

Subject: Global Infrastructure and Networks – GSCT003 Self-Protected Voltage Transformers up to U_m 36 kV

Application AreasPerimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks***CONTENTS**

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The Head of Network Components

Maurizio Mazzotti

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1 DOCUMENT AIMS AND APPLICATION AREA

This document prescribes the technical characteristics, performance and testing methods for Self-protected Voltage Transformers (SVT) to be used to provide energy to MV remote switching points in the distribution network up to 36 kV and to feed auxiliary services in MV cells of Enel Group Distribution Companies whose Countries are listed below:

Country	Distribution Company
Argentina	Edesur
Brazil	Enel Distribuição Rio Enel Distribuição Ceará Enel Distribuição Goiás Enel Enel Distribuição São Paulo
Chile	Enel Distribución Chile
Colombia	Codensa
Iberia	e-distribución
Italy	e-distribuzione
Peru	Enel Distribución Perú
Romania	Enel Distribuție Banat Enel Distribuție Dobrogea Enel Distribuție Muntenia

1.1 RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL

This document applies to both Enel Global Infrastructure and Networks Srl Company and to Infrastructure and Networks Business Line perimeter when each Company does not have to issue further documents.

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2 DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
00	14/01/2016	First emission
01	15/03/2016	Updated list of Country codes; Updated list of routine tests
02	25/11/2016	4.3 Added particular local seismic requirements – 3 Updated DSOs names - 5 Added elongation at break according to ISO/R527 between 20-50% - 7.2.2 Updated voltage level for SVT partial discharge type test 7.2.9 Added verification of local seismic requirements type test by analytic demonstration - 7.3.3 Updated voltage level for SVT partial discharge routine test - 7.4.1 Improved description of the accelerate environmental electric ageing test
03	05/07/2021	Issuing of “Global Infrastructure and Networks – GSCT003 Self-Protected Voltage Transformers up to U_m 36 kV” technical specification Main characteristics update - New global types added - New types with air bushings added - Standardized plug-in and air bushings size - Clarification of some test procedures

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3 UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

- Global Infrastructure and Networks: Engineering and Construction / Components and Devices Design / Network Components

Responsible for authorizing the document:

- Global Infrastructure and Networks: Head of Engineering and 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;
- RACI Handbook Infrastructure and Networks no. 06;
- Enel Global Compliance Program (EGCP);
- Integrated Policy of Quality, Health and Safety, Environment and anti-Bribery;

5 ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

Value Chain/Process Area: Networks Management

Macro Process: Materials management

Process: Network components standardization

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6 DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
Technical Conformity Assessment (TCA)	A “conformity assessment” with respect to “specified requirements” consists in functional, dimensional, constructional and test characteristics required for a product (or a series of products) and quoted in technical specifications and quality requirements issued by Enel Group distribution companies. This also includes the verification of conformity with respect to local applicable regulation and laws and possession of relevant requested certifications.

6.1 ENEL GLOBAL INFRASTRUCTURE AND NETWORKS COUNTRIES REFERENCE STANDARDS

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

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

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7 DESCRIPTION

7.1 LIST OF COMPONENTS

The SVT can be used in Enel Group distribution network up to 36 kV, according to following correlation tables between voltage level of country distribution networks and primary voltage levels of global type SVTs.

7.1.1. SVT with plug-in primary terminals

GLOBAL TYPE	GSCT003/11	GSCT003/12	GSCT003/13	GSCT003/14	GSCT003/15
SVT Primary Rated Voltage (kV)	20-15-13,2-10	12-11-10	25-23	13,8-13,2-11,4	34,5-33
COUNTRIES	COUNTRY CODE				
ARGENTINA				0102-1941	0102-1940
BRAZIL				990358	990357
CHILE		530048	530050		
COLOMBIA				531264	
IBERIA	530138	530143	530145		
ITALY	530010		530008		
PERU	530056				
ROMANIA	530005				

7.1.2. SVT with air bushing primary terminals

GLOBAL TYPE	GSCT003/21	GSCT003/22	GSCT003/23	GSCT003/24	GSCT003/25
SVT Primary Rated Voltage (kV)	20-15-13,2-10	12-11-10	25-23	13,8-13,2-11,4	34,5-33
COUNTRIES	COUNTRY CODE				
ARGENTINA				0102-1939	0102-1938
BRAZIL				990356	990355
CHILE		530047	530049		
COLOMBIA					
IBERIA	530139	530146	530144		
ITALY	530009		530007		
PERU	530055				
ROMANIA	530006				

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7.2 APPLICABLE LAWS AND REFERENCE STANDARDS

7.2.1.Laws

7.2.1.1. **Argentina**

Norma IRAM

7.2.1.2. **Brazil**

NR-10 - segurança em instalações e serviços em eletricidade.

7.2.1.3. **Chile**

NSEG 5. E.n.71 - Reglamento de Instalaciones Eléctricas de Corrientes Fuertes.

7.2.1.4. **Colombia**

RETIE - Reglamento Técnico de Instalaciones Eléctricas.

Ley 400 de 1997.

7.2.1.5. **Italy**

D.Lgs n. 81 of the 9th of April 2008 and subsequent modifications.

PVR006 - Barcode

7.2.1.6. **Perú**

Código Nacional de Electricidad Suministro.

7.2.1.7. **Romania**

D.Lgs n. 81 of the 9th of April 2008 and subsequent modifications.

PVR006 - Barcode

7.2.1.8. **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.

R.D. 223/2008, de 15 de febrero, por el que se aprueban el Reglamento sobre condiciones técnicas y garantías de seguridad en líneas eléctricas de alta tensión y sus instrucciones técnicas complementarias ITC-LAT 01 a 09.

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7.2.2. Standards

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

Standards	
IEC 61869-1	IEC 60529 + AMD1 + AMD2
IEC 61869-3	IEC 60332-1-1 + AMD1
IEC 60282-1	IEC 60332-1-2 + AMD1
IEC 62217	IEC TS 60815
IEC 62271-200	IEC 60137
IEC 60660	EN 50181

7.2.3. Particular local seismic requirements

7.2.3.1. Chile

ETGI-1020 - Especificaciones técnicas generales – Requisitos de diseño sísmico para equipo eléctrico
DMAD-0184 - Poste de hormigón armado 13,5 m.

7.2.3.2. Colombia

NSR – 10 - Norma Sismo Resistente Colombiana

7.2.3.3. Italy

IEC 62271-210 – Severity level 1 – PGA 0,5 – Class 2

7.2.3.4. Peru

E-SE-010 - Acción sísmica en equipos eléctricos y mecánicos

7.2.3.5. Romania

P100-1 2006 – Code de proiectare seismică

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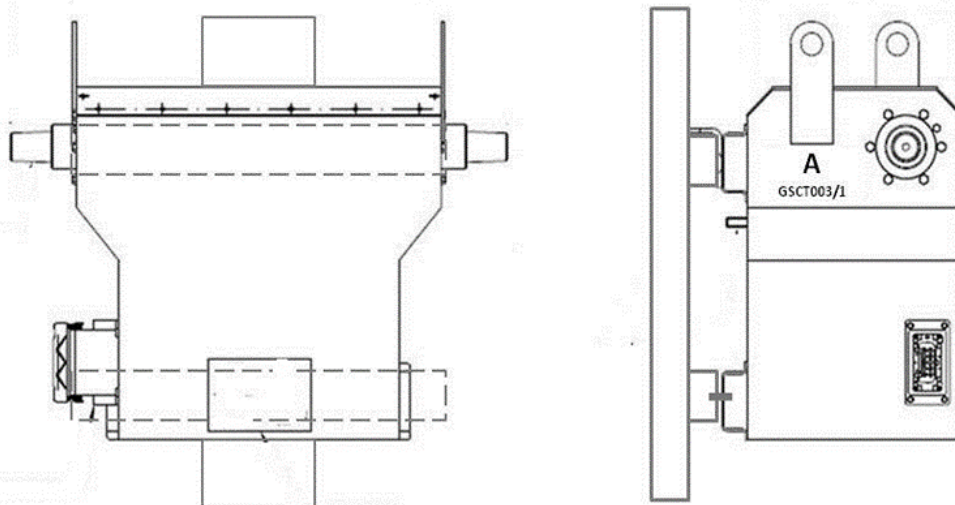
 Business Line: *Infrastructure & Networks*

7.3 MAIN CHARACTERISTICS

7.3.1. SVT with plug-in primary terminals

GLOBAL TYPE	GSCT003/11	GSCT003/12	GSCT003/13	GSCT003/14	GSCT003/15
Primary rated voltage (kV)	20-15-13,2-10	12-11-10	25-23	13,8-13,2-11,4	34,5-33
Secondary rated voltage (kV)	0,11	0,11	0,11	0,11	0,11
Insulation level (kV)	24/50/125	17,5/38/95	36/70/170	17,5/38/95	36/70/170
Rated Frequency (Hz)	50 and 60				
Rated power / Class / Thermal power	300 VA / 3 / 600 VA				
Voltage Factor	1,2 Continuous				
Type of installation	Outdoor according to IEC 61869-1/3				
Degree of protection (IEC 60529)	IP 65				
Type of internal filling insulation	Synthetic polyurethane resin or equivalent solid insulation (*)				
Insulating thermal class of internal filling insulation	B				
Primary Terminals	Plug-in outside cone type according to EN 50181				
	Type C-630 A-36kV	Type C-630 A-36kV	Type C-630 A-36kV	Type C-630 A-36kV	Type C-630 A-36kV
Rated current of fuses (IEC 60282-1)	2A ($U_m = 24$ kV)	2A ($U_m = 24$ kV)	2A ($U_m = 36$ kV)	2A ($U_m = 24$ kV)	2A ($U_m = 36$ kV)
Maximum overall dimensions (mm), without primary terminals	450 L x 250 W x 450 H	450 L x 250 W x 450 H	550 L x 300 W x 550 H	450 L x 250 W x 450 H	550 L x 300 W x 550 H
Approximate weight (kg)	90	90	130	90	130
Altitude (m)	1000 (up to 2700 for specific applications) (**)				
Ambient air temperature	- 30°C / +50°C (**)				
Relative humidity	98%				
Pollution level (IEC TS 60815)	Very High (IV)				

(*) With indicative elongation at break according to ISO/R527 40-50%

 (**) Extended level to take into account all different situations of Enel Group DSOs


Example of Self-protected Voltage Transformer (SVT) with plug-in primary terminals

GSCT003/11-12-13-14-15

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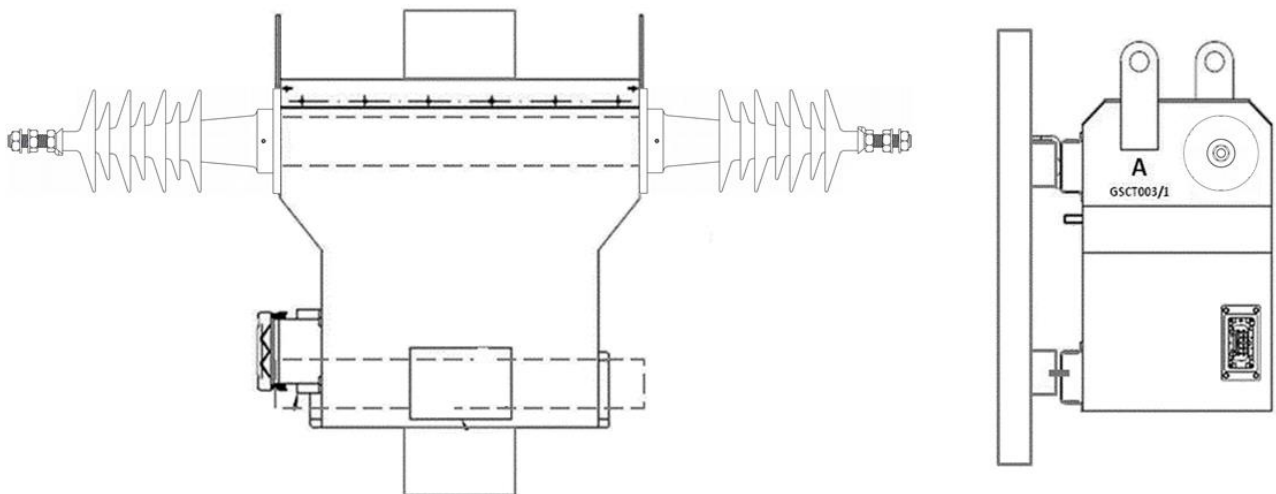
Business Line: *Infrastructure & Networks*

7.3.2. SVT with air bushing primary terminals

GLOBAL TYPE	GSCT003/21	GSCT003/22	GSCT003/23	GSCT003/24	GSCT003/25
Primary rated voltage (kV)	20-15-13,2-10	12-11-10	25-23	13,8-13,2-11,4	34,5-33
Secondary rated voltage (kV)	0,11	0,11	0,11	0,11	0,11
Insulation level (kV)	24/50/125	17,5/38/95	36/70/170	17,5/38/95	36/70/170
Rated Frequency (Hz)	50 and 60				
Rated power / Class / Thermal power	300 VA / 3 / 600 VA				
Voltage Factor	1,2 Continuous				
Type of installation	Outdoor according to IEC 61869-1/3				
Degree of protection (IEC 60529)	IP 65				
Type of internal filling insulation	Synthetic polyurethane resin or equivalent solid insulation (*)				
Insulating thermal class of internal filling insulation	B				
Primary Terminals	Air bushings according to IEC 60137 with clamp type terminals / 630 A				
Ins. level of Primary Terminals	24 kV	24 kV	36 kV	24 kV	36 kV
Pollution level (IEC TS 60815)	Very High (IV)				
RUSCD (mm/kV)	53,7				
Rated current of fuses (IEC 60282-1)	2A ($U_m = 24$ kV)	2A ($U_m = 24$ kV)	2A ($U_m = 36$ kV)	2A ($U_m = 24$ kV)	2A ($U_m = 36$ kV)
Maximum overall dimensions (mm), without primary terminals	450L x 250W x 450H	450L x 250W x 450H	550L x 300W x 550H	450L x 250W x 450H	550L x 300W x 550H
Approximate weight (kg)	90	90	130	90	130
Altitude (m)	1000 (up to 2700 for specific applications) (**)				
Ambient air temperature	- 30°C / +50°C (**)				
Relative humidity	98%				

(*) With indicative elongation at break according to ISO/R527 40-50%

(**) Extended level to take into account all different situations of Enel Group DSOs



Example of Self-protected Voltage Transformer (SVT) with air bushing primary terminals

GSCT003/21-22-23-24-25

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7.4 DESIGN AND CONSTRUCTION REQUIREMENTS

7.4.1. General

The SVT box shall be made of stainless steel AISI 316 and equipped with suitable brackets for positioning on pole.

The SVT shall have an internal voltage transformer (VT) in compliance with IEC 61869-1 and IEC 61869-3, two medium voltage fuses in compliance with IEC 60282-1 and two connection interfaces made by external plug-in in compliance with EN 50181 or by air bushing terminals in compliance with IEC 60137.

The internal filling insulation between components must be made of synthetic polyurethane resin without mineral add or equivalent solid insulation, excluding insulating oil and SF6 gas.

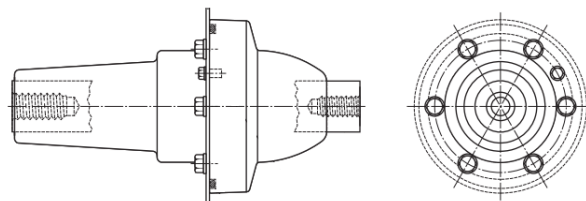
Internal fuses on primary circuit shall be incorporated in the solid filling insulation and not be accessible. They shall avoid any external effect in case of a possible internal fault, phase to phase and/or phase to earth including the particular case of double phase to earth fault.

The SVT shall be supplied with bracket interface type GSCS006 and with low voltage cable as specified in the following.

7.4.2. Primary terminals

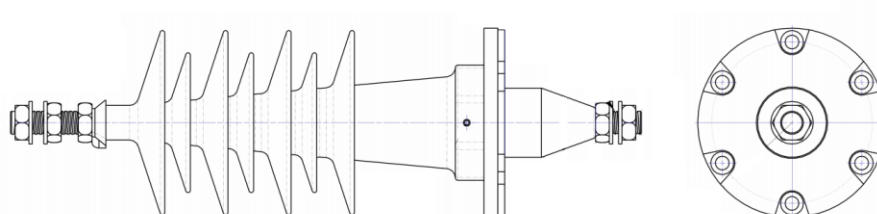
Primary terminals of SVT models GSCT003/11-12-13-14-15 shall be plug-in outside cone, type C (630 A) U_m 36 kV according to EN50181.

In the following drawing an example of external cone type C (630A) with sealing gasket is given:



Primary terminals of SVT models GSCT003/21-22-23-24-25 shall be air bushing terminals according to IEC 60137 (630 A) with U_m 36 kV or 24 kV (According to table of clause 7.3.2) with clamp adapters made of bi-metallic anticorrosion material and suitable for conductor of $16 \div 70 \text{ mm}^2$. The housing of air bushings shall be made of silicone without EPDM.

In the following drawing an example of air bushing (630A) with sealing gasket is given:



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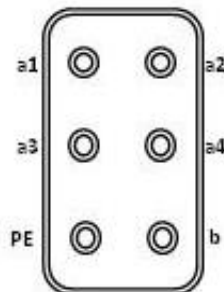
7.4.3. Secondary terminals of SVT

Terminals of the secondary circuit of SVT shall be made with a specific system connection (female and male parts are included in the supply), according to following technical data:

- Material: Aluminum die cast
- Surface: powder coated
- Type connection for female part: cage terminal
- Type external connection for male part: cage terminal
- Limiting temperatures: $-40^{\circ}\text{C} \div 125^{\circ}\text{C}$
- Degree of protection for coupled connector (according to IEC 60529) \geq IP65
- Number of contacts: 6 + PE
- Rated current \geq 16 A
- Rated voltage \geq 500 V
- Rated impulse voltage \geq 6 kV
- Pollution degree \geq 3
- Mating cycles \geq 500

The male part includes a cable gland for passage and locking of the low voltage cable included in the supply.

The position of SVT secondary terminals on the specific connection system shall be in compliance with the following drawing:



7.4.3.1. Details for secondary terminals

The different primary voltage rated values will be obtained by changing the connection on the secondary winding and the connections on the equivalent hating female part fixed on the SVT, according to the following criteria for each SVT Enel type:

GSCT003/11-21

- *PE = Protection Equipotential (for grounding the secondary terminal)*
- *b = Common secondary terminal (will be connected to PE in the male insert)*
- *a1 = Ratio 20 / 0,11 (kV/kV)*
- *a2 = Ratio 15 / 0,11 (kV/kV)*
- *a3 = Ratio 13,2 / 0,11 kV/kV)*
- *a4 = Ratio 10 / 0,11 kV/kV)*

GSCT003/12-22

- *PE = Protection Equipotential (for grounding the secondary terminal)*
- *b = Common secondary terminal (will be connected to PE in the male insert)*
- *a1 = Ratio 12 / 0,11 (kV/kV)*
- *a2 = Ratio 11 / 0,11 (kV/kV)*

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- $a3 = \text{Ratio } 10 / 0,11 \text{ (kV/kV)}$
- $a4 = \text{Not Used}$

GSCT003/13-23

- $PE = \text{Protection Equipotential (for grounding the secondary terminal)}$
- $b = \text{Common secondary terminal (will be connected to PE in the male insert)}$
- $a1 = \text{Ratio } 25 / 0,11 \text{ (kV/kV)}$
- $a2 = \text{Ratio } 23 / 0,11 \text{ (kV/kV)}$
- $a3 = \text{Not Used}$
- $a4 = \text{Not Used}$

GSCT003/14-24

- $PE = \text{Protection Equipotential (for grounding the secondary terminal)}$
- $b = \text{Common secondary terminal (will be connected to PE in the male insert)}$
- $a1 = \text{Ratio } 13,8 / 0,11 \text{ (kV/kV)}$
- $a2 = \text{Ratio } 13,2 / 0,11 \text{ (kV/kV)}$
- $a3 = \text{Ratio } 11,4 / 0,11 \text{ (kV/kV)}$
- $a4 = \text{Not Used}$

GSCT003/15-25

- $PE = \text{Protection Equipotential (for grounding the secondary terminal)}$
- $b = \text{Common secondary terminal (will be connected to PE in the male insert)}$
- $a1 = \text{Ratio } 34,5 / 0,11 \text{ (kV/kV)}$
- $a2 = \text{Ratio } 33 / 0,11 \text{ (kV/kV)}$
- $a3 = \text{Not Used}$
- $a4 = \text{Not Used}$

7.4.3.2. Cable for secondary terminals of SVT

Each type of SVT shall be provided with a cable connected to the male part of the harthing system connection, with blue conductor of the cable connected to "b" and "PE" pins (equipotential connection) and brown conductor of the cable in free position (it will be connected during the installation to the proper pin for the chosen ratio)

The cable shall be: $2 \times 2,5 \text{ mm}^2$, with flexible conductors (class 5), length 15 m, insulation level 0,6 - 1 kV, color of the outer sheath grey, color of the internal conductors: blue and brown, suitable for outdoor installation, according to following characteristics:

- Operating ambient temperature - $30^\circ\text{C} + 50^\circ\text{C}$
- Water resistant AD2
- Impact resistant AG2
- Sun radiation resistant AN2
- Fire retardant according to IEC 60332-1-1 and 2

7.4.4.Fuses

The SVT configuration types GSCT003/11-12-14-21-22-24 must be equipped with fuses on the primary circuit in compliance with IEC 60282-1, not accessible, embedded in the synthetic polyurethane resin, with the following characteristics:

- *Rated voltage: 24 kV*
- *Rated current: 2 A*
- *Rated breaking current: 16 kA*
- *Rated transient recovery voltage (rated TRV) $\geq 41 \text{ kV}$*

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The SVT configuration provided in GSCT003/13-15-23-25 must be equipped with fuses on the primary circuit conform to IEC 60282-1, not accessible, embedded in the synthetic polyurethane resin, with the following characteristics:

- *Rated voltage: 36 kV*
- *Rated current: 2 A*
- *Rated breaking current: 16 kA*
- *Rated transient recovery voltage (rated TRV) ≥ 61 kV*

7.4.5.Voltage Transformer

The VT, inside the SVT, must be placed and connected to the fuses and to the specific connection system for secondary terminals. The internal VT shall be in compliance with IEC 61869-1 and IEC 61869-3 standards.

7.4.6.High Voltage connections

Inside the SVT the primary terminals A and B of the VT (Voltage Transformer) shall be connected to fuses with copper or aluminum bars having minimum size 25 mm x 3 mm. The fuses shall be connected directly to the internal side of primary plug-in or air bushings. In this particular point of connection, the minimum distance between active part and metallic ground part (thickness of the solid insulation) must be 50 mm.

7.4.7.Low Voltage cabling

The secondary terminals (ref. point 7.4.3) inside the SVT shall be connected to the specific connection system, with silicon rubber isolated Cu conductors, having minimum section 2,5 mm².

7.4.8.Metal enclosure

The external enclosure of the SVT must be made with stainless steel AISI 316, with thickness not less than 20/10 mm to ensure safe handling and sealing in case internal fault.

Fasteners and other small exposed parts must be made of stainless steel.

7.4.9.Internal insulation

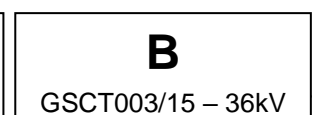
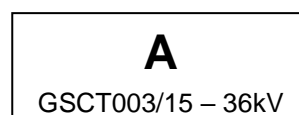
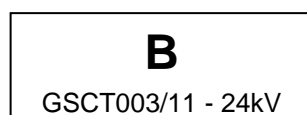
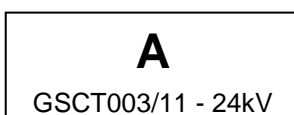
The SVT must be made of stainless steel with cover up fixed with sealing gasket rubber in order to achieve IP 65 protection degree after closing the cover up. The internal filling insulation of SVT shall be made with synthetic polyurethane resin, dielectrically homogeneous and with adequate elasticity degree; or with equivalent solution compatible with resin of VT (Voltage Transformer) and resin of the primary terminals (type C plug-in cones and air bushings) with a good adherence to internal metallic parts of SVT.

7.4.10. Rating plate

The nameplate shall be made in the language of the Country of destination, shall be located on the same side of the terminal strip side, must mention all the characteristics required by IEC 62271-200 including the year of construction and weight in kg. It must also report the wiring diagram with fuses, transformation ratio, degree of protection and all information required by IEC 61869-1 and IEC 61869-3, ratings of internal fuses, the compliance to IEC 60282-1 and the compliance to EN 50181 for external cones type C or to IEC 60137 for air bushing terminals.

7.4.11. Marking of primary terminals

Identify with name plates the SVT primary terminals according to IEC 61869-2 (Pole A and B), the Enel Global Type and insulation voltage level, in compliance with following examples:



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Application Areas

Perimeter: *Global*

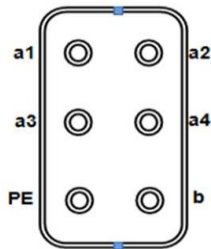
Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

7.4.12. Marking of secondary terminals

Reporting the details of secondary terminals with reference to point 7.4.3.1, near the harting connection of secondary terminals, in compliance with following example:



ENEL GLOBAL TYPE: GSCT003/11 - 24 kV

PE = Protection Equipotential (for grounding the secondary terminal)

b = Common secondary terminal (will be connected to PE in the male HARTING insert)

a1 = Ratio 20 / 0,11 (kV/kV)

a2 = Ratio 15 / 0, 11 (kV/kV)

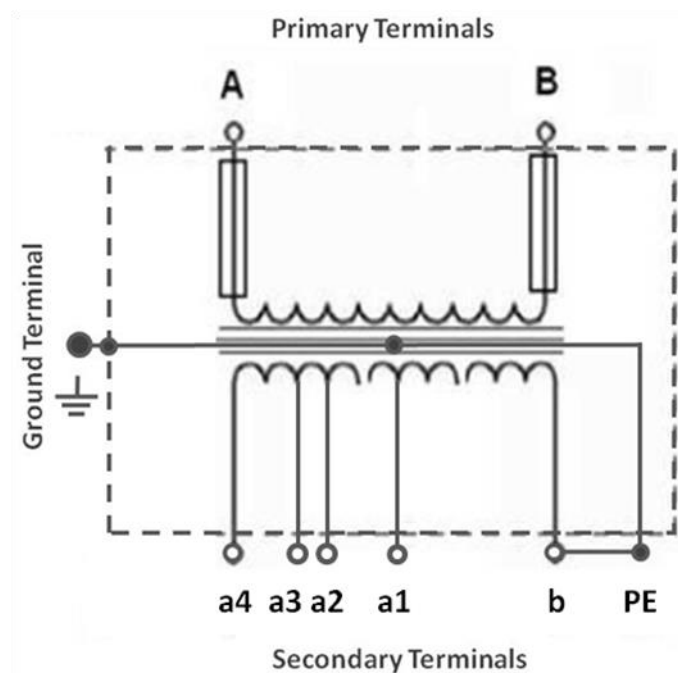
a3 = Ratio 13,2 / 0, 11 (kV/kV)

a4 = Ratio 10 / 0, 11 (kV/kV)

7.4.13. SVT electric scheme

The SVT shall be made according to following electrical schemes.

7.4.13.1. GSCT003/11-21 (U_m 24kV)



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Application Areas

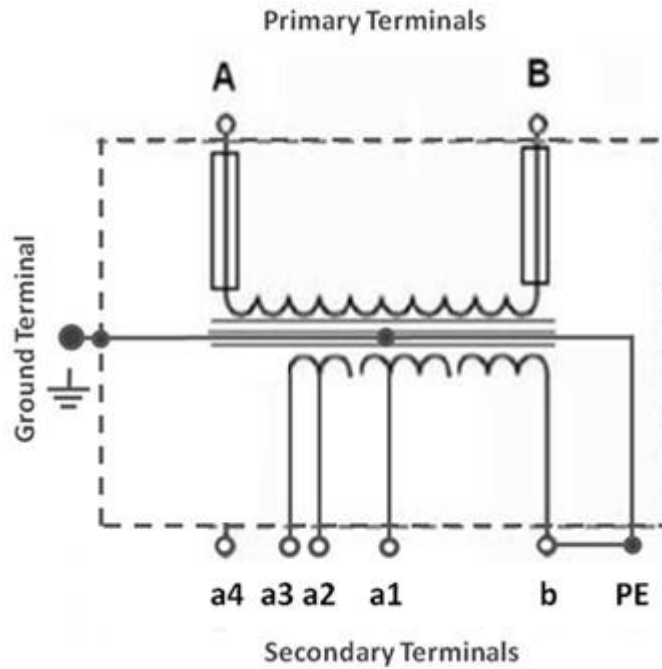
Perimeter: *Global*

Staff Function: -

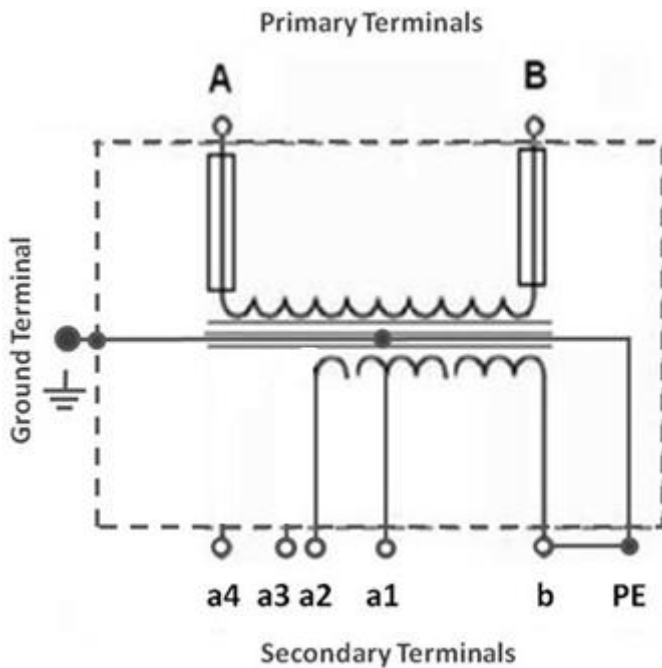
Service Function: -

Business Line: *Infrastructure & Networks*

7.4.13.2. **GSCT003/12-22 (U_m 17,5kV) and GSCT003/14-24 (U_m 17,5kV)**



7.4.13.3. **GSCT003/13-23 (U_m 36kV) and GSCT003/15-25 (U_m 36kV)**



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Application Areas

Perimeter: *Global*

Staff Function: -

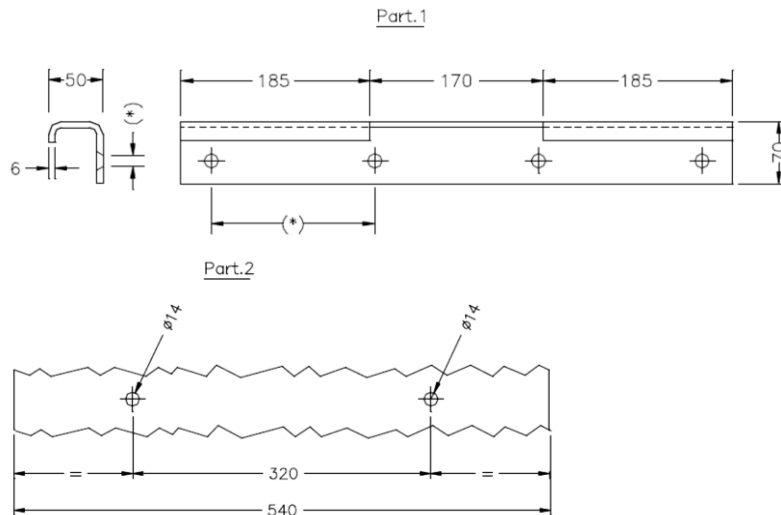
Service Function: -

Business Line: *Infrastructure & Networks*

7.4.14. Bracket

Each SVT shall be provided with bracket in accordance with GSCS006 for installation on the pole.

Moreover, each SVT shall be provided with support coupling interface in stainless steel in accordance to the following drawing (part. 1 and 2).



Note:

The number and size of the holes for fixing the equipment and their interaxes distance shall be stated by the Manufacturer in order to assure the stability of the structure with a weight which is the double of the normal weight of the equipment.

7.4.14.1. Chile

The SVT shall be provided with a support which has to comply with the technical specification DMAD-0184.

7.4.14.2. Italy

The bracket GSCS006 shall be fixed on the pole with the stainless steel tape according with DS3230/2 and braces DS3240/2 (ref. GSCS006).

7.4.14.3. Romania

The bracket GSCS006 shall be fixed on the pole with the stainless steel tape according with DS3230/2 and braces DS3240/2 (ref. GSCS006).

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Application AreasPerimeter: *Global*

Staff Function: -

Service Function: -

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7.4.15. Manual and packaging

Each SVT shall be equipped with the manual for installation and operation, in the language of the Country in which the SVT has to be delivered. It shall also include the procedures to be adopted for storage, transportation and dismantle.

Packing for transportation and storage (which does not take part in the homologation process) will be according to the documents referring of each Country.

The primary terminal bushings shall be opportunely protected to safeguard them from impacts that may damage them. These protections shall be realized so not to have a difficult assembling and in order to be removed for the installation.

Outside of the box containing the SVT, it shall be clearly written:

- Name of the Distribution Company;
- Name of the supplier;
- Description of the product;
- Code assigned by the supplier;
- Type code and serial number of the Distribution Company;
- Gross weight.

7.5 LIST OF TESTS**7.5.1.General**

On the SVT the tests described in the following paragraphs shall be performed and are divided in:

- Type tests
- Routine tests
- Special tests

During tests maintenance is not allowed.

7.5.2.Type test

Type tests according to IEC 61869-1 and IEC 61869-3 shall be applied to VT and SVT separately.

The first two listed type tests are according to IEC 62271-200 and shall apply to SVT only (Visual inspection, partial discharge test).

7.5.2.1. Verification of the compliance to this technical specification

The characteristics of the components, including ratings and design requirements, shall be in compliance with this technical specification. The visual inspection shall be performed to verify the absence of imperfections and defects.

7.5.2.2. Verification of the degree of protection (IP)

The control shall be made in accordance with IEC 60529 on the SVT as defined in this global standard.

7.5.2.3. Temperature rise test

The test shall be performed in accordance with IEC 61869-1 and IEC 61869-3 on the inside VT and SVT

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Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

7.5.2.4. Impulse voltage withstand test on primary terminals

The test shall be performed in accordance with IEC 61869-1 and IEC 61869-3 on the inside VT and SVT

7.5.2.5. Wet test for outdoor type transformers

The test shall be performed in accordance with IEC 61869-1 and IEC 61869-3 only on the SVT.

7.5.2.6. Test for accuracy

The test shall be performed in accordance with IEC 61869-1 and IEC 61869-3 on the inside VT and SVT

7.5.2.7. Short-circuit withstand capability test

The test shall be performed in accordance with IEC 61869-1 and IEC 61869-3 on the VT and SVT

7.5.2.8. Verification of local seismic requirements

The local seismic requirements shall be demonstrated with an appropriate calculation in accordance with the local requirements specified in 7.2.3 for complete SVT with bracket GSCS006

7.5.3. Routine tests

Routine tests according to IEC 61869-1 and IEC 61869-3 shall apply to VT and SVT separately.

7.5.3.1. Visual inspection

The visual inspection shall verify the compliance with this technical specification and the approved prototype and the absence of imperfections and defects.

7.5.3.2. Power-frequency voltage withstand tests on primary terminals

The test shall be performed in accordance with IEC 61869-1 and IEC 61869-3 on the VT and SVT.

7.5.3.3. Partial discharge measurement

The test shall be performed in accordance with IEC 61869-1 and IEC 61869-3 on the VT.

7.5.3.4. Partial discharge test

The test shall be performed in accordance with IEC 62271-200 on the SVT with the following indication:

- SVT partial discharge inception and extinction voltages shall be recorded;
- SVT partial discharge extinction voltage shall not be less than $1,1 U_m/\sqrt{3}$;
- SVT partial discharges intensity shall not be more than 100 pC at $1,05 U_m$.

7.5.3.5. Power-frequency voltage withstand tests on secondary terminals

The test shall be performed in accordance with IEC 61869-1 and IEC 61869-3 on the VT and SVT.

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Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

7.5.3.6. Test for accuracy

The test shall be performed in accordance with IEC 61869-1 and IEC 61869-3 on the VT and SVT.

7.5.3.7. Verification of markings

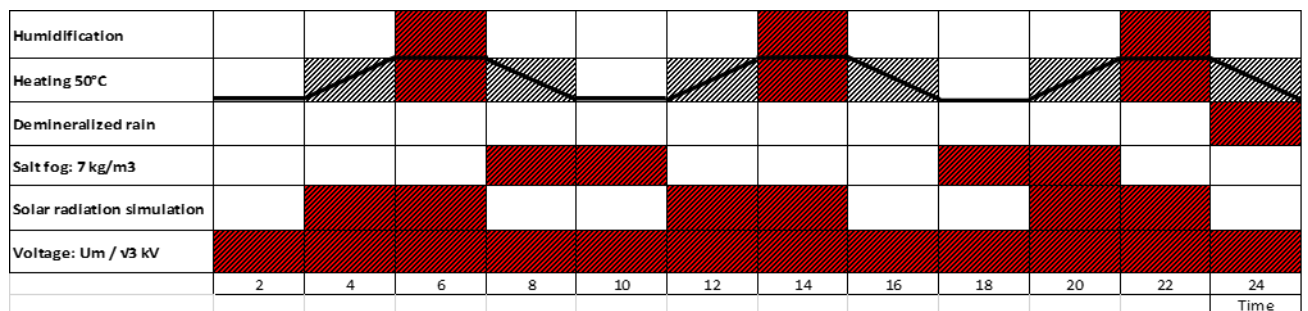
The test shall be performed in accordance with IEC 62271-200, IEC 61869-1 and IEC 61869-3 and present global standard on the SVT.

7.5.4.Special tests

7.5.4.1. Accelerated environmental - electric ageing test

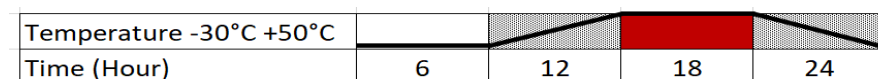
The test shall be conducted on SVT prototypes according to the standard IEC 61109 and the following indications:

A first prototype of SVT shall be arranged with the primary circuit energized for a period of 1000 h and with range of ambient air temperature $+20^{\circ}\text{C}$ $+50^{\circ}\text{C}$ according the following cycle diagram:



The test is successful if no discharge occurs during test and the SVT is able to withstand a power frequency voltage on primary terminals at a value of 80% of the rated power frequency voltage.

A second SVT prototype shall be arranged without energization, for a period of 500 h, at the range of ambient air temperature -30°C $+50^{\circ}\text{C}$ according to the following cycle diagram:



The test is successful if not evident external damages are visible and the SVT is able to withstand a power frequency voltage test on primary terminals at a value of 80% of the rated power frequency voltage.

Test according to the previous version of this Specification will be considered.

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Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

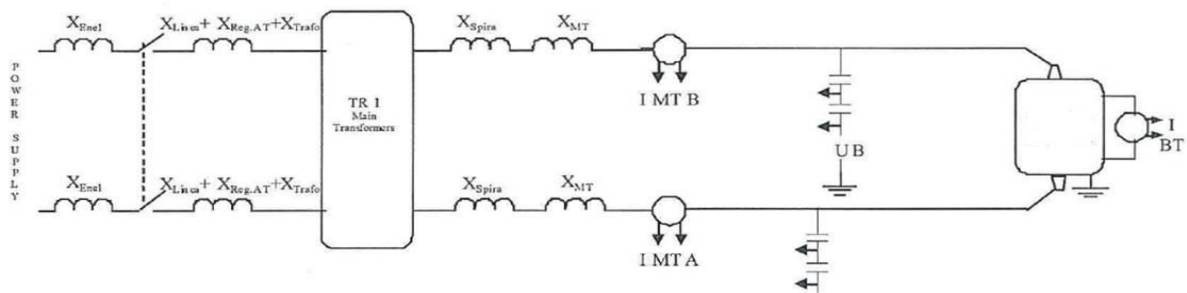
7.5.4.2. Internal fault test

The test is required specifically on SVT in accordance with this global standard and has to be performed in compliance with following prescription.

7.5.4.2.a) Method test for keeping the internal fault

- Prepare the SVT (U_m 17,5kV, U_m 24kV and U_m 36 kV) on a support compatible with the bracket
- The pin "a1" and the pin "b" of secondary terminals shall be short circuited with a conductor of proper section. The "b" pin and the "PE" pin shall be earthed;
- Set-up the power supply network for 16 kA for 1 sec;
- Set-up the power supply network to obtain a minimum TRV value of 30 kV (for U_m 17,5 kV), 41 kV (for U_m 24kV) and 61 kV (for U_m 36 kV);
- Wait until the occurrence of an internal fault or the fuses operation on the primary circuit;
- After the fuses operation, the power supply shall be maintained for 30 minutes.

7.5.4.2.b) Circuit test for keeping the internal fault



7.5.4.2.c) Circuit test to check the dielectric withstand after the positive result of the internal fault test

Having successfully passed the first test phase (ref. 7.5.4.2.a), in order to check the dielectric withstand of the primary terminals A and B alternately, the following power-frequency voltage will be applied:

- 30 kV x 1 minute for SVT with U_m 17,5 kV
- 40 kV x 1 minute for SVT with U_m 24 kV
- 56 kV x 1 minute for SVT with U_m 36 kV

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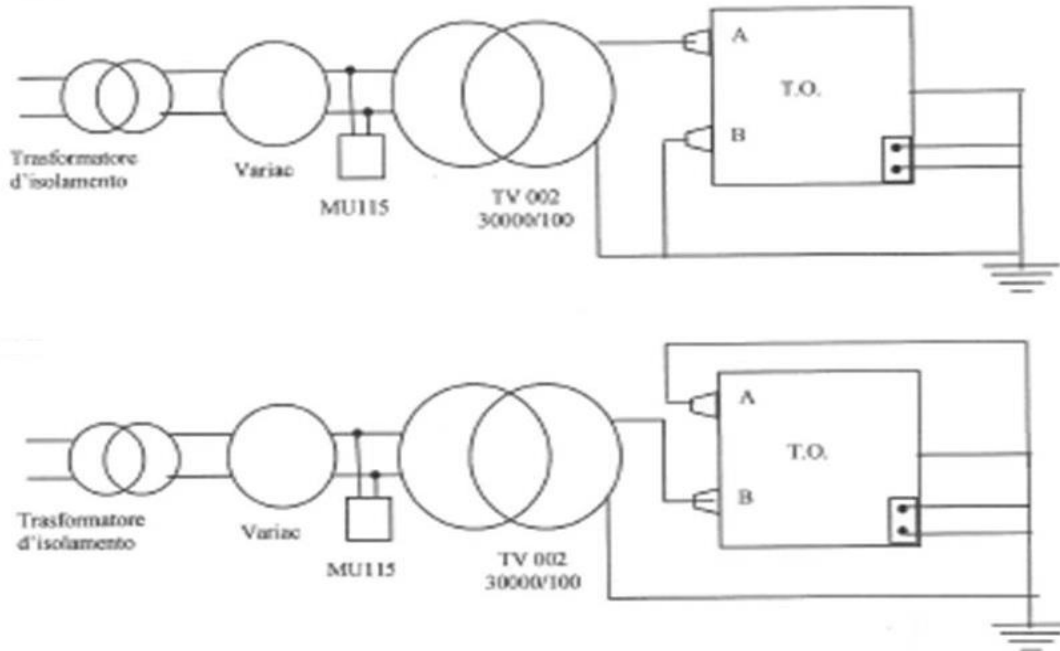
Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*



7.5.4.2.d) Conditions for positive result of the internal fault test

- SVT during internal fault has not to show deformations;
- SVT during internal fault has not to show external flame;
- SVT during internal fault has been selective with respect to the power supply protections;
- SVT after internal fault shall maintain the safety design conditions;
- SVT after internal fault has withstood the test of dielectric withstand according to p. 7.5.4.2.c

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Application Areas

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Staff Function: -

Service Function: -

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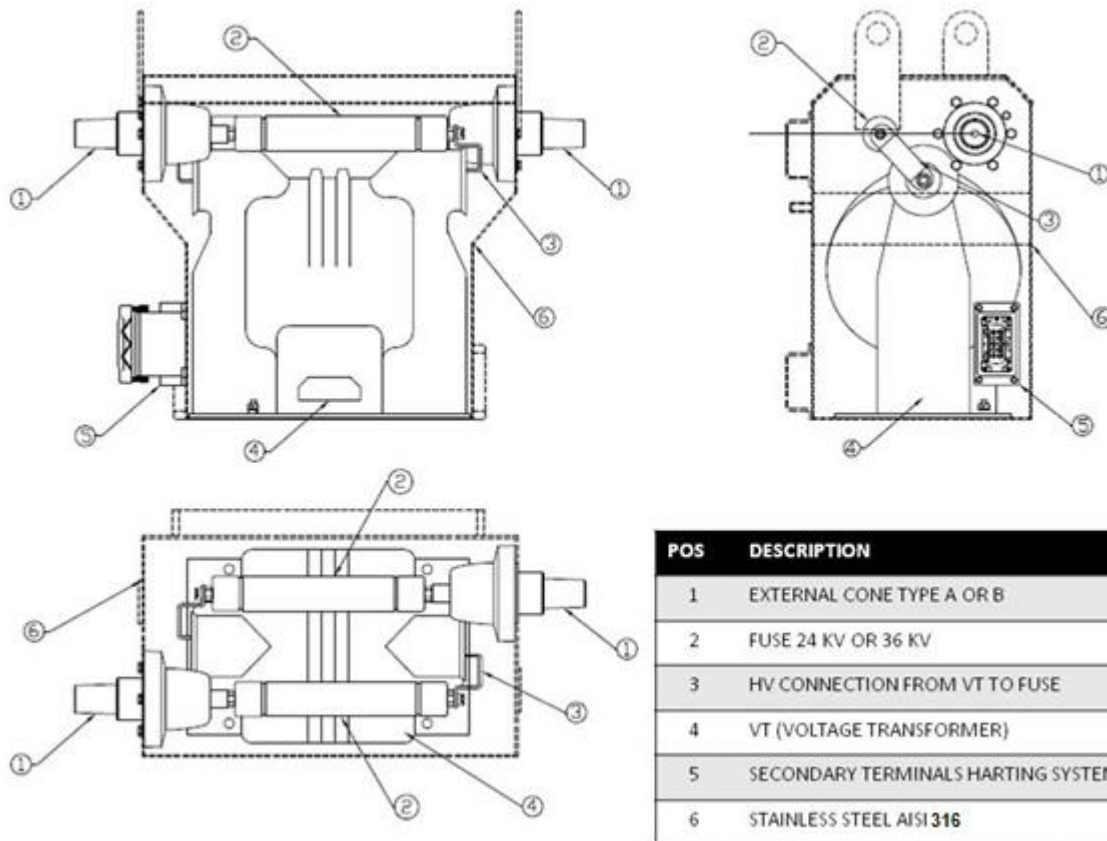
7.6 ADDITIONAL INFORMATION

The SVT must be manufactured in according to following additional information.

7.6.1.Connector system

The gland for LV cable on the male part of equivalent harting connector system shall be positioned in the bottom part with SVT in vertical position.

7.6.2.Example of SVT (Self-protected Voltage Transformer)



7.6.3.Earth connection of the SVT

The earth connection for the SVT shall be made with two bolts M12x30 in stainless steel AISI 316 positioned in proximity to the primary poles A and B complete with washers and nut.

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Application Areas

 Perimeter: *Global*

Staff Function: -

Service Function: -

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7.7 DOCUMENTATION

7.7.1. Documentation of individual components of the SVT for TCA process

- Test report of the internal VT according to IEC 61869-1 and 3
- Conformity declaration of the internal VT according to IEC 61869-1 and -3
- Drawings and data sheet of internal VT
- Test report of external cones type C or of air bushings (primary terminals of the SVT)
- Declaration of conformity of the primary terminals according to EN 50181 (If primary terminals are plug-in type)
- Declaration of conformity of the primary terminals according to IEC 60137 (If primary terminals are air bushing type)
- Drawings and data sheet of the external cones type C or of air bushings (primary terminals of the SVT)
- Test report of the fuses (U_m 24 kV and U_m 36 kV)
- Declaration of conformity of the HV fuses according to IEC 62281-1 (U_m 24 kV and U_m 36 kV)
- Drawings and data sheet of the HV fuses (U_m 24 kV and U_m 36 kV)
- Test report of the SVT filling solid insulation (synthetic polyurethane resin or equivalent solution)
- Data sheet of the SVT filling solid insulation (synthetic polyurethane resin or equivalent solution)
- Drawings and data sheet of the secondary terminals (Harting connection system 6 pin)
- Drawings and data sheet of the inox steel AISI 316 used for the SVT

7.7.2. Documentation of the complete SVT for TCA process

- Drawings of the SVT assembly with overall dimensions
- Drawing of the SVT assembly with the internal position of the fuses
- Executive Drawing with part list of the SVT assembly
- Declaration of conformity of the SVT according to IEC 61869-1 and -3 and IEC 62271-200

7.7.3. Documentation of the tests performed on the prototype of SVT for TCA process

- Report of type tests
- Report of special tests
- Report of acceptance tests

7.7.4. Documentation to be delivered with each SVT

- Manual for installation and operation (with drawings and dimensions)
- Declaration of conformity to GSCT003 and related IEC standard
- Acceptance Test report

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Application Areas

Perimeter: *Global*

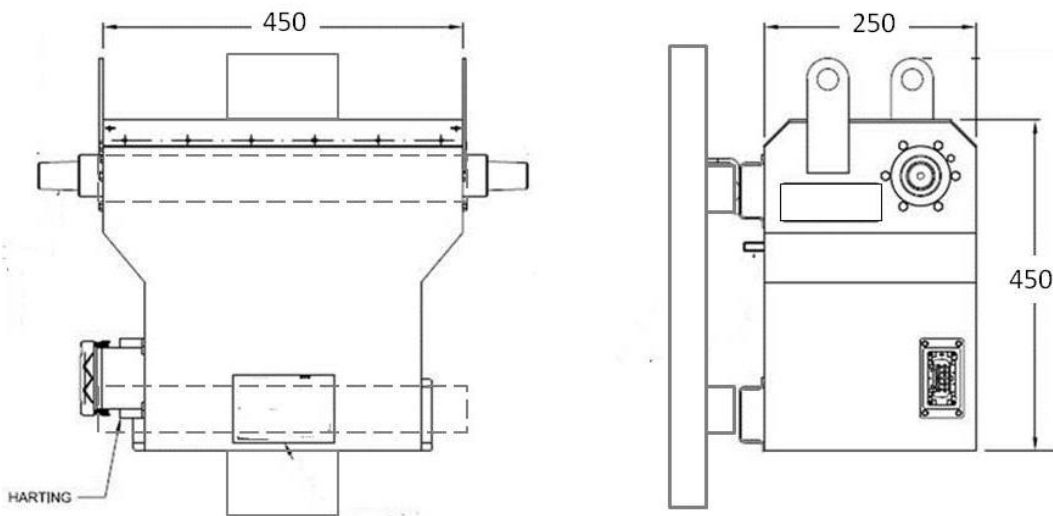
Staff Function: -

Service Function: -

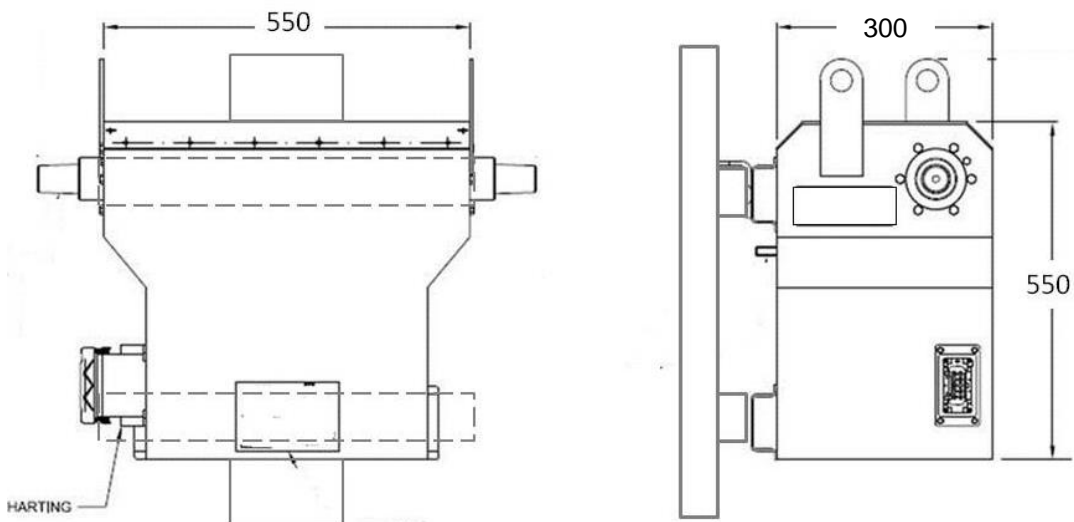
Business Line: *Infrastructure & Networks*

7.8 OVERALL DIMENSIONS AND LAYOUT

7.8.1.SELF-PROTECTED VOLTAGE TRANSFORMER 17,5 kV OR 24 kV (GSCT003/11-12-14)



7.8.2.SELF-PROTECTED VOLTAGE TRANSFORMER 36kV (GSCT003/13-15)



Subject: Global Infrastructure and Networks – GSCT003 Self-Protected Voltage Transformers up to U_m 36 kV

Application Areas

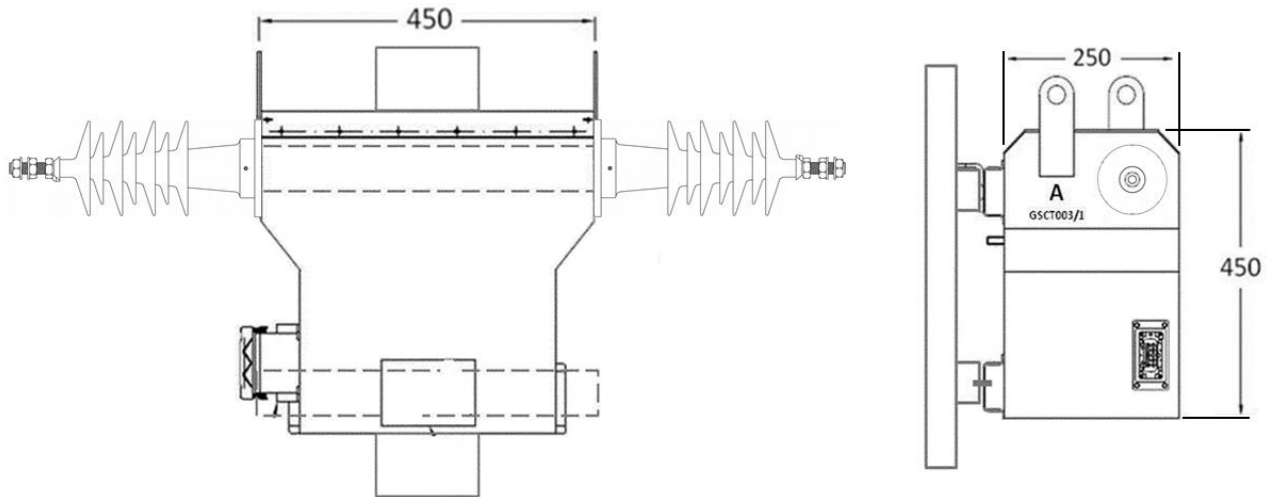
Perimeter: *Global*

Staff Function: -

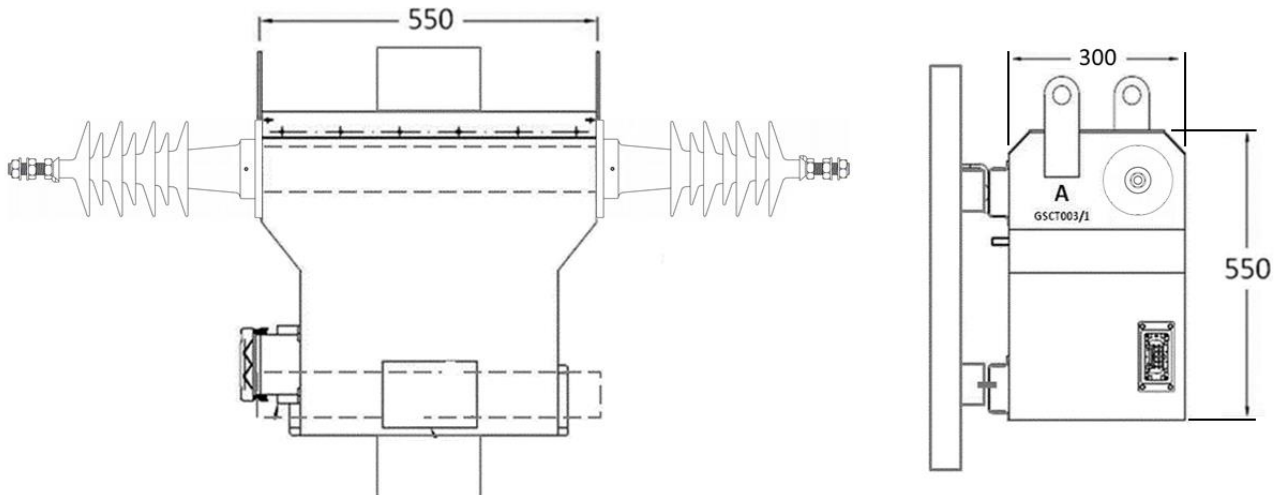
Service Function: -

Business Line: *Infrastructure & Networks*

7.8.3.SELF-PROTECTED VOLTAGE TRANSFORMER 17,5 kV OR 24 kV (GSCT003/21-22-24)



7.8.4.SELF-PROTECTED VOLTAGE TRANSFORMER 36 kV (GSCT003/23-25)





Technical Specification code: MAT-E&C-NC-2021-0045-EGIN

Version no. 3 dated 05/07/2021

Subject: Global Infrastructure and Networks – GSCT003 Self-Protected Voltage Transformers up to U_m 36 kV

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

8 ANNEXES

8.1 Check list for tender

Example of check list to be used for tender

Subject: Global Infrastructure and Networks – GSCT003 Self-Protected Voltage Transformers up to U_m 36 kV

Application Areas

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Infrastructure & Networks*

Global Standard:		To be filled by the Supplier
GSCT003		
Enel Type:	CSCT003/11	Supplier code:
Enel Code:	.....	.....
Enel Company:	Enel	Supplier Name:
Country:	Italy	.....
Description	Required value	Offered value:
Rated transformation ratio (kV/kV)	20-15-13,2-10/0,11	.....
Insulation level (kV)	24/50/125	.....
Rated Frequency (Hz)	50 and 60	.....
Rated power / Class / Thermal power	300 VA / 3 / 600 VA	.....
Voltage Factor	1,2 Continuous	.....
Type of installation	Outdoor according to IEC 61869-1/3	.....
Degree of protection (IEC 60529)	IP 65	.....
Type of internal filling insulation	Synthetic polyurethane resin or equivalent solid insulation (With elongation at break according to ISO/R527 between 40-50%)	.....
Insulating Thermal class of the internal filling insulation	B	.....
Primary Terminals	Plug-in outside cone type according to EN 50181 - Type C - 630 A – 36 kV	.....
Maximum overall dimensions (mm), without primary terminals	450 L x 250 W x 450 H	.....
Maximum Weight (kg)	90	.....
Rated current and U_m of fuses (IEC 60282-1)	2A (24 kV)	
Altitude (m)	1000 (up to 2700 for specific application)	.....
Ambient air temperature	-30 +50 °C	.....
Relative humidity	98%	.....
Pollution level (IEC TS 60815)	Very High (IV)	.....
Metal enclosure steel type	AISI 316	.....
Documentation		
Drawing with overall dimensions including brackets of GSCT003 and support for pole detailed in GSCS006 (part of supply)	to be attached	.....
Drawing of rating plate, electrical scheme and secondary terminal box	to be attached	.....
List and ratings of the main components used to manufacture GST003 (fuses, medium voltage plug-in or air bushings, low voltage connection system, ecc) and main characteristics of the filling resin used	to be attached	.....
List of deviations to technical specifications	No / List attached	.....