

VOLTAGE TRANSFORMERS

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PURPOSE AND SCOPE

This document describes the technical requirements for User's equipment directly connected to the England and Wales Transmission system and located within NGET's busbar protection zone operating at nominal voltages of 400 kV, 275 kV, 132 kV and 66 kV unless otherwise agreed with the user as defined in the Bilateral agreement. The principles of this document applies to equipment connected at other voltages".

PART 1 – PROCEDURAL

1 GENERAL REQUIREMENTS

Voltage transformers shall comply with National Grid Technical Specifications TS 1 (RES), TS 2.02 (RES) and BS EN 61869-1.

Both ends of the secondary winding shall be brought out to permit connection to links or fuses external to the voltage transformer.

Terminals intending to be earthed shall also be provided with links in the secondary terminal box for this purpose.

All secondary terminals and links shall be suitable for their required purpose regarding rating, reliability and environmental conditions.

1.1 Additional Requirements for Capacitor Voltage Transformers

Capacitor voltage transformers shall comply with BS EN 61869-5.

1.2 Additional Requirements for Inductive Voltage Transformers

Inductive voltage transformers shall comply with BS EN 61869-3.

Resin impregnated post-type voltage transformers shall be provided with an effective and supervised means of protecting the primary winding.

2 PERFORMANCE REQUIREMENTS

All voltage transformers shall comply with the performance requirements for the primary ratings detailed in TS 1 (RES) and TS 2.02 (RES). The following requirements shall also apply as appropriate.

2.1 Additional Requirements for Voltage Transformers for Protection and General Use

Voltage transformers for protection and general use forming part of an NGET protection scheme shall meet the requirements of Table 1.

Maximum Primary	Accuracy Class	Rated Burden (VA)	Rated Voltage Factor pu	Transformation Ratio (kV/V)
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Voltage (kV)				
420	0.5/3P	50	1.5, 30 secs	$396/\sqrt{3} : 110/\sqrt{3}$
300	0.5/3P	50	1.5, 30 secs	$275/\sqrt{3} : 110/\sqrt{3}$
145	0.5/3P	50	1.5, 30 secs	$132/\sqrt{3} : 110/\sqrt{3}$
72.5	0.5/3P	50	1.9, 30 secs	$66/\sqrt{3} : 110/\sqrt{3}$
36	0.5/3P	50	1.9, 30 secs	$33/\sqrt{3} : 110/\sqrt{3}$
Less than 36	Applications at NGC primary system below 36 kV are site specific			

Table 1 – Performance requirements for Voltage Transformers for Protection and General Use

3 TYPE TEST REQUIREMENTS

Radio interference voltage tests to BS EN 62271-1 are to be performed on open terminal voltage transformers.

All oil filled voltage transformers rated at 72.5kV and above, shall be subject to a 600 chopped negative polarity impulse test at 60% of the rated BIL level for that equipment. The time to chop shall be between 2 to 5 μ s. A full set of routine electrical tests shall be performed before and after the test. Oil samples for dissolved gas analysis shall be taken both before and 3 days after this test (including oil samples from the capacitors of capacitor voltage transformers).

The supplier shall submit to the user details of how the test will be conducted.

The three criteria that must all be satisfied for the voltage transformer to pass the test are:

- a) The results of the electrical tests, performed before and after the chopped impulse test, are the same within the error specification of the test field.
- b) No evidence of degradation is found when the voltage transformer is dismantled and examined after the test
- c) Any increases in the dissolved gas analysis levels are within the limits listed in Table 3.

Dissolved gas	Allowable increase after 3 days (ppm)
Hydrogen (H2)	5
Methane (CH4)	3
Ethane (C2H6)	3
Ethylene (C2H4)	2
Acetylene (C2H2)	No detectable increase

Table 3 – Allowable Change in Dissolved Gas Concentrations for Multichopped Impulse Test

For all oil filled voltage transformers, oil samples for dissolved gas analysis shall be taken before and after the dielectric type tests. This requirement does not apply to capacitor units of capacitor voltage transformers.

Routine tests shall be performed before and after the complete sequence of type tests.

For voltage transformers using a gas insulation system, a leakage test on the gas system shall be performed by the supplier to demonstrate compliance with TS 2.02 (RES).

3.1 Additional Type Tests for Capacitor Voltage Transformers

Capacitor voltage transformers shall be tested in accordance with the type and special test requirements of BS EN 61869-5 and BS EN 60358.

3.2 Additional Type Tests for Inductive Voltage Transformers

Inductive voltage transformers shall be tested in accordance with the type and special test requirements of BS EN 61869-3.

4 ROUTINE TEST REQUIREMENTS

Accuracy tests shall be performed in a laboratory having traceability to National/International standards.

4.1 Additional Requirements for Capacitive Voltage Transformers

All Capacitive Voltage Transformers shall be subject to routine tests in accordance with BS EN 61869-5.

4.2 Additional Requirements for Inductive Voltage Transformers

All Inductive Voltage Transformers shall be subject to routine tests in accordance with BS EN 61869-3.

For inductive voltage transformers, dissolved gas analysis will be performed on an oil sample taken at least 24 hours after the electrical tests have been performed.

5 FORMS AND RECORDS

None.

PART 2 - DEFINITIONS AND DOCUMENT HISTORY

6 DEFINITIONS

The definitions used in TS 1(RES) and TS 2.02 (RES) apply.

7 AMENDMENTS RECORD

Issue	Date	Summary of Changes / Reasons	Author(s)	Approved By (Inc. Job Title)
1	September 2016	New document	Martin Carpenter	GCRP

7.1 Procedure Review Date

5 years from publication date.

PART 3 – GUIDANCE NOTES AND APPENDICES**8 REFERENCES****8.1 International, European and British National Documentation**

This document makes reference to or should be read in conjunction with the documents listed below. Where a Standard has been harmonised into a Euronorm, only this latter reference is given. The issue and date of the documents detailed below shall be that applicable at the time of issue of this specification unless a specific issue date is given.

BS EN 61869-1	Instrument Transformers – Part 1 : General requirements
BS EN 61869-3	Instrument Transformers – Part 3 : Additional requirements for inductive voltage transformers
BS EN 61869-5	Instrument Transformers – Part 5 : Additional requirements for capacitor voltage transformers
BS EN 60358	Coupling Capacitors and Capacitor Dividers
BS EN 60567	Oil-filled electrical equipment – Sampling of gases and of oil for analysis of free and dissolved gases - Guidance
BS EN 62271-1	High-voltage switchgear and controlgear – Part 1: Common specifications

8.2 National Grid TS (RES) Documents

The following TS documentation is relevant to voltage transformers and should be read in conjunction with this document.

TS 1(RES)	Ratings and General Requirements for Plant, Equipment, Apparatus and Services for use on and Direct Connections to the National Grid Transmission System
TS 2.02 (RES)	Switchgear for use on, and at Connection Points to, the National Grid System

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