



SCT15 – TRANSFORMERS (APPLICABLE ALSO TO REACTORS AND QUADRATURE BOOSTERS)

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Station		Circuit:	
Manufacturer's Contract No		Contractor's Signature:	
National Contract No:		Accepted by Engineer:	
Contractor:		Date:	

PURPOSE AND SCOPE

This document contains the site commissioning checks and tests to be performed on the installation of Transformers, Reactors and Quadrature Boosters in National Grid (NG) substations.

PART 1 – STAGE 1 COMMISSIONING

1 GENERAL DATA (TRANSFORMER)

1.1 Transformer

Manufacturers Serial No:						
NGC Serial No: (T Number)						
			HV	LV1	LV2	Tertiary
Rated Power	OFAF	MVA				
Rated Power	ONAN	MVA				
Rated Voltage		kV				
Rated Current on Principle Tap		Amp				
Vector Group						

Impedance in % on Rated MVA, on principle tap	HV/LV (or HV/LV(1))	
	HV/Tertiary (or HV/LV(2))	
	LV/Tertiary (or LV(1)/LV(2))	

Tapping Range	+%		Tap No	
	-%		Tap No	
Tapping expressed as variation of HV or LV Voltage				
Number of positions				

1.2 Bushings

		HV	LV	Tertiary	Neutral
Manufacturer					
Type					
Serial Number	AØ				
	BØ				
	CØ				

1.3 Tap Changer

Manufacturer	
Type	
Serial Number(s)	

2 GENERAL INSPECTION

	HV	LV
Coordinating gap electrodes positioned and aligned correctly (where surge arresters not installed)		
Setting of coordinating gap (if fitted)		
Setting of bushing arcing horn gap (below 132kv)		
All bushing and oil filled chambers oil levels correct		
Air release plugs vented		
Pressure relief diaphragm intact		
Earthing connections satisfactory		
All protective covers and shields fitted		
All insulators undamaged and clean		
Complete transformer oil tight		
Painting visually satisfactory		
All rating, diagram, identification, valve location, vacuum capability, plates etc, fitted and satisfactory		
Tightness of all fastenings		
Dehydrating breathers satisfactory and pipework joints tight		
Refrigeration type		
Silica get type (Silica gel blue and oil free)		
All cabling and wiring visually satisfactory		
Kiosk and cubicle heaters operating satisfactorily		
Interposing current transformers fitted and wired correctly		
All compartments clean and tidy		
All valves in correct operational position		
All blanking plates satisfactory and correctly stored		
Spring operated pressure relief devices and associated ducting satisfactory		
Dissolved gas monitor (or provision for future fitting of same) satisfactory		
Anti vibration pads satisfactory and evenly compressed		

3 CALIBRATED TEST EQUIPMENT

Record of Calibrated Test Equipment used during Commissioning

	Manufacturer and Type	Serial Number	Date Last Calibrated	Date Next Calibration Due
Insulation Resistance Tester				
Multimeter				
Others (state function)				

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4 EQUIPMENT CHECKS

4.1 Primary Insulation Resistance Tests

4.1.1 Magnetic Circuit (at 2500 v D.C.. for 1 minute)

Core to Frame	MΩ
Core to Tank	MΩ
Frame to Tank	MΩ
Temperature of oil	°C

4.1.2 Windings (at 1000 v D.C. for 1 minute) with all other windings. Core, frame and tank connected together and earthed

HV winding	MΩ
LV(1) winding	MΩ
Tertiary winding (or LV(2) if fitted)	MΩ
Temperature of oil	°C

4.2 Ratio and HV Magnetising Current Tests

With a three phase, four wire low voltage (typically 415 volt) supply connected to HV terminals and star point, with normal earth connection from star point disconnected:

Check ratio on all taps	
Measure HV magnetising current on all taps	
Check voltage continually during tap changing through complete range in both directions.	

Tap No:	HV Volts			HV Mag Current (Ma)			LV(1) Volts			Tertiary or LV(2) Volts		
	A-N A-B	B-N B-C	C-N C-A	A	B	C	a-N a-b	b-N b-c	c-N c-a			
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												

Tap No:	HV Volts			HV Mag Current (Ma)			LV(1) Volts			Tertiary or LV(2) Volts		
	A-N A-B	B-N B-C	C-N C-A	A	B	C	a-N a-b	b-N b-c	c-N c-a			
12												
13												
14												
15												
16												
17												
18												
19												

4.3 Vector Group Check

Connect one HV terminal to one LV terminal, normally HV A phase to LV (or Tertiary) a phase.
Connect three phase low voltage (typically 415 volt) supply to HV terminals. With transformer on nominal tap measure the following voltages, as necessary.

HV-LV(1)							
A-a		A-b		A-c		A-B	
B-a		B-b		B-c		B-C	
C-a		C-b		C-c		C-A	

HV-LV(2) or Tertiary							
A-a		A-b		A-c		A-B	
B-a		B-b		B-c		B-C	
C-a		C-b		C-c		C-A	

Vector Symbol as determined from Test	
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Sketch of Connections giving terminal numbering

Checking Vector Groups according to BS 171 (Part 3.3)

BS 171 Vector Group	Vector Diagram		Combination of HV and LV Sides for Comparison	Connection for Measuring of Vector Position
	HV	LV		
D d 0 Y y 0 D z 0				Connect A to a Energise on terminals ABC with three-phase voltage. Measure between Bb, Cc, AB, Bc. <i>Voltage relationships</i> 1 Bb = Cc 2 Bb < AB 3 Bb < Bc
D d 6 Y y 6 D z 6				Connect A to a Energise on terminals ABC with three-phase voltage. Measure between Bb, Cc, AB, Bc. <i>Voltage relationship</i> 1 Bb = Cc 2 Bb > AB 3 Bb > Bc
D y 1 Y d 1 Y z 1 Z y 1				Connect A to a Energise on terminals ABC with three-phase voltage. Measure between Bb, Cc, AB, Bc. <i>Voltage relationship</i> 1 Bb = Cc 2 Bb < AB 3 Bb < Bc
D y 11 Y d 11 Y z 11 Z y 11				Connect A to a Energise on terminals ABC with three-phase voltage. Measure between Bb, Cc, AB, Cb <i>Voltage relationship</i> 1 Bb = Cc 2 Bb < AB 3 Cc < Cb

Motor					
Item	Rated Current (Amps)	Start Current (Amps)	Run Current (Amps)	Correct Rotation?	Insulation Resistance MΩ
Tapchanger					
Pump A					
Pump B					
Fan					
Fan					
Fan					
Fan					
Fan					
Fan					
Fan					
Fan					
Fan					
Fan					
Fan					
Fan					
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Fan					
Fan					
Fan					

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4.6 Gas and Oil Operated Relay

		Main Tank	Selector (or Selector A)	Selector B	Selector C
Manufacturer					
Type					
Serial No:					
Inclination (degrees)	Longitudinal (3-7°)				
	Lateral (0-0.5°)				
Quantity of air to operate alarm contacts	Make (cc)				
	Break (cc)				
Approx min air pressure to operate surge contacts (psi).					
Check surge and gas contacts stable when starting coolers, auto and manual with oil cold when pipework vibrates etc.					
Check surge and gas contacts stable for an immediate restoration of cooler supply following a loss of supply during normal cooler operation.					
Oil Temperature					

4.7 Automatic Breather

Refrigeration Type

Refrigeration Breather Serial No	
Check breather is working satisfactorily	
Check alarm activates and is correctly annunciated	
Freeze current (Amps)	
Defrost current (Amps)	
Counter reading at switch on	
Counter reading after 24 hours	
Counter reading after 7 days	

Self-Regenerating Desiccant Type

Regenerating Breather Serial No	
Check breather is working satisfactorily	
Check alarm activates and is correctly annunciated	

NOTE:

Fill in relevant table to match breather type installed.

Where additional/multiple breathers are installed, use additional copies of this sheet to record details for each unit fitted, recording the breather location as appropriate (Selector, Conservator 1, 2 etc).