REF: 11126-3
ISSUE: 1

TECHNICAL REPORT ON

CURRENT TRANSFORMER TESTS AT GASCOIGNE WOOD SUB STATION

OSGODBY CIRCUIT

By

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JOB INFORMATION

REPORT REFERENCE	11126-3 ISSUE 1
CUSTOMER	NORTHERN POWERGRID
SITE	GASCOINGNE WOOD
JOB DESCRIPTION	CURRENT TRANSFORMER TEST
TEST ENGINEERS	CHRIS CAPEL, STEFAN DRAGOSTINOV
TEST DATE	28TH NOVEMBER 2017
REPORT PREPARED BY	CHRIS CAPEL
DATE	13TH DECEMBER 2017
REPORT AUTHORISED BY	STEFAN DRAGOSTINOV
DATE	18TH DECEMBER 2017

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INTRODUCTION

The following report documents the tests performed on two measurement CT's associated with the Osgodby circuit at the Gascoigne Wood Sub-Station. The purpose of the testing was to assess the units for suitability for metering purposes and determine the accuracy.

The CT's were tested using the CT analyser and tested within the switchgear Figure 2 shows the test circuit.

The following tests were performed to assess the condition of the CT's in accordance with IEC 60044-1

- Class
- Resistance
- Ratio
- Excitation

Calibration data for the test equipment used is listed in Table 1.

Figure 1. CT Rating Plate.

CONCLUSIONS

The results obtained confirm that the metering CT's connected to the Osgodby circuit meet specification for metering class of current transformer in accordance with IEC 60044-1.

RESULTS

Results from the tests carried out are given in the following section. No further action is required for both CT's tested.

TEST RESULTS AND FIGURES

TEST EQUIPMENT			
Test conducted	Equipment used	Serial no	Calibration due
CT Analyser	Omicron CT Analyser	LF643J	28th Feb 2018

Table 1

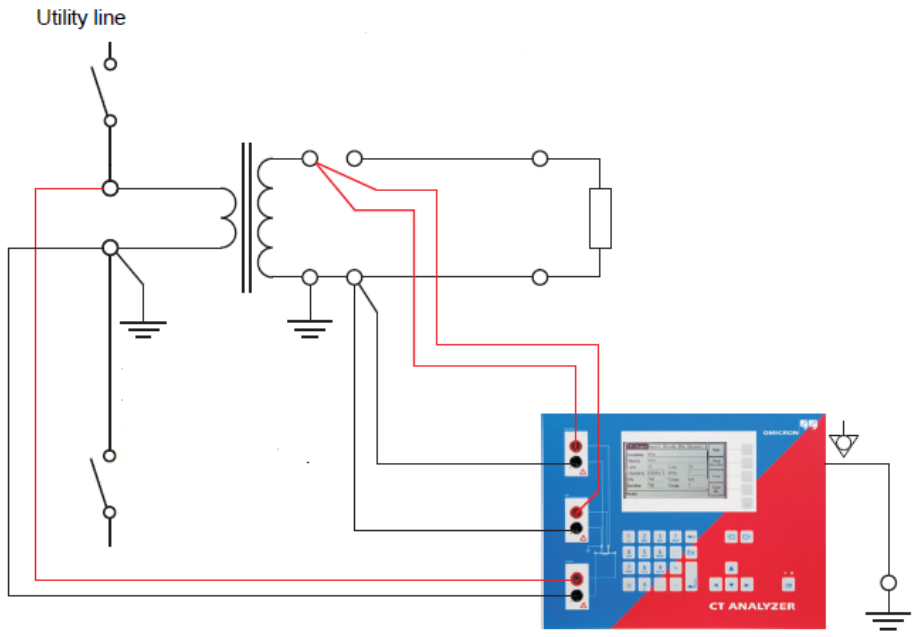


Figure 1. Test Circuit

Test Report 1 Osgodby Red Phase CT

Date/Time: 2017-11-28, 12:46:10

Assessment	Auto	Manual
	Passed	

Location

Company:	Doble/NPG	**Country:**	UK
Station:	Gascoigne Wood	**Feeder:**	Osgodby
Phase:	RED	**IEC-ID:**	

CT Nameplate

Manufacturer:		**Tap:**	
Type:		**Core Number:**	
Serial Number:	3KC 13005	**Optional 1:**	
Ratio:	600:5	**Core Type:**	Metering CT
Frequency:	50Hz	**Class:**	0.5 - FS 5 ext. 120% (IEC 60044-1)
Nominal Burden:	7.5 VA	**Operating Burden:**	7.5 VA

Comment

Osgodby Red Phase Metering CT 13005

Equipment

Test Device:	CT-Analyzer	**Software Version:**	4.40 (14-06-24 09:36)
Serial Number:	LF643J	**Hardware Version:**	01/01/08/05/00/11

Test Settings:

Primary Current I-pn:	600.0A	**Nominal Burden:**	7.5VA cos φ: 0.8
Secondary Current I-sn:	5.0A	**Operating Burden:**	7.5VA [?] cos φ: 0.8 [?]
Frequency:	50.0Hz		
Applied Standard:	IEC 60044-1	**Core Type:**	Metering CT
Class:	0.5 - FS 5 ext. 120%		
Rct:	0.132Ω [?] (75.0°C)		
FS:	2.0 [?]	**Ext. I-pn:**	120%
		Ext. VA:	No

Multiplying Factor for Ratio Assessment: 1.000
Delta compensation: Ratio 1

[?] Value is automatically detected by CT Analyzer's guesser function.
[*] Auto-detection may prevent assessment. Explicit setting might be mandatory for automatic assessment.

Assessments:

Parameter	Auto	Manual
Class	Passed	
...ε	Passed	
...Δφ	Passed	
FS	Passed	
FSi	Passed	

Resistance

Secondary Winding:

R-meas:	110.9mΩ	**T-meas:**	25.0°C
R-ref:	132.3mΩ	**T-ref:**	75.0°C

Ratio

Results with nominal burden:

Used Burden:	7.5 VA cos φ: 0.8
Used I-p:	600.00A
Ratio:	600.0 : 4.9824
Deviation:	-0.352%
ε-c:	0.379%
RCF:	1.00353
N:	120.04
Phase:	2.35min
Polarity:	OK

Burden	Current ratio error in % at % of rated current								Designation
VA / cos φ	1.0 %	5.0 %	10 %	20 %	50 %	100 %	120 %	200 %	
7.50 / 0.8	-0.459	-0.439	-0.422	-0.400	-0.357	-0.352	-0.363	! -0.467	100% Nom.Burden
3.75 / 1.0	-0.159	-0.180	-0.191	-0.201	-0.207	-0.203	-0.202	-0.194	50% Nom.Burden
1.875 / 1.0	-0.121	-0.135	-0.143	-0.151	-0.158	-0.158	-0.157	-0.155	25% Nom.Burden
1.00 / 1.0	-0.105	-0.115	-0.121	-0.127	-0.134	-0.135	-0.135	-0.133	1 VA

Burden	Phase displacement in minutes at % of rated current								Designation
VA / cos φ	1.0 %	5.0 %	10 %	20 %	50 %	100 %	120 %	200 %	
7.50 / 0.8	13.99	9.90	7.68	5.25	2.23	2.35	3.52	! 15.20	100% Nom.Burden
3.75 / 1.0	13.09	10.79	9.44	7.88	5.63	4.29	4.06	5.97	50% Nom.Burden
1.875 / 1.0	9.53	8.11	7.22	6.17	4.60	3.41	3.19	3.16	25% Nom.Burden
1.00 / 1.0	7.82	6.79	6.09	5.28	4.04	3.06	2.81	2.38	1 VA

NOTE: Measurements with '!' have reduced accuracy. Accuracy only guaranteed on non-gapped cores.

Excitation:

Knee Points:

Standard	V	I
IEC 60044-1	3.610V	48.14mA

Results:

Kr: 44%

Lm: 412.3mH

Ls: 21.0µH

Results with nominal burden:

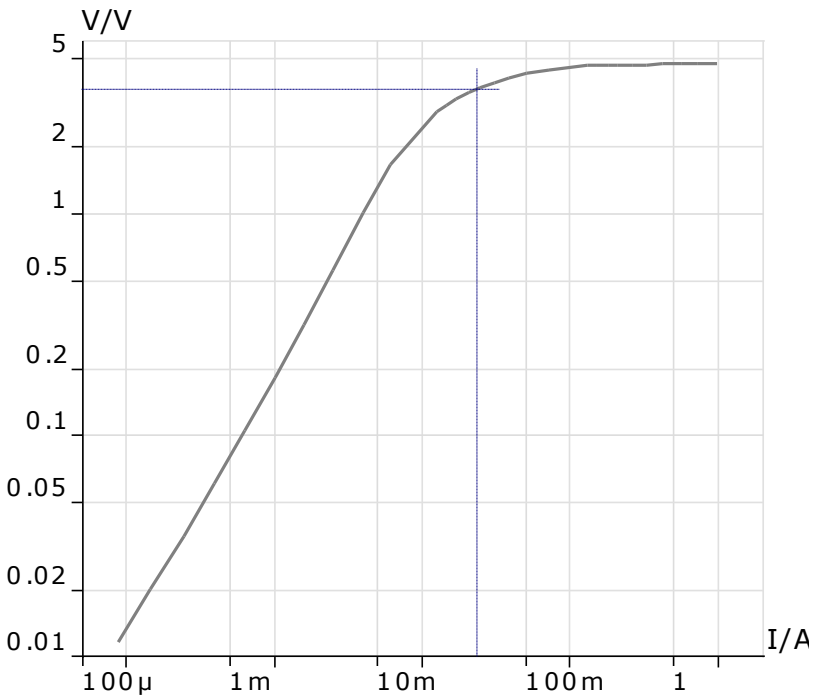
Burden:	7.5 VA cos φ: 0.8
FS:	>2.35
FSi:	2.27
Ts:	1.108s
ε-i:	>17.79% (@ FS = 5.0)

Results with operating burden:

Burden:	7.5 VA cos φ: 0.8
FS:	>2.35
FSi:	2.27
Ts:	1.108s
ε-i:	>17.79% (@ FS = 5.0)

Excitation Table:

Actual Values		
V	**I**	**L**
4.707V	2.025A	2.4mH
4.695V	1.497A	3.1mH
4.686V	1.155A	4.1mH
4.677V	866.1mA	5.7mH
4.668V	669.3mA	8.0mH
4.660V	535.9mA	10.7mH
4.650V	431.2mA	14.6mH
4.639V	374.2mA	17.0mH
4.623V	313.4mA	22.2mH
4.600V	264.5mA	28.4mH
4.422V	146.9mA	59.6mH
4.239V	104.3mA	88.0mH
4.051V	79.61mA	117.1mH
3.862V	63.01mA	147.6mH
3.668V	50.91mA	181.8mH
3.470V	41.85mA	218.5mH
3.270V	34.93mA	258.1mH
3.068V	29.59mA	300.4mH
2.857V	25.89mA	344.9mH
1.647V	12.43mA	434.8mH
1.001V	8.186mA	387.6mH
0.547V	5.107mA	338.6mH
0.314V	3.270mA	305.7mH
0.181V	2.071mA	278.1mH
0.105V	1.300mA	255.2mH
0.060V	805.2µA	236.6mH
0.035V	493.3µA	223.0mH
0.020V	298.6µA	212.6mH
0.012V	178.6µA	205.0mH



Test Report 2 Osgodby Blue Phase CT

Date/Time: 2017-11-28, 12:55:25

Assessment	Auto	Manual
	Passed	

Location

Company:	Doble/NPG	**Country:**	UK
Station:	Gascoigne Wood	**Feeder:**	Osgodby
Phase:	Blue	**IEC-ID:**	

CT Nameplate

Manufacturer:		**Tap:**	
Type:		**Core Number:**	
Serial Number:	3KC 13006	**Optional 1:**	
Ratio:	600:5	**Core Type:**	Metering CT
Frequency:	50Hz	**Class:**	0.5 - FS 5 ext. 120% (IEC 60044-1)
Nominal Burden:	7.5 VA	**Operating Burden:**	7.5 VA

Comment

Osgodby CT Blue Phase 13006

Equipment

Test Device:	CT-Analyzer	**Software Version:**	4.40 (14-06-24 09:36)
Serial Number:	LF643J	**Hardware Version:**	01/01/08/05/00/11

Test Settings:

Primary Current I-pn:	600.0A	**Nominal Burden:**	7.5VA cos φ: 0.8
Secondary Current I-sn:	5.0A	**Operating Burden:**	7.5VA [?] cos φ: 0.8 [?]
Frequency:	50.0Hz		
Applied Standard:	IEC 60044-1	**Core Type:**	Metering CT
Class:	0.5 - FS 5 ext. 120%		
Rct:	0.127Ω [?] (75.0°C)		
FS:	2.0 [?]	**Ext. I-pn:**	120%
		Ext. VA:	No

Multiplying Factor for Ratio Assessment: 1.000
Delta compensation: Ratio 1

[?] Value is automatically detected by CT Analyzer's guesser function.
[*] Auto-detection may prevent assessment. Explicit setting might be mandatory for automatic assessment.

Assessments:

Parameter	Auto	Manual
Class	Passed	
...ε	Passed	
...Δφ	Passed	
FS	Passed	
FSi	Passed	

Resistance

Secondary Winding:

R-meas:	106.7mΩ	**T-meas:**	25.0°C
R-ref:	127.2mΩ	**T-ref:**	75.0°C

Ratio:

Results with nominal burden:

Used Burden:	7.5 VA cos φ: 0.8
Used I-p:	600.00A
Ratio:	600.0 : 4.9865
Deviation:	-0.269%
ε-c:	0.288%
RCF:	1.00270
N:	120.03
Phase:	1.59min
Polarity:	OK

Burden	Current ratio error in % at % of rated current								Designation
VA / cos φ	1.0 %	5.0 %	10 %	20 %	50 %	100 %	120 %	200 %	
7.50 / 0.8	-0.361	-0.346	-0.332	-0.313	-0.278	-0.269	-0.277	! -0.348	100% Nom.Burden
3.75 / 1.0	-0.115	-0.132	-0.141	-0.149	-0.155	-0.153	-0.152	-0.148	50% Nom.Burden
1.875 / 1.0	-0.086	-0.097	-0.103	-0.109	-0.115	-0.116	-0.115	-0.114	25% Nom.Burden
1.00 / 1.0	-0.073	-0.081	-0.086	-0.091	-0.096	-0.097	-0.097	-0.096	1 VA

Burden	Phase displacement in minutes at % of rated current								Designation
VA / cos φ	1.0 %	5.0 %	10 %	20 %	50 %	100 %	120 %	200 %	
7.50 / 0.8	11.43	8.24	6.42	4.46	1.91	1.59	2.34	! 10.44	100% Nom.Burden
3.75 / 1.0	10.52	8.83	7.74	6.47	4.64	3.42	3.17	4.33	50% Nom.Burden
1.875 / 1.0	7.59	6.59	5.88	5.04	3.78	2.80	2.57	2.36	25% Nom.Burden
1.00 / 1.0	6.19	5.48	4.94	4.29	3.30	2.51	2.30	1.85	1 VA

NOTE: Measurements with '!' have reduced accuracy. Accuracy only guaranteed on non-gapped cores.

Excitation:

Knee Points:

Standard	V	I
IEC 60044-1	3.648V	37.34mA

Results:

Kr: 48%

Lm: 523.2mH

Ls: 25.6µH

Results with nominal burden:

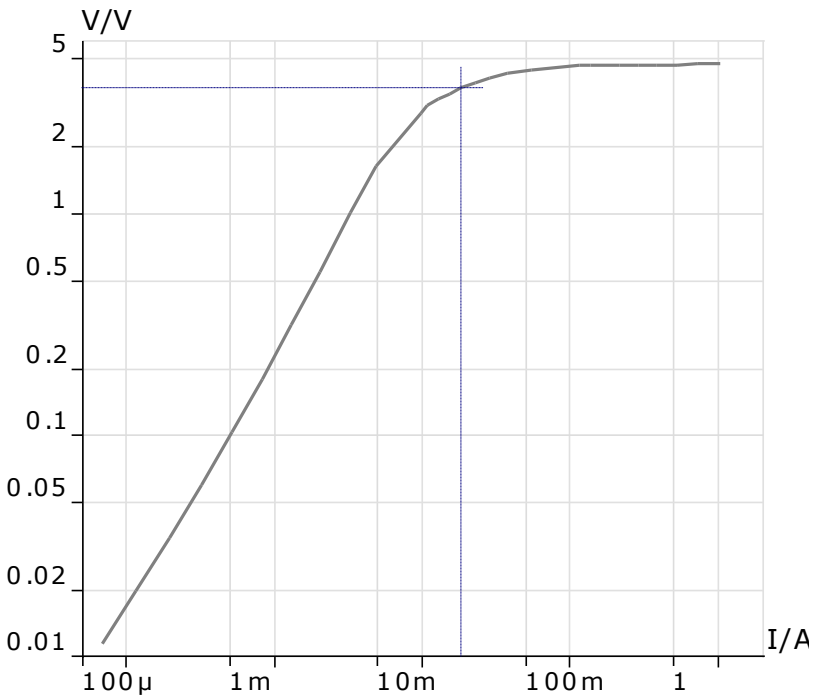
Burden:	7.5 VA cos φ: 0.8
FS:	>2.37
FSi:	2.29
Ts:	1.425s
ε-i:	>18.26% (@ FS = 5.0)

Results with operating burden:

Burden:	7.5 VA cos φ: 0.8
FS:	>2.37
FSi:	2.29
Ts:	1.425s
ε-i:	>18.26% (@ FS = 5.0)

Excitation Table:

Actual Values		
V	**I**	**L**
4.697V	2.097A	2.4mH
4.681V	1.487A	3.2mH
4.669V	1.076A	4.4mH
4.659V	781.2mA	6.2mH
4.651V	587.3mA	8.8mH
4.640V	442.5mA	12.6mH
4.630V	349.7mA	16.8mH
4.615V	282.8mA	21.5mH
4.599V	234.0mA	28.1mH
4.432V	111.8mA	76.3mH
4.244V	77.27mA	117.9mH
4.054V	58.73mA	158.7mH
3.858V	46.49mA	201.3mH
3.657V	37.65mA	247.5mH
3.454V	31.11mA	297.5mH
3.248V	26.17mA	350.6mH
3.042V	22.37mA	404.2mH
2.832V	19.77mA	460.4mH
1.630V	9.859mA	544.1mH
1.001V	6.642mA	478.1mH
0.540V	4.125mA	415.7mH
0.309V	2.643mA	372.7mH
0.178V	1.677mA	338.0mH
0.103V	1.052mA	310.3mH
0.059V	651.3µA	287.0mH
0.034V	397.9µA	270.8mH
0.020V	239.0µA	259.8mH
0.011V	141.7µA	252.2mH



CIRCULATION

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