TRANSFORMER TEST REPORT

BEFORE AND AFTER MAINTENCE

(OLTC Service)

TRANSFORMER TESTING REPORTS

Location: PPU MALAYSINO
Job: T2 BEFORE SERVICE
Date: 28/09/2024

TRANSFORMER NO	: 02
SERIAL NO	: 30001
VOLTAGE	: 33000/22000
KVA	: 30000
MANUFACTURE	: MTM
YEAR	: 2010
TESTING DATE	: 28/09/2024

TEST PERFORMED

S.NO.	TITLE
1	TANDELTA WINDING
2	EXCITATION CURRENT 10KV
3	TURN RATIO MEASUREMENT
4	DC WINDING RESISTANCE
5	OLTC DYNAMIC CURRENT MEASUREMENT
6	INSULATION RESISTANCE / POLARIZATION INDEX

TEST EQUIPMENT USED :

1. **MEGGER TDX 120**
2. **MEGGER TRAX 220**
3. **MEGGER MIT515 INSULATION TESTER**

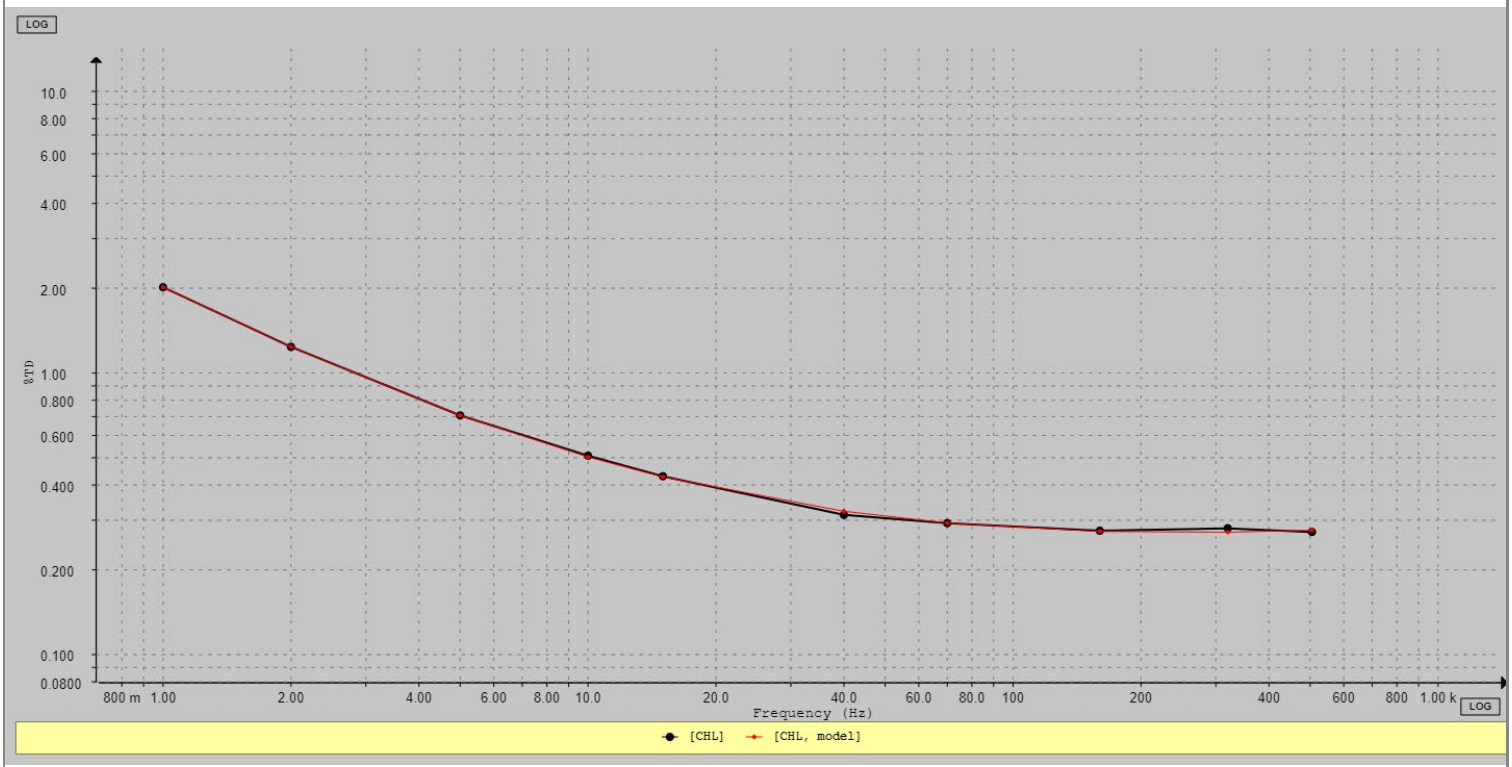
TESTING PERFORMED BY:

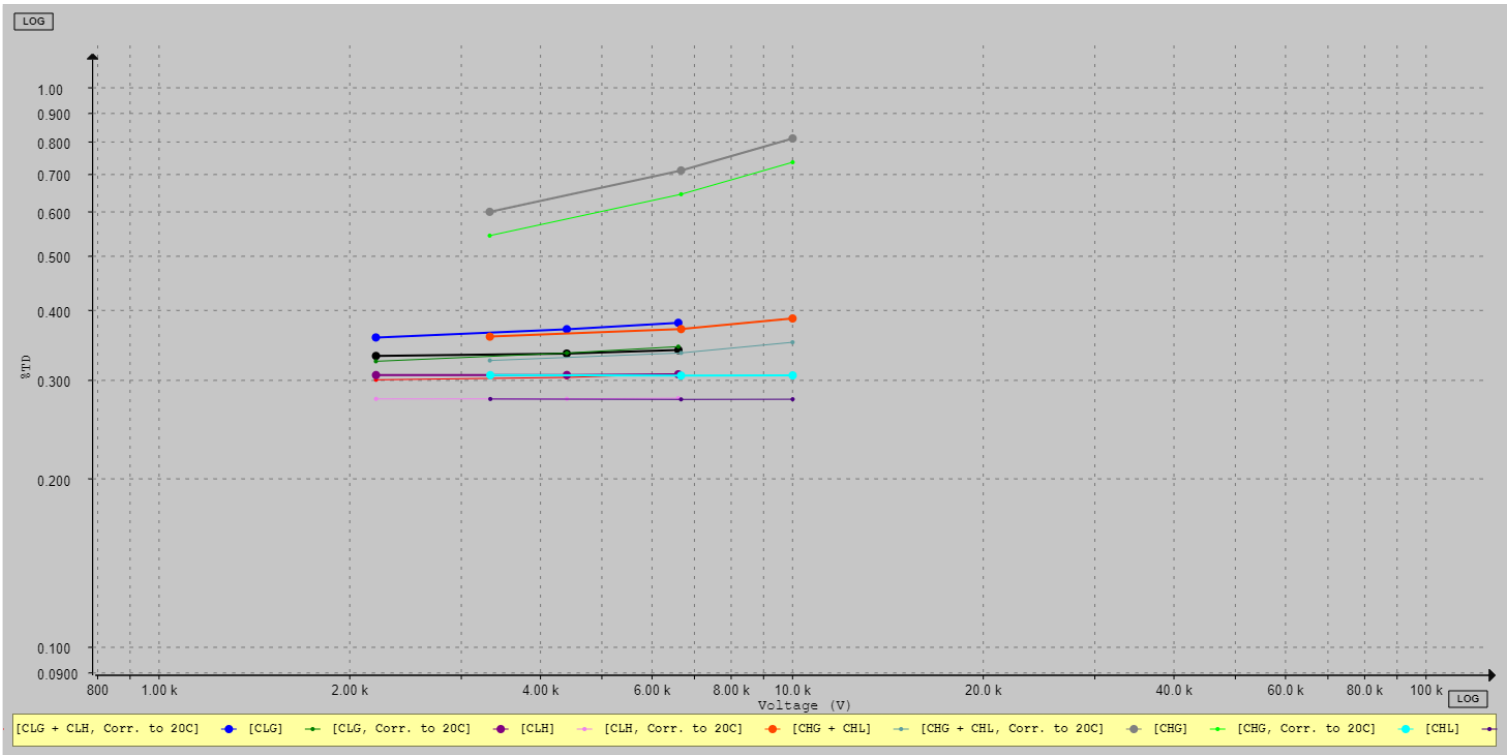
1. **VICKNESH A/L SUBRAMANIAM**
2. **GOBINATH RAJU**
3. **SAKTHI**

TRANSFORMER TANDELTA TEST REPORT

Tan Delta - Power Transformer

Designation	Test Mode	f (Hz)	U	I eq	C	%TD at 40 °C	ITC2 Corr. Factor	Corr. %TD to 20°C	P eq at 40 °C	% VDF	ITC2
CHG + CHL	GST-GND	50.00	9.999 kV	53.73 mA	17.10 nF	0.401	0.907	**0.364**	2.154 W	0.02 %	
CHG	GSTg-RB	50.00	10.01 kV	8.481 mA	2.700 nF	0.823	0.907	**0.746**	697.7 mW	0.06 %	●
CHL	UST-R	50.00	10.01 kV	45.25 mA	14.40 nF	0.308	0.907	**0.279**	1.393 W	0.02 %	
CLG + CLH	GST-GND	50.00	6.601 kV	72.83 mA	23.18 nF	0.343	0.907	**0.311**	2.500 W	0.02 %	
CLG	GSTg-RB	50.00	6.608 kV	27.59 mA	8.782 nF	0.383	0.907	**0.347**	1.057 W	0.02 %	
CLH	UST-R	50.00	6.608 kV	45.25 mA	14.40 nF	0.308	0.907	**0.279**	1.394 W	0.01 %	




LOG
1.00
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.0900
%TD
800
1.00 k
2.00 k
4.00 k
6.00 k
8.00 k
10.0 k
20.0 k
40.0 k
60.0 k
80.0 k
100 k
Voltage (V)
LOG
[CLG + CLH, Corr. to 20C]
[CLG]
[CLG, Corr. to 20C]
[CLH]
[CLH, Corr. to 20C]
[CHG + CHL]
[CHG + CHL, Corr. to 20C]
[CHG]
[CHG, Corr. to 20C]
[CHL]

Comment:

TRANSFORMER EXCITATION 10KV TEST REPORT

Tan Delta - Power Transformer Excitation

Connection	Tap	Tap Voltage (V)	f (Hz)	U	I eq	L	P eq at 48 °C
A-B	1	36 310	50.00	10.06 kV	66.34 mA	757.4 H	513.2 W
B-C	1	36 310	50.00	9.974 kV	29.72 mA	1.794 kH	238.5 W
C-A	1	36 310	50.00	10.03 kV	60.58 mA	877.7 H	485.3 W
A-B	2	35 759	50.00	9.988 kV	68.31 mA	735.0 H	528.3 W
B-C	2	35 759	50.00	10.02 kV	30.33 mA	1.768 kH	244.1 W
C-A	2	35 759	50.00	9.978 kV	61.96 mA	857.8 H	496.2 W
A-B	3	35 207	50.00	9.980 kV	70.02 mA	718.6 H	542.3 W
B-C	3	35 207	50.00	9.997 kV	31.05 mA	1.738 kH	250.7 W
C-A	3	35 207	50.00	10.01 kV	63.41 mA	840.0 H	508.4 W
A-B	4	34 656	50.00	10.02 kV	71.60 mA	704.5 H	555.5 W
B-C	4	34 656	50.00	9.994 kV	31.77 mA	1.712 kH	257.6 W
C-A	4	34 656	50.00	9.973 kV	65.01 mA	823.5 H	522.7 W
A-B	5	34 105	50.00	10.03 kV	73.39 mA	690.0 H	570.8 W
B-C	5	34 105	50.00	10.02 kV	32.55 mA	1.686 kH	265.1 W
C-A	5	34 105	50.00	9.977 kV	66.69 mA	806.3 H	537.4 W
A-B	6	33 553	50.00	10.04 kV	75.17 mA	676.8 H	586.4 W
B-C	6	33 553	50.00	10.01 kV	33.40 mA	1.659 kH	273.5 W
C-A	6	33 553	50.00	10.02 kV	68.39 mA	790.0 H	552.6 W
A-B	7	33 002	50.00	10.02 kV	77.15 mA	663.2 H	604.0 W
B-C	7	33 002	50.00	9.988 kV	34.36 mA	1.631 kH	282.8 W
C-A	7	33 002	50.00	10.00 kV	70.23 mA	774.3 H	569.5 W
A-B	8	32 451	50.00	10.03 kV	79.14 mA	650.3 H	621.8 W
B-C	8	32 451	50.00	10.04 kV	35.30 mA	1.608 kH	292.3 W
C-A	8	32 451	50.00	10.03 kV	72.14 mA	759.1 H	587.0 W
A-B	9	31 899	50.00	10.05 kV	81.32 mA	637.1 H	641.7 W
B-C	9	31 899	50.00	9.973 kV	37.98 mA	1.394 kH	303.5 W
C-A	9	31 899	50.00	10.02 kV	74.27 mA	743.1 H	606.7 W
A-B	10	31 348	50.00	9.977 kV	84.71 mA	600.4 H	660.7 W
B-C	10	31 348	50.00	10.02 kV	38.92 mA	1.369 kH	312.0 W
C-A	10	31 348	50.00	9.987 kV	77.70 mA	688.9 H	624.7 W
A-B	11	30 797	50.00	9.989 kV	86.91 mA	587.6 H	679.6 W
B-C	11	30 797	50.00	9.980 kV	40.00 mA	1.339 kH	321.8 W
C-A	11	30 797	50.00	10.01 kV	79.80 mA	674.4 H	643.4 W
A-B	12	30 245	50.00	9.959 kV	89.35 mA	574.5 H	701.0 W

Connection	Tap	Tap Voltage (V)	f (Hz)	U	I eq	L	P eq at 48 °C
B-C	12	30 245	50.00	10.04 kV	41.06 mA	1.319 kH	332.2 W
C-A	12	30 245	50.00	10.00 kV	82.01 mA	660.4 H	663.5 W
A-B	13	29 694	50.00	10.02 kV	91.72 mA	562.5 H	721.9 W
B-C	13	29 694	50.00	10.02 kV	42.34 mA	1.292 kH	344.3 W
C-A	13	29 694	50.00	9.993 kV	84.46 mA	645.3 H	685.6 W
A-B	14	29 143	50.00	10.04 kV	94.28 mA	550.6 H	744.8 W
B-C	14	29 143	50.00	9.955 kV	43.74 mA	1.263 kH	357.5 W
C-A	14	29 143	50.00	9.997 kV	86.97 mA	631.6 H	708.8 W
A-B	15	28 591	50.00	10.06 kV	96.99 mA	538.8 H	769.3 W
B-C	15	28 591	50.00	9.974 kV	45.23 mA	1.241 kH	372.5 W
C-A	15	28 591	50.00	10.02 kV	89.61 mA	617.5 H	733.0 W
A-B	16	28 040	50.00	10.03 kV	100.1 mA	526.5 H	797.2 W
B-C	16	28 040	50.00	10.03 kV	47.38 mA	1.206 kH	393.5 W
C-A	16	28 040	50.00	10.01 kV	92.53 mA	603.0 H	759.9 W

Comment:

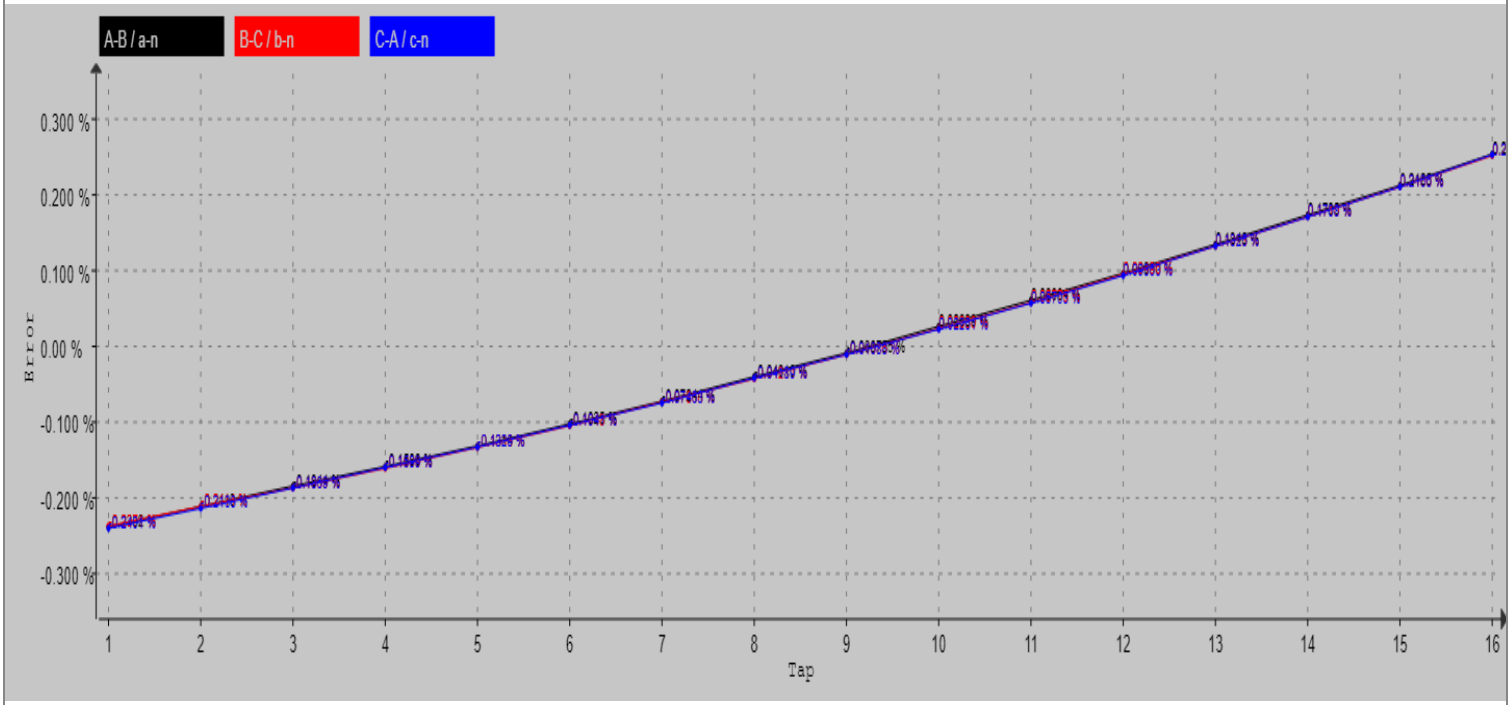
TRANSFORMER TURNS RATIO TEST REPORT

Turns ratio measurements

Connection	Tap (P)	Tap Voltage (V)	U	Test frequency	TTR	Measured TTR	Error	I Exc	Phase
A-B / a-n	1	36 310	125.0 V	50.00 Hz	2.859	2.852	-0.24 %	1.419 mA	0.0 °
B-C / b-n	1	36 310	125.0 V	50.00 Hz	2.859	2.852	-0.24 %	1.108 mA	0.0 °
C-A / c-n	1	36 310	125.0 V	50.00 Hz	2.859	2.852	-0.24 %	1.476 mA	0.0 °
A-B / a-n	2	35 759	125.0 V	50.00 Hz	2.815	2.809	-0.21 %	1.456 mA	0.0 °
B-C / b-n	2	35 759	125.0 V	50.00 Hz	2.815	2.809	-0.21 %	1.131 mA	0.0 °
C-A / c-n	2	35 759	125.0 V	50.00 Hz	2.815	2.809	-0.21 %	1.520 mA	0.0 °
A-B / a-n	3	35 207	125.0 V	50.00 Hz	2.772	2.767	-0.18 %	1.499 mA	0.0 °
B-C / b-n	3	35 207	125.0 V	50.00 Hz	2.772	2.767	-0.19 %	1.160 mA	0.0 °
C-A / c-n	3	35 207	125.0 V	50.00 Hz	2.772	2.767	-0.19 %	1.560 mA	0.0 °
A-B / a-n	4	34 656	125.0 V	50.00 Hz	2.728	2.724	-0.16 %	1.544 mA	0.0 °
B-C / b-n	4	34 656	125.0 V	50.00 Hz	2.728	2.724	-0.16 %	1.195 mA	0.0 °
C-A / c-n	4	34 656	125.0 V	50.00 Hz	2.728	2.724	-0.16 %	1.594 mA	0.0 °
A-B / a-n	5	34 105	125.0 V	50.00 Hz	2.685	2.682	-0.13 %	1.588 mA	0.0 °
B-C / b-n	5	34 105	125.0 V	50.00 Hz	2.685	2.681	-0.13 %	1.230 mA	0.0 °
C-A / c-n	5	34 105	125.0 V	50.00 Hz	2.685	2.681	-0.13 %	1.636 mA	0.0 °
A-B / a-n	6	33 553	125.0 V	50.00 Hz	2.642	2.639	-0.10 %	1.626 mA	0.0 °
B-C / b-n	6	33 553	125.0 V	50.00 Hz	2.642	2.639	-0.10 %	1.265 mA	0.0 °
C-A / c-n	6	33 553	125.0 V	50.00 Hz	2.642	2.639	-0.10 %	1.685 mA	0.0 °
A-B / a-n	7	33 002	125.0 V	50.00 Hz	2.598	2.596	-0.07 %	1.673 mA	0.0 °
B-C / b-n	7	33 002	125.0 V	50.00 Hz	2.598	2.596	-0.07 %	1.299 mA	0.0 °
C-A / c-n	7	33 002	125.0 V	50.00 Hz	2.598	2.596	-0.07 %	1.738 mA	0.0 °
A-B / a-n	8	32 451	125.0 V	50.00 Hz	2.555	2.554	-0.04 %	1.727 mA	0.0 °
B-C / b-n	8	32 451	125.0 V	50.00 Hz	2.555	2.554	-0.04 %	1.329 mA	0.0 °
C-A / c-n	8	32 451	125.0 V	50.00 Hz	2.555	2.554	-0.04 %	1.788 mA	0.0 °
A-B / a-n	9	31 899	125.0 V	50.00 Hz	2.511	2.511	-0.01 %	1.782 mA	0.0 °
B-C / b-n	9	31 899	125.0 V	50.00 Hz	2.511	2.511	-0.01 %	1.366 mA	0.0 °
C-A / c-n	9	31 899	125.0 V	50.00 Hz	2.511	2.511	-0.01 %	1.847 mA	0.0 °
A-B / a-n	10	31 348	125.0 V	50.00 Hz	2.468	2.469	0.03 %	1.842 mA	0.0 °
B-C / b-n	10	31 348	125.0 V	50.00 Hz	2.468	2.469	0.02 %	1.421 mA	0.0 °
C-A / c-n	10	31 348	125.0 V	50.00 Hz	2.468	2.469	0.02 %	1.894 mA	0.0 °
A-B / a-n	11	30 797	125.0 V	50.00 Hz	2.425	2.426	0.06 %	1.900 mA	0.0 °
B-C / b-n	11	30 797	125.0 V	50.00 Hz	2.425	2.426	0.06 %	1.467 mA	0.0 °
C-A / c-n	11	30 797	125.0 V	50.00 Hz	2.425	2.426	0.06 %	1.948 mA	0.0 °
A-B / a-n	12	30 245	125.0 V	50.00 Hz	2.381	2.384	0.10 %	1.952 mA	0.0 °
B-C / b-n	12	30 245	125.0 V	50.00 Hz	2.381	2.383	0.09 %	1.515 mA	0.0 °
C-A / c-n	12	30 245	125.0 V	50.00 Hz	2.381	2.383	0.09 %	2.014 mA	0.0 °
A-B / a-n	13	29 694	125.0 V	50.00 Hz	2.338	2.341	0.13 %	2.010 mA	0.0 °

Connection	Tap (P)	Tap Voltage (V)	U	Test frequency	TTR	Measured TTR	Error	I Exc	Phase
B-C / b-n	13	29 694	125.0 V	50.00 Hz	2.338	2.341	0.13 %	1.561 mA	0.0 °
C-A / c-n	13	29 694	125.0 V	50.00 Hz	2.338	2.341	0.13 %	2.075 mA	0.0 °
A-B / a-n	14	29 143	125.0 V	50.00 Hz	2.294	2.298	0.17 %	2.086 mA	0.0 °
B-C / b-n	14	29 143	125.0 V	50.00 Hz	2.294	2.298	0.17 %	1.603 mA	0.0 °
C-A / c-n	14	29 143	125.0 V	50.00 Hz	2.294	2.298	0.17 %	2.134 mA	0.0 °
A-B / a-n	15	28 591	125.0 V	50.00 Hz	2.251	2.256	0.21 %	2.155 mA	0.0 °
B-C / b-n	15	28 591	125.0 V	50.00 Hz	2.251	2.256	0.21 %	1.652 mA	0.0 °
C-A / c-n	15	28 591	125.0 V	50.00 Hz	2.251	2.256	0.21 %	2.205 mA	0.0 °
A-B / a-n	16	28 040	125.0 V	50.00 Hz	2.208	2.213	0.25 %	2.226 mA	0.0 °
B-C / b-n	16	28 040	125.0 V	50.00 Hz	2.208	2.213	0.25 %	1.706 mA	0.0 °
C-A / c-n	16	28 040	125.0 V	50.00 Hz	2.208	2.213	0.25 %	2.286 mA	0.0 °

Comment:



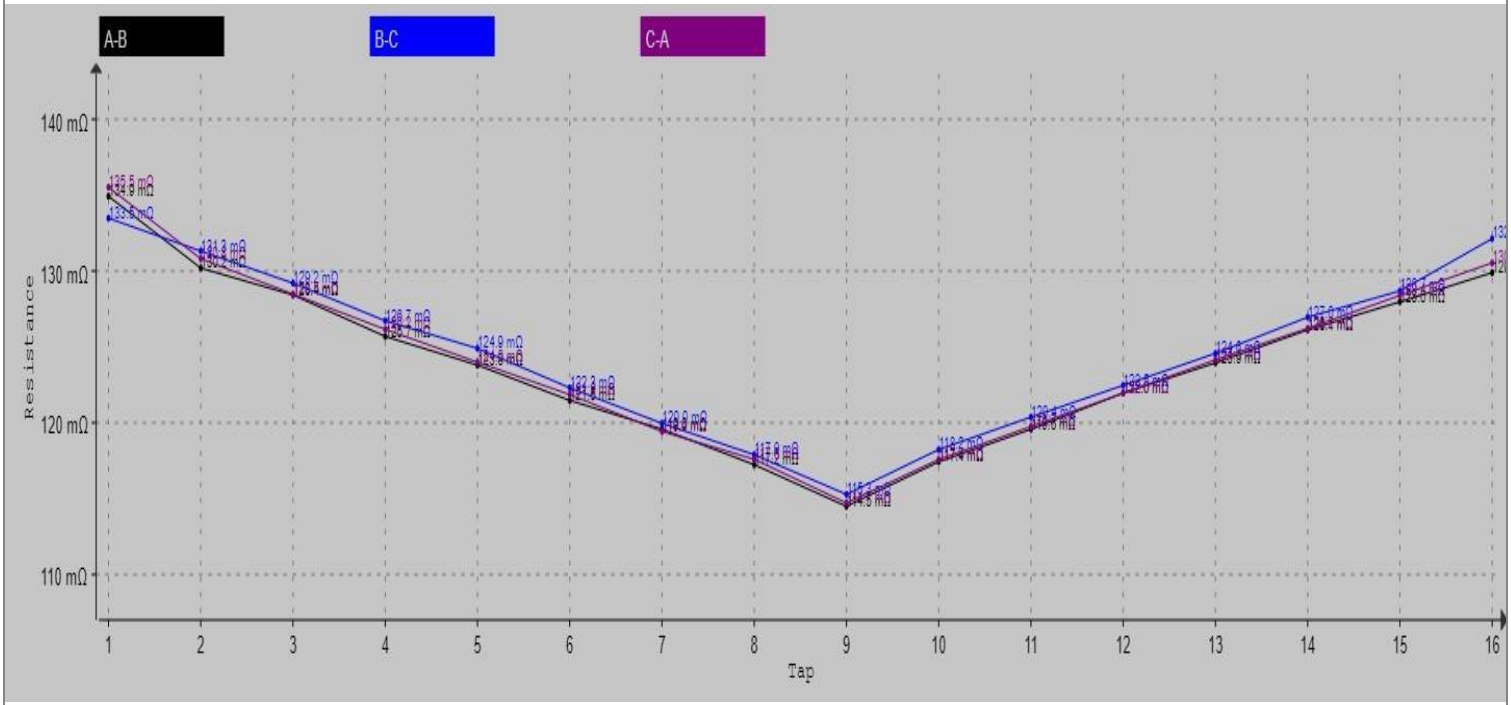
TRANSFORMER DC WINDING RESITANCE TEST REPORT

HV Winding resistance measurements

Connection	Tap (P)	Current	48°C Resistance corrected to 75°C	Stability	Variation	Continuity
A-B	1	9.998 A	147.8 mΩ	98.84 %	---	✓
B-C	1	10.01 A	146.2 mΩ	99.87 %	---	✓
C-A	1	10.00 A	148.4 mΩ	98.85 %	1.51 %	✓
A-B	2	9.997 A	142.6 mΩ	99.73 %	---	✓
B-C	2	10.01 A	143.8 mΩ	99.93 %	---	✓
C-A	2	10.00 A	143.3 mΩ	99.92 %	0.86 %	✓
A-B	3	10.01 A	140.7 mΩ	99.32 %	---	✓
B-C	3	10.01 A	141.5 mΩ	99.75 %	---	✓
C-A	3	10.00 A	140.7 mΩ	99.39 %	0.61 %	✓
A-B	4	10.01 A	137.7 mΩ	99.95 %	---	✓
B-C	4	10.00 A	138.8 mΩ	99.60 %	---	✓
C-A	4	10.01 A	138.2 mΩ	99.52 %	0.82 %	✓
A-B	5	10.01 A	135.6 mΩ	99.47 %	---	✓
B-C	5	10.01 A	136.8 mΩ	99.68 %	---	✓
C-A	5	10.01 A	135.8 mΩ	99.64 %	0.89 %	✓
A-B	6	10.01 A	133.1 mΩ	99.91 %	---	✓
B-C	6	9.997 A	134.0 mΩ	99.96 %	---	✓
C-A	6	10.01 A	133.5 mΩ	99.61 %	0.68 %	✓
A-B	7	9.994 A	131.0 mΩ	99.60 %	---	✓
B-C	7	10.02 A	131.4 mΩ	98.96 %	---	✓
C-A	7	10.01 A	130.8 mΩ	99.84 %	0.45 %	✓
A-B	8	10.01 A	128.4 mΩ	99.57 %	---	✓
B-C	8	10.02 A	129.1 mΩ	99.74 %	---	✓
C-A	8	10.00 A	128.8 mΩ	99.34 %	0.56 %	✓
A-B	9	10.00 A	125.4 mΩ	99.53 %	---	✓
B-C	9	10.02 A	126.3 mΩ	99.85 %	---	✓
C-A	9	10.01 A	125.7 mΩ	99.18 %	0.69 %	✓
A-B	10	10.01 A	128.6 mΩ	99.14 %	---	✓
B-C	10	10.01 A	129.5 mΩ	99.93 %	---	✓
C-A	10	10.00 A	128.8 mΩ	99.51 %	0.68 %	✓
A-B	11	10.01 A	131.0 mΩ	99.76 %	---	✓
B-C	11	10.01 A	131.9 mΩ	99.90 %	---	✓
C-A	11	10.01 A	131.2 mΩ	99.80 %	0.67 %	✓
A-B	12	10.01 A	133.6 mΩ	99.63 %	---	✓
B-C	12	10.01 A	134.1 mΩ	99.96 %	---	✓
C-A	12	10.01 A	133.6 mΩ	99.74 %	0.42 %	✓
A-B	13	10.01 A	135.8 mΩ	99.01 %	---	✓

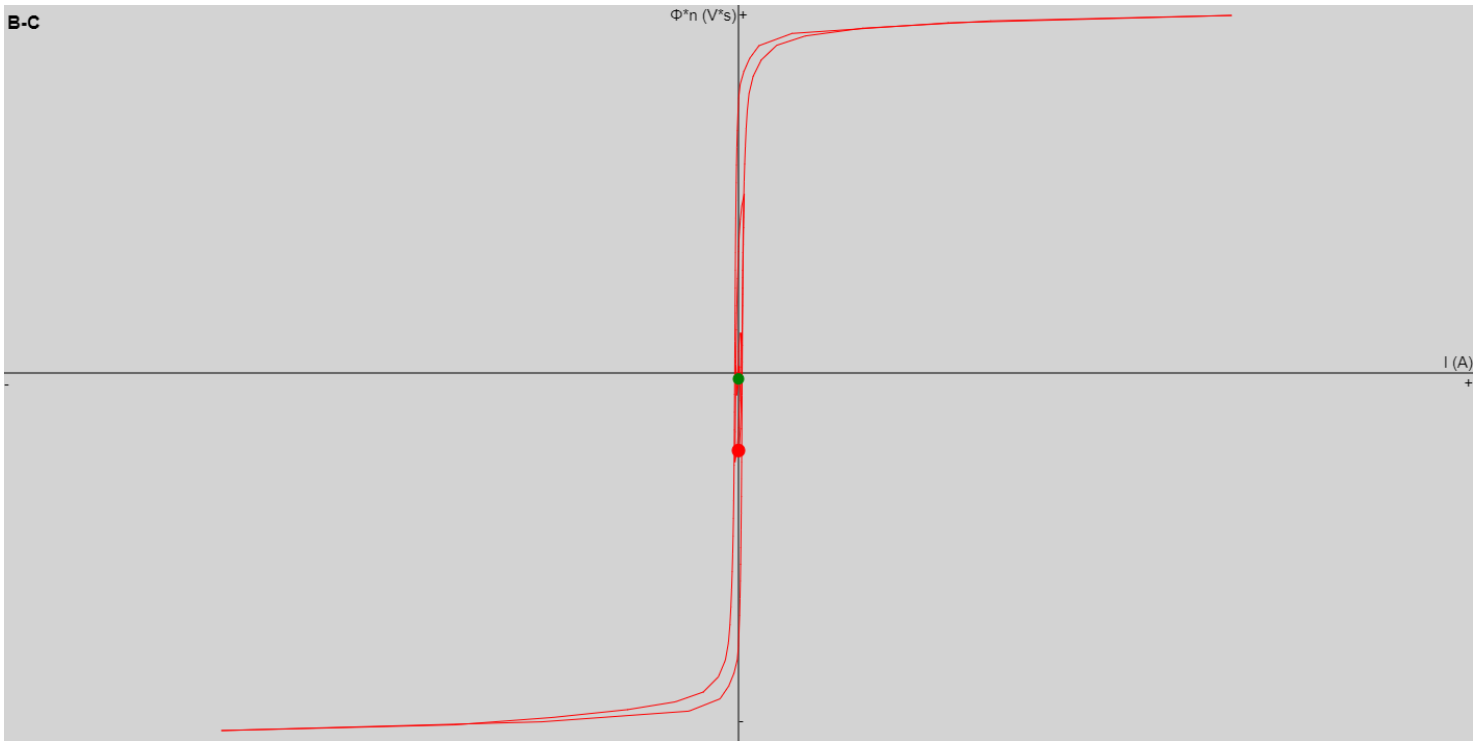
Connection	Tap (P)	Current	48°C Resistance corrected to 75°C	Stability	Variation	Continuity
B-C	13	10.00 A	136.5 mΩ	99.73 %	---	✓
C-A	13	10.01 A	136.0 mΩ	99.73 %	0.50 %	✓
A-B	14	9.986 A	138.2 mΩ	99.02 %	---	✓
B-C	14	10.01 A	139.1 mΩ	99.80 %	---	✓
C-A	14	10.01 A	138.3 mΩ	99.77 %	0.66 %	✓
A-B	15	9.999 A	140.2 mΩ	99.83 %	---	✓
B-C	15	10.01 A	141.0 mΩ	99.39 %	---	✓
C-A	15	10.00 A	140.6 mΩ	99.46 %	0.56 %	✓
A-B	16	10.00 A	142.3 mΩ	99.77 %	---	✓
B-C	16	10.01 A	144.7 mΩ	98.85 %	---	✓
C-A	16	10.00 A	143.0 mΩ	99.86 %	1.71 %	✓

Comment:



Demag measurements

Designation	Current	Time	Remanence before demag	Remanence after demag
B-C	0.000 A	31.59 s	21.68 %	1.646 %



Comment:

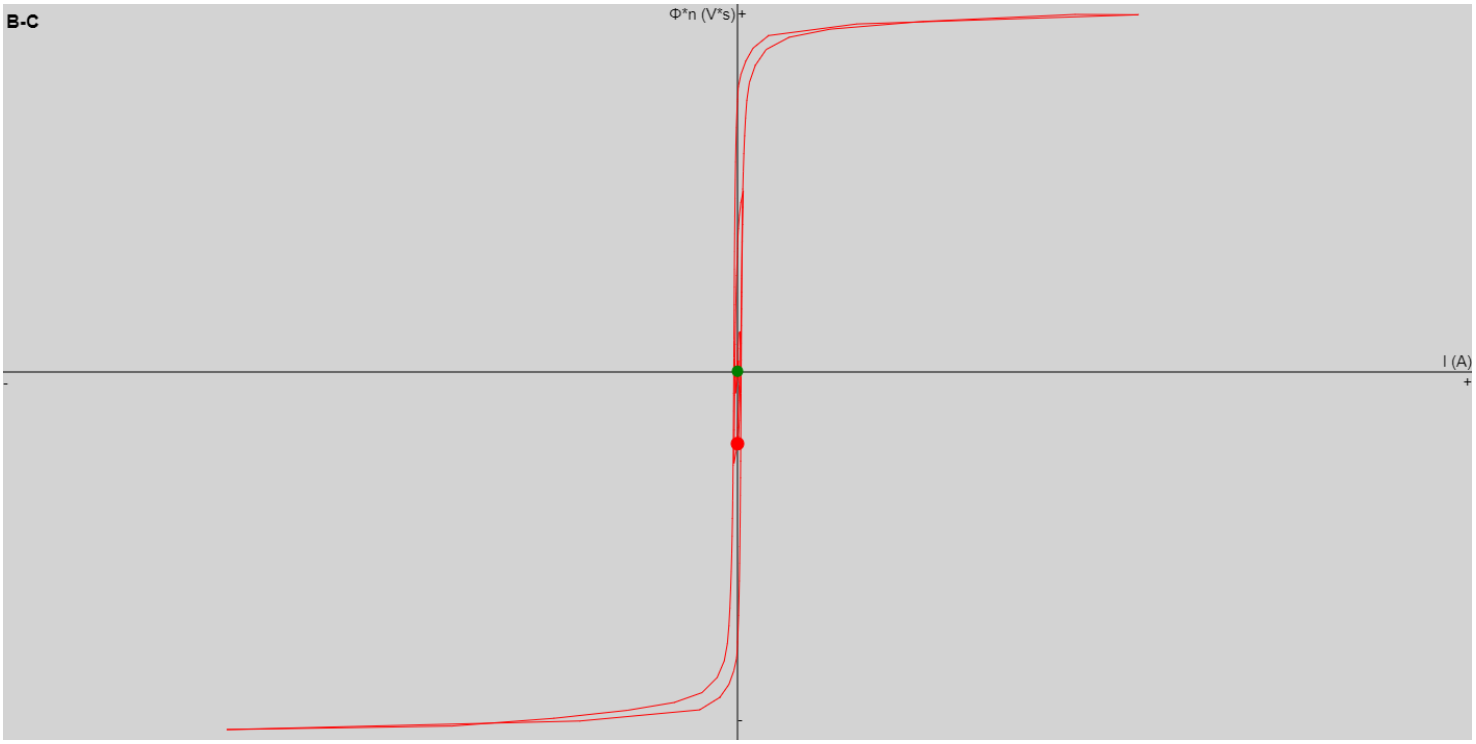
LV Winding resistance measurements

Connection	Tap (S)	Current	48°C Resistance corrected to 75°C	Stability	Variation
a-n	1	9.974 A	25.66 mΩ	99.55 %	---
b-n	1	10.00 A	25.28 mΩ	99.51 %	---
c-n	1	9.999 A	25.65 mΩ	99.24 %	1.51 %

Comment:

Demag measurements

Designation	Current	Time	Remanence before demag	Remanence after demag
B-C	0.000 A	28.18 s	20.10 %	<1 %



Comment:

TRANSFORMER OLTC DYNAMIC RESISTANCE TEST REPORT

On Load Tap Changer Measurements

Software configuration

OLTC Type	Taps on	Secondary Side
Non-vacuum R	Primary	Open Circuit

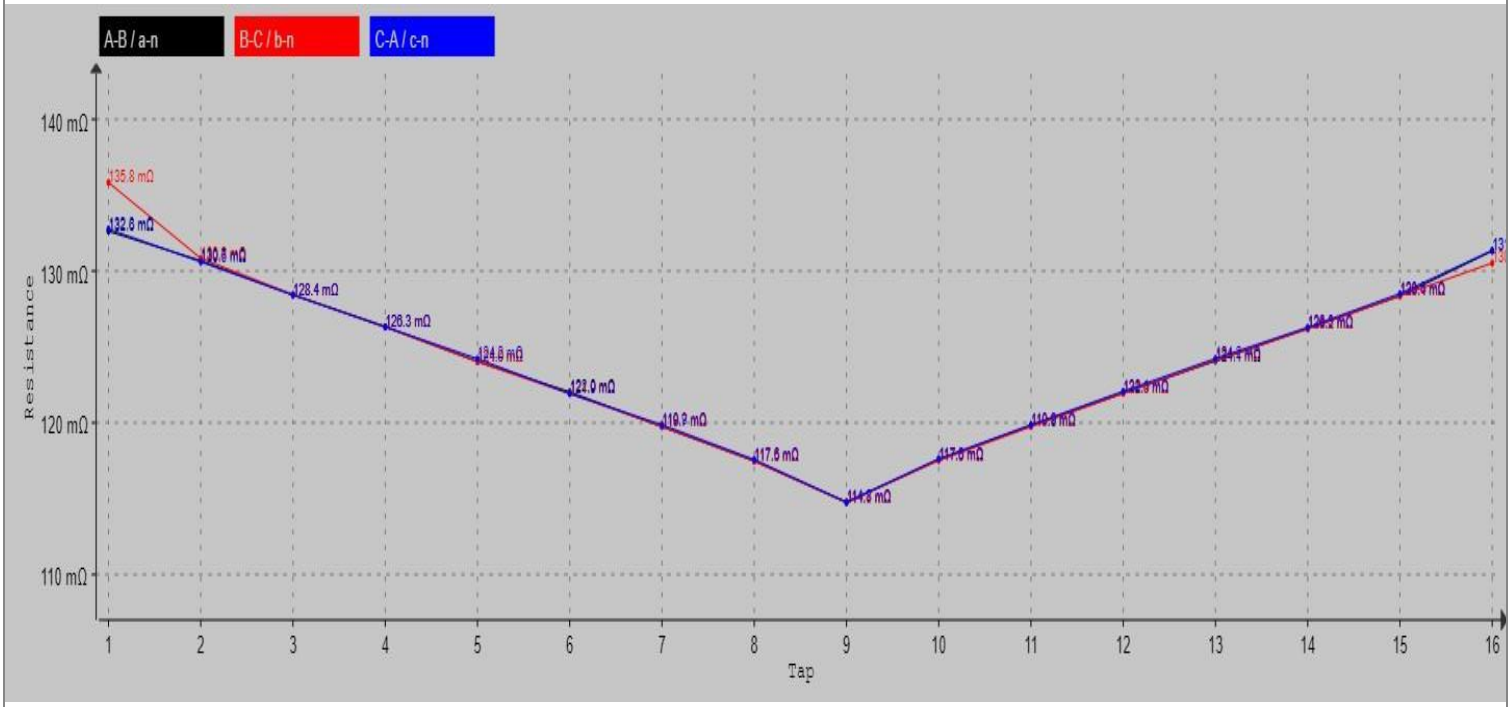
Connection	Transition	t start	t	Ripple	Slope	Continuity
A-B / a-n	16 → 15	4.678 s	61.5 ms	11.70 %	9.509 A/s	✓
A-B / a-n	15 → 14	4.428 s	58.7 ms	11.12 %	9.435 A/s	✓
A-B / a-n	14 → 13	4.436 s	61.4 ms	11.34 %	9.213 A/s	✓
A-B / a-n	13 → 12	4.446 s	60.8 ms	10.95 %	9.007 A/s	✓
A-B / a-n	12 → 11	4.449 s	61.4 ms	10.77 %	8.763 A/s	✓
A-B / a-n	11 → 10	4.449 s	60.5 ms	10.39 %	8.577 A/s	✓
A-B / a-n	10 → 9	4.436 s	60.7 ms	10.25 %	8.437 A/s	✓
A-B / a-n	9 → 8	4.424 s	60.1 ms	8.552 %	7.106 A/s	✓
A-B / a-n	8 → 7	4.429 s	60.2 ms	9.641 %	8.002 A/s	✓
A-B / a-n	7 → 6	4.42 s	58.7 ms	9.333 %	7.928 A/s	✓
A-B / a-n	6 → 5	4.42 s	61.2 ms	9.565 %	7.807 A/s	✓
A-B / a-n	5 → 4	4.429 s	61 ms	9.325 %	7.629 A/s	✓
A-B / a-n	4 → 3	4.443 s	61.2 ms	9.212 %	7.512 A/s	✓
A-B / a-n	3 → 2	4.448 s	60.1 ms	8.881 %	7.368 A/s	✓
A-B / a-n	2 → 1	4.433 s	61.2 ms	8.932 %	7.291 A/s	✓
A-B / a-n	--	---	---	---	---	✓
B-C / b-n	1 → 2	4.687 s	68.3 ms	7.503 %	5.469 A/s	✓
B-C / b-n	2 → 3	4.422 s	65.9 ms	7.526 %	5.711 A/s	✓
B-C / b-n	3 → 4	4.412 s	63.9 ms	7.376 %	5.749 A/s	✓
B-C / b-n	4 → 5	4.407 s	66.9 ms	7.771 %	5.794 A/s	✓
B-C / b-n	5 → 6	4.413 s	64 ms	7.649 %	5.969 A/s	✓
B-C / b-n	6 → 7	4.419 s	63.7 ms	7.550 %	5.908 A/s	✓
B-C / b-n	7 → 8	4.421 s	65.2 ms	7.930 %	6.075 A/s	✓
B-C / b-n	8 → 9	4.415 s	65.1 ms	8.090 %	6.188 A/s	✓
B-C / b-n	9 → 10	4.41 s	63.9 ms	9.701 %	7.583 A/s	✓
B-C / b-n	10 → 11	4.416 s	66.9 ms	8.457 %	6.299 A/s	✓
B-C / b-n	11 → 12	4.401 s	63.1 ms	8.412 %	6.661 A/s	✓
B-C / b-n	12 → 13	4.402 s	66.5 ms	8.875 %	6.668 A/s	✓
B-C / b-n	13 → 14	4.4 s	66.3 ms	8.946 %	6.730 A/s	✓
B-C / b-n	14 → 15	4.41 s	62.9 ms	8.710 %	6.915 A/s	✓
B-C / b-n	15 → 16	4.402 s	65.2 ms	9.135 %	6.991 A/s	✓
B-C / b-n	--	---	---	---	---	✓
C-A / c-n	16 → 15	4.676 s	61.8 ms	11.64 %	9.408 A/s	✓
C-A / c-n	15 → 14	4.412 s	61 ms	11.25 %	9.208 A/s	✓
C-A / c-n	14 → 13	4.416 s	61.1 ms	11.06 %	9.037 A/s	✓
C-A / c-n	13 → 12	4.441 s	61.4 ms	10.88 %	8.846 A/s	✓
C-A / c-n	12 → 11	4.445 s	60.8 ms	10.55 %	8.664 A/s	✓
C-A / c-n	11 → 10	4.446 s	61 ms	10.36 %	8.479 A/s	✓
C-A / c-n	10 → 9	4.446 s	60.8 ms	10.15 %	8.340 A/s	✓
C-A / c-n	9 → 8	4.421 s	60.1 ms	8.369 %	6.928 A/s	✓

Connection	Transition	t start	t	Ripple	Slope	Continuity
C-A / c-n	8 → 7	4.415 s	61 ms	9.615 %	7.851 A/s	✓
C-A / c-n	7 → 6	4.413 s	60.8 ms	9.452 %	7.765 A/s	✓
C-A / c-n	6 → 5	4.433 s	60.8 ms	9.303 %	7.645 A/s	✓
C-A / c-n	5 → 4	4.435 s	61.3 ms	9.241 %	7.527 A/s	✓
C-A / c-n	4 → 3	4.441 s	60.5 ms	9.033 %	7.459 A/s	✓
C-A / c-n	3 → 2	4.436 s	61.5 ms	8.964 %	7.274 A/s	✓
C-A / c-n	2 → 1	4.435 s	60.5 ms	8.759 %	7.236 A/s	✓
C-A / c-n	--	---	---	---	---	✓

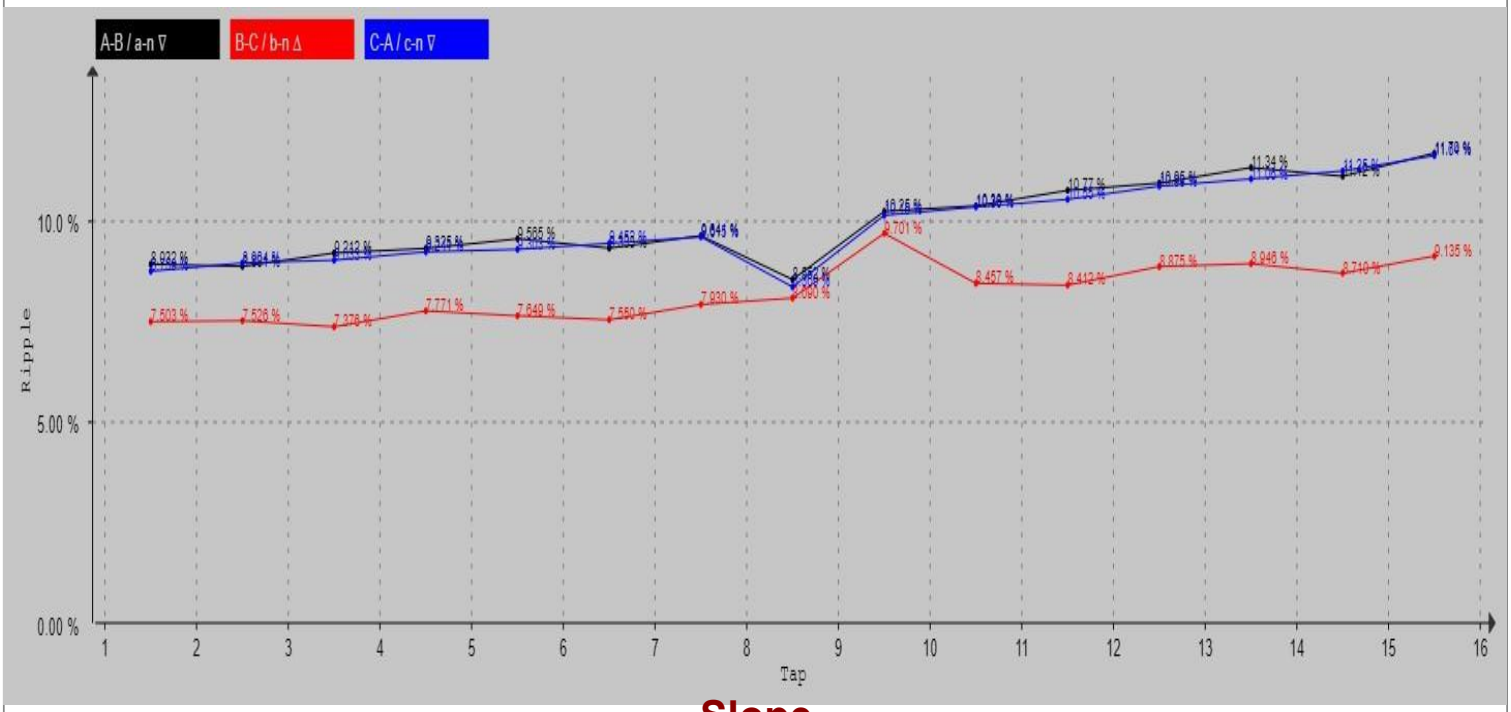
Connection	Tap (P)	Tap Voltage (V)	Current	48°C Resistance corrected to 75°C	Stability	Variation
A-B / a-n	16	28 040	5.000 A	143.9 mΩ	99.14 %	---
A-B / a-n	15	28 591	5.000 A	140.6 mΩ	99.98 %	---
A-B / a-n	14	29 143	5.000 A	138.3 mΩ	99.71 %	---
A-B / a-n	13	29 694	5.000 A	135.9 mΩ	99.76 %	---
A-B / a-n	12	30 245	5.000 A	133.6 mΩ	99.70 %	---
A-B / a-n	11	30 797	5.000 A	131.2 mΩ	99.77 %	---
A-B / a-n	10	31 348	5.000 A	128.8 mΩ	99.83 %	---
A-B / a-n	9	31 899	5.000 A	125.7 mΩ	99.95 %	---
A-B / a-n	8	32 451	5.000 A	128.7 mΩ	99.97 %	---
A-B / a-n	7	33 002	5.000 A	131.2 mΩ	99.57 %	---
A-B / a-n	6	33 553	5.000 A	133.7 mΩ	99.70 %	---
A-B / a-n	5	34 105	5.000 A	135.9 mΩ	99.72 %	---
A-B / a-n	4	34 656	5.000 A	138.4 mΩ	99.61 %	---
A-B / a-n	3	35 207	5.000 A	140.7 mΩ	99.70 %	---
A-B / a-n	2	35 759	4.999 A	143.1 mΩ	99.82 %	---
A-B / a-n	1	36 310	5.000 A	145.3 mΩ	99.93 %	---
B-C / b-n	1	36 310	5.000 A	148.8 mΩ	98.76 %	---
B-C / b-n	2	35 759	5.000 A	143.3 mΩ	99.90 %	---
B-C / b-n	3	35 207	5.000 A	140.7 mΩ	99.69 %	---
B-C / b-n	4	34 656	4.999 A	138.3 mΩ	99.79 %	---
B-C / b-n	5	34 105	5.000 A	135.9 mΩ	99.73 %	---
B-C / b-n	6	33 553	5.000 A	133.6 mΩ	99.81 %	---
B-C / b-n	7	33 002	5.000 A	131.2 mΩ	99.67 %	---
B-C / b-n	8	32 451	5.000 A	128.7 mΩ	99.70 %	---
B-C / b-n	9	31 899	5.000 A	125.7 mΩ	99.91 %	---
B-C / b-n	10	31 348	5.000 A	128.7 mΩ	99.81 %	---
B-C / b-n	11	30 797	5.000 A	131.2 mΩ	99.82 %	---
B-C / b-n	12	30 245	5.000 A	133.6 mΩ	99.96 %	---
B-C / b-n	13	29 694	5.000 A	136.0 mΩ	99.91 %	---

Connection	Tap (P)	Tap Voltage (V)	Current	48°C Resistance corrected to 75°C	Stability	Variation
B-C / b-n	14	29 143	5.000 A	138.2 mΩ	99.94 %	---
B-C / b-n	15	28 591	5.001 A	140.6 mΩ	99.97 %	---
B-C / b-n	16	28 040	5.000 A	143.0 mΩ	99.80 %	---
C-A / c-n	16	28 040	5.000 A	143.9 mΩ	99.25 %	0.63 %
C-A / c-n	15	28 591	5.000 A	140.8 mΩ	99.97 %	0.12 %
C-A / c-n	14	29 143	5.000 A	138.3 mΩ	99.68 %	0.08 %
C-A / c-n	13	29 694	5.000 A	136.1 mΩ	99.81 %	0.12 %
C-A / c-n	12	30 245	5.000 A	133.7 mΩ	99.69 %	0.12 %
C-A / c-n	11	30 797	5.000 A	131.3 mΩ	99.71 %	0.10 %
C-A / c-n	10	31 348	5.000 A	128.8 mΩ	99.54 %	0.09 %
C-A / c-n	9	31 899	5.000 A	125.7 mΩ	99.98 %	0.03 %
C-A / c-n	8	32 451	5.000 A	128.8 mΩ	99.95 %	0.09 %
C-A / c-n	7	33 002	5.000 A	131.3 mΩ	99.34 %	0.11 %
C-A / c-n	6	33 553	5.000 A	133.5 mΩ	99.68 %	0.09 %
C-A / c-n	5	34 105	5.000 A	136.1 mΩ	99.58 %	0.16 %
C-A / c-n	4	34 656	5.000 A	138.4 mΩ	99.72 %	0.03 %
C-A / c-n	3	35 207	4.999 A	140.7 mΩ	99.65 %	0.02 %
C-A / c-n	2	35 759	5.000 A	143.1 mΩ	99.59 %	0.18 %
C-A / c-n	1	36 310	5.000 A	145.4 mΩ	99.01 %	2.40 %

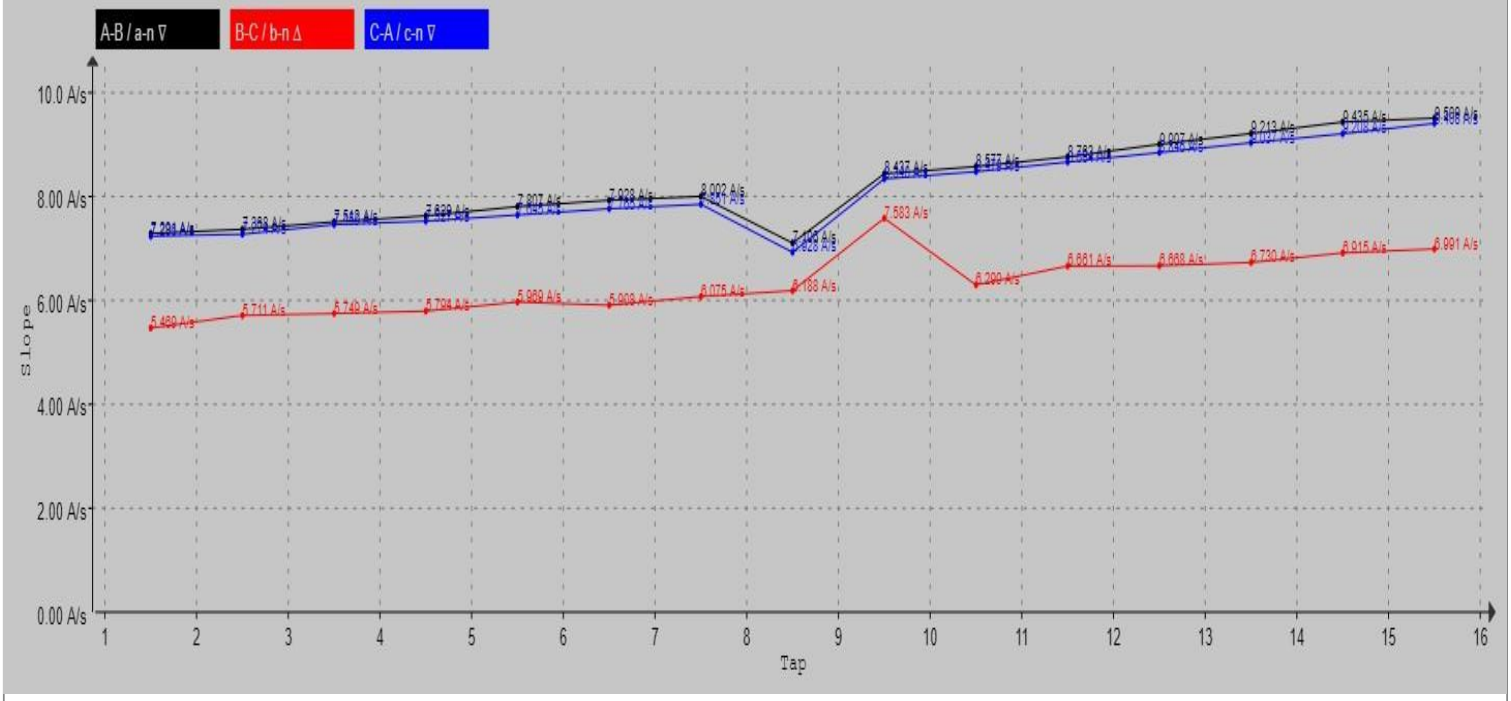
WRM



Ripple



Slope



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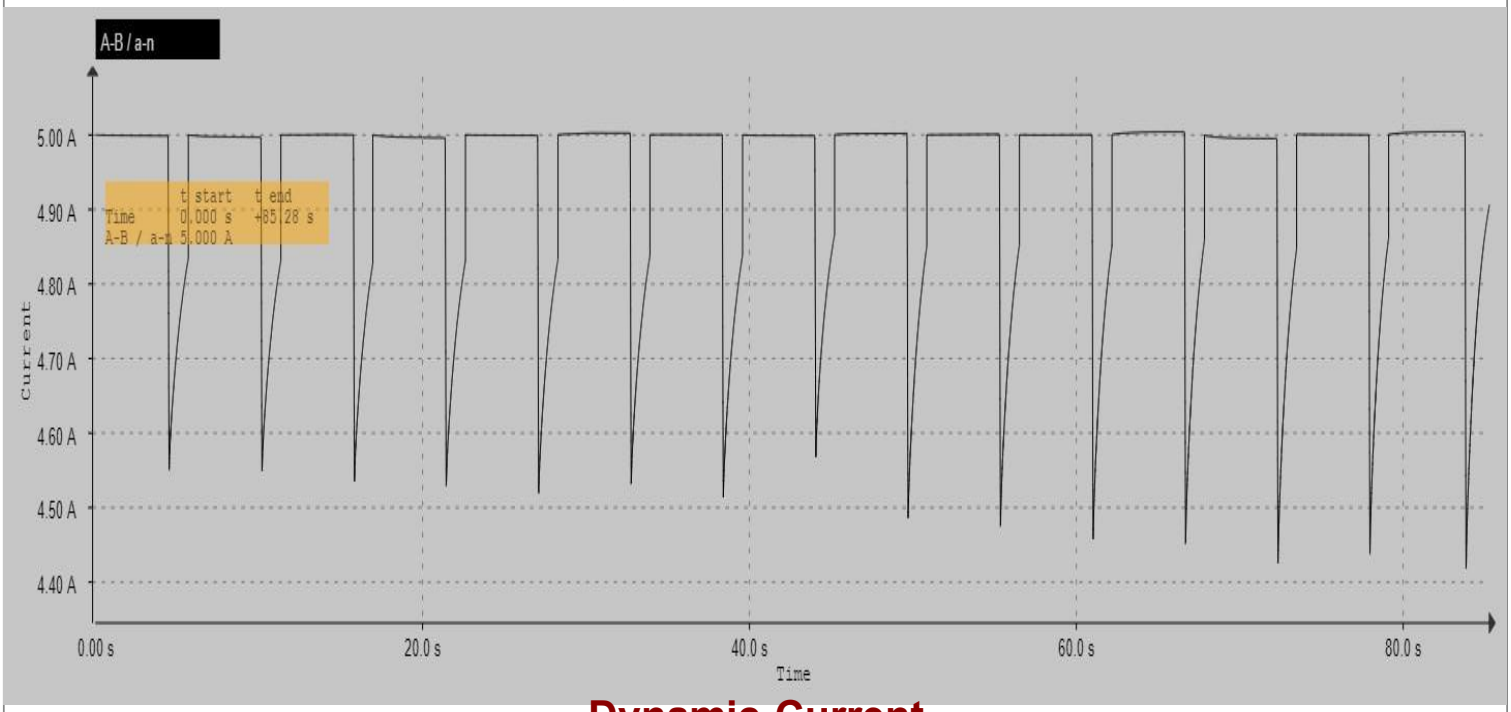

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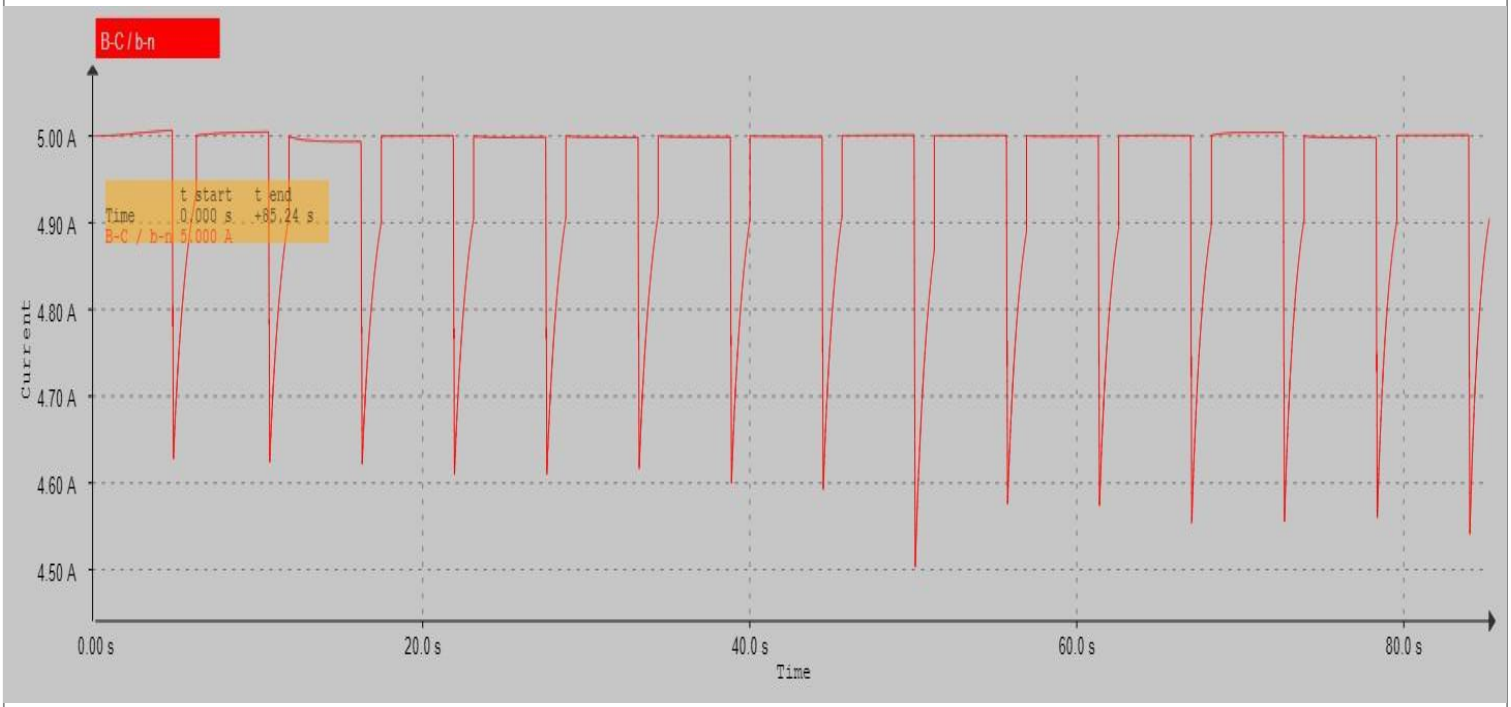

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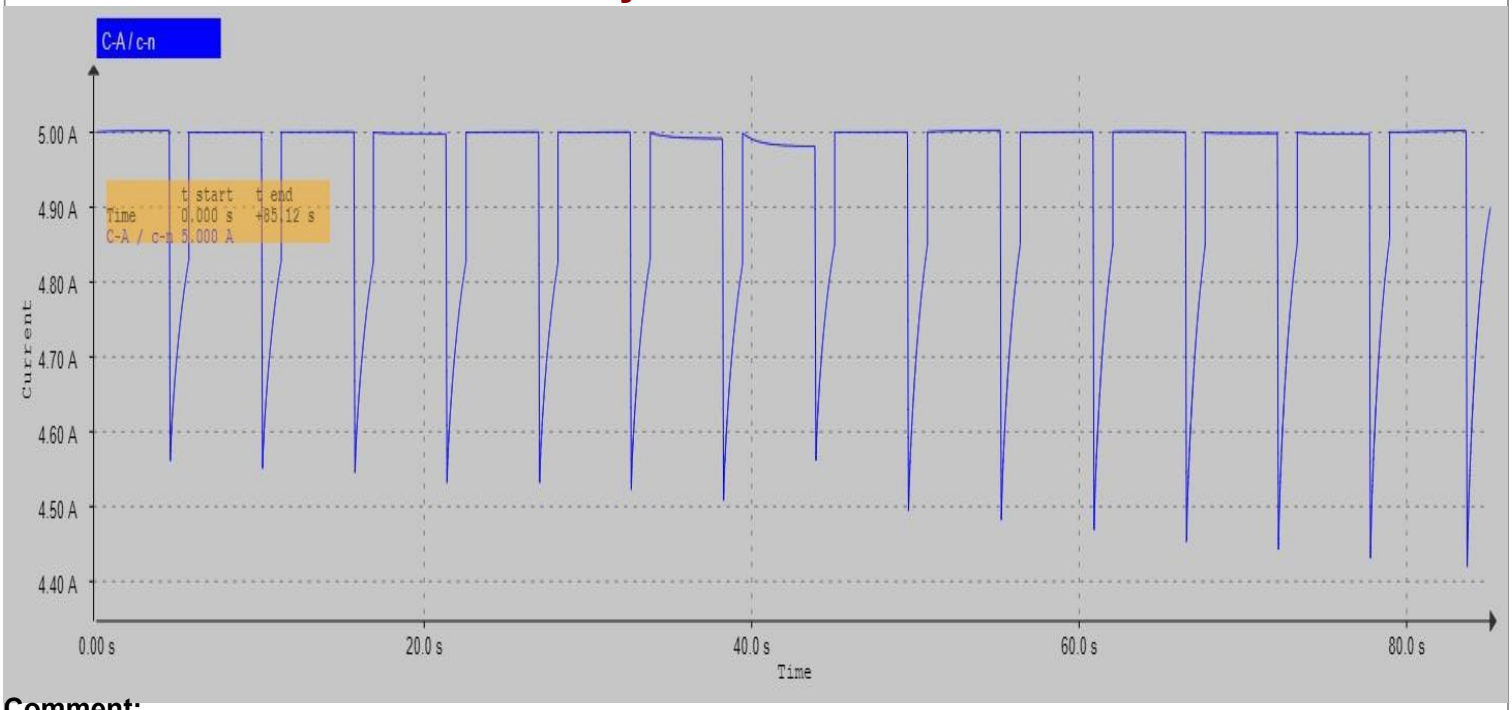


Comment:

TRANSFORMER INSULATION RESISTANCE TEST REPORT

SPAJ Electrical Engineering (M) Sdn. Bhd.

TEST CERTIFICATE

POWER TRANSFORMER TEST

RECOGNIZED AND CERTIFIED USER OF Megger.

Client :	TENAGA NASIONAL BERHAD	**Main Contractor :**	MALAYSIA TRANSFORMER MANUFACTURING SDN BHD
Station :	PPU MALAYSINO	**Manufacture year:**	2010
Circuit :	33/22KV MTM TRANSFORMER :2	**Serial No.:**	30001

BAY ID: TX2

INSULATION RESISTANCE & POLIRIZATION TEST

For Tr. Winding

1. 5kV Megger Insulation Reading

1) TNB Standards Insulation = 1 G OHMS
2) Polarization Index = (R 10 M/ R1M)

BEFORE SERVICE:

MAINTANANCE :

TRANSFORMER INSULATION

1 Min Reading :		10 Min Reading :		Polarization Index > 1.2
HV To E :	535 MΩ	HV To E :	650 MΩ	1.214953
LV To E :	420 MΩ	LV To E :	510 MΩ	1.214286
HV To LV :	420 MΩ	HV To LV :	520 MΩ	1.238095

NOTE: AMBIENT TEMPERATURE: 36 **°C**
OIL TEMPERATURE: 48 **°C**

TIME : 10.40 AM

Tested by:	Witnessed by:	Verified by :	ESE COMMENT:
Name: VICKNESH Dept: Tester	Name: Mr. ARIF Dept: TNB	Name: Dept:	
Date: 28/09/2024	Date: 28/09/2024	Date: 28/09/2024	

TRANSFORMER TESTING REPORTS

Location: PPU MALAYSINO

Job: T2 AFTER SERVICE

Date: 28/09/2024

TRANSFORMER NO	: 02
SERIAL NO	: 30001
VOLTAGE	: 33000/22000
KVA	: 30000
MANUFACTURE	: MTM
YEAR	: 2010
TESTING DATE	: 28/09/2024

TEST PERFORMED

S.NO.	TITLE
1	TANDELTA WINDING
2	EXCITATION CURRENT 10KV
3	TURN RATIO MEASUREMENT
4	DC WINDING RESISTANCE
5	OLTC DYNAMIC CURRENT MEASUREMENT
6	INSULATION RESISTANCE / POLARIZATION INDEX

TEST EQUIPMENT USED :

1. **MEGGER TDX 120**
2. **MEGGER TRAX 220**
3. **MEGGER MIT515 INSULATION TESTER**

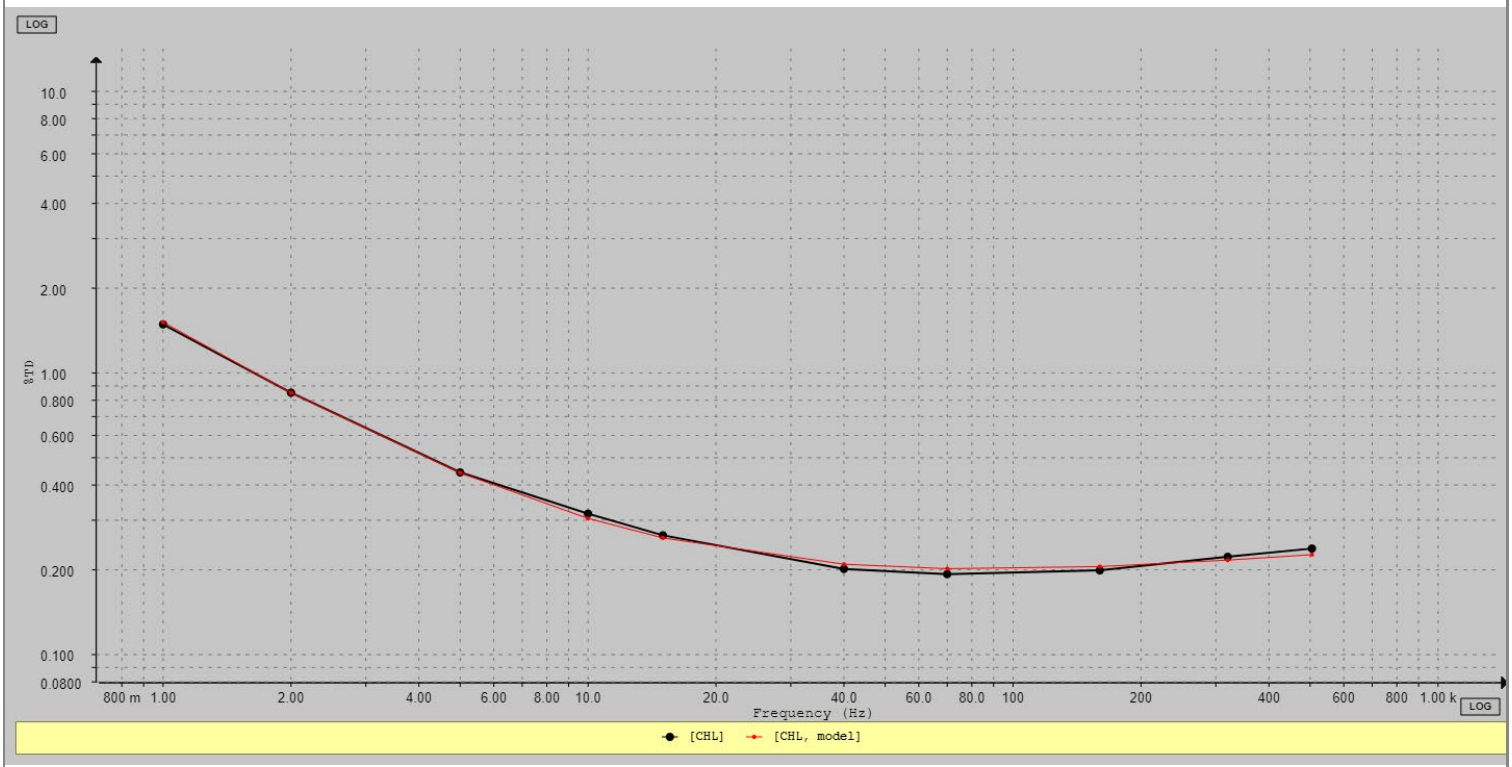
TESTING PERFORMED BY:

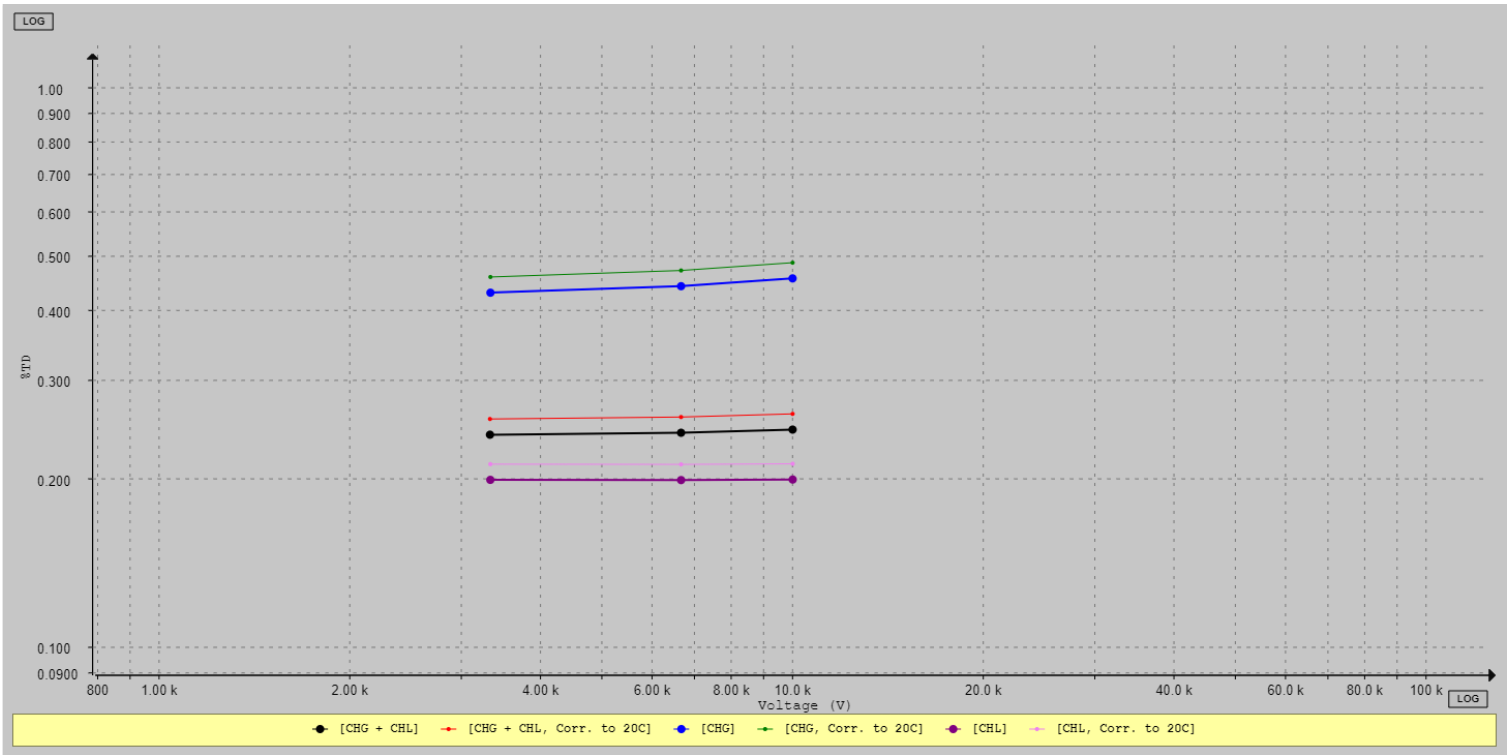
1. **VICKNESH A/L SUBRAMANIAM**
2. **GOBINATH RAJU**
3. **SAKTHI**

TRANSFORMER TANDELTA TEST REPORT

Tan Delta - Power Transformer

Designation	Test Mode	f (Hz)	U	I eq	C	%TD at 34 °C	ITC2 Corr. Factor	Corr. %TD to 20°C	P eq at 34 °C	% VDF	ITC2
CHG + CHL	GST-GND	50.00	10.00 kV	45.44 mA	14.46 nF	0.246	1.067	**0.262**	1.117 W	0.01 %	
CHG	GSTg-RB	50.00	10.01 kV	7.726 mA	2.459 nF	0.465	1.067	**0.496**	359.0 mW	0.02 %	●
CHL	UST-R	50.00	10.01 kV	37.72 mA	12.01 nF	0.200	1.067	**0.213**	753.4 mW	0.01 %	
CLG + CLH	GST-GND	50.00	6.001 kV	61.73 mA	19.65 nF	0.267	1.067	**0.285**	1.647 W	0.01 %	
CLG	GSTg-RB	50.00	6.006 kV	24.02 mA	7.644 nF	0.374	1.067	**0.399**	897.8 mW	0.02 %	
CLH	UST-R	50.00	6.007 kV	37.72 mA	12.01 nF	0.199	1.067	**0.212**	750.0 mW	0.01 %	




LOG
1.00
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.0900
%TD
800
1.00 k
2.00 k
4.00 k
6.00 k
8.00 k
10.0 k
20.0 k
40.0 k
60.0 k
80.0 k
100 k
LOG
Voltage (V)
[CHG + CHL]
[CHG + CHL, Corr. to 20C]
[CHG]
[CHG, Corr. to 20C]
[CHL]
[CHL, Corr. to 20C]

Comment:

TRANSFORMER EXCITATION 10KV TEST REPORT

Tan Delta - Power Transformer Excitation

Connection	Tap	Tap Voltage (V)	f (Hz)	U	I eq	L	P eq at 36 °C
A-B	1	36 310	50.00	9.992 kV	69.15 mA	749.4 H	545.6 W
B-C	1	36 310	50.00	10.02 kV	29.94 mA	1.838 kH	244.2 W
C-A	1	36 310	50.00	10.01 kV	66.13 mA	816.9 H	534.3 W
A-B	2	35 759	50.00	10.03 kV	70.47 mA	736.0 H	556.4 W
B-C	2	35 759	50.00	9.973 kV	30.63 mA	1.804 kH	250.4 W
C-A	2	35 759	50.00	9.966 kV	67.54 mA	799.4 H	545.5 W
A-B	3	35 207	50.00	10.06 kV	72.04 mA	720.8 H	569.1 W
B-C	3	35 207	50.00	10.02 kV	31.29 mA	1.780 kH	256.7 W
C-A	3	35 207	50.00	9.969 kV	69.11 mA	783.4 H	559.0 W
A-B	4	34 656	50.00	9.966 kV	74.05 mA	702.2 H	585.6 W
B-C	4	34 656	50.00	10.03 kV	32.02 mA	1.750 kH	263.6 W
C-A	4	34 656	50.00	10.03 kV	70.63 mA	770.3 H	572.8 W
A-B	5	34 105	50.00	9.963 kV	75.97 mA	686.3 H	601.7 W
B-C	5	34 105	50.00	10.03 kV	32.82 mA	1.724 kH	271.4 W
C-A	5	34 105	50.00	10.04 kV	72.42 mA	754.9 H	588.8 W
A-B	6	33 553	50.00	9.960 kV	77.96 mA	671.4 H	618.8 W
B-C	6	33 553	50.00	9.985 kV	33.74 mA	1.689 kH	279.9 W
C-A	6	33 553	50.00	9.981 kV	74.42 mA	737.4 H	606.3 W
A-B	7	33 002	50.00	10.03 kV	79.82 mA	660.5 H	636.3 W
B-C	7	33 002	50.00	9.970 kV	34.69 mA	1.662 kH	289.3 W
C-A	7	33 002	50.00	9.967 kV	76.45 mA	722.5 H	624.8 W
A-B	8	32 451	50.00	9.986 kV	82.09 mA	645.0 H	656.1 W
B-C	8	32 451	50.00	10.04 kV	35.61 mA	1.642 kH	298.7 W
C-A	8	32 451	50.00	9.963 kV	78.59 mA	706.9 H	644.1 W
A-B	9	31 899	50.00	9.980 kV	84.33 mA	631.4 H	676.0 W
B-C	9	31 899	50.00	9.966 kV	38.31 mA	1.414 kH	309.9 W
C-A	9	31 899	50.00	10.05 kV	80.57 mA	695.6 H	663.2 W
A-B	10	31 348	50.00	9.965 kV	87.78 mA	594.7 H	695.7 W
B-C	10	31 348	50.00	9.982 kV	39.24 mA	1.388 kH	318.4 W
C-A	10	31 348	50.00	10.06 kV	84.06 mA	648.4 H	682.3 W
A-B	11	30 797	50.00	10.02 kV	89.93 mA	583.7 H	715.1 W
B-C	11	30 797	50.00	10.03 kV	40.23 mA	1.365 kH	327.8 W
C-A	11	30 797	50.00	9.954 kV	86.63 mA	631.3 H	704.5 W
A-B	12	30 245	50.00	10.06 kV	92.26 mA	571.6 H	735.6 W
B-C	12	30 245	50.00	9.993 kV	41.40 mA	1.337 kH	338.6 W

Connection	Tap	Tap Voltage (V)	f (Hz)	U	I eq	L	P eq at 36 °C
C-A	12	30 245	50.00	10.03 kV	88.83 mA	620.4 H	725.2 W
A-B	13	29 694	50.00	9.991 kV	95.10 mA	556.5 H	759.8 W
B-C	13	29 694	50.00	10.04 kV	42.56 mA	1.314 kH	349.8 W
C-A	13	29 694	50.00	10.05 kV	91.34 mA	607.4 H	748.1 W
A-B	14	29 143	50.00	9.945 kV	97.93 mA	543.3 H	784.7 W
B-C	14	29 143	50.00	10.04 kV	43.88 mA	1.287 kH	362.4 W
C-A	14	29 143	50.00	9.972 kV	94.33 mA	590.7 H	774.2 W
A-B	15	28 591	50.00	10.04 kV	100.5 mA	532.0 H	807.9 W
B-C	15	28 591	50.00	9.985 kV	45.40 mA	1.258 kH	376.9 W
C-A	15	28 591	50.00	9.961 kV	97.30 mA	577.2 H	801.6 W
A-B	16	28 040	50.00	10.05 kV	103.4 mA	521.1 H	834.7 W
B-C	16	28 040	50.00	9.972 kV	47.17 mA	1.230 kH	394.4 W
C-A	16	28 040	50.00	9.986 kV	100.3 mA	565.8 H	830.0 W

Comment:

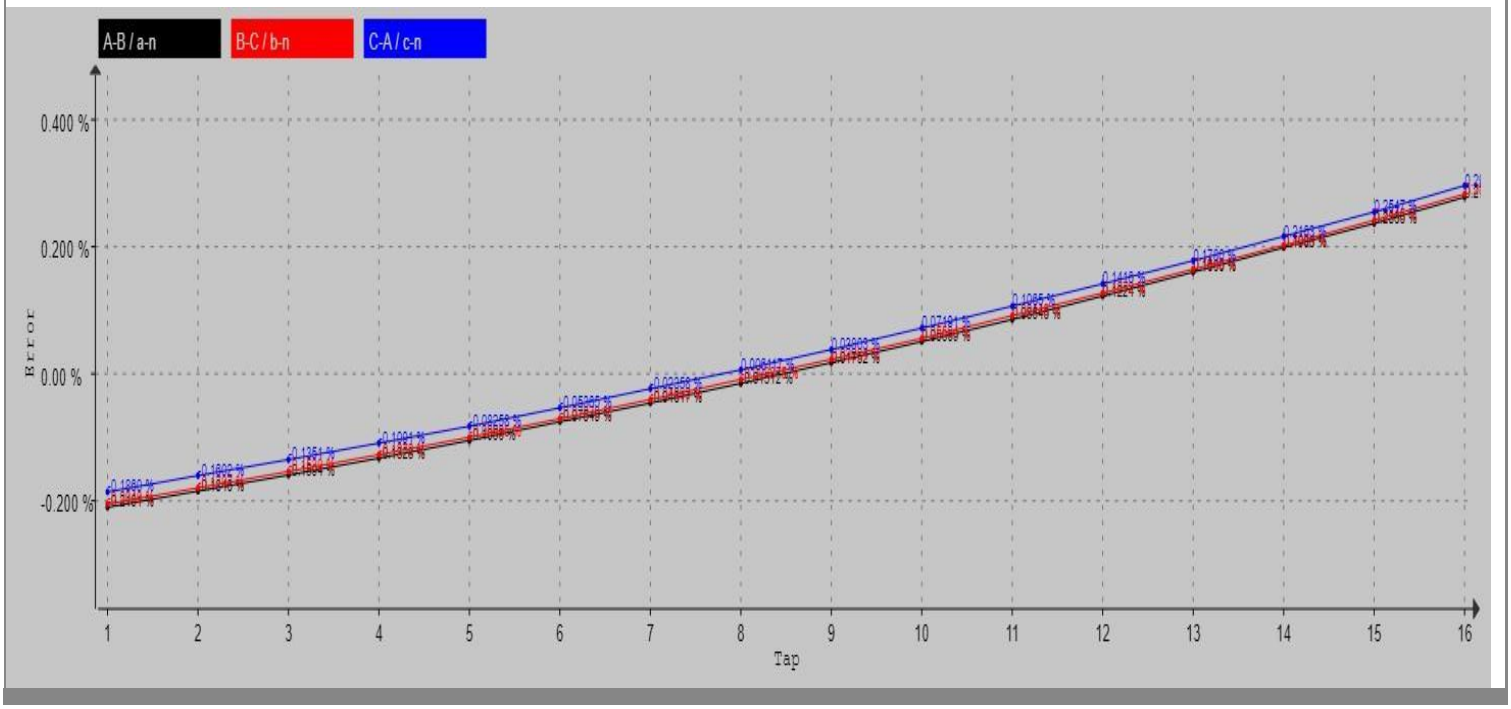
TRANSFORMER TURNS RATIO TEST REPORT

Turns ratio measurements

Connection	Tap (P)	Tap Voltage (V)	U	Test frequency	TTR	Measured TTR	Error	I Exc	Phase
A-B / a-n	1	36 310	125.0 V	50.00 Hz	2.859	2.853	-0.21 %	4.182 mA	0.0 °
B-C / b-n	1	36 310	125.0 V	50.00 Hz	2.859	2.853	-0.20 %	3.580 mA	0.0 °
C-A / c-n	1	36 310	125.0 V	50.00 Hz	2.859	2.853	-0.19 %	7.250 mA	-0.01 °
A-B / a-n	2	35 759	125.0 V	50.00 Hz	2.815	2.810	-0.18 %	4.296 mA	0.0 °
B-C / b-n	2	35 759	125.0 V	50.00 Hz	2.815	2.810	-0.18 %	3.668 mA	0.0 °
C-A / c-n	2	35 759	125.0 V	50.00 Hz	2.815	2.811	-0.16 %	7.394 mA	-0.01 °
A-B / a-n	3	35 207	125.0 V	50.00 Hz	2.772	2.767	-0.16 %	4.413 mA	0.0 °
B-C / b-n	3	35 207	125.0 V	50.00 Hz	2.772	2.768	-0.15 %	3.764 mA	0.0 °
C-A / c-n	3	35 207	125.0 V	50.00 Hz	2.772	2.768	-0.14 %	7.562 mA	-0.01 °
A-B / a-n	4	34 656	125.0 V	50.00 Hz	2.728	2.725	-0.13 %	4.534 mA	0.0 °
B-C / b-n	4	34 656	125.0 V	50.00 Hz	2.728	2.725	-0.13 %	3.878 mA	0.0 °
C-A / c-n	4	34 656	125.0 V	50.00 Hz	2.728	2.725	-0.11 %	7.746 mA	-0.01 °
A-B / a-n	5	34 105	125.0 V	50.00 Hz	2.685	2.682	-0.11 %	4.663 mA	0.0 °
B-C / b-n	5	34 105	125.0 V	50.00 Hz	2.685	2.682	-0.10 %	3.999 mA	0.0 °
C-A / c-n	5	34 105	125.0 V	50.00 Hz	2.685	2.683	-0.08 %	7.927 mA	-0.01 °
A-B / a-n	6	33 553	125.0 V	50.00 Hz	2.642	2.640	-0.08 %	4.795 mA	0.0 °
B-C / b-n	6	33 553	125.0 V	50.00 Hz	2.642	2.640	-0.07 %	4.118 mA	0.0 °
C-A / c-n	6	33 553	125.0 V	50.00 Hz	2.642	2.640	-0.05 %	8.106 mA	-0.01 °
A-B / a-n	7	33 002	125.0 V	50.00 Hz	2.598	2.597	-0.05 %	4.940 mA	0.0 °
B-C / b-n	7	33 002	125.0 V	50.00 Hz	2.598	2.597	-0.04 %	4.234 mA	0.0 °
C-A / c-n	7	33 002	125.0 V	50.00 Hz	2.598	2.598	-0.02 %	8.316 mA	-0.01 °
A-B / a-n	8	32 451	125.0 V	50.00 Hz	2.555	2.554	-0.02 %	5.088 mA	0.0 °
B-C / b-n	8	32 451	125.0 V	50.00 Hz	2.555	2.555	-0.01 %	4.359 mA	0.0 °
C-A / c-n	8	32 451	125.0 V	50.00 Hz	2.555	2.555	0.01 %	8.539 mA	-0.01 °
A-B / a-n	9	31 899	125.0 V	50.00 Hz	2.511	2.512	0.02 %	5.247 mA	0.0 °
B-C / b-n	9	31 899	125.0 V	50.00 Hz	2.511	2.512	0.02 %	4.523 mA	0.0 °
C-A / c-n	9	31 899	125.0 V	50.00 Hz	2.511	2.512	0.04 %	8.748 mA	-0.01 °
A-B / a-n	10	31 348	125.0 V	50.00 Hz	2.468	2.469	0.05 %	5.397 mA	0.0 °
B-C / b-n	10	31 348	125.0 V	50.00 Hz	2.468	2.469	0.06 %	4.657 mA	0.0 °
C-A / c-n	10	31 348	125.0 V	50.00 Hz	2.468	2.470	0.07 %	8.955 mA	-0.01 °
A-B / a-n	11	30 797	125.0 V	50.00 Hz	2.425	2.427	0.09 %	5.573 mA	0.0 °
B-C / b-n	11	30 797	125.0 V	50.00 Hz	2.425	2.427	0.09 %	4.802 mA	0.0 °
C-A / c-n	11	30 797	125.0 V	50.00 Hz	2.425	2.427	0.11 %	9.205 mA	-0.01 °
A-B / a-n	12	30 245	125.0 V	50.00 Hz	2.381	2.384	0.12 %	5.760 mA	0.0 °
B-C / b-n	12	30 245	125.0 V	50.00 Hz	2.381	2.384	0.13 %	4.961 mA	0.0 °
C-A / c-n	12	30 245	125.0 V	50.00 Hz	2.381	2.385	0.14 %	9.487 mA	-0.01 °
A-B / a-n	13	29 694	125.0 V	50.00 Hz	2.338	2.342	0.16 %	5.957 mA	0.0 °
B-C / b-n	13	29 694	125.0 V	50.00 Hz	2.338	2.342	0.16 %	5.130 mA	0.0 °

Connection	Tap (P)	Tap Voltage (V)	U	Test frequency	TTR	Measured TTR	Error	I Exc	Phase
C-A / c-n	13	29 694	125.0 V	50.00 Hz	2.338	2.342	0.18 %	9.767 mA	-0.01 °
A-B / a-n	14	29 143	125.0 V	50.00 Hz	2.294	2.299	0.20 %	6.160 mA	0.0 °
B-C / b-n	14	29 143	125.0 V	50.00 Hz	2.294	2.299	0.20 %	5.309 mA	0.0 °
C-A / c-n	14	29 143	125.0 V	50.00 Hz	2.294	2.299	0.22 %	10.05 mA	-0.01 °
A-B / a-n	15	28 591	125.0 V	50.00 Hz	2.251	2.256	0.24 %	6.377 mA	0.0 °
B-C / b-n	15	28 591	125.0 V	50.00 Hz	2.251	2.256	0.24 %	5.495 mA	0.0 °
C-A / c-n	15	28 591	125.0 V	50.00 Hz	2.251	2.257	0.25 %	10.38 mA	-0.01 °
A-B / a-n	16	28 040	125.0 V	50.00 Hz	2.208	2.214	0.28 %	6.595 mA	0.0 °
B-C / b-n	16	28 040	125.0 V	50.00 Hz	2.208	2.214	0.28 %	5.693 mA	0.0 °
C-A / c-n	16	28 040	125.0 V	50.00 Hz	2.208	2.214	0.30 %	10.71 mA	-0.01 °

Comment:



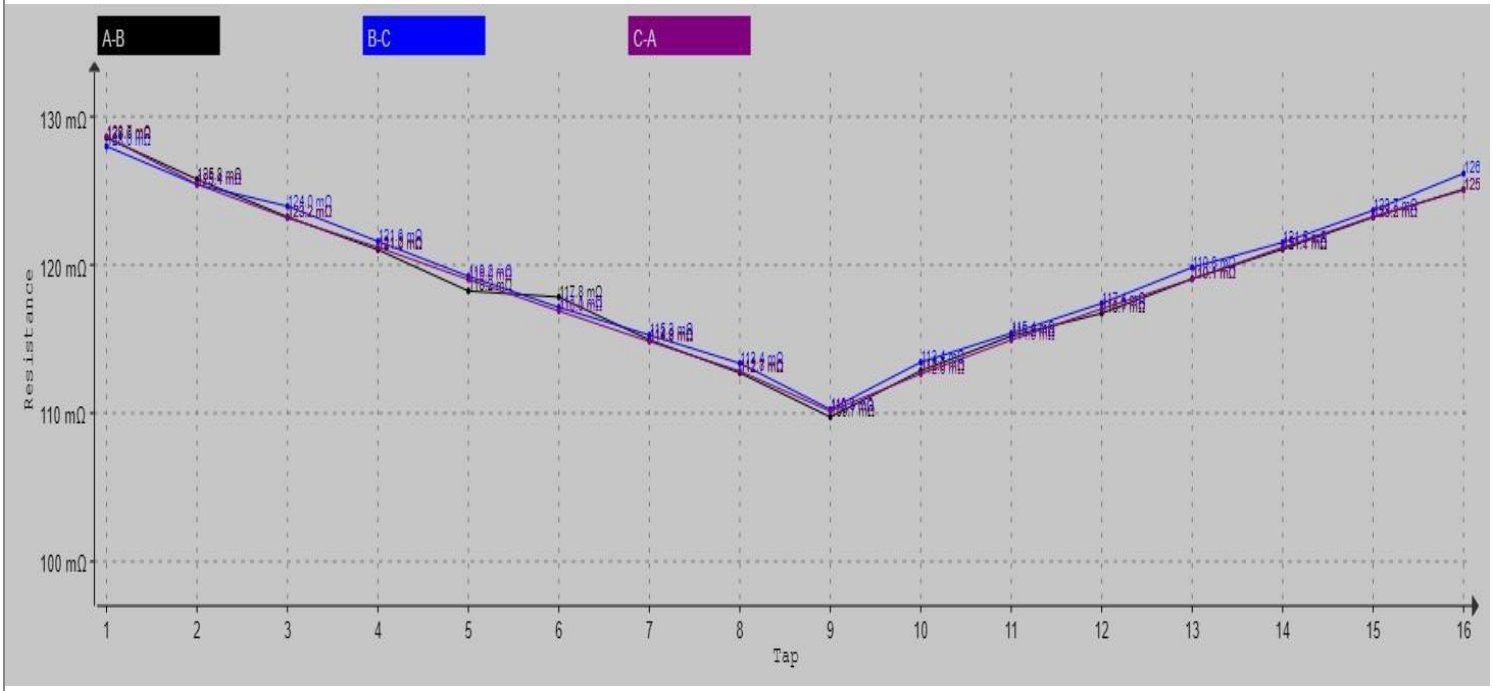
TRANSFORMER DC WINDING RESITANCE TEST REPORT

HV Winding resistance measurements

Connection	Tap (P)	Current	34°C Resistance corrected to 75°C	Stability	Variation	Continuity
A-B	1	10.00 A	148.2 mΩ	99.12 %	---	✓
B-C	1	9.992 A	147.5 mΩ	99.93 %	---	✓
C-A	1	10.00 A	148.3 mΩ	99.39 %	0.51 %	✓
A-B	2	9.980 A	144.9 mΩ	99.49 %	---	✓
B-C	2	10.00 A	144.5 mΩ	99.38 %	---	✓
C-A	2	10.00 A	144.6 mΩ	99.53 %	0.28 %	✓
A-B	3	9.996 A	142.0 mΩ	99.46 %	---	✓
B-C	3	10.02 A	142.9 mΩ	99.87 %	---	✓
C-A	3	10.00 A	141.9 mΩ	99.43 %	0.64 %	✓
A-B	4	10.01 A	139.5 mΩ	99.77 %	---	✓
B-C	4	10.01 A	140.1 mΩ	99.84 %	---	✓
C-A	4	10.00 A	139.7 mΩ	99.82 %	0.47 %	✓
A-B	5	10.03 A	136.3 mΩ	99.04 %	---	✓
B-C	5	10.01 A	137.4 mΩ	99.61 %	---	✓
C-A	5	10.00 A	137.2 mΩ	99.96 %	0.84 %	✓
A-B	6	9.990 A	135.8 mΩ	99.20 %	---	✓
B-C	6	10.00 A	135.0 mΩ	99.60 %	---	✓
C-A	6	10.01 A	134.7 mΩ	99.71 %	0.80 %	✓
A-B	7	10.01 A	132.5 mΩ	99.86 %	---	✓
B-C	7	10.00 A	132.8 mΩ	99.88 %	---	✓
C-A	7	10.01 A	132.3 mΩ	99.70 %	0.38 %	✓
A-B	8	10.00 A	129.9 mΩ	99.80 %	---	✓
B-C	8	9.998 A	130.6 mΩ	99.94 %	---	✓
C-A	8	10.00 A	130.0 mΩ	99.64 %	0.57 %	✓
A-B	9	9.990 A	126.5 mΩ	99.65 %	---	✓
B-C	9	10.02 A	127.1 mΩ	99.94 %	---	✓
C-A	9	10.00 A	126.9 mΩ	99.21 %	0.47 %	✓
A-B	10	10.01 A	130.1 mΩ	99.99 %	---	✓
B-C	10	9.981 A	130.7 mΩ	99.67 %	---	✓
C-A	10	10.00 A	129.8 mΩ	99.77 %	0.70 %	✓
A-B	11	9.989 A	132.8 mΩ	99.97 %	---	✓
B-C	11	9.996 A	133.0 mΩ	99.86 %	---	✓
C-A	11	10.01 A	132.5 mΩ	99.81 %	0.39 %	✓
A-B	12	10.01 A	134.5 mΩ	99.64 %	---	✓
B-C	12	10.01 A	135.3 mΩ	99.88 %	---	✓
C-A	12	10.01 A	134.9 mΩ	99.78 %	0.57 %	✓
A-B	13	10.01 A	137.2 mΩ	99.77 %	---	✓

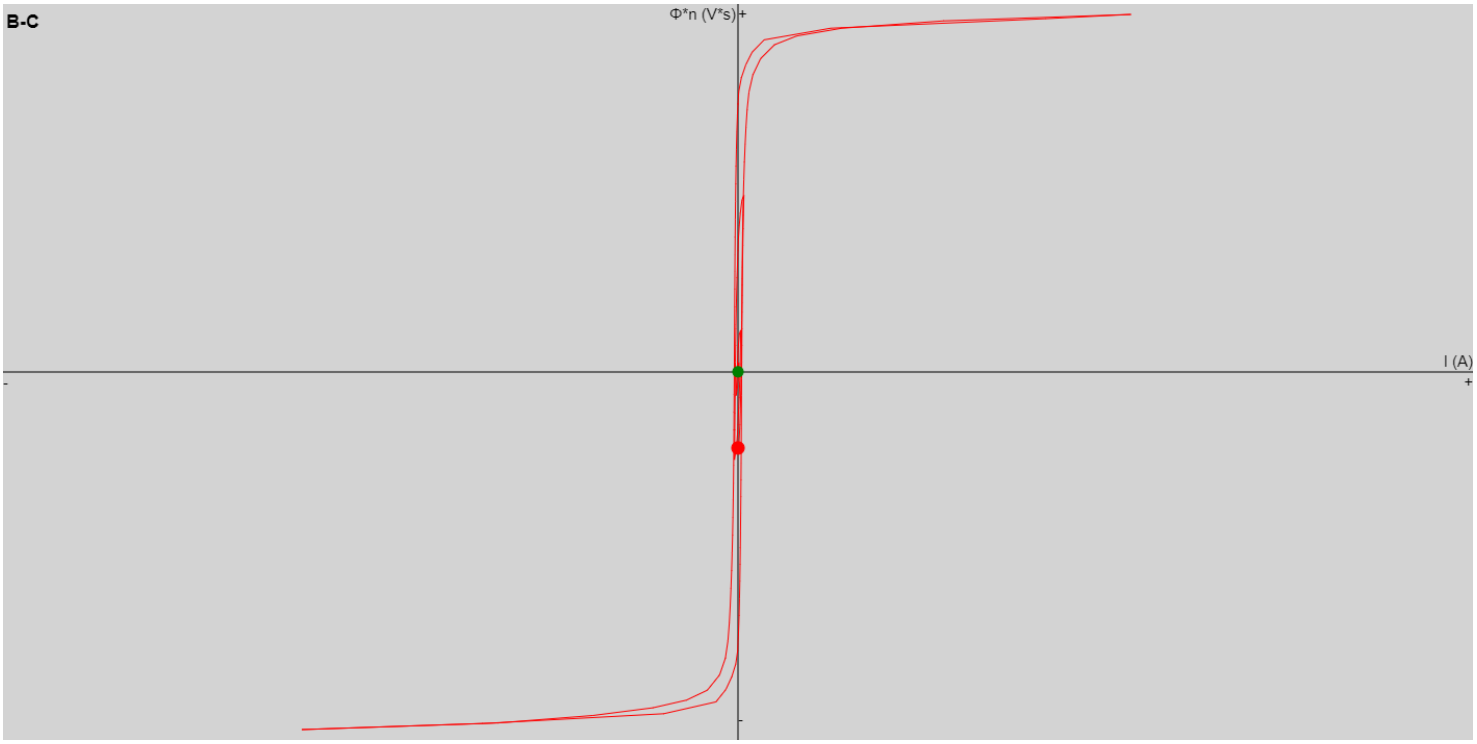
Connection	Tap (P)	Current	34°C Resistance corrected to 75°C	Stability	Variation	Continuity
B-C	13	10.02 A	138.1 mΩ	99.87 %	---	✓
C-A	13	10.00 A	137.2 mΩ	99.85 %	0.65 %	✓
A-B	14	10.00 A	139.5 mΩ	99.71 %	---	✓
B-C	14	10.01 A	140.0 mΩ	99.93 %	---	✓
C-A	14	10.00 A	139.7 mΩ	99.83 %	0.37 %	✓
A-B	15	10.00 A	142.0 mΩ	99.61 %	---	✓
B-C	15	10.01 A	142.5 mΩ	99.78 %	---	✓
C-A	15	10.00 A	142.0 mΩ	99.57 %	0.37 %	✓
A-B	16	10.00 A	144.2 mΩ	99.93 %	---	✓
B-C	16	10.00 A	145.4 mΩ	99.53 %	---	✓
C-A	16	10.01 A	144.1 mΩ	99.98 %	0.89 %	✓

Comment:



Demag measurements

Designation	Current	Time	Remanence before demag	Remanence after demag
B-C	0.000 A	28.91 s	21.28 %	<1 %



Comment:

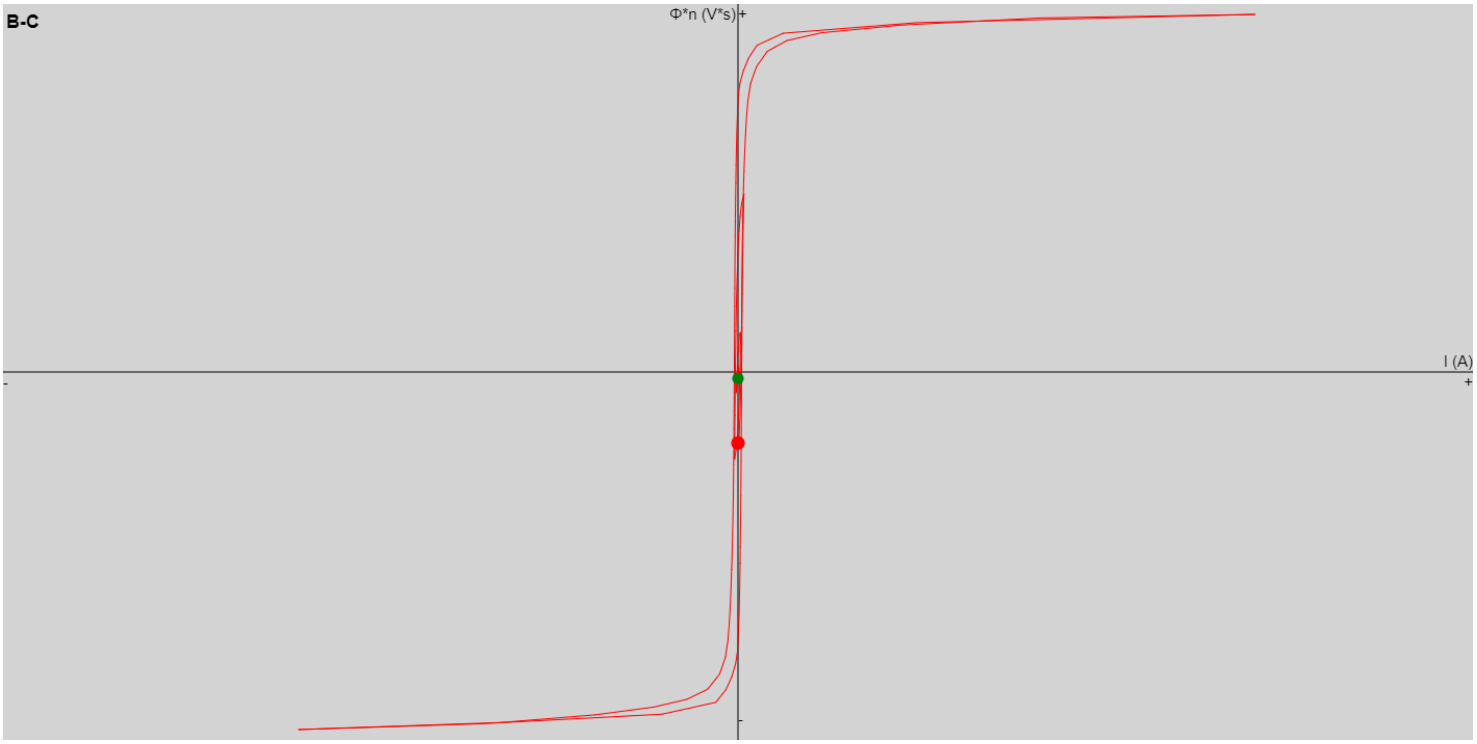
LV Winding resistance measurement

Connection	Tap (S)	Current	34°C Resistance corrected to 75°C	Stability	Variation
a-n	1	9.988 A	25.67 mΩ	99.77 %	---
b-n	1	9.987 A	25.70 mΩ	99.80 %	---
c-n	1	9.999 A	25.93 mΩ	99.37 %	1.02 %

Comment:

Demag measurements

Designation	Current	Time	Remanence before demag	Remanence after demag
B-C	0.000 A	31.71 s	19.87 %	1.865 %



Comment:

TRANSFORMER OLTC DYNAMIC RESISTANCE TEST REPORT

On Load Tap Changer Measurements

Software configuration

OLTC Type	Taps on	Secondary Side
Non-vacuum R	Primary	Open Circuit

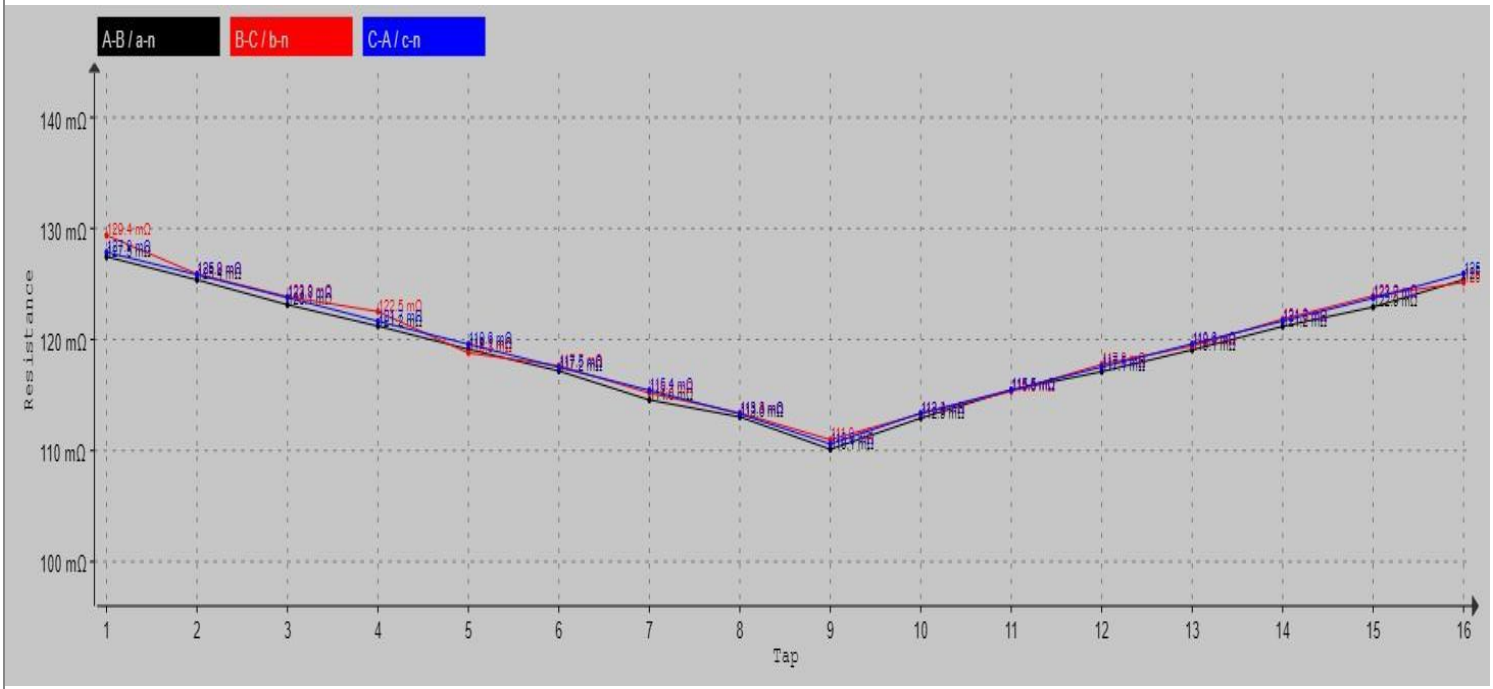
Connection	Transition	t start	t	Ripple	Slope	Continuity
A-B / a-n	16 → 15	4.729 s	62 ms	11.87 %	9.571 A/s	✓
A-B / a-n	15 → 14	4.49 s	62.1 ms	11.74 %	9.537 A/s	✓
A-B / a-n	14 → 13	4.515 s	61.7 ms	11.33 %	9.170 A/s	✓
A-B / a-n	13 → 12	4.497 s	60.7 ms	11.03 %	9.079 A/s	✓
A-B / a-n	12 → 11	4.49 s	61.5 ms	10.83 %	8.787 A/s	✓
A-B / a-n	11 → 10	4.482 s	61.5 ms	10.72 %	8.741 A/s	✓
A-B / a-n	10 → 9	4.494 s	61.7 ms	10.37 %	8.339 A/s	✓
A-B / a-n	9 → 8	4.498 s	61.1 ms	8.860 %	7.221 A/s	✓
A-B / a-n	8 → 7	4.48 s	62 ms	9.904 %	7.962 A/s	✓
A-B / a-n	7 → 6	4.489 s	62.1 ms	9.738 %	7.813 A/s	✓
A-B / a-n	6 → 5	4.483 s	62.7 ms	9.688 %	7.738 A/s	✓
A-B / a-n	5 → 4	4.484 s	60.9 ms	9.249 %	7.523 A/s	✓
A-B / a-n	4 → 3	4.494 s	61.4 ms	9.241 %	7.544 A/s	✓
A-B / a-n	3 → 2	4.495 s	61.3 ms	9.150 %	7.483 A/s	✓
A-B / a-n	2 → 1	4.495 s	61.9 ms	8.992 %	7.246 A/s	✓
A-B / a-n	--	---	---	---	---	✓
B-C / b-n	1 → 2	4.615 s	63.9 ms	7.321 %	5.706 A/s	✓
B-C / b-n	2 → 3	4.371 s	65 ms	7.337 %	5.609 A/s	✓
B-C / b-n	3 → 4	4.369 s	63.9 ms	7.404 %	5.767 A/s	✓
B-C / b-n	4 → 5	4.359 s	62 ms	7.415 %	5.971 A/s	✓
B-C / b-n	5 → 6	4.364 s	63 ms	7.477 %	5.930 A/s	✓
B-C / b-n	6 → 7	4.37 s	63 ms	7.583 %	5.993 A/s	✓
B-C / b-n	7 → 8	4.363 s	62.2 ms	7.818 %	6.306 A/s	✓
B-C / b-n	8 → 9	4.362 s	62.5 ms	7.792 %	6.194 A/s	✓
B-C / b-n	9 → 10	4.36 s	62.3 ms	9.442 %	7.535 A/s	✓
B-C / b-n	10 → 11	4.368 s	66.9 ms	8.404 %	6.250 A/s	✓
B-C / b-n	11 → 12	4.372 s	63.8 ms	8.369 %	6.527 A/s	✓
B-C / b-n	12 → 13	4.356 s	63.1 ms	8.516 %	6.725 A/s	✓
B-C / b-n	13 → 14	4.357 s	63.6 ms	8.776 %	6.911 A/s	✓
B-C / b-n	14 → 15	4.357 s	64 ms	8.716 %	6.762 A/s	✓
B-C / b-n	15 → 16	4.369 s	62.5 ms	8.901 %	7.096 A/s	✓
B-C / b-n	--	---	---	---	---	✓
C-A / c-n	16 → 15	4.737 s	64.2 ms	12.21 %	9.497 A/s	✓
C-A / c-n	15 → 14	4.476 s	63.1 ms	11.90 %	9.431 A/s	✓
C-A / c-n	14 → 13	4.481 s	61.4 ms	11.36 %	9.242 A/s	✓
C-A / c-n	13 → 12	4.477 s	61.8 ms	11.16 %	9.018 A/s	✓
C-A / c-n	12 → 11	4.471 s	61.7 ms	10.93 %	8.841 A/s	✓
C-A / c-n	11 → 10	4.473 s	61.8 ms	10.71 %	8.653 A/s	✓
C-A / c-n	10 → 9	4.474 s	62.8 ms	10.58 %	8.417 A/s	✓
C-A / c-n	9 → 8	4.474 s	61.6 ms	8.949 %	7.254 A/s	✓
C-A / c-n	8 → 7	4.461 s	63.1 ms	10.15 %	8.028 A/s	✓

Connection	Transition	t start	t	Ripple	Slope	Continuity
C-A / c-n	7 → 6	4.457 s	62.9 ms	9.947 %	7.902 A/s	✓
C-A / c-n	6 → 5	4.46 s	61.9 ms	9.621 %	7.765 A/s	✓
C-A / c-n	5 → 4	4.471 s	61.5 ms	9.445 %	7.660 A/s	✓
C-A / c-n	4 → 3	4.478 s	61.4 ms	9.301 %	7.562 A/s	✓
C-A / c-n	3 → 2	4.47 s	61.7 ms	9.223 %	7.471 A/s	✓
C-A / c-n	2 → 1	4.46 s	62.8 ms	9.143 %	7.268 A/s	✓
C-A / c-n	--	---	---	---	---	✓

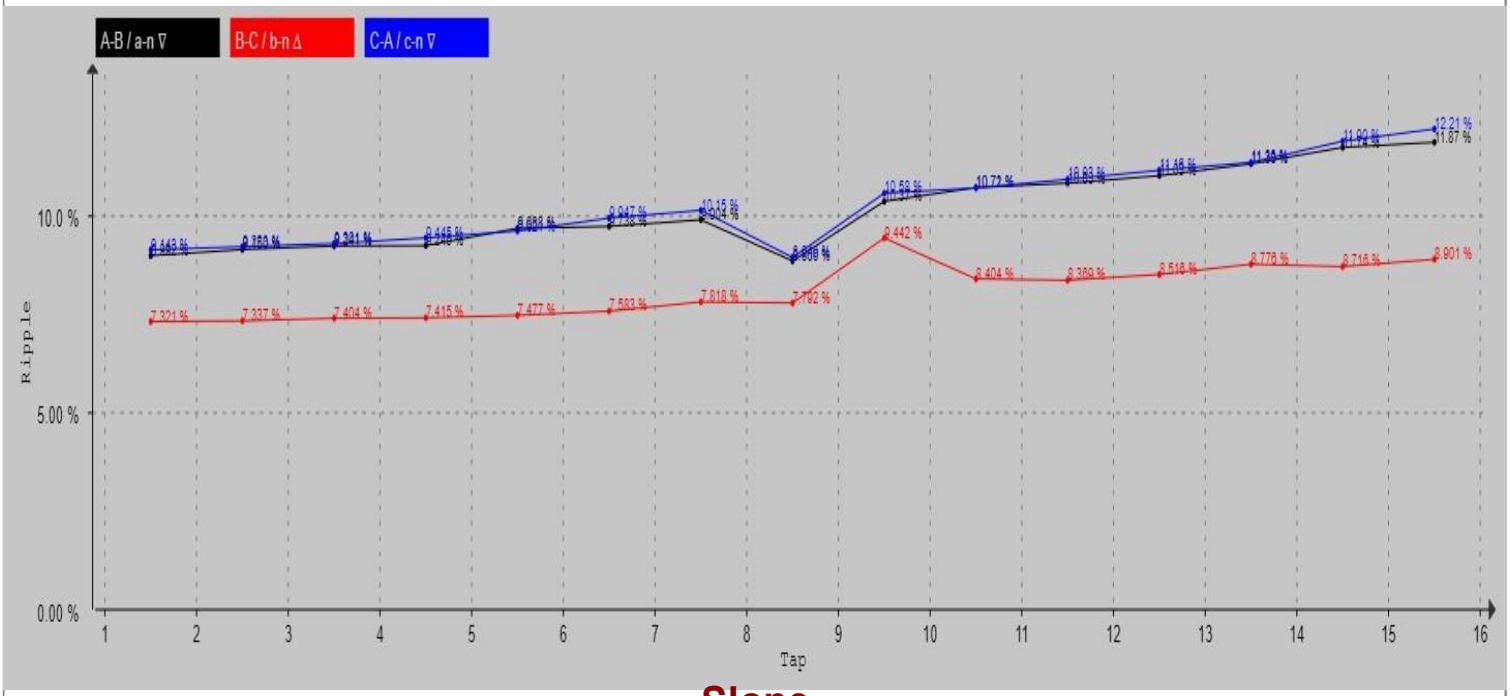
Connection	Tap (P)	Tap Voltage (V)	Current	32°C Resistance corrected to 75°C	Stability	Variation
A-B / a-n	16	28 040	5.001 A	145.6 mΩ	99.66 %	---
A-B / a-n	15	28 591	4.999 A	142.7 mΩ	99.95 %	---
A-B / a-n	14	29 143	5.003 A	140.7 mΩ	99.93 %	---
A-B / a-n	13	29 694	5.004 A	138.2 mΩ	99.88 %	---
A-B / a-n	12	30 245	5.000 A	136.0 mΩ	99.93 %	---
A-B / a-n	11	30 797	5.001 A	134.0 mΩ	99.53 %	---
A-B / a-n	10	31 348	4.993 A	131.1 mΩ	99.98 %	---
A-B / a-n	9	31 899	5.000 A	127.8 mΩ	99.84 %	---
A-B / a-n	8	32 451	5.014 A	131.2 mΩ	99.77 %	---
A-B / a-n	7	33 002	5.007 A	133.0 mΩ	99.94 %	---
A-B / a-n	6	33 553	5.004 A	136.0 mΩ	99.65 %	---
A-B / a-n	5	34 105	4.999 A	138.3 mΩ	99.87 %	---
A-B / a-n	4	34 656	5.000 A	140.7 mΩ	99.95 %	---
A-B / a-n	3	35 207	5.003 A	143.0 mΩ	99.81 %	---
A-B / a-n	2	35 759	5.000 A	145.6 mΩ	99.60 %	---
A-B / a-n	1	36 310	5.000 A	148.0 mΩ	100.0 %	---
B-C / b-n	1	36 310	5.000 A	150.2 mΩ	99.75 %	---
B-C / b-n	2	35 759	5.000 A	146.2 mΩ	99.76 %	---
B-C / b-n	3	35 207	5.000 A	143.8 mΩ	99.76 %	---
B-C / b-n	4	34 656	5.000 A	142.3 mΩ	99.83 %	---
B-C / b-n	5	34 105	4.992 A	137.9 mΩ	99.19 %	---
B-C / b-n	6	33 553	5.000 A	136.6 mΩ	99.64 %	---
B-C / b-n	7	33 002	4.993 A	133.7 mΩ	99.85 %	---
B-C / b-n	8	32 451	4.994 A	131.7 mΩ	99.70 %	---
B-C / b-n	9	31 899	5.000 A	128.8 mΩ	99.28 %	---
B-C / b-n	10	31 348	5.000 A	131.6 mΩ	99.81 %	---
B-C / b-n	11	30 797	5.002 A	133.9 mΩ	99.53 %	---
B-C / b-n	12	30 245	5.000 A	136.7 mΩ	99.70 %	---
B-C / b-n	13	29 694	4.997 A	138.6 mΩ	99.71 %	---
B-C / b-n	14	29 143	4.988 A	141.5 mΩ	99.59 %	---
B-C / b-n	15	28 591	5.002 A	143.9 mΩ	99.76 %	---

Connection	Tap (P)	Tap Voltage (V)	Current	32°C Resistance corrected to 75°C	Stability	Variation
B-C / b-n	16	28 040	4.987 A	145.3 mΩ	99.74 %	---
C-A / c-n	16	28 040	5.000 A	146.2 mΩ	99.76 %	0.63 %
C-A / c-n	15	28 591	5.000 A	143.7 mΩ	99.95 %	0.82 %
C-A / c-n	14	29 143	5.000 A	141.3 mΩ	99.96 %	0.54 %
C-A / c-n	13	29 694	5.000 A	138.9 mΩ	99.96 %	0.45 %
C-A / c-n	12	30 245	5.000 A	136.4 mΩ	99.95 %	0.55 %
C-A / c-n	11	30 797	5.000 A	134.1 mΩ	99.94 %	0.11 %
C-A / c-n	10	31 348	5.000 A	131.6 mΩ	99.96 %	0.40 %
C-A / c-n	9	31 899	5.000 A	128.4 mΩ	99.98 %	0.78 %
C-A / c-n	8	32 451	5.000 A	131.5 mΩ	99.97 %	0.32 %
C-A / c-n	7	33 002	5.000 A	134.0 mΩ	99.99 %	0.76 %
C-A / c-n	6	33 553	5.000 A	136.4 mΩ	99.93 %	0.41 %
C-A / c-n	5	34 105	5.000 A	138.8 mΩ	99.95 %	0.67 %
C-A / c-n	4	34 656	5.000 A	141.2 mΩ	99.95 %	1.07 %
C-A / c-n	3	35 207	5.000 A	143.7 mΩ	99.95 %	0.59 %
C-A / c-n	2	35 759	5.000 A	146.1 mΩ	99.97 %	0.42 %
C-A / c-n	1	36 310	5.000 A	148.4 mΩ	99.96 %	1.50 %

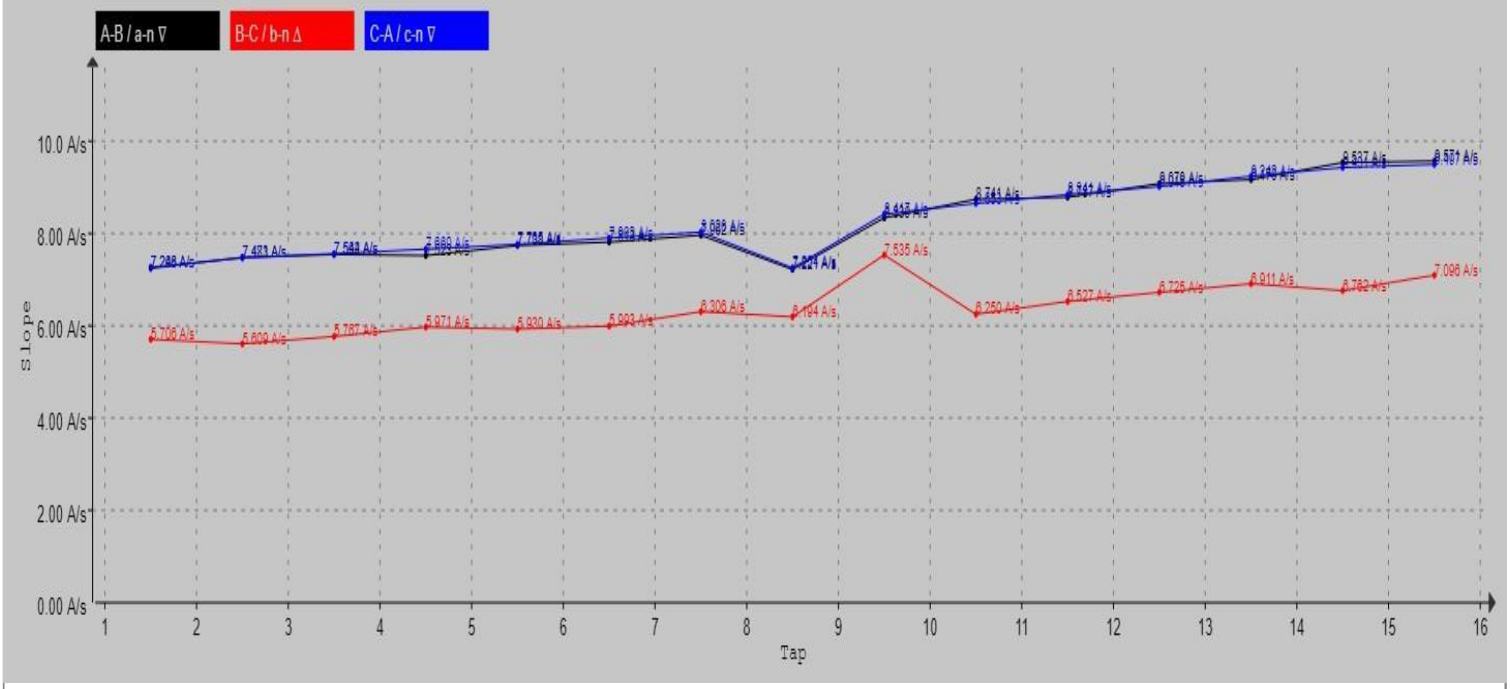
WRM



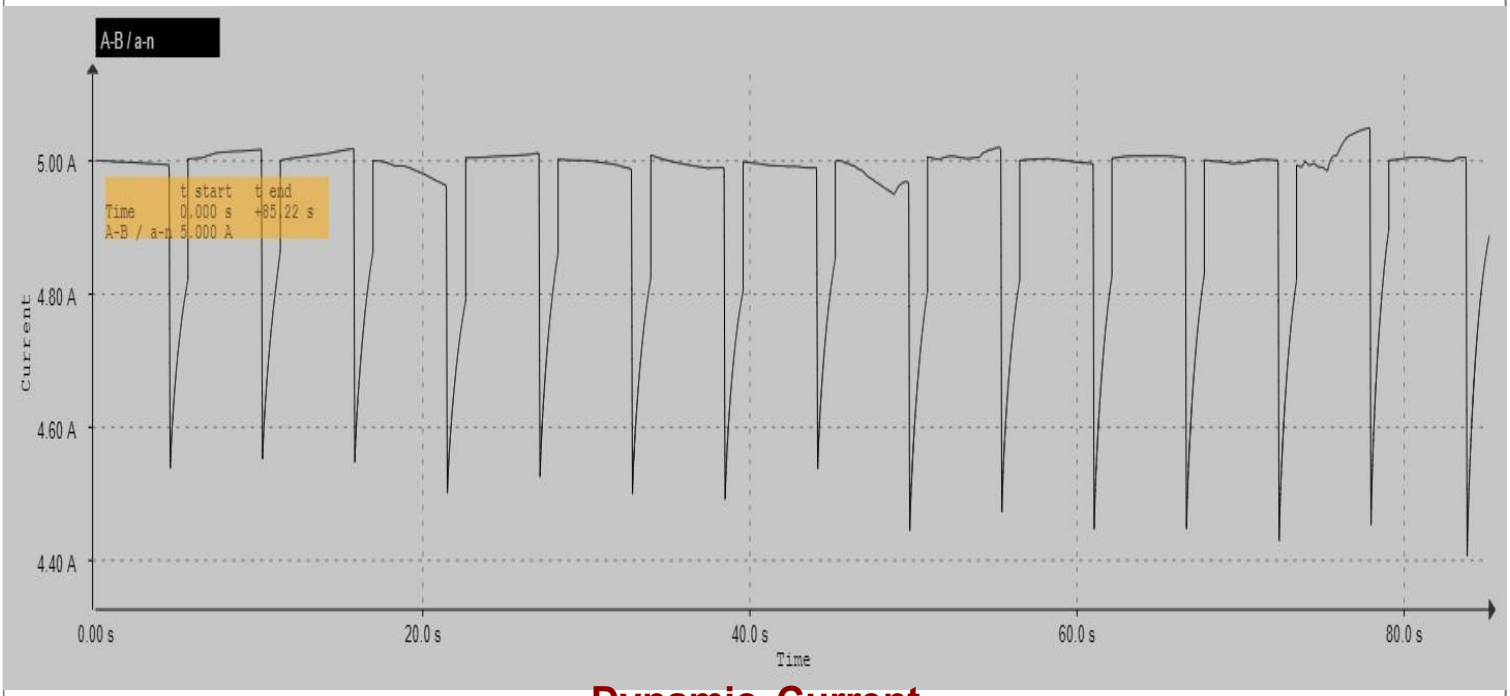
Ripple



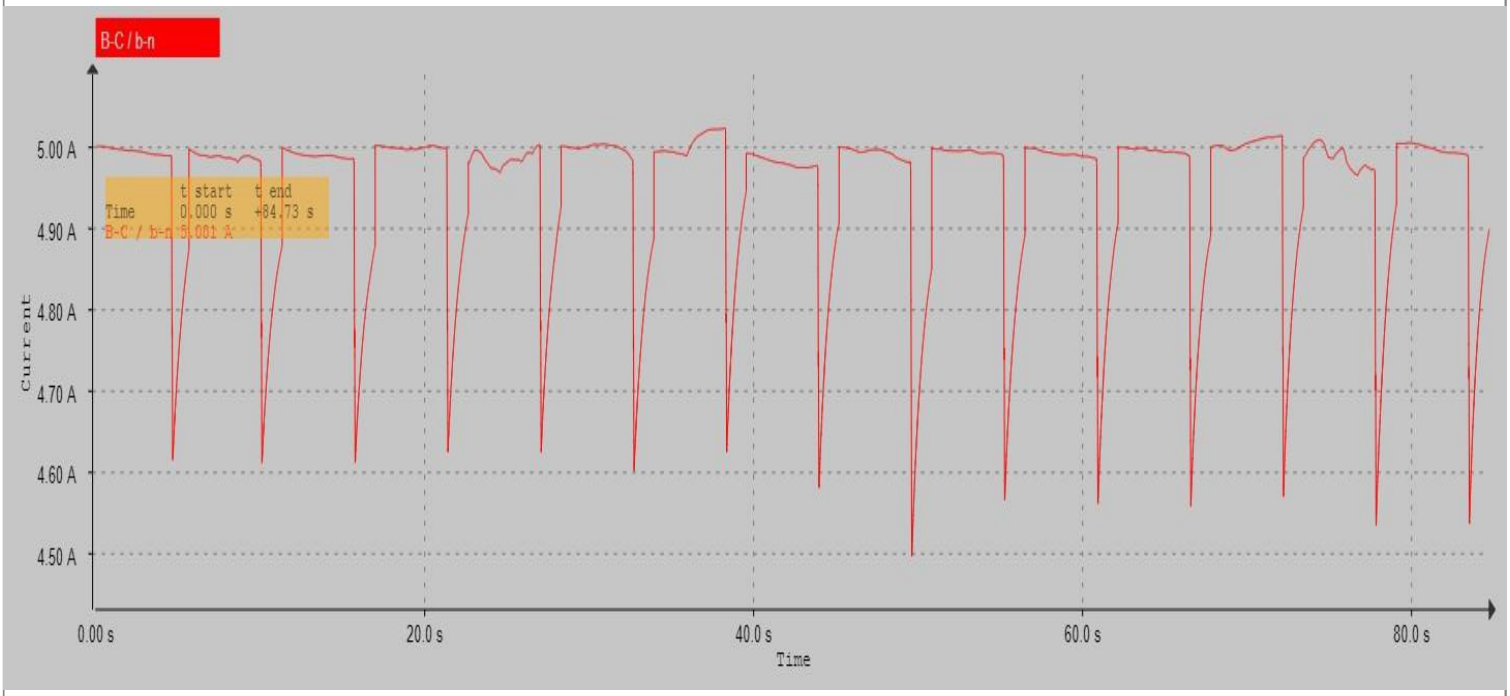
Slope



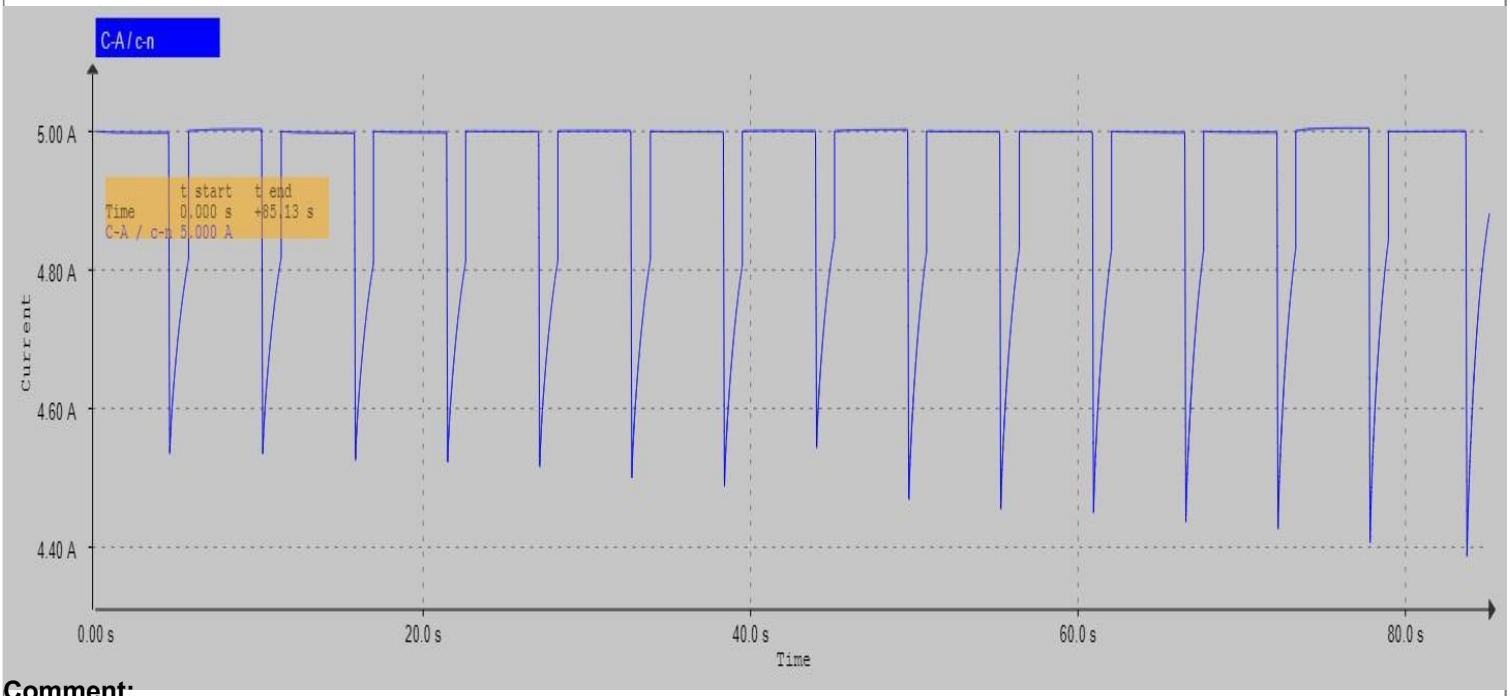
Dynamic Current



Dynamic Current



Dynamic Current



Comment:

TRANSFORMER INSULATION RESISTANCE TEST REPORT

SPAJ Electrical Engineering (M) Sdn. Bhd.

TEST CERTIFICATE

POWER TRANSFORMER TEST

RECOGNIZED AND CERTIFIED USER OF Megger.

Client :	TENAGA NASIONAL BERHAD	**Main Contractor :**	MALAYSIA TRANSFORMER MANUFACTURING SDN BHD
Station :	PPU MALAYSINO	**Manufacture year:**	2010
Circuit :	33/22KV MTM TRANSFORMER :2	**Serial No.:**	30001

BAY ID: **TX2**

INSULATION RESISTANCE & POLIRIZATION TEST

For Tr. Winding

1. 5kV Megger Insulation Reading

1) TNB Standards Insulation = 1 G OHMS
2) Polarization Index = (R 10 M/ R1M)

AFTER SERVICE:

MAINTANANCE :

TRANSFORMER INSULATION

1 Min Reading :			10 Min Reading :			Polarization Index > 1.2
HV To E :	640	MΩ	HV To E :	790	MΩ	1.234375
LV To E :	510	MΩ	LV To E :	620	MΩ	1.215686
HV To LV :	475	MΩ	HV To LV :	580	MΩ	1.221053

NOTE: AMBIENT TEMPERATURE: 36 **°C**
OIL TEMPERATURE: 40 **°C**

TIME : 05.40 PM

Tested by:	Witnessed by:	Verified by :	ESE COMMENT:
Name: VICKNESH Dept: Tester	Name: Mr. ARIF Dept: TNB	Name: Dept:	
Date: 28/09/2024	Date: 28/09/2024	Date: 28/09/2024	