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ADDENDUM

Date Addendum Issued:	30/10/2014
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	Originated by	Approved by
Name	Martin Carpenter	Jon Fenn
Job Title	Policy Development Engineer	
Department	Asset Policy	
Date	17 th October 2014	

ORIGINAL DOCUMENT DETAILS

DOCUMENT TITLE	Voltage Transformers
DOCUMENT NUMBER	TS 3.02.05
ISSUE NUMBER	5
ISSUE DATE	May 2010

ADDENDUM DETAILS

The above document shall be read in conjunction with the following amendments:

Check appropriate boxes below

Addition	X	Replacement		Deletion	
1.5 Additional Requirements for Capacitor Voltage Transformers An attachment point for earthing intermediate flanges, for example where the capacitor stack is constructed of multiple insulator sections, shall be provided. When the earth is applied it shall be visible.					

ADDENDUM

Date Addendum Issued:	27/03/2014
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	Originated by	Approved by
Name	Martin Carpenter	Jon Fenn
Job Title	Policy Development Engineer	Network Engineering Manager
Department	Asset Policy	Network Engineering
Date	17 th March 2014	27 th March 2014

ORIGINAL DOCUMENT DETAILS

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DOCUMENT NUMBER	TS 3.02.05
ISSUE NUMBER	5
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ADDENDUM DETAILS

The above document shall be read in conjunction with the following amendments:

Check appropriate boxes below

Addition		Replacement	X	Deletion	
2.4 Additional Requirements for Voltage Transformers for Discharge Duty					
Inductive Voltage Transformers required to perform discharge duties for capacitor bank (SVC/MSC) applications shall be capable of meeting the discharge performance requirements specified in TS 2.21 and TS 2.26.					
Where Inductive Voltage Transformers are required to perform circuit discharge duties for overhead line feeder and cable circuit applications, the duty shall be 3 discharges with an interval of 1 second and second interval of 5 minutes. This is then followed by a 12 hour recovery period.					
<i>Informative: The 3 discharge application is based on a protection operation followed by auto-reclose and a subsequent manual energisation.</i>					
Unless specifically amended in the contract, discharge voltages for capacitor bank (SVC/MSC) applications are specified in TS 2.21 and TS 2.26. For overhead line feeder and cable applications the specified discharge voltage shall be $(1.3 \times \sqrt{2} \times U_m / \sqrt{3})$.					
Inductive Voltage Transformers for overhead line feeder circuit applications shall be capable of discharging a minimum capacitance of $5\mu\text{F}$ unless otherwise specified. Minimum capacitance discharge levels for cable circuits shall be specified in the contract.					
The supplier shall provide the following information:					
- Primary winding leakage inductance - Primary winding resistance - Core saturation curve and losses i.e. hysteresis curve - Number of primary turns					

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VOLTAGE TRANSFORMERS

PURPOSE AND SCOPE

This document provides a functional and performance specification for voltage transformers for use on the National Grid UK Electricity Transmission System.

This specification is applicable only to direct connections to National Grid System at 400/275/132kV substations.

PART 1 – PROCEDURAL

1 GENERAL REQUIREMENTS

Voltage transformers shall comply with National Grid Technical Specifications TS 1, TS 2.1, and TS 2.2.

Voltage transformers shall be of the single-phase type except for voltage transformers using a gas insulation system which may be of a three phase design.

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.

A single terminal box shall be mounted on each voltage transformer to accommodate appropriate alarm equipment and secondary terminal connections.

All secondary terminals and links shall be suitable for their required purpose regarding rating, reliability and environmental conditions. Details of the terminals used shall be included with the type registration pack.

Oil filled voltage transformers shall be fitted with a means to allow samples of oil to be removed for the purposes of dissolved gas analysis (DGA). Valves where the oil is extracted using a hypodermic needle are not acceptable.

Informative: Oil sampling points are not required for the capacitor units of capacitor voltage transformers.

The supplier shall provide details of the equivalent circuit, covering the performance of the voltage transformer up to 10 kHz.

1.1 Additional Requirements for Voltage Transformers for Protection and General Use

Voltage transformers for protection and general purposes shall have one secondary winding.

1.2 Additional Requirements for Voltage Transformers for Settlement Metering Use

Voltage transformers for settlement metering shall have two secondary windings.

Facilities shall be provided to enable the terminal box, where the voltage transformer secondary terminals are situated, to be locked and for the application of a wire security seal.

1.3 Additional Requirements for Voltage Transformers for Quality of Supply Measurement

Voltage Transformers for Quality of Supply measurement shall be of the Capacitor Voltage (CVT) type.

The CVT shall be equipped with current transformers in the earth connections of the low voltage capacitor unit (C2) and the electromagnetic unit (EMU), See connections drawing Appendix A.

The High Current CT (HCCT) and the Low Current CT (LCCT) secondary connections shall be brought out to a suitable termination point in the CVT main terminal box and marked HCCT and LCCT. The leads shall be clearly marked to show the direction of the current flow. The current shall enter the primary winding of the HCCT from the low voltage capacitor end and exit HCCT to the earth point. The current shall enter the LCCT primary winding from the earth end of the EMU and exit LCCT to the earth point. The secondary of both the HCCT and the LCCT are so marked to designate the aforementioned directions as positive.

The secondary wiring of the HCCT and the LCCT shall be connected via a cable to a separate termination box which houses the Signal Conditioning Module (SCM). The termination box shall be attached to the CVT structure as shown in Appendix B. The minimum dimensions of the SCM termination box are shown in Appendix C.

Depending on the particular site application, voltage transformers for Quality of Supply Measurement shall be supplied in either of two options:

- a) With the HCCT and the LCCT installed together with the associated connecting cable and termination box. For the purposes of the specification this type of voltage transformer is termed a PQ Ready CVT.
- b) As a) but including the Signal Conditioning Module. This type of voltage transformer is termed a PQ CVT.

The particular option of voltage transformer to be supplied shall be specified in the contract.

1.4 Additional Requirements For Voltage Transformers For Mechanically Switched Capacitor Bank Use

Voltage Transformers required to perform discharge duties for mechanically switched capacitor bank applications shall be of the Inductive Voltage type.

1.5 Additional Requirements for Capacitor Voltage Transformers

Capacitor voltage transformers shall comply with EN 60044-5.

Capacitor voltage transformers rated at 300 kV and 420 kV shall allow the use of power line carrier in accordance with TS 3.6.10.

1.6 Additional Requirements for Inductive Voltage Transformers

Inductive voltage transformers shall comply with EN 60044-2.

An insulation test terminal (test tap) shall be provided for oil-filled inductive voltage transformers for the purpose of performing capacitance and dielectric loss angle ($\tan \delta$) measurements during routine maintenance. The purpose of this terminal and its connection shall be clearly identified in the terminal box. A link shall be provided to earth this terminal in the secondary terminal box.

For oil-filled inductive voltage transformers, means shall be provided to give a permanent visual indication of the volume of the oil present. The status of the indicator should be visible from the ground level.