatamente trattati, per rendere possibile l'interfacciamento con morsetteria in alluminio o lega di alluminio



Tipo	Edizione Tabella	Matricola
LM 1037	3 ^a Nov. 1984	20.08.42

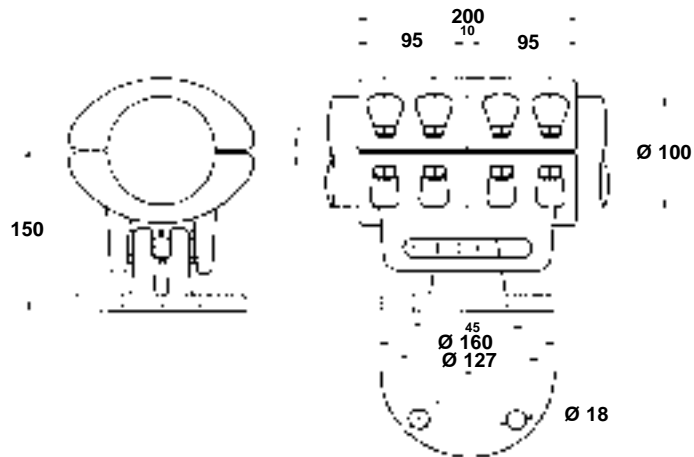
Morsetto per collegamento tubo lega Al Ø 100 mm passante - piastra a 4 fori

Materiali

Lega di Alluminio. Bulloneria M12x45 acciaio inox

Codice Carcano

ENS1037



Tipo	Edizione Tabella	Matricola
LM 1041	2ª Nov. 1984	20.64.40

**Morsetto portante scorrevole per giunzione diritta tubo lega
Al Ø 100 mm - tubo lega Ø 100 mm**

Materiali

Lega di Alluminio. Bulloneria M12x45 acciaio inox

Codice Carcano

ENS1041

PALETTI DI TERRA IN TONDO DI ACCIAIO RIVESTITO IN
RAME O DI ACCIAIO ZINCATO

21 70 B

DM1206Luglio 1981
Ed.2 - 1/1

La presente tabella sostituisce la tabella:
LM 1206 Ed. 1

morsello per connessione a
corda di rame $\phi 10,5$ sez. 63 mm^2
(C 1002)

londo $\phi = 18 \div 26$

$H \pm 5\%$

MATRICOLA	TIPO	H (m)
21 70 03	1206/1	3
21 70 04	1206/2	6
21 70 05	1206/3	9

- 1 - Materiale: acciaio zincato a caldo o acciaio rivestito in rame.
- 2 - I paletti devono essere realizzati con elementi componibili da 1,5 m.
- 3 - Su ciascun esemplare dovrà essere marcata la sigla o il marchio di fabbrica della ditta fornitrice.
- 4 - Prescrizioni: per la costruzione Norme CEI 7-9 e 11-8 e prescrizioni ENEL M 2006; per il collaudo Norme CEI 7-9.
- 5 - Unità di misura: numero di esemplari (n).
- 6 - Per la realizzazione di impianti di messa a terra di rilevante estensione che richiedono connessioni a carattere ripetitivo, in alternativa al sistema a compressione, la connessione della corda di rame al paletto di terra può essere realizzata mediante procedimento allumino-termico.

Designazione abbreviata: **P A L T E R A C C O C W L 9 0 0 0 U E**

	SPECIFICA TECNICA UNIFICATA	Pagina 1 di 6
	<i>Punti fissi per la messa a terra e in cto cto di elementi di impianto AT ed MT in conduttori nudi di Cabine Primarie</i>	EA-0482 Rev. 02 del 01/04/2010

INDICE

1.	SCOPO	2
2.	CAMPO DI APPLICAZIONE	2
3.	IDENTIFICAZIONE COMPONENTI	2
4.	PRESCRIZIONI DI RIFERIMENTO	2
5.	UNITÀ DI MISURA	2
6.	CARATTERISTICHE TECNICHE	2
7.	PRESCRIZIONI PER IL COLLAUDO E LA FORNITURA	4

Revisione	Natura della modifica
01	Prima emissione della Specifica Tecnica
02	Modificato par. 7.1.3

	SPECIFICA TECNICA UNIFICATA	Pagina 2 di 6
	<i>Punti fissi per la messa a terra e in cto cto di elementi di impianto AT ed MT in conduttori nudi di Cabine Primarie</i>	EA-0482 Rev. 02 del 01/04/2010

1. SCOPO

Il presente documento ha lo scopo di definire i requisiti funzionali e costruttivi di punti fissi che devono essere installati su elementi di impianto elettrico presenti in Cabina Primaria per potervi collegare i dispositivi mobili di messa a terra di cui a specifica EA0480.

2. CAMPO DI APPLICAZIONE

I punti fissi descritti in specifica devono essere utilizzati sui seguenti elementi di impianto elettrico in conduttori nudi MT ed AT di Cabina Primaria:

- Elementi di impianto MT realizzati in sbarre di rame a sezione rettangolare;
- Elementi di impianto AT realizzati in tubo di alluminio di diametro pari a 100 mm e 150 mm;

3. IDENTIFICAZIONE COMPONENTI

PUNTI FISSI MAT E CC IN CP EA0482

Descrizione	Identificazione del componente	Matricola
Punto fisso a testa sferica di diametro 20 mm con attacco femmina.	EA0482/1	852152
Punto fisso per conduttori in alluminio diametro 100 mm	EA0482/2	852153
Punto fisso per conduttori in alluminio diametro 150 mm	EA0482/3	852154

4. PRESCRIZIONI DI RIFERIMENTO

non applicabile

5. UNITÀ DI MISURA

n (numero di confezioni).

6. CARATTERISTICHE TECNICHE

	SPECIFICA TECNICA UNIFICATA	Pagina 3 di 6
	<i>Punti fissi per la messa a terra e in cto cto di elementi di impianto AT ed MT in conduttori nudi di Cabine Primarie</i>	EA-0482 Rev. 02 del 01/04/2010

6.1 PUNTI FISSI A TESTA SFERICA

Devono poter essere collegati nelle barre MT degli impianti di CP garantendo un buon contatto elettrico ed un'adeguata connessione meccanica senza danneggiare il conduttore dell'impianto. Devono essere realizzati in rame elettrolitico stagnato rispettando le dimensioni riportate in figura 1. Tutte le superfici devono essere accuratamente rifinite e prive di spigoli vivi. Il fissaggio alla sbarra, che sarà a cura territoriale, dovrà avvenire tramite perno filettato M12 completo di dado e rondella elastica (o tramite bullone e rondella) in acciaio inox. I valori di corrente e tempo nominali (I_r / t_r) di utilizzo non devono essere inferiori a 16 kA / 0,5s.

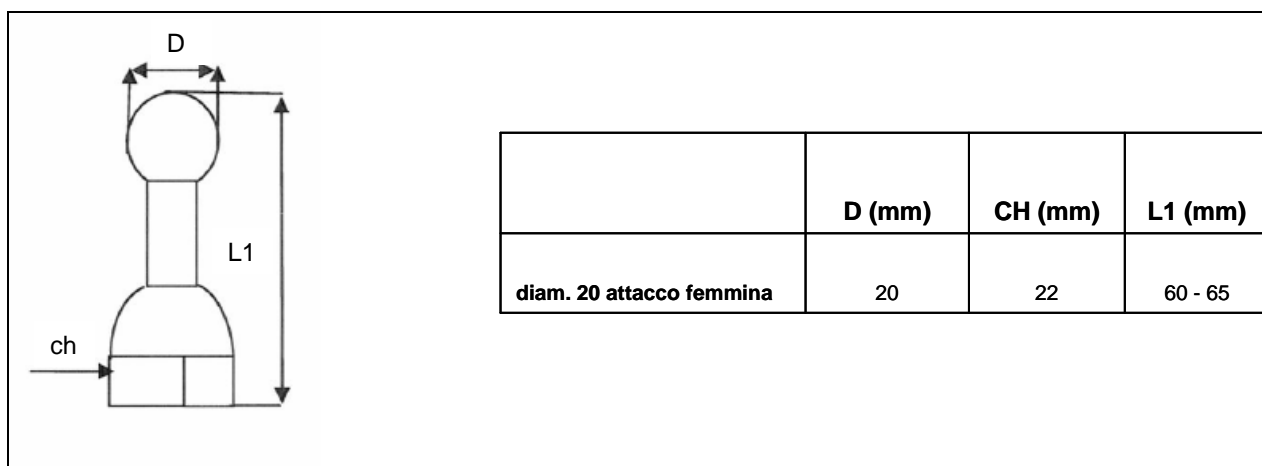


Fig. 1 Punti fissi a testa sferica (il disegno è solo a titolo indicativo, le misure sono vincolanti)

6.2 PUNTI FISSI PER CONDUTTORI IN TUBO DI ALLUMINIO

Devono poter essere collegati sui conduttori cilindrici in tubo di alluminio di diametro 100 mm o 150 mm degli impianti AT di CP garantendo un buon contatto elettrico ed un'adeguata connessione meccanica senza danneggiare il conduttore dell'impianto.

Il corpo del dispositivo deve essere realizzato in lega leggera, le parti metalliche accessorie devono essere di acciaio inox. Tutte le superfici devono essere accuratamente rifinite e prive di spigoli vivi. Devono essere realizzati rispettando le dimensioni riportate in figura 2.

I valori di corrente e tempo nominali (I_r / t_r) di utilizzo non devono essere inferiori a 31,5 kA / 0,5s.

	SPECIFICA TECNICA UNIFICATA	Pagina 4 di 6
	<i>Punti fissi per la messa a terra e in cto cto di elementi di impianto AT ed MT in conduttori nudi di Cabine Primarie</i>	EA-0482 Rev. 02 del 01/04/2010

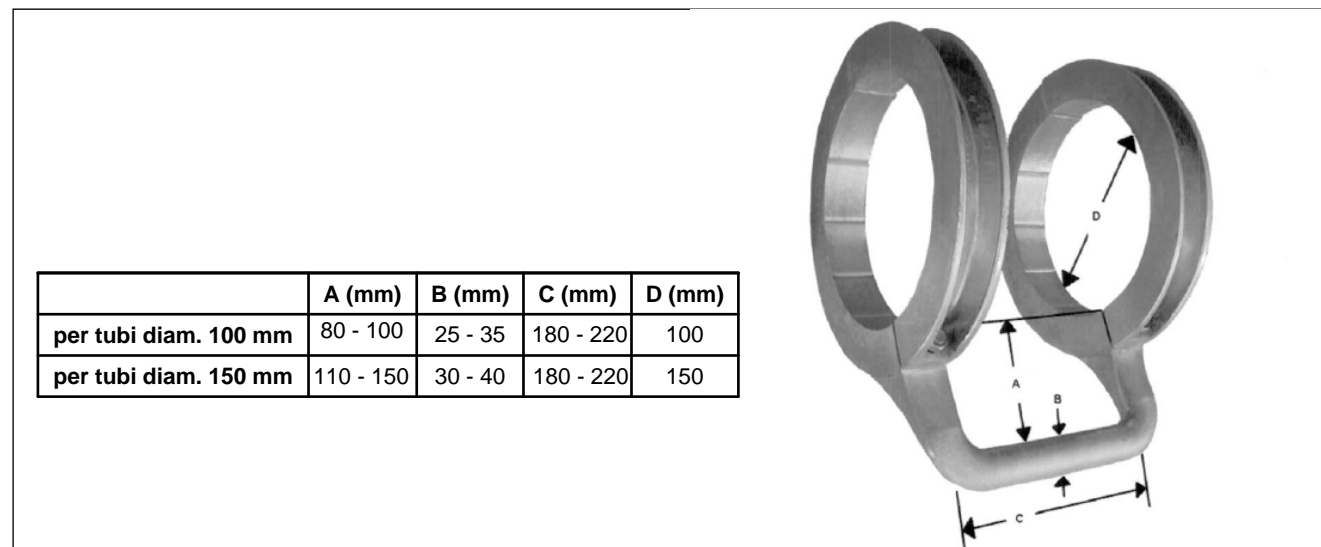


Fig. 2 Punto fisso a maniglia (il disegno è solo a titolo indicativo, le misure sono vincolanti)

6.3 MARCATURE

I componenti oggetto della presente specifica dovranno presentare le seguenti marcature:

- nome del fabbricante o marchio di fabbricazione
- modello
- anno di fabbricazione

7. PRESCRIZIONI PER IL COLLAUDO E LA FORNITURA

7.1 Elenco e descrizione delle prove

Sui componenti oggetto della presente specifica dovranno essere eseguite le prove elencate in tab. 1.

N° della PROVA	COLLAUDO		DESCRIZIONE
	Tipo	Accettaz.	
1	X	X	Esame a vista e verifica delle dimensioni
2	X		Prova di corto circuito
3		X	Verifica della rispondenza costruttiva ai componenti approvati

Tab. 1 Elenco delle prove

	SPECIFICA TECNICA UNIFICATA	Pagina 5 di 6
	<i>Punti fissi per la messa a terra e in cto cto di elementi di impianto AT ed MT in conduttori nudi di Cabine Primarie</i>	EA-0482 Rev. 02 del 01/04/2010

7.1.1 Esame a vista e verifica delle dimensioni

Si deve verificare che i punti fissi abbiano tutte le caratteristiche riportate in specifica, in particolare per quanto riguarda le dimensioni, i materiali, l'accuratezza nella lavorazione e le marcature.

7.1.2 Prova di corto circuito

Deve essere eseguita presso un laboratorio accreditato all'esecuzione della specifica prova e il fornitore deve rendere disponibile la certificazione rilasciatagli dal laboratorio suddetto.

Il punto fisso, collegato al tubo (o alla sbarra) e al dispositivo mobile di messa a terra, deve essere sottoposto al passaggio di una corrente di cortocircuito del valore pari al valore nominale I_r indicato in specifica per un intervallo di tempo, pari al tempo t_r indicato in specifica.

La prova si intende superata se, al suo termine, il punto fisso non ha subito deformazioni meccaniche o fisiche e se il serraggio sulla sbarra/conduttore non ha subito allentamenti o deformazioni.

7.1.3 Verifica della corrispondenza costruttiva ai componenti approvati

Il controllo deve essere eseguito confrontando le caratteristiche costruttive e dimensionali dei prodotti presentati al collaudo con quanto riportato nella documentazione approvata.

7.2 **Approvazione dei componenti**

Per l'approvazione dei componenti devono essere eseguite tutte le prove indicate in tab. 1.

A tal proposito il fornitore dovrà presentare la seguente documentazione:

- schede tecniche e disegni/foto di prodotto;
- certificazioni comprovanti le caratteristiche tecniche prescritte al par. 6;
- certificazione di laboratorio accreditato relativa alla prova di cto cto.

7.3 **Collaudo**

Saranno effettuate le prove indicate in tab. 1.

Tale controllo, non deve evidenziare difformità e/o difetti costruttivi.

7.4 **Confezione**

I punti fissi dovranno essere forniti in scatole di imballaggio tale da assicurare una idonea protezione durante il trasporto e l'immagazzinamento.

All'esterno della scatola di imballaggio dovrà essere riportato con caratteri chiaramente leggibili quanto segue:

	SPECIFICA TECNICA UNIFICATA	Pagina 6 di 6
	<i>Punti fissi per la messa a terra e in cto cto di elementi di impianto AT ed MT in conduttori nudi di Cabine Primarie</i>	EA-0482 Rev. 02 del 01/04/2010

- nome e/o sigla del fornitore
- modello e/o sigla del prodotto assegnato dal fornitore
- matricola Enel del prodotto
- peso