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HV CAPACITOR VOLTAGE TRANSFORMERS

Edition	Date	Main changes description
01	30/06/2023	Issuing of Global E&C – GSCT015 – HV CAPACITOR VOLTAGE TRANSFORMERS
02	03/10/2024	The standard was modified according with organizational changes.
03	28/02/2025	Company logo update

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1.DOCUMENT AIMS AND APPLICATION AREA

The aim of this document is to provide technical requirements for the supply of HV Capacitor Voltage Transformers for Rețele electrice România.

2.RELATED DOCUMENTS TO BE IMPLEMENTED

See 4.2.6.

3.UNITS IN CHARGE OF THE DOCUMENT

Responsible for the preparation of the document:

- Engineering & Standardization / Homologation & Standardization

Responsible for the authorization of the document:

- Network Operations Directorate

4.REFERENCES

- Integrated Policy for Quality, Health and Safety, Environment, Anti-Bribery, and Information Security.
- Stop Work Policy.
- IL-RE-097 - TECHNICAL CONFORMITY ASSESSMENT
- Code of Ethics.
- Human Right Policy.
- Zero Tolerance of Corruption (ZTC) Plan.

4.1.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.ROMANIAN REFERENCE LAWS

- Prescripția Energetică 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.

4.3.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

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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 1000V
IEC 60137	Insulated bushings for alternating voltages above 1000V
IEC 61462	Composite hollow insulators - Pressurized and unpressurized insulators for use in electrical equipment with rated voltage greater than 1000V - 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
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.
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.

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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. 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
EN 60068-3-3	Environmental testing - Part 3: Guidance - Seismic test methods for equipment.
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.ROMANIAN STANDARDS AND OTHER RELEVANT DOCUMENTS

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.

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

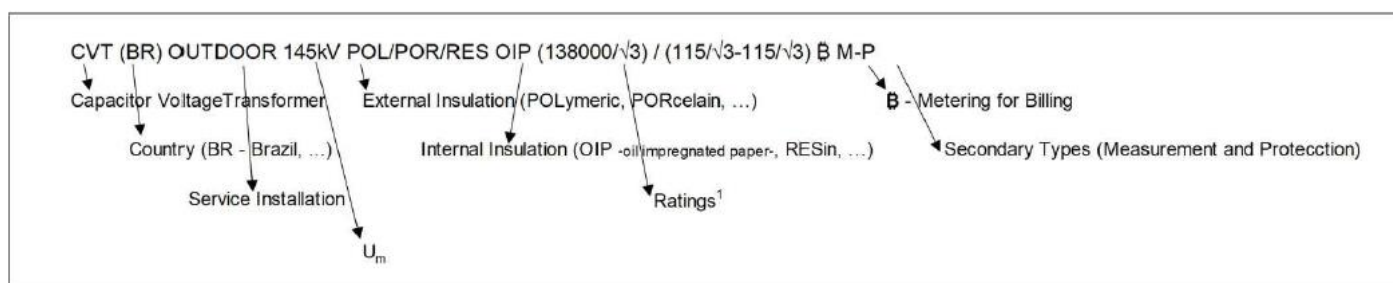
6.DEFINITIONS AND ACRONYMS

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.

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SIS	Swedish institute for standards.
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 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.
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.

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



1 Ratings Symbology

/ Indicates the rated current ratios

| Indicates the tact that there are several primary currents by changing secondary turns.

: Indicates the rated current ratio)

- 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

7.DESCRPTION

This Common Part 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 types of transformers
- The “List of Components” (Annex A) with the Type Code/GS Code for each transformer of the Rețele electrice România.
- 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 ANNEX C.
- The ANNEX C with the specific requirements.

7.1.DOCUMENT/SECTION SCOPE

The scope of this section/part is to define the Common Part to provide the technical standard requirements for all types of the Capacitor Voltage Transformers .

7.2.LIST OF COMPONENTS

For the List of Components, please refer to ANNEX A

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7.3.SERVICE CONDITIONS

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

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

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 ^{III} (g)	Network Frequency (Hz)	Ambient Temp. (Min/Max) (°C)	Corrosivity (ISO 12944)
Romania	-	Heavy	43,3	0,5	50	-30 / +40	C4

Table 2

7.4.TECHNICAL CHARACTERISTICS

For definitions see IEC-61698-1 and IEC-61698-5.

7.4.1.Type of Capacitor Voltage Transformers

This document applies to single-phase capacitive type voltage transformers with three secondary windings located at the bottom of the unit. TTs are intended to be connected to the high-voltage grid for measurement and protection with $U_m = 123\text{kV}$.

Secondary windings are intended to provide low voltage for measurement, control, and protection functions.

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.

7.4.12.Static Withstand Load (F_R)

See Datasheets.

7.4.13.Installation

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

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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

See ANNEX C.

7.5.CONSTRUCTION CHARACTERISTICS.

The active part of voltage transformers should be placed in metal housings.

CVT shall be designed to ensure that constant oil pressure is maintained if the specified temperature range is exceeded.

Measures shall be taken to achieve effective shielding between primary and secondary windings.

The supplier shall show the features required for the support and the mounting element.

Each voltage transformer shall be supplied with:

- fixing materials.
- clamps necessary for connection of the transformer to the external power circuit.
- clamps, terminals or earthing screws.
- gland plates for incoming cables (number and size will be determined according to specific requirements).

7.5.1.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 Rețele electrice România 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.

The internal insulating fluid of both capacitive divider and electromagnetic unit shall be biodegradable and compatible with the environment. The absence of PCB shall be guaranteed.

The manufacturer shall demonstrate that the oil used does not contain PCB.

7.5.2.External Insulation

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 Rețele electrice România approval.

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

For further details see ANNEX C.

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7.5.3.Overall Dimensions and Layouts

Insulators shall be made of inorganic porcelain composite material or with HTV (high temperature vulcanized) or LSR (liquid silicone rubber) silicone rubber, without EPDM or other light gray organic rubber, in accordance with IEC 61462 for mechanical testing and IEC 61109 for dielectric testing and accelerated aging testing.

The exterior insulation must be in one piece. The shape of the casing and the length of the total leakage line of the insulator shall guarantee the resistance of the surface insulation to the indicated salinity and stress values under the prescribed environmental conditions.

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, nuts, and screws for assembling of the electrical and mechanical components shall be made of stainless steel AISI 304 or higher quality. External protective coatings are not required for stainless steel parts.

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 3

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 ANNEX C.

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

7.5.5.1.Primary Outer Terminals

The high-voltage primary terminal shall be suitable for connecting a conductor with section of 300 mm². 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.

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. Rețele electrice România reserves the right to evaluate the feasibility and suitability of solutions proposed.

The secondary terminals shall be suitable for connecting cables with a 4-10 mm² section.

Terminals should have clearly distinguishable polarity markings.

7.5.5.3.Grounding Terminals

The manufacturer shall supply terminals to connect the CVTs to the substation ground system.

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Transformers shall be equipped with suitable terminals to make the following grounding connections:

- For primary winding, a hole $\varnothing 14$ mm shall be provided on the base metal structure.
- For secondary windings, a terminal shall be provided inside the secondary terminal box.

7.5.5.4.CVT Support Base

See ANNEX C

7.5.5.5.Secondary Terminals Box

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

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

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

See Datasheets.

7.5.5.9.Lifting Lugs

Placed to facilitate lifting of CVT.

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):

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

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

All fixed screws and nuts must be made of non-corrosive material. The plate must be made of aluminum.

7.5.5.11.Terminal Markings

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

7.5.5.12.Capacitive Tap

See Datasheets.

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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.

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

See Datasheets.

7.6.TESTING

The measurement transformers shall have all tests and checks in accordance with the international standards in force. General certificates issued for a wide range of basic parameters shall not be considered valid.

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

The Testing lab shall be certified according to the standard SR EN ISO/IEC 17025.

7.6.1.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 4 below:

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 4

In addition to the tests set out in paragraph 7.6.1 of GSCT015, IEC 60358 shall apply for requirements and tests for capacitor voltage transformers regarding high-frequency characteristics. In addition, visual and dimensional checks are carried out.

Note: The sequence of these tests and the possibility of using several units of the same type to carry out the tests are established in agreement with the persons responsible for Romanian Power Grids. In any case, all dielectric tests are performed on the same unit.

7.6.2.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 5):

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 δ 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 5

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

Also, compared to the planned tests, painting checks are carried out.

7.6.3.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 6, 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 6

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 7, below:

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

Table 7

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7.7.CONDITIONS OF SUPPLY

7.7.1.Warranty

The technical guarantee will be five (5) years, counted from the date of delivery to Rețele electrice România'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, DWG 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.
- 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.

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 RETELE ELECTRIC's warehouses, unless otherwise indicated in the purchase order.

The equipment must be prepared for delivery so that it can be handled easily and also to prevent any damage during transportation.

Each transformer will be packed on its own in a box or pallet. A properly installed shock recorder must be provided to record shocks during transport. The manufacturer must provide a shock recorder report after delivery of the equipment.

Each package is marked with paint that will not be erased by rain or discolored due to solar radiation and the following information is indicated:

- Production factory.

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- The code and serial number must be clearly visible in relation to the other information and at least 20 mm high.
- Weight.
- The position of the center of gravity.
- Warning signs for the fragile product.
- Order number of the package within the scope of delivery.

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

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

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:

- 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

All equipment documentation must be in Romanian, complete and detailed; The technical documentation of the equipment is part of the delivery.

The manufacturer will provide the transport, storage, installation, operation, and maintenance instructions written in Romanian.

Shipping and storage instructions will be provided in a timely manner prior to delivery, and installation, operation and maintenance instructions will be provided at a later date after the product is delivered.

The operating instructions must be in a different manual than the installation and maintenance instructions.

The voltage transformers will comply with the Romanian legislation in force regarding the commissioning and commissioning of equipment used in commercial transactions.

The delivered transformers will be accompanied, in accordance with the provisions of the Law on Safety and Health at Work no. 319/2006, by certificates on safety and health at work. The certificates will be issued after the transformers have been tested according to the methodology contained in HG 1425/2006.

7.7.6.Technical Conformity Assessment (TCA)

Technical compliance is issued by Rețele electrice România 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 Rețele electrice România's Standard: ILRE097 - 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 Rețele electrice România.

8.ANNEX

8.1.ANNEX A – LIST OF COMPONENTS

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
GSCT015/007	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)

8.2.ANNEX B – DATASHEET AND CHECK LIST (EXAMPLE)

COMPONENT ID	Rețele electrice România 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		
Highest voltage for equipment (Um) [kV]		
Rated lightning impulse withstand voltage [kV]		

Rated power frequency withstand voltage	[kV]		
Rated frequency (f _R)	[Hz]		
Metering for Billing (^)			
Rated (Total) Capacitor C _R = (C ₁ ·C ₂ /(C ₁ +C ₂))	[Pf]		
Capacitor C ₁	[Pf]		
Capacitor C ₂	[Pf]		
Rated Voltage Factor (VF)			
Number of Secondaries	[nr.]		
REQUIREMENTS FOR CARRIER-FREQUENCY ACCESORIES			
Drain Coil (YES/NO)			
Drain Coil impedance			
Drain Coil voltage drop			
High Frequency Range (HF)			
Capacitance & Parasitic Conductance (HF Terminal)			
High Frequency tolerance for Capacitors			
Secondary Winding #1			
Function			
Primary Voltage - Secondary Winding #1	[V]		
Rated secondary Voltage	[V]		
Rated output (S _r)	[VA]		
Accuracy class			
Secondary Winding #2			
Function			
Primary Voltage - Secondary Winding #2	[V]		
Rated secondary Voltage	[V]		
Rated output (S _r)	[VA]		
Accuracy class			
Secondary Winding #3			
Function			
Primary Voltage - Secondary Winding #3	[V]		

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Rated secondary Voltage	[V]		
Rated output (Sr)	[VA]		
Accuracy class			
COMPONENT GENERAL REQUIREMENTS			
External Insulation	[POLymeric, RESin, PORcelain, OTHer]		
Internal Insulation	[OIP, RESin, SF6, OTHers]		
Arc Distance	[mm]	To be indicated by supplier	
Creepage Distance (ka=1; IEC 60137)	[mm]		
Overall Dimensions (hxxwxxl)	[mm]		
Fixing holes - Diameter	[mm]		
Fixing holes - Distances (wxxl)	[mm]		
Total Weight	[kg]		
Internal Insulation Class	[Oil, Cycloaliphatic Resin, SF6 GAS]	To be indicated by supplier	
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]		
Pressure Relief system	[YES, NO, NA]		
Oil Sampling tap	[YES, NO, NA]		
Primary Terminal Type			
Secondary Terminal Type			
Earthing Terminal Type			
MECHANICAL REQUIREMENTS			
Static withstands test load (Fr)	[N]		
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)			

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8.3.ANNEX C SECTION ROMANIA (RO)

GS Code GSCT015/007 Country Code 653201

CVT (RO) OUTDOOR 123kV POL OIP (110000/ $\sqrt{3}$) / (100/ $\sqrt{3}$ -100/ $\sqrt{3}$ -100) ^ M-P-P

COMPONENT ID		
Type of Instrument Transformer		CVT - Capacitor Voltage Transformer
Country		ROMANIA
GS Code		GSCT015/007
Country Code		653201
Old Country Reference Code		-
SERVICE CONDITIONS		
Installation Conditions		OUTDOOR
Service Conditions Type		Special
Temperature category	[°C]	-35/+40
Daily Average Amb. Temperature	[°C]	<35°C
Altitude (maximum)	[m]	1000
Seismic Qualification Level according to IEC 60068-3-3		AF5
RUSCD (Reference unified specific creepage distance)	[mm/kV]	43,3
ELECTRICAL RATINGS		
Highest voltage for equipment (U_m)	[kV]	123
Rated lightning impulse withstand voltage	[kV]	550
Rated power frequency withstand voltage	[kV]	230
Rated frequency (f_R)	[Hz]	50
Metering for Billing (^)		YES
Rated (Total) Capacitor CR = $(C_1 \cdot C_2 / (C_1 + C_2))$	[Pf]	-
Capacitor C_1	[Pf]	-
Capacitor C_2	[Pf]	-
Rated Voltage Factor (VF)		1,2 continuous; 1,5x30 s
Number of Secondaries	[nr.]	3
REQUIREMENTS FOR CARRIER-FREQUENCY ACCESORIES		

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Drain Coil (YES/NO)		-
Drain Coil impedance		-
Drain Coil voltage drop		-
High Frequency Range (HF)		-
Capacitance & Parasitic Conductance (HF Terminal)		-
High Frequency tolerance for Capacitors		-
Secondary Winding #1		
Function		Measurement
Primary Voltage - Secondary Winding #1	[V]	110000/$\sqrt{3}$
Rated secondary Voltage	[V]	100/$\sqrt{3}$
Rated output (S _r)	[VA]	50
Accuracy class		0,2
Secondary Winding #2		
Function		Protection
Primary Voltage - Secondary Winding #2	[V]	110000/$\sqrt{3}$
Rated secondary Voltage	[V]	100/$\sqrt{3}$
Rated output (S _r)	[VA]	100
Accuracy class		0,5-3P
Secondary Winding #3		
Function		Protection
Primary Voltage - Secondary Winding #3	[V]	110000/$\sqrt{3}$
Rated secondary Voltage	[V]	100
Rated output (S _r)	[va]	100
Accuracy class		3P
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 (ka=1; IEC 60137)	[mm]	minimum 3.075 mm
Overall Dimensions (hxxwxxl)	[mm]	2100x450x450

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Fixing holes - Diameter	[mm]	-
Fixing holes - Distances (wxl)	[mm]	-
Total Weight	[kg]	800
Internal Insulation Class	[Oil, Cycloaliphatic Resin, SF6 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]	YES
Primary Terminal Type		Al/Cu or Al/Cu alloy cylinder: 80 mm - Φ40 mm
Secondary Terminal Type		DIN-type Terminal Block 4-10 mm²
Earthing Terminal Type		M12
MECHANICAL REQUIREMENTS		
Static withstands test load (Fr)	[N]	1000
Specific Horizontal force applied (in a specific area)	[N]	2000
Specific Vertical force applied (in a specific area)	[N]	2000
ADDITIONAL REQUIREMENTS/COMMENTS		
(1) Old Local Technical Specification of reference: FT-191_MAT		

CVT (RO) OUTDOOR 123kV POL OIP (110000/ $\sqrt{3}$) / (100/ $\sqrt{3}$ -100/ $\sqrt{3}$ -100) ^ M-P-P
DRAWINGS (OVERALL/DETAILED INDICATIONS)