TRANSFORMER TEST REPORT

BEFORE AND AFTER MAINTENCE
(Maintank Oil Recondition & OLTC Service)

TRANSFORMER TESTING REPORTS

Location: PMU TPID

Job: T5 BEFORE SERVICE

Date: 24/08/2024

TRANSFORMER NO	: 05
SERIAL NO	: P/194/30007
VOLTAGE	: 33000/11000
KVA	: 30000
MANUFACTURE	: MTM
YEAR	: 1997
TESTING DATE	: 24/08/2024

TEST PERFORMED

S.NO.	TITLE
1	FREQUENCY DOMAIN SPECTROSCOPY(FDS)
2	TANDELTA WINDING
3	EXCITATION CURRENT 10KV
4	TURN RATIO MEASUREMENT
5	DC WINDING RESISTANCE
6	OLTC DYNAMIC CURRENT MEASUREMENT
7	INSULATION RESISTANCE / POLARIZATION INDEX

TEST EQUIPMENT USED :

1. **MEGGER IDAX 300**
2. **MEGGER TDX 120**
3. **MEGGER TRAX 220**
4. **MEGGER MIT515 INSULATION TESTER**

TESTING PERFORMED BY:

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

TRANSFORMER FREQUENCY DOMAIN SPECTROSCOPY (FDS) TEST REPORT

Megger

2024-08-24

IDAX Measurement Report

General

Company:	MTM
Division:	PERAK
Location:	PMU TPID T5
Date:	24/8/2024

Test conditions

Ambient temperature, °C:	36
Ambient %RH:	65
Object temperature, °C:	48
Weather:	SUNNY
Tester:	VICKNESH

Test object information

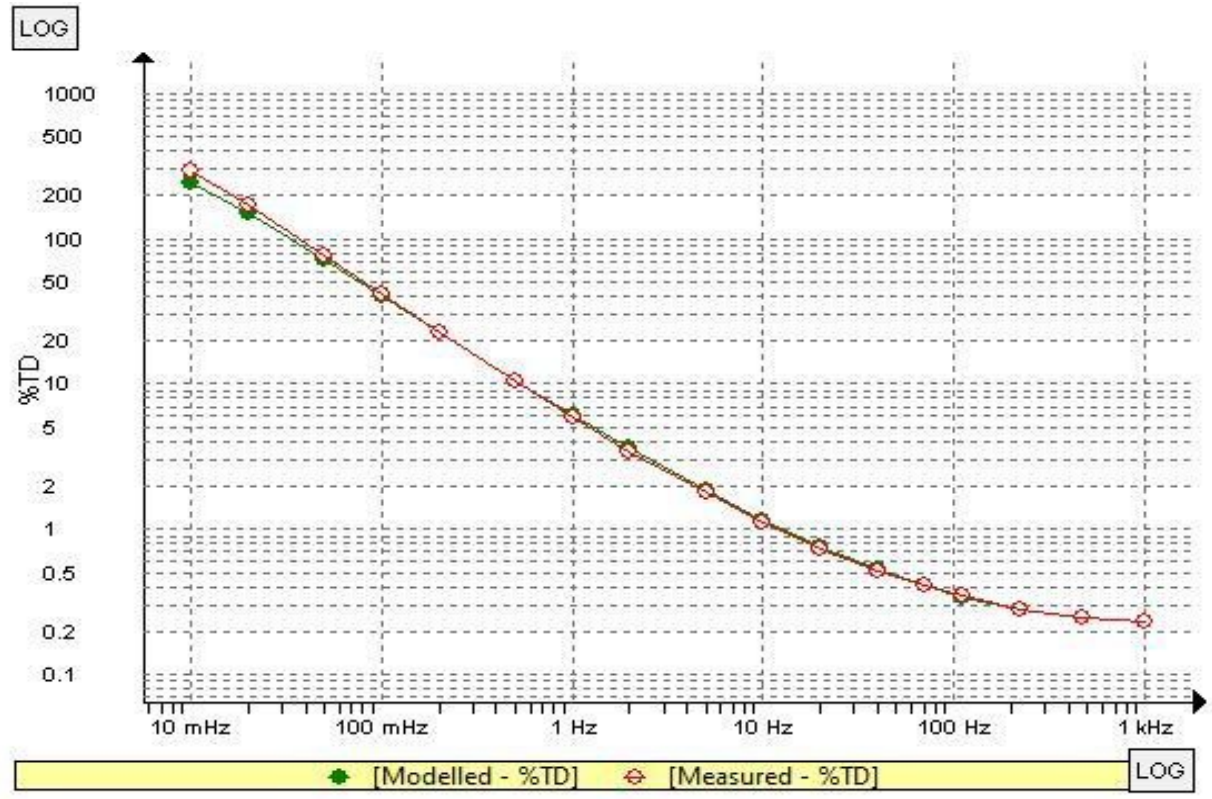
Test object:	Two Winding Transformer
Designation:	PMU TPID T5 BEFORE
Manufacturer:	MTM
Type:	NT1
Core type:	Core
Serial no:	P/194/30007
Coolant:	Mineral Oil
Cooling class:	ONAN/ONAF
Voltage (kV):	33/11
MVA:	30
Vector group:	DYN11
Frequency:	50

Insulation assessment (CHG)

Measurement	Voltage (Vrms)	Freq (Hz)	C (pF)	%TD meas	%TD @ 20°C
CHG	140	50	2923	0.473	0.240

Analysis results

%TD @ 50 Hz & 20°C	Moisture %(wt/wt)	Liquid %TD @ 50 Hz & 25°C
0.240	**2.4**	**0.026**
< 0.30 % As new	< 1.0 % As new	< 0.0060 % As new
0.30 - 0.50 % Good	1.0 - 2.0 % Dry	0.0060 - 0.060 % Good
0.50 - 1.0 % Deteriorated	2.0 - 3.0 % Moderately wet	0.060 - 0.60 % Service aged
> 1.0 % Investigate	> 3.0 % Wet	> 0.60 % Deteriorated

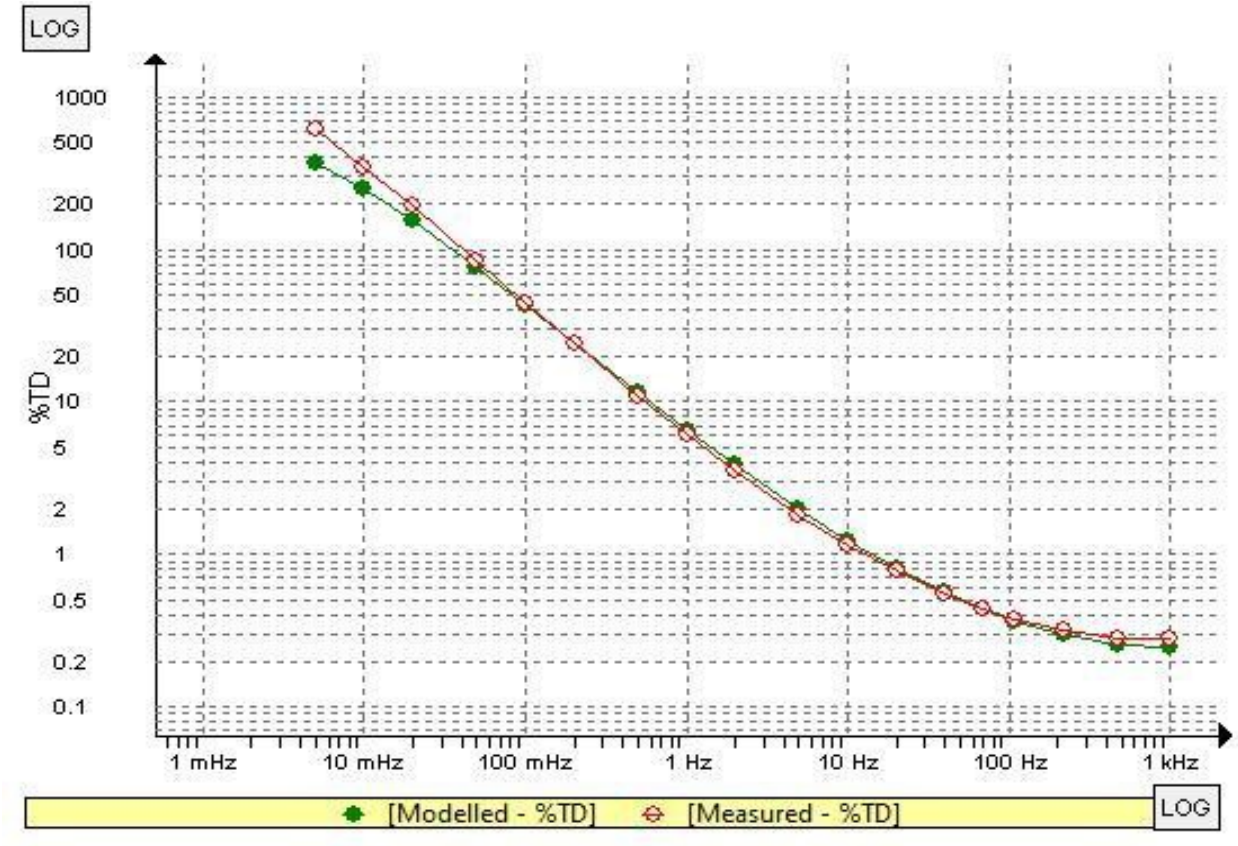


Insulation assessment(CHL)

Measurement	Voltage (Vrms)	Freq (Hz)	C (pF)	%TD meas	%TD @ 20°C
CHL	140	50	7067	0.500	0.254

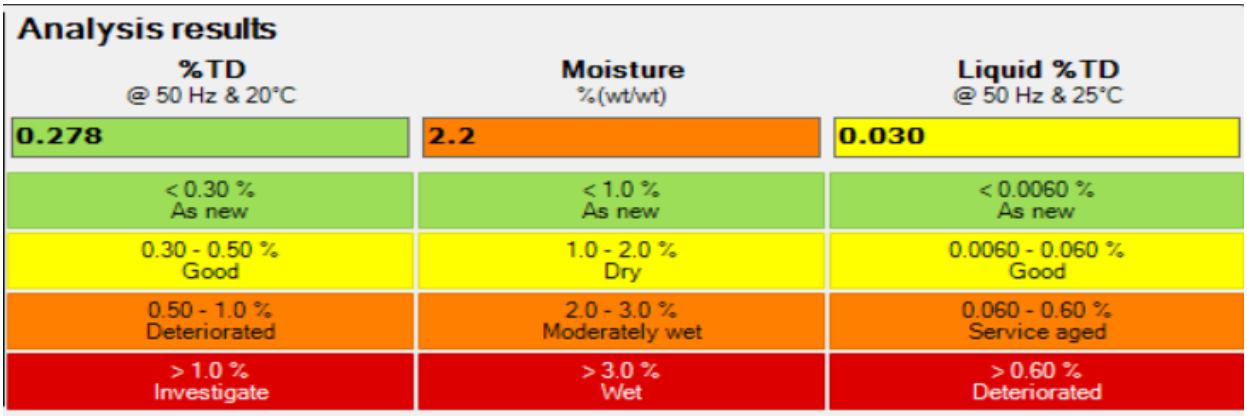
Analysis results

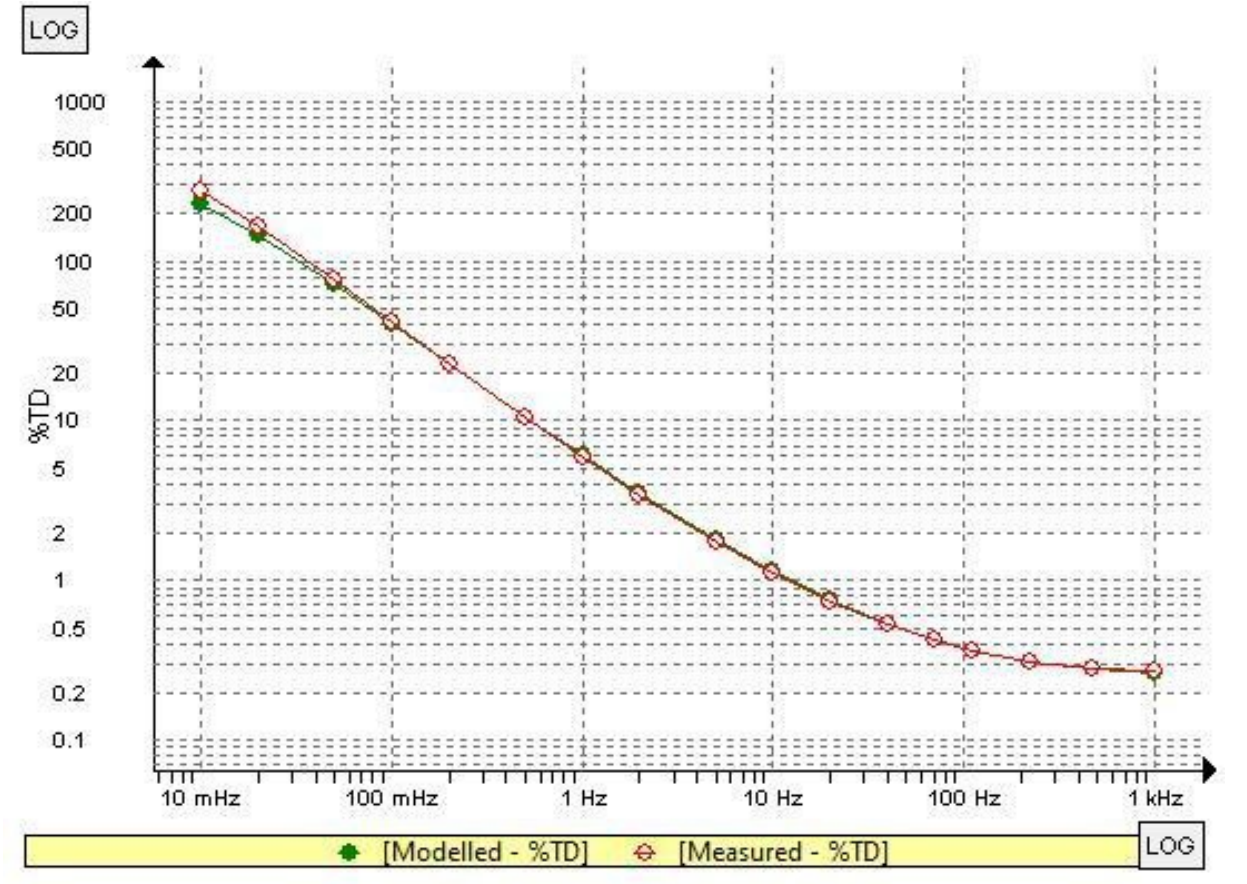
%TD @ 50 Hz & 20°C	Moisture %(wt/wt)	Liquid %TD @ 50 Hz & 25°C
0.254	**2.4**	**0.029**
< 0.30 % As new	< 1.0 % As new	< 0.0060 % As new
0.30 - 0.50 % Good	1.0 - 2.0 % Dry	0.0060 - 0.060 % Good
0.50 - 1.0 % Deteriorated	2.0 - 3.0 % Moderately wet	0.060 - 0.60 % Service aged
> 1.0 % Investigate	> 3.0 % Wet	> 0.60 % Deteriorated



Insulation assessment(CLG)

Measurement	Voltage (Vrms)	Freq (Hz)	C (pF)	%TD meas	%TD @ 20°C
CLG	140	50	9328	0.486	0.278





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PMU TPID T5 BEFORE 2024-08-24 12.01

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CHG - (24/8/2024 12:15:03 PM)

Test Mode	Hum (50Hz)	Offset	Capacitance (930Hz, 140 (RMS))
UST-R	16 nA	1.5 nA	7.0 nF
UST-B	---	---	---
UST-RB	16 nA*	1.5 nA*	7.0 nF*
GST-G	41 nA*	-2.7 nA*	9.9 nF
GSTg-R	57 nA*	-1.2 nA*	2.9 nF*
GSTg-B	41 nA*	-2.7 nA*	9.9 nF*
GSTg-RB	57 nA	-1.2 nA	2.9 nF

* Estimated from measurements of other Test Modes

Hum current is peak value of the fundamental

1000	2.90904E-09	6.79583E-12	0.233611	0.23361
470	2.91207E-09	7.2483E-12	0.248906	0.248905
220	2.91524E-09	8.26644E-12	0.28356	0.283559
110	2.91859E-09	1.0079E-11	0.345339	0.345337
70	2.92099E-09	1.19196E-11	0.408067	0.408064
40	2.92439E-09	1.52439E-11	0.521267	0.52126
20	2.92948E-09	2.17858E-11	0.743673	0.743653
10	2.93615E-09	3.29546E-11	1.12238	1.1223
5	2.94518E-09	5.23227E-11	1.77656	1.77628

2	2.96289E-09	1.02295E-10	3.45253	3.45047
1	2.98329E-09	1.76169E-10	5.90519	5.89492
0.5	3.01206E-09	3.11425E-10	10.3393	10.2844
0.2	3.06491E-09	6.88954E-10	22.4788	21.9315
0.1	3.12409E-09	1.28825E-09	41.2361	38.1221
0.05	3.21141E-09	2.47406E-09	77.0395	61.029
0.02	3.42953E-09	5.88075E-09	171.474	86.3837
0.01	3.80081E-09	1.13544E-08	298.736	94.8281

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CHL - (24/8/2024 12:05:57 PM)

Test Mode	Hum (50Hz)	Offset	Capacitance (930Hz, 140 (RMS))
UST-R	16 nA	1.1 nA	7.0 nF
UST-B	--- ---	---	
UST-RB	16 nA*	1.1 nA*	7.0 nF*
GST-G	40 nA*	-14 nA*	9.9 nF
GSTg-R	57 nA*	-13 nA*	2.9 nF*
GSTg-B	40 nA*	-14 nA*	9.9 nF*
GSTg-RB	57 nA	-13 nA	2.9 nF

*Estimated from measurements of other Test Modes

Hum current is peak value of the fundamental

1000	7.03189E-09	1.96269E-11	0.279113	0.279112
470	7.03821E-09	1.99149E-11	0.282954	0.282953

220	7.04668E-09	2.21423E-11	0.314224	0.314222
110	7.05525E-09	2.64397E-11	0.374752	0.374749
70	7.06181E-09	3.07771E-11	0.435825	0.435821
40	7.07061E-09	3.87406E-11	0.54791	0.547902
20	7.08369E-09	5.45985E-11	0.770763	0.770741
10	7.10024E-09	8.18927E-11	1.15338	1.1533
5	7.12201E-09	1.2958E-10	1.81944	1.81914
2	7.16316E-09	2.54783E-10	3.55686	3.55461
1	7.20838E-09	4.43746E-10	6.15597	6.14434
0.5	7.27217E-09	7.95749E-10	10.9424	10.8775
0.2	7.39389E-09	1.78681E-09	24.166	23.4898
0.1	7.52018E-09	3.37893E-09	44.9315	40.9845
0.05	7.71487E-09	6.50477E-09	84.3147	64.4602
0.02	8.12791E-09	1.56557E-08	192.616	88.7519
0.01	8.73274E-09	3.04446E-08	348.626	96.1238
0.005	9.74976E-09	5.95205E-08	610.482	98.6848

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CLG - (24/8/2024 12:20:40 PM)

Test Mode	Hum (50Hz)	Offset	Capacitance (930Hz, 140 (RMS))
UST-R	40 nA	1.3 nA	7.0 nF
UST-B	--- ---	---	
UST-RB	40 nA*	1.3 nA*	7.0 nF*
GST-G	18 nA*	-2.8 nA*	16 nF
GSTg-R	57 nA*	-1.5 nA*	9.3 nF*

GSTG-B	18 nA*	-2.8 nA*	16 nF*
GSTG-RB	57 nA	-1.5 nA	9.3 nF

* Estimated from measurements of other Test Modes

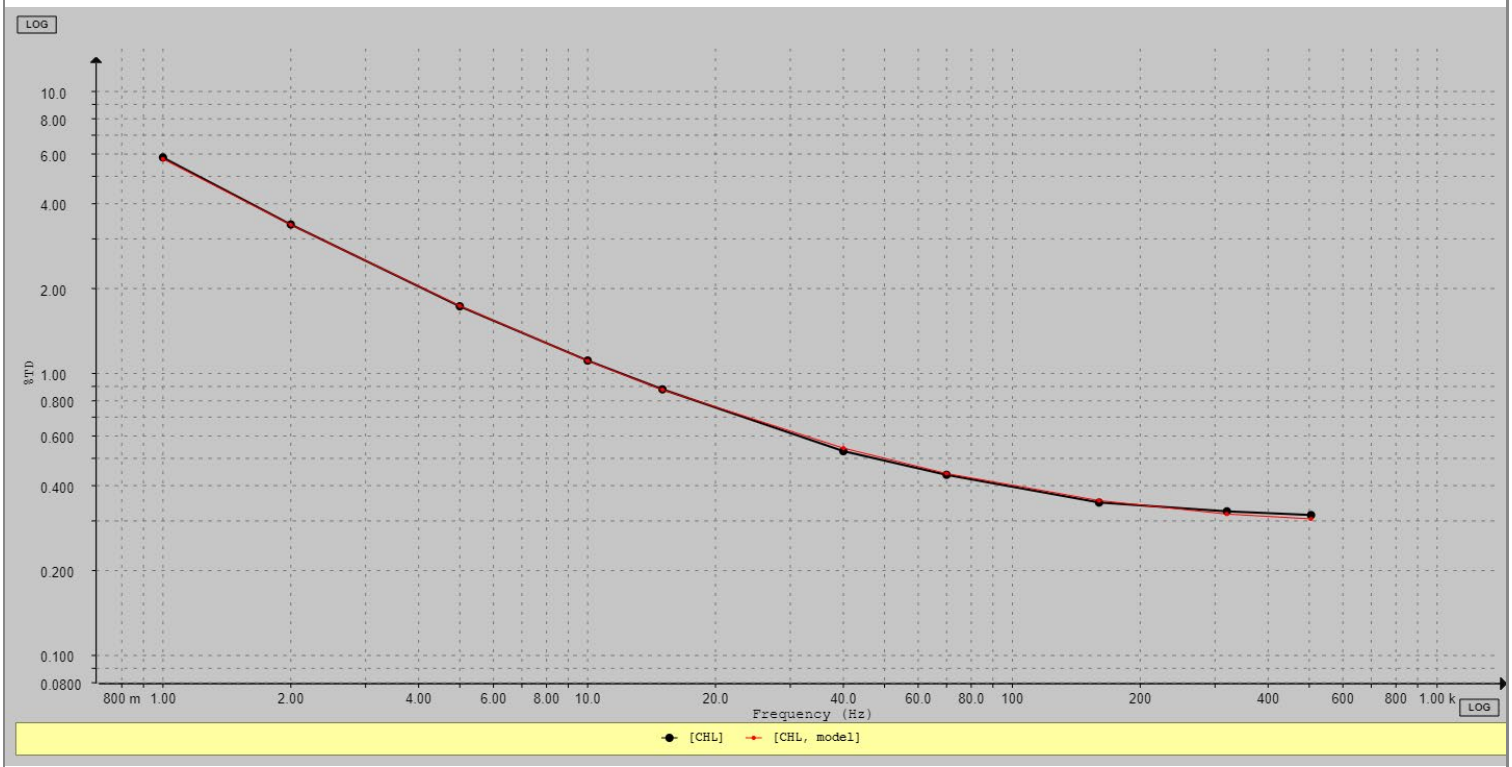
Hum current is peak value of the fundamental

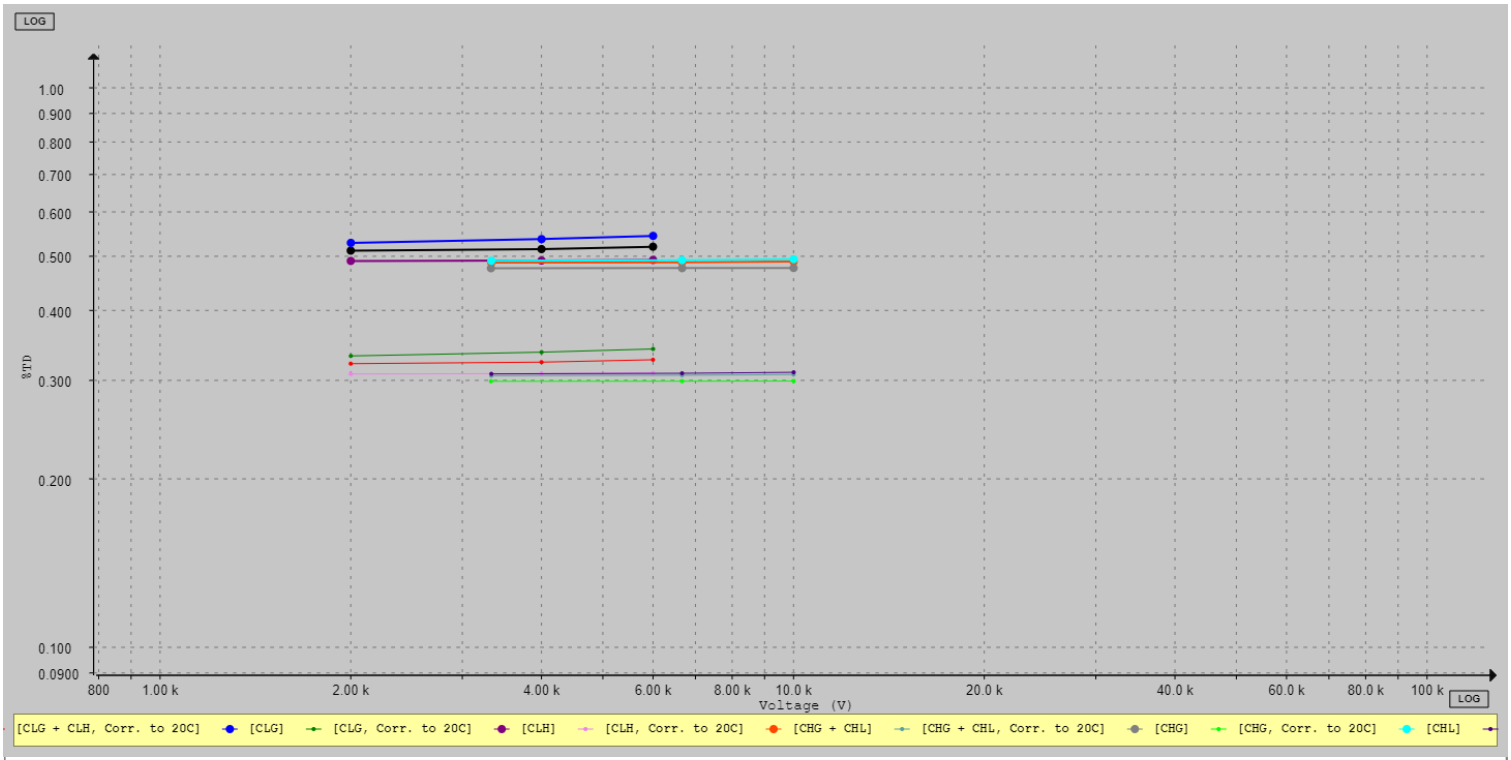
1000	9.28019E-09	2.50029E-11	0.269422	0.269421
470	9.2901E-09	2.58697E-11	0.278465	0.278464
220	9.30175E-09	2.87257E-11	0.30882	0.308819
110	9.31309E-09	3.41426E-11	0.366609	0.366606
70	9.32116E-09	3.96387E-11	0.425254	0.425251
40	9.33294E-09	4.9592E-11	0.531365	0.531358
20	9.34987E-09	6.9445E-11	0.742738	0.742717
10	9.37115E-09	1.03672E-10	1.10629	1.10622
5	9.39883E-09	1.6329E-10	1.73735	1.73709
2	9.45118E-09	3.19767E-10	3.38336	3.38142
1	9.509E-09	5.56126E-10	5.84842	5.83845
0.5	9.59194E-09	9.95921E-10	10.3829	10.3274
0.2	9.76331E-09	2.23062E-09	22.8469	22.273
0.1	9.97815E-09	4.19214E-09	42.0132	38.7336
0.05	1.03587E-08	8.00172E-09	77.2467	61.1319
0.02	1.13159E-08	1.87121E-08	165.361	85.5699
0.01	1.29277E-08	3.55988E-08	275.368	93.994

TRANSFORMER TANDELTA TEST REPORT

Tan Delta - Power Transformer

Designation	Test Mode	f (Hz)	U	I eq	C	%TD at 48 °C	ITC2 Corr. Factor	Corr. %TD to 20°C	P eq at 48 °C	% VDF	ITC2
CHG + CHL	GST-GND	50.00	10.00 kV	31.39 mA	9.993 nF	0.489	0.628	**0.307**	1.537 W	0.02 %	
CHG	GSTg-RB	50.00	10.00 kV	9.197 mA	2.928 nF	0.477	0.628	**0.299**	438.4 mW	0.01 %	●
CHL	UST-R	50.00	10.01 kV	22.20 mA	7.066 nF	0.494	0.628	**0.310**	1.097 W	0.02 %	
CLG + CLH	GST-GND	50.00	6.001 kV	49.17 mA	15.65 nF	0.518	0.628	**0.325**	2.548 W	0.02 %	
CLG	GSTg-RB	50.00	6.004 kV	26.98 mA	8.588 nF	0.545	0.628	**0.342**	1.470 W	0.02 %	
CLH	UST-R	50.00	6.004 kV	22.20 mA	7.066 nF	0.493	0.628	**0.309**	1.094 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	36 307	50.00	10.02 kV	73.05 mA	717.5 H	580.4 W
B-C	1	36 307	50.00	9.978 kV	22.70 mA	2.720 kH	194.5 W
C-A	1	36 307	50.00	9.972 kV	74.04 mA	724.7 H	596.0 W
A-B	2	35 756	50.00	10.01 kV	75.05 mA	697.3 H	595.7 W
B-C	2	35 756	50.00	9.975 kV	23.18 mA	2.682 kH	199.2 W
C-A	2	35 756	50.00	10.00 kV	75.69 mA	709.8 H	609.7 W
A-B	3	35 205	50.00	9.991 kV	76.92 mA	681.8 H	611.3 W
B-C	3	35 205	50.00	9.978 kV	23.72 mA	2.642 kH	204.4 W
C-A	3	35 205	50.00	9.981 kV	77.62 mA	694.3 H	626.3 W
A-B	4	34 654	50.00	10.04 kV	78.88 mA	665.8 H	627.4 W
B-C	4	34 654	50.00	9.978 kV	24.32 mA	2.601 kH	210.2 W
C-A	4	34 654	50.00	10.03 kV	79.50 mA	681.8 H	643.4 W
A-B	5	34 102	50.00	10.05 kV	81.03 mA	649.5 H	645.3 W
B-C	5	34 102	50.00	10.00 kV	24.94 mA	2.571 kH	216.5 W
C-A	5	34 102	50.00	9.999 kV	81.71 mA	665.0 H	662.2 W
A-B	6	33 551	50.00	10.03 kV	83.21 mA	635.5 H	664.5 W
B-C	6	33 551	50.00	10.03 kV	25.62 mA	2.535 kH	223.4 W
C-A	6	33 551	50.00	9.980 kV	84.03 mA	649.5 H	682.6 W
A-B	7	33 000	50.00	9.991 kV	85.59 mA	621.3 H	685.6 W
B-C	7	33 000	50.00	10.02 kV	26.39 mA	2.493 kH	231.0 W
C-A	7	33 000	50.00	10.01 kV	86.32 mA	636.0 H	703.3 W
A-B	8	32 449	50.00	9.994 kV	88.22 mA	605.1 H	708.2 W
B-C	8	32 449	50.00	9.982 kV	28.30 mA	2.111 kH	239.5 W
C-A	8	32 449	50.00	10.03 kV	88.74 mA	623.0 H	725.6 W
A-B	9	31 898	50.00	10.04 kV	91.46 mA	574.3 H	727.5 W
B-C	9	31 898	50.00	10.02 kV	28.96 mA	2.076 kH	245.7 W
C-A	9	31 898	50.00	9.997 kV	92.45 mA	585.1 H	747.4 W
A-B	10	31 347	50.00	9.946 kV	94.14 mA	559.8 H	750.3 W
B-C	10	31 347	50.00	10.00 kV	29.76 mA	2.026 kH	252.7 W
C-A	10	31 347	50.00	10.01 kV	95.05 mA	572.2 H	770.7 W
A-B	11	30 796	50.00	10.01 kV	96.97 mA	545.0 H	774.0 W
B-C	11	30 796	50.00	10.01 kV	30.59 mA	1.988 kH	260.7 W
C-A	11	30 796	50.00	10.04 kV	97.72 mA	558.6 H	793.9 W
A-B	12	30 245	50.00	9.956 kV	100.0 mA	528.7 H	798.6 W
B-C	12	30 245	50.00	9.960 kV	31.51 mA	1.943 kH	269.1 W

Connection	Tap	Tap Voltage (V)	f (Hz)	U	I eq	L	P eq at 48 °C
C-A	12	30 245	50.00	10.04 kV	100.7 mA	545.3 H	820.0 W
A-B	13	29 693	50.00	9.969 kV	103.1 mA	514.9 H	825.1 W
B-C	13	29 693	50.00	10.01 kV	32.47 mA	1.903 kH	278.3 W
C-A	13	29 693	50.00	9.986 kV	104.0 mA	529.7 H	848.6 W
A-B	14	29 142	50.00	10.06 kV	106.4 mA	501.7 H	854.7 W
B-C	14	29 142	50.00	9.974 kV	33.61 mA	1.856 kH	289.1 W
C-A	14	29 142	50.00	9.944 kV	107.4 mA	516.4 H	879.7 W
A-B	15	28 591	50.00	9.972 kV	110.3 mA	485.2 H	886.7 W
B-C	15	28 591	50.00	9.978 kV	34.84 mA	1.812 kH	300.9 W
C-A	15	28 591	50.00	9.982 kV	110.9 mA	503.1 H	910.9 W
A-B	16	28 040	50.00	9.991 kV	114.2 mA	470.9 H	920.6 W
B-C	16	28 040	50.00	9.936 kV	36.34 mA	1.753 kH	314.8 W
C-A	16	28 040	50.00	10.01 kV	114.5 mA	491.8 H	944.7 W

Comment:

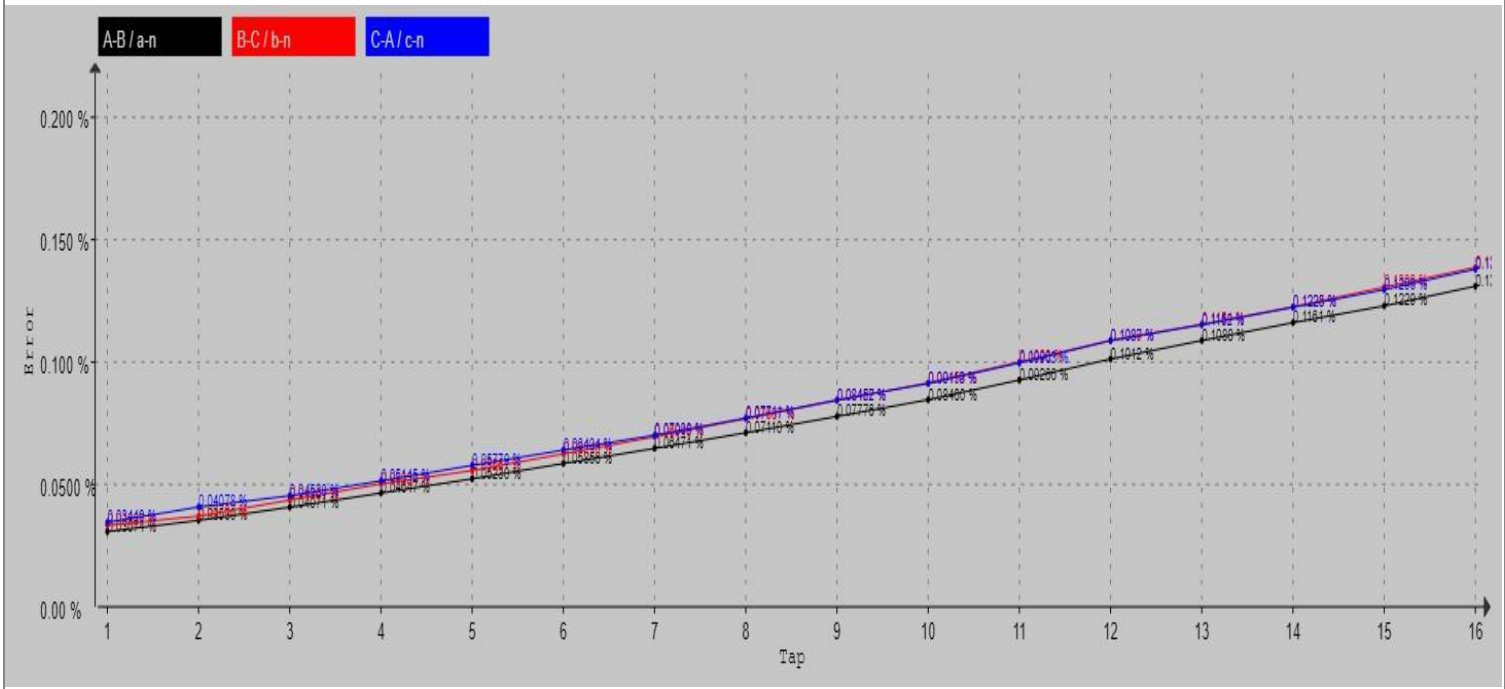
TRANSFORMER TURNS RATIO TEST REPORT

Turns ratio measurements

Connection	Tap (P)	Tap Voltage (V)	U	Test frequency	TTR	Measured TTR	Error	I Exc	Phase
A-B / a-n	1	36 307	125.0 V	50.00 Hz	5.717	5.719	0.03 %	2.696 mA	0.0 °
B-C / b-n	1	36 307	125.0 V	50.00 Hz	5.717	5.719	0.03 %	2.123 mA	0.0 °
C-A / c-n	1	36 307	125.0 V	50.00 Hz	5.717	5.719	0.03 %	2.894 mA	0.0 °
A-B / a-n	2	35 756	125.0 V	50.00 Hz	5.630	5.632	0.04 %	2.756 mA	0.0 °
B-C / b-n	2	35 756	125.0 V	50.00 Hz	5.630	5.632	0.04 %	2.179 mA	0.0 °
C-A / c-n	2	35 756	125.0 V	50.00 Hz	5.630	5.632	0.04 %	2.968 mA	0.0 °
A-B / a-n	3	35 205	125.0 V	50.00 Hz	5.543	5.546	0.04 %	2.827 mA	0.0 °
B-C / b-n	3	35 205	125.0 V	50.00 Hz	5.543	5.546	0.04 %	2.227 mA	0.0 °
C-A / c-n	3	35 205	125.0 V	50.00 Hz	5.543	5.546	0.05 %	3.056 mA	0.0 °
A-B / a-n	4	34 654	125.0 V	50.00 Hz	5.457	5.459	0.05 %	2.914 mA	0.0 °
B-C / b-n	4	34 654	125.0 V	50.00 Hz	5.457	5.459	0.05 %	2.283 mA	0.0 °
C-A / c-n	4	34 654	125.0 V	50.00 Hz	5.457	5.459	0.05 %	3.124 mA	0.0 °
A-B / a-n	5	34 102	125.0 V	50.00 Hz	5.370	5.373	0.05 %	2.999 mA	0.0 °
B-C / b-n	5	34 102	125.0 V	50.00 Hz	5.370	5.373	0.06 %	2.344 mA	0.0 °
C-A / c-n	5	34 102	125.0 V	50.00 Hz	5.370	5.373	0.06 %	3.207 mA	0.0 °
A-B / a-n	6	33 551	125.0 V	50.00 Hz	5.283	5.286	0.06 %	3.071 mA	0.0 °
B-C / b-n	6	33 551	125.0 V	50.00 Hz	5.283	5.286	0.06 %	2.408 mA	0.0 °
C-A / c-n	6	33 551	125.0 V	50.00 Hz	5.283	5.286	0.06 %	3.310 mA	0.0 °
A-B / a-n	7	33 000	125.0 V	50.00 Hz	5.196	5.200	0.06 %	3.164 mA	0.0 °
B-C / b-n	7	33 000	125.0 V	50.00 Hz	5.196	5.200	0.07 %	2.474 mA	0.0 °
C-A / c-n	7	33 000	125.0 V	50.00 Hz	5.196	5.200	0.07 %	3.397 mA	0.0 °
A-B / a-n	8	32 449	125.0 V	50.00 Hz	5.109	5.113	0.07 %	3.265 mA	0.0 °
B-C / b-n	8	32 449	125.0 V	50.00 Hz	5.109	5.113	0.08 %	2.547 mA	0.0 °
C-A / c-n	8	32 449	125.0 V	50.00 Hz	5.109	5.113	0.08 %	3.503 mA	0.0 °
A-B / a-n	9	31 898	125.0 V	50.00 Hz	5.023	5.027	0.08 %	3.376 mA	0.0 °
B-C / b-n	9	31 898	125.0 V	50.00 Hz	5.023	5.027	0.08 %	2.632 mA	0.0 °
C-A / c-n	9	31 898	125.0 V	50.00 Hz	5.023	5.027	0.08 %	3.598 mA	0.0 °
A-B / a-n	10	31 347	125.0 V	50.00 Hz	4.936	4.940	0.08 %	3.474 mA	0.0 °
B-C / b-n	10	31 347	125.0 V	50.00 Hz	4.936	4.940	0.09 %	2.713 mA	0.0 °
C-A / c-n	10	31 347	125.0 V	50.00 Hz	4.936	4.940	0.09 %	3.714 mA	0.0 °
A-B / a-n	11	30 796	125.0 V	50.00 Hz	4.849	4.854	0.09 %	3.566 mA	0.0 °
B-C / b-n	11	30 796	125.0 V	50.00 Hz	4.849	4.854	0.10 %	2.800 mA	0.0 °
C-A / c-n	11	30 796	125.0 V	50.00 Hz	4.849	4.854	0.10 %	3.818 mA	0.0 °
A-B / a-n	12	30 245	125.0 V	50.00 Hz	4.762	4.767	0.10 %	3.690 mA	0.0 °
B-C / b-n	12	30 245	125.0 V	50.00 Hz	4.762	4.767	0.11 %	2.885 mA	0.0 °
C-A / c-n	12	30 245	125.0 V	50.00 Hz	4.762	4.767	0.11 %	3.925 mA	0.0 °
A-B / a-n	13	29 693	125.0 V	50.00 Hz	4.675	4.681	0.11 %	3.800 mA	0.0 °
B-C / b-n	13	29 693	125.0 V	50.00 Hz	4.675	4.681	0.12 %	2.975 mA	0.0 °

Connection	Tap (P)	Tap Voltage (V)	U	Test frequency	TTR	Measured TTR	Error	I Exc	Phase
C-A / c-n	13	29 693	125.0 V	50.00 Hz	4.675	4.681	0.12 %	4.055 mA	0.0 °
A-B / a-n	14	29 142	125.0 V	50.00 Hz	4.589	4.594	0.12 %	3.916 mA	0.0 °
B-C / b-n	14	29 142	125.0 V	50.00 Hz	4.589	4.594	0.12 %	3.060 mA	0.0 °
C-A / c-n	14	29 142	125.0 V	50.00 Hz	4.589	4.594	0.12 %	4.191 mA	0.0 °
A-B / a-n	15	28 591	125.0 V	50.00 Hz	4.502	4.507	0.12 %	4.063 mA	0.0 °
B-C / b-n	15	28 591	125.0 V	50.00 Hz	4.502	4.508	0.13 %	3.152 mA	0.0 °
C-A / c-n	15	28 591	125.0 V	50.00 Hz	4.502	4.508	0.13 %	4.318 mA	0.0 °
A-B / a-n	16	28 040	125.0 V	50.00 Hz	4.415	4.421	0.13 %	4.191 mA	0.0 °
B-C / b-n	16	28 040	125.0 V	50.00 Hz	4.415	4.421	0.14 %	3.259 mA	0.0 °
C-A / c-n	16	28 040	125.0 V	50.00 Hz	4.415	4.421	0.14 %	4.458 mA	0.0 °

Comment:



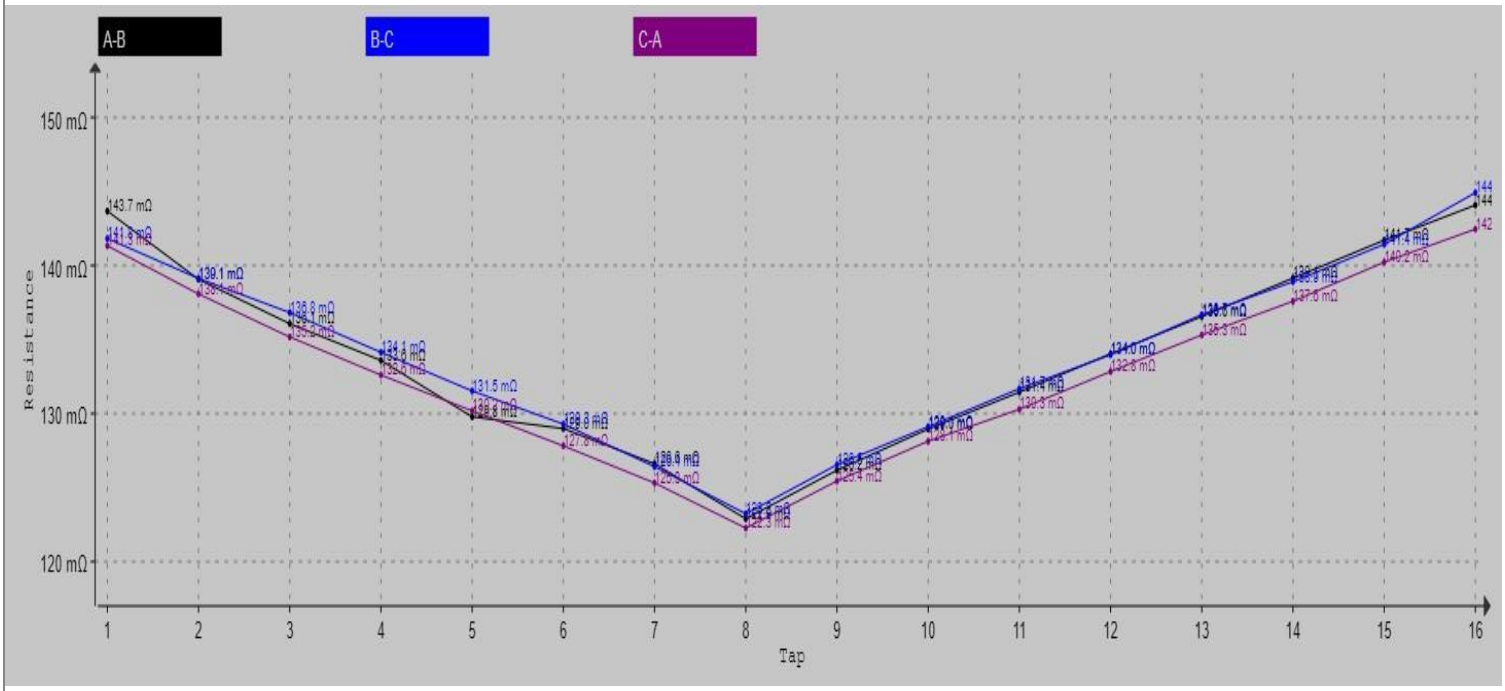
TRANSFORMER DC WINDING RESITANCE TEST REPORT

HV Winding resistance measurements

Connection	Tap (P)	Current	48°C Resistance corrected to 75°C	Stability	Variation	Continuity
A-B	1	9.995 A	157.4 mΩ	98.23 %	---	✓
B-C	1	10.02 A	155.4 mΩ	99.76 %	---	✓
C-A	1	10.00 A	154.8 mΩ	99.40 %	1.65 %	✓
A-B	2	10.03 A	152.3 mΩ	99.47 %	---	✓
B-C	2	10.01 A	152.4 mΩ	99.67 %	---	✓
C-A	2	9.998 A	151.3 mΩ	99.13 %	0.76 %	✓
A-B	3	9.999 A	149.1 mΩ	99.87 %	---	✓
B-C	3	10.01 A	149.9 mΩ	99.99 %	---	✓
C-A	3	10.00 A	148.1 mΩ	99.04 %	1.21 %	✓
A-B	4	9.985 A	146.3 mΩ	98.17 %	---	✓
B-C	4	10.01 A	146.9 mΩ	99.77 %	---	✓
C-A	4	10.00 A	145.3 mΩ	99.25 %	1.15 %	✓
A-B	5	10.02 A	142.2 mΩ	99.24 %	---	✓
B-C	5	10.01 A	144.1 mΩ	99.71 %	---	✓
C-A	5	10.01 A	142.6 mΩ	99.57 %	1.34 %	✓
A-B	6	9.992 A	141.3 mΩ	99.15 %	---	✓
B-C	6	10.02 A	141.6 mΩ	99.96 %	---	✓
C-A	6	10.00 A	140.0 mΩ	99.14 %	1.14 %	✓
A-B	7	9.999 A	138.7 mΩ	98.81 %	---	✓
B-C	7	10.00 A	138.5 mΩ	99.74 %	---	✓
C-A	7	9.999 A	137.3 mΩ	98.80 %	1.03 %	✓
A-B	8	10.00 A	134.6 mΩ	99.06 %	---	✓
B-C	8	10.01 A	135.0 mΩ	99.75 %	---	✓
C-A	8	9.999 A	133.9 mΩ	99.79 %	0.79 %	✓
A-B	9	10.00 A	138.2 mΩ	99.52 %	---	✓
B-C	9	10.01 A	138.6 mΩ	99.96 %	---	✓
C-A	9	9.999 A	137.4 mΩ	98.56 %	0.87 %	✓
A-B	10	10.03 A	141.3 mΩ	98.34 %	---	✓
B-C	10	10.01 A	141.4 mΩ	99.76 %	---	✓
C-A	10	10.01 A	140.4 mΩ	99.73 %	0.76 %	✓
A-B	11	10.01 A	144.0 mΩ	99.72 %	---	✓
B-C	11	10.01 A	144.2 mΩ	99.95 %	---	✓
C-A	11	10.00 A	142.7 mΩ	99.43 %	1.06 %	✓
A-B	12	10.01 A	146.8 mΩ	99.80 %	---	✓
B-C	12	10.01 A	146.8 mΩ	99.79 %	---	✓
C-A	12	10.00 A	145.5 mΩ	99.72 %	0.90 %	✓
A-B	13	10.00 A	149.6 mΩ	99.75 %	---	✓

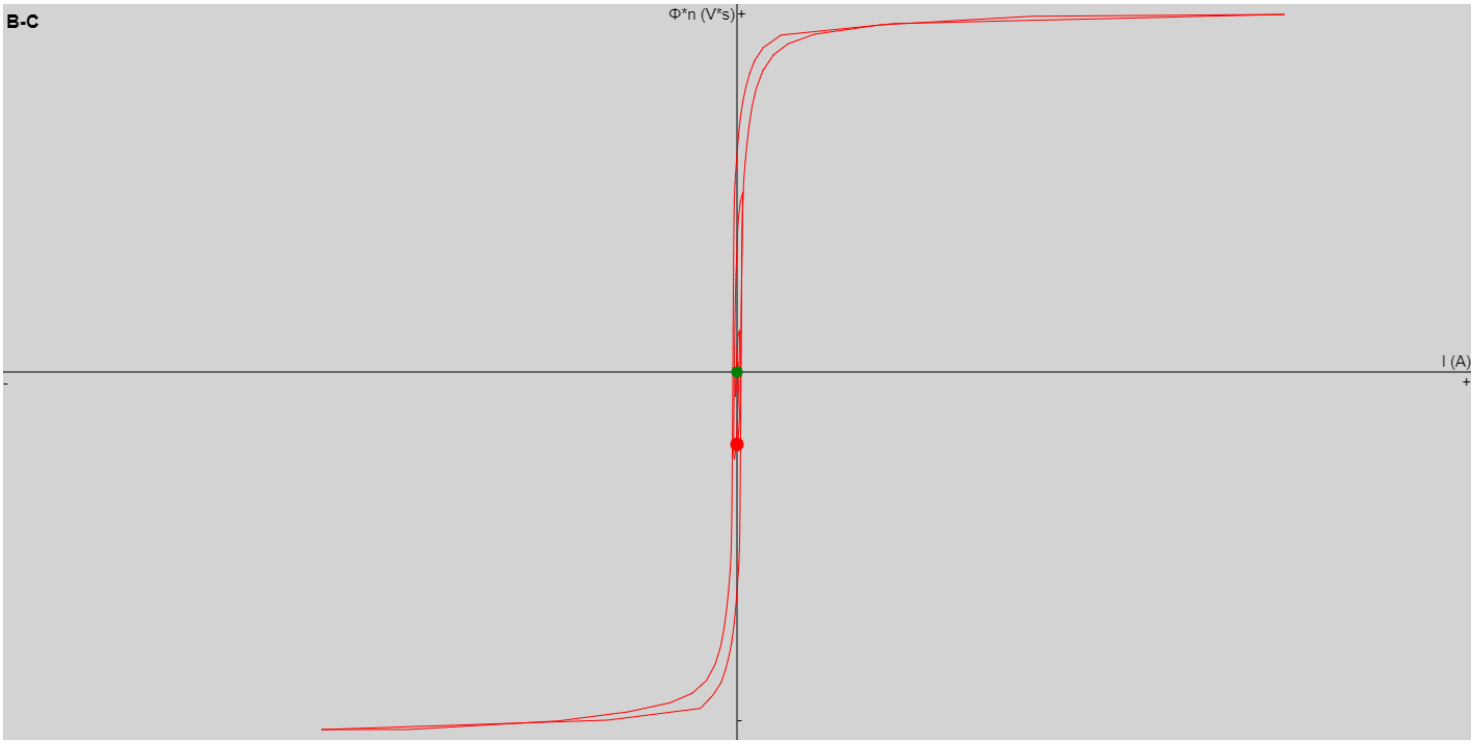
Connection	Tap (P)	Current	48°C Resistance corrected to 75°C	Stability	Variation	Continuity
B-C	13	10.04 A	149.7 mΩ	99.47 %	---	✓
C-A	13	10.00 A	148.2 mΩ	99.59 %	1.01 %	✓
A-B	14	10.00 A	152.4 mΩ	99.76 %	---	✓
B-C	14	10.01 A	152.2 mΩ	99.70 %	---	✓
C-A	14	10.00 A	150.7 mΩ	99.55 %	1.13 %	✓
A-B	15	10.00 A	155.2 mΩ	99.34 %	---	✓
B-C	15	10.00 A	154.9 mΩ	99.81 %	---	✓
C-A	15	10.00 A	153.6 mΩ	99.73 %	1.05 %	✓
A-B	16	10.01 A	157.8 mΩ	99.86 %	---	✓
B-C	16	10.00 A	158.7 mΩ	99.05 %	---	✓
C-A	16	10.01 A	156.1 mΩ	98.95 %	1.71 %	✓

Comment:



Demag measurements

Designation	Current	Time	Remanence before demag	Remanence after demag
B-C	0.000 A	28.00 s	19.94 %	<1 %



Comment:

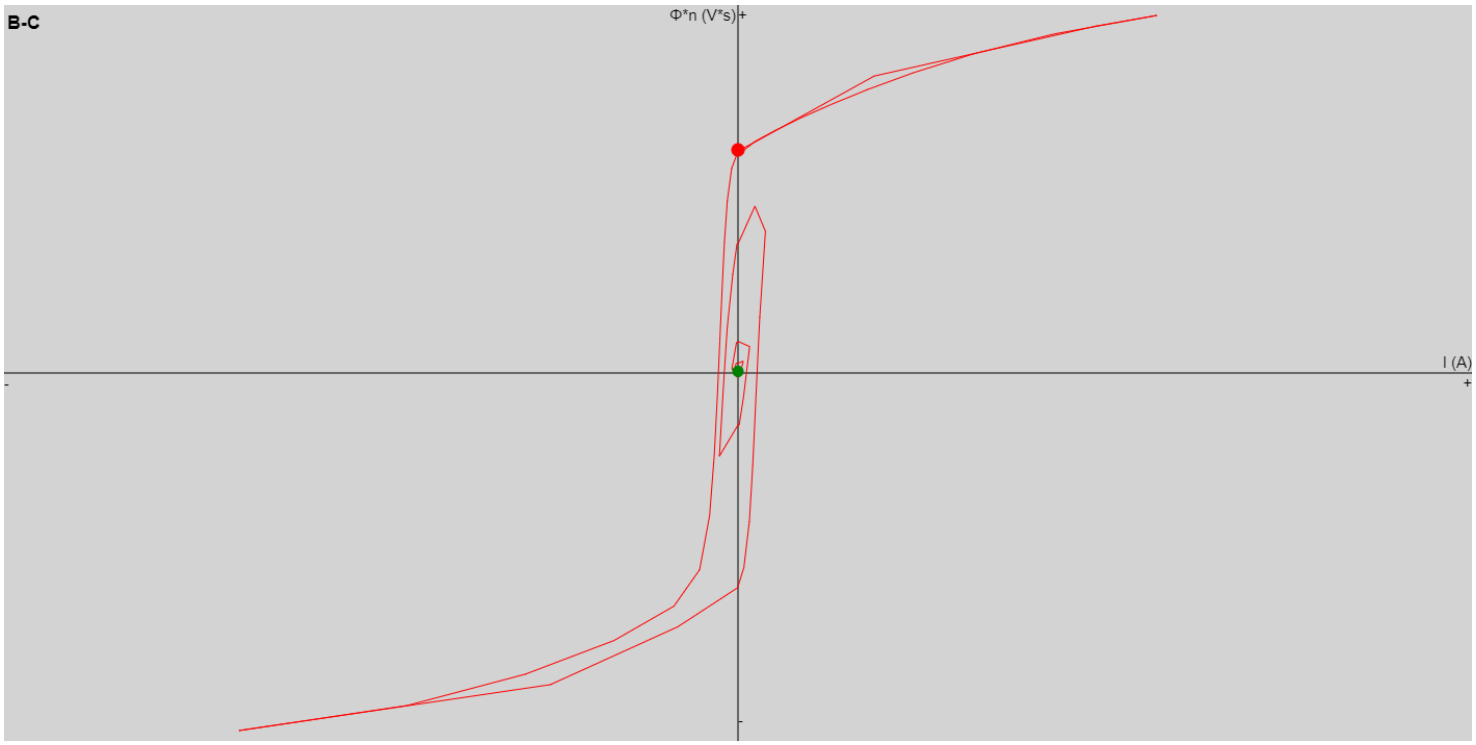
LV Winding resistance measurement

Connection	Tap (S)	Current	48°C Resistance corrected to 75°C	Stability	Variation
a-n	1	10.00 A	6.884 mΩ	99.49 %	---
b-n	1	9.999 A	7.423 mΩ	99.87 %	---
c-n	1	10.00 A	6.953 mΩ	99.55 %	***7.59 %***

Comment:

Demag measurements

Designation	Current	Time	Remanence before demag	Remanence after demag
B-C	0.000 A	14.81 s	60.51 %	<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

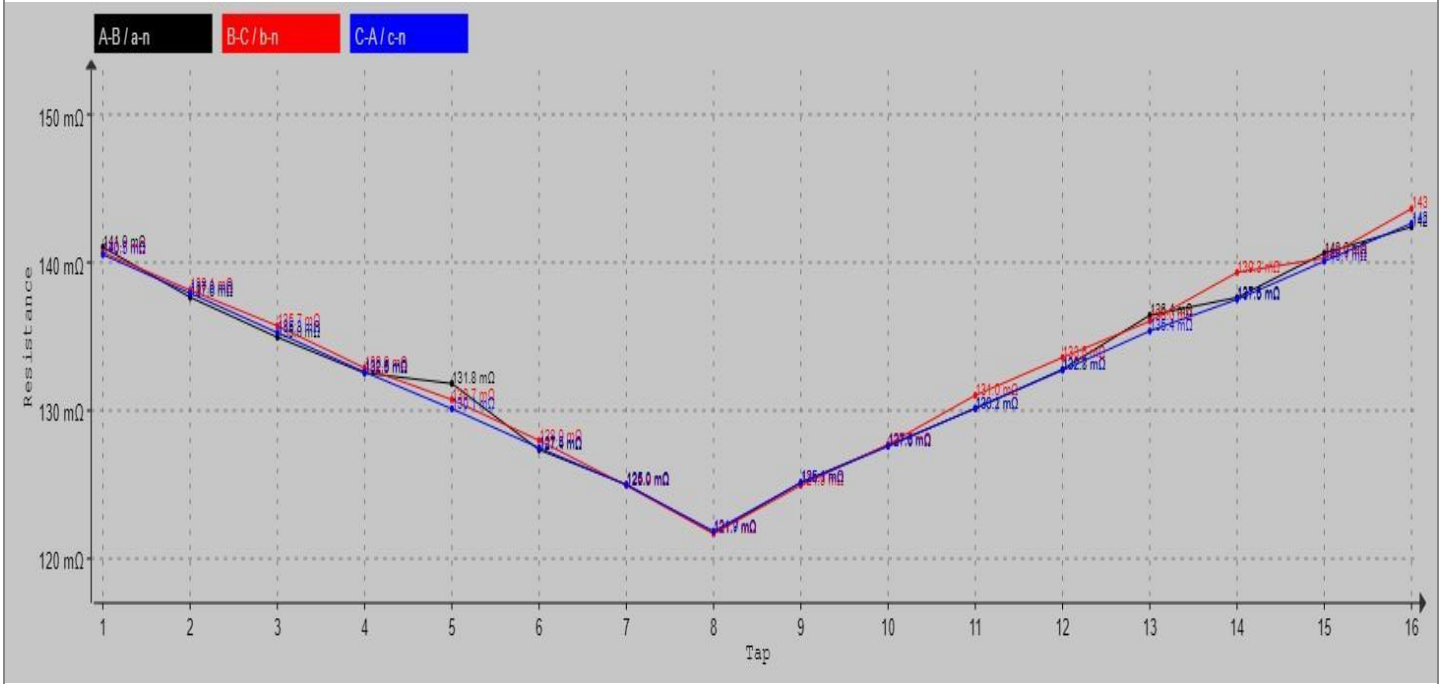
Connection	Transition	t start	t	Ripple	Slope	Continuity
A-B / a-n	1 → 2	5.164 s	61.5 ms	3.180 %	2.583 A/s	✓
A-B / a-n	2 → 3	3.775 s	62.1 ms	3.392 %	2.731 A/s	✓
A-B / a-n	3 → 4	3.635 s	61.1 ms	3.349 %	2.739 A/s	✓
A-B / a-n	4 → 5	3.613 s	61.9 ms	3.487 %	2.803 A/s	✓
A-B / a-n	5 → 6	3.616 s	61.3 ms	3.499 %	2.831 A/s	✓
A-B / a-n	6 → 7	3.653 s	60.7 ms	3.586 %	2.942 A/s	✓
A-B / a-n	7 → 8	7.393 s	61.9 ms	3.521 %	2.840 A/s	✓
A-B / a-n	8 → 9	4.267 s	60.1 ms	5.041 %	4.190 A/s	✓
A-B / a-n	9 → 10	3.933 s	60.5 ms	3.590 %	2.952 A/s	✓
A-B / a-n	10 → 11	3.747 s	61.7 ms	3.805 %	3.086 A/s	✓
A-B / a-n	11 → 12	3.664 s	60.9 ms	3.683 %	2.997 A/s	✓
A-B / a-n	12 → 13	4.105 s	60.8 ms	3.803 %	3.123 A/s	✓
A-B / a-n	13 → 14	3.563 s	60.6 ms	3.857 %	3.180 A/s	✓
A-B / a-n	14 → 15	3.606 s	59.8 ms	3.893 %	3.250 A/s	✓
A-B / a-n	15 → 16	3.686 s	59.1 ms	4.039 %	3.432 A/s	✓
A-B / a-n	--	---	---	---	---	✓
B-C / b-n	16 → 15	4.602 s	60.7 ms	9.416 %	7.750 A/s	✓
B-C / b-n	15 → 14	4.285 s	60.5 ms	8.968 %	7.208 A/s	✓
B-C / b-n	14 → 13	4.039 s	59.7 ms	8.636 %	7.220 A/s	✓
B-C / b-n	13 → 12	4.431 s	59.9 ms	8.564 %	7.139 A/s	✓
B-C / b-n	12 → 11	3.749 s	59.8 ms	8.387 %	6.991 A/s	✓
B-C / b-n	11 → 10	3.916 s	60.8 ms	8.357 %	6.857 A/s	✓
B-C / b-n	10 → 9	3.924 s	61.6 ms	8.293 %	6.741 A/s	✓
B-C / b-n	9 → 8	3.916 s	61.5 ms	8.080 %	6.550 A/s	✓
B-C / b-n	8 → 7	4.19 s	57.4 ms	6.027 %	5.251 A/s	✓
B-C / b-n	7 → 6	4.067 s	60.6 ms	7.589 %	6.257 A/s	✓
B-C / b-n	6 → 5	4.627 s	60.1 ms	7.470 %	6.215 A/s	✓
B-C / b-n	5 → 4	4.511 s	60.4 ms	7.327 %	6.054 A/s	✓
B-C / b-n	4 → 3	4.061 s	59.9 ms	7.271 %	6.057 A/s	✓
B-C / b-n	3 → 2	3.835 s	60.2 ms	7.197 %	5.971 A/s	✓
B-C / b-n	2 → 1	4.287 s	61.4 ms	7.162 %	5.827 A/s	✓
B-C / b-n	--	---	---	---	---	✓
C-A / c-n	1 → 2	4.348 s	62.4 ms	3.165 %	2.519 A/s	✓
C-A / c-n	2 → 3	3.793 s	60.9 ms	3.280 %	2.683 A/s	✓
C-A / c-n	3 → 4	3.602 s	61.6 ms	3.405 %	2.744 A/s	✓
C-A / c-n	4 → 5	3.823 s	62.1 ms	3.481 %	2.785 A/s	✓
C-A / c-n	5 → 6	3.761 s	61.2 ms	3.565 %	2.918 A/s	✓
C-A / c-n	6 → 7	3.523 s	63.4 ms	3.629 %	2.861 A/s	✓
C-A / c-n	7 → 8	3.594 s	60.8 ms	3.542 %	2.900 A/s	✓
C-A / c-n	8 → 9	3.727 s	60.5 ms	5.375 %	4.433 A/s	✓
C-A / c-n	9 → 10	3.723 s	62.7 ms	3.876 %	3.091 A/s	✓

Connection	Transition	t start	t	Ripple	Slope	Continuity
C-A / c-n	10 → 11	3.842 s	60.2 ms	3.786 %	3.145 A/s	✓
C-A / c-n	11 → 12	3.663 s	59.8 ms	3.833 %	3.213 A/s	✓
C-A / c-n	12 → 13	3.775 s	60.4 ms	3.844 %	3.172 A/s	✓
C-A / c-n	13 → 14	3.674 s	60 ms	3.923 %	3.268 A/s	✓
C-A / c-n	14 → 15	4.152 s	61 ms	4.071 %	3.316 A/s	✓
C-A / c-n	15 → 16	3.982 s	59.5 ms	4.014 %	3.371 A/s	✓
C-A / c-n	--	---	---	---	---	✓

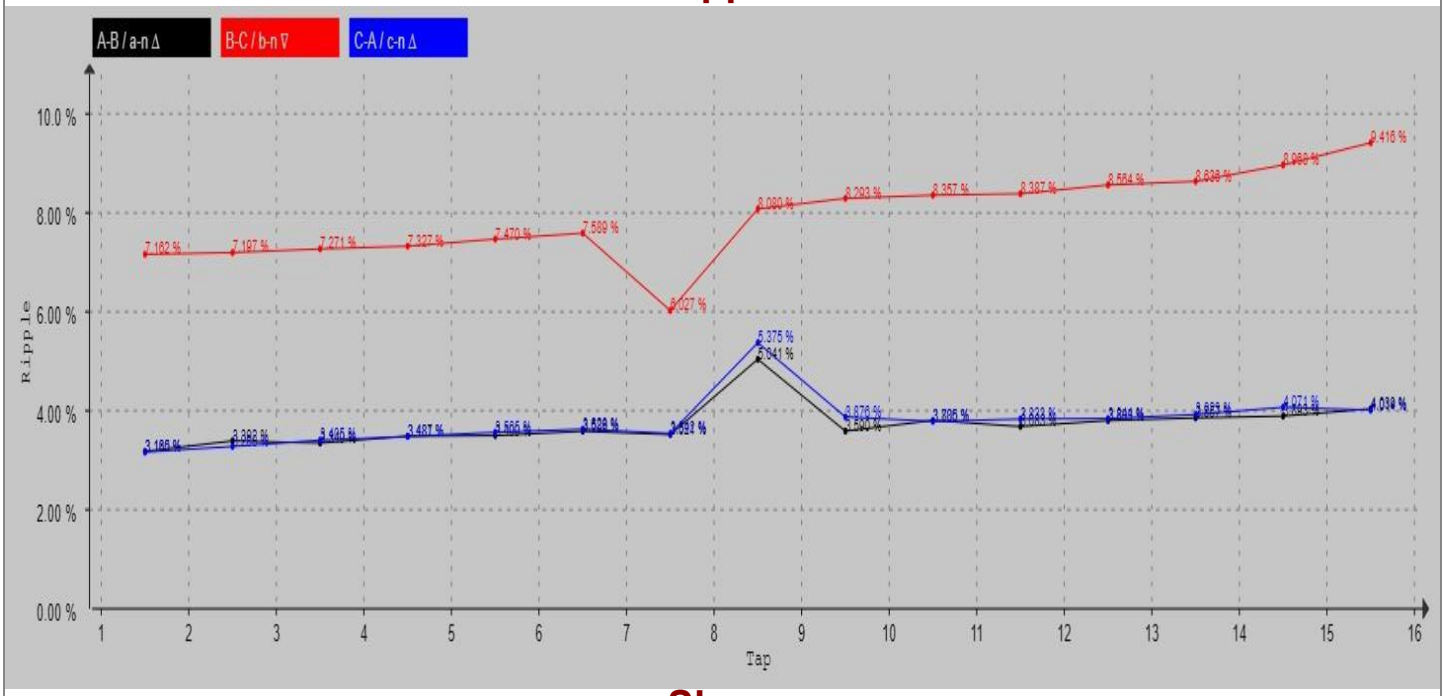
Connection	Tap (P)	Tap Voltage (V)	Current	48°C Resistance corrected to 75°C	Stability	Variation
A-B / a-n	1	36 310	5.000 A	154.5 mΩ	99.49 %	---
A-B / a-n	2	35 759	4.998 A	150.8 mΩ	98.91 %	---
A-B / a-n	3	35 209	4.997 A	147.8 mΩ	99.01 %	---
A-B / a-n	4	34 658	4.997 A	145.2 mΩ	98.85 %	---
A-B / a-n	5	34 107	5.007 A	144.4 mΩ	98.44 %	---
A-B / a-n	6	33 557	5.000 A	139.5 mΩ	99.68 %	---
A-B / a-n	7	33 006	5.000 A	136.9 mΩ	99.40 %	---
A-B / a-n	8	32 455	5.000 A	133.3 mΩ	99.21 %	---
A-B / a-n	9	31 905	5.001 A	137.1 mΩ	99.97 %	---
A-B / a-n	10	31 354	5.000 A	139.8 mΩ	99.97 %	---
A-B / a-n	11	30 803	5.001 A	142.6 mΩ	99.82 %	---
A-B / a-n	12	30 253	5.000 A	145.4 mΩ	99.92 %	---
A-B / a-n	13	29 702	5.001 A	149.5 mΩ	98.44 %	---
A-B / a-n	14	29 151	4.998 A	150.8 mΩ	99.35 %	---
A-B / a-n	15	28 601	4.998 A	154.0 mΩ	99.08 %	---
A-B / a-n	16	28 050	4.995 A	156.0 mΩ	99.10 %	---
B-C / b-n	16	28 050	5.000 A	157.3 mΩ	99.19 %	---
B-C / b-n	15	28 601	4.996 A	153.7 mΩ	99.67 %	---
B-C / b-n	14	29 151	5.000 A	152.6 mΩ	99.37 %	---
B-C / b-n	13	29 702	5.002 A	149.0 mΩ	99.84 %	---
B-C / b-n	12	30 253	5.001 A	146.3 mΩ	99.70 %	---
B-C / b-n	11	30 803	5.000 A	143.5 mΩ	99.13 %	---
B-C / b-n	10	31 354	4.997 A	139.9 mΩ	99.68 %	---
B-C / b-n	9	31 905	5.002 A	136.9 mΩ	99.35 %	---
B-C / b-n	8	32 455	4.999 A	133.3 mΩ	99.49 %	---
B-C / b-n	7	33 006	5.001 A	136.8 mΩ	99.31 %	---
B-C / b-n	6	33 557	5.000 A	140.2 mΩ	99.96 %	---
B-C / b-n	5	34 107	5.000 A	143.2 mΩ	99.47 %	---
B-C / b-n	4	34 658	4.999 A	145.6 mΩ	99.89 %	---
B-C / b-n	3	35 209	4.999 A	148.7 mΩ	99.32 %	---
B-C / b-n	2	35 759	5.000 A	151.3 mΩ	99.61 %	---

Connection	Tap (P)	Tap Voltage (V)	Current	48°C Resistance corrected to 75°C	Stability	Variation
B-C / b-n	1	36 310	4.999 A	154.1 mΩ	99.87 %	---
C-A / c-n	1	36 310	5.000 A	153.9 mΩ	99.70 %	0.35 %
C-A / c-n	2	35 759	4.998 A	151.1 mΩ	98.81 %	0.35 %
C-A / c-n	3	35 209	4.998 A	148.2 mΩ	98.72 %	0.57 %
C-A / c-n	4	34 658	5.000 A	145.3 mΩ	99.90 %	0.25 %
C-A / c-n	5	34 107	5.000 A	142.5 mΩ	99.98 %	1.30 %
C-A / c-n	6	33 557	5.000 A	139.6 mΩ	99.71 %	0.49 %
C-A / c-n	7	33 006	5.000 A	136.9 mΩ	99.79 %	0.07 %
C-A / c-n	8	32 455	5.000 A	133.5 mΩ	99.43 %	0.14 %
C-A / c-n	9	31 905	5.000 A	137.0 mΩ	99.76 %	0.16 %
C-A / c-n	10	31 354	5.000 A	139.8 mΩ	99.99 %	0.11 %
C-A / c-n	11	30 803	5.000 A	142.6 mΩ	99.99 %	0.68 %
C-A / c-n	12	30 253	5.000 A	145.4 mΩ	99.79 %	0.65 %
C-A / c-n	13	29 702	4.999 A	148.3 mΩ	99.06 %	0.78 %
C-A / c-n	14	29 151	5.000 A	150.6 mΩ	99.56 %	1.32 %
C-A / c-n	15	28 601	4.999 A	153.4 mΩ	99.56 %	0.39 %
C-A / c-n	16	28 050	4.999 A	156.3 mΩ	99.42 %	0.86 %

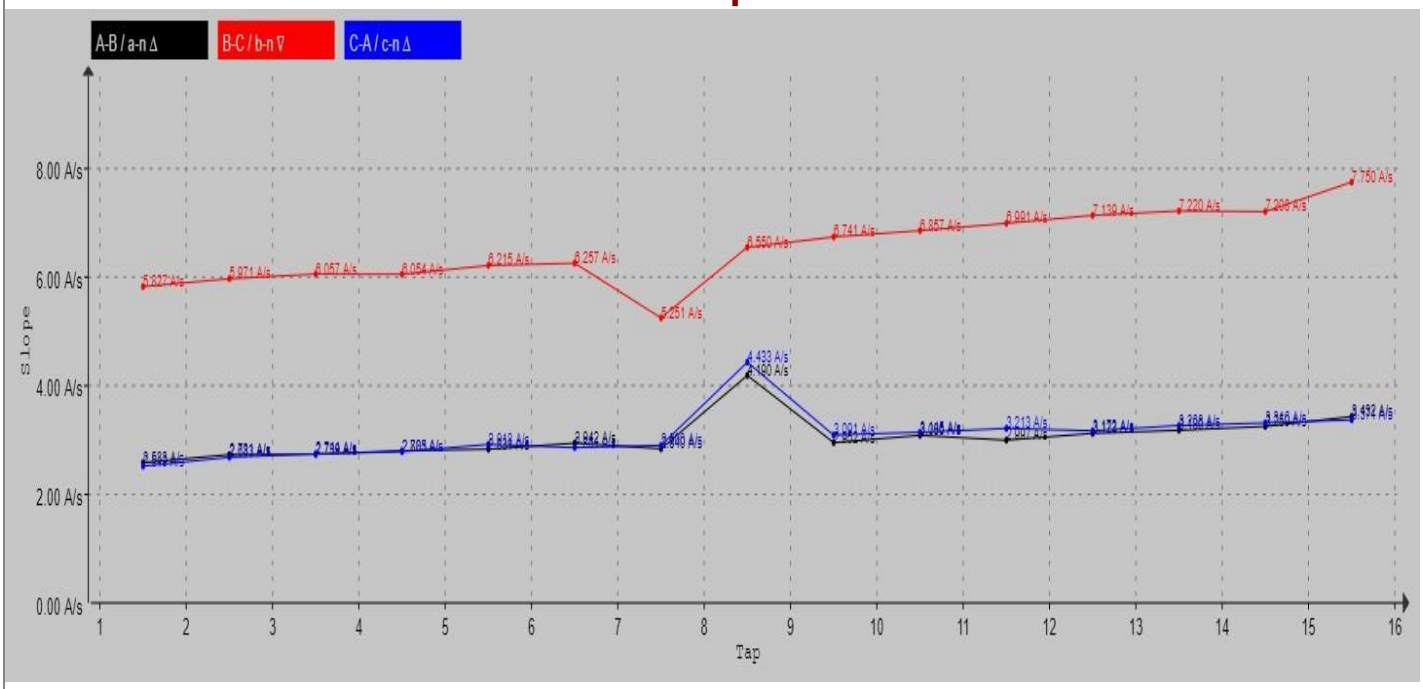
WRM



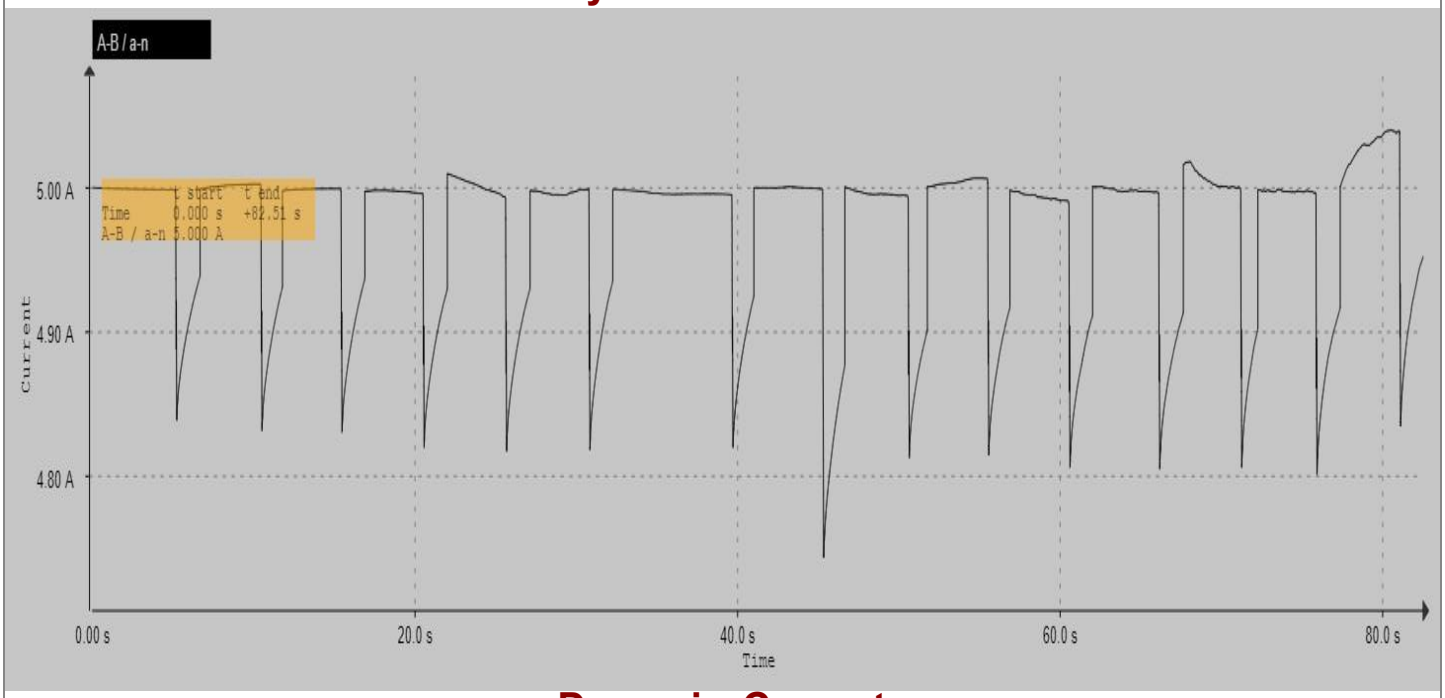
Ripple



Slope



Dynamic Current



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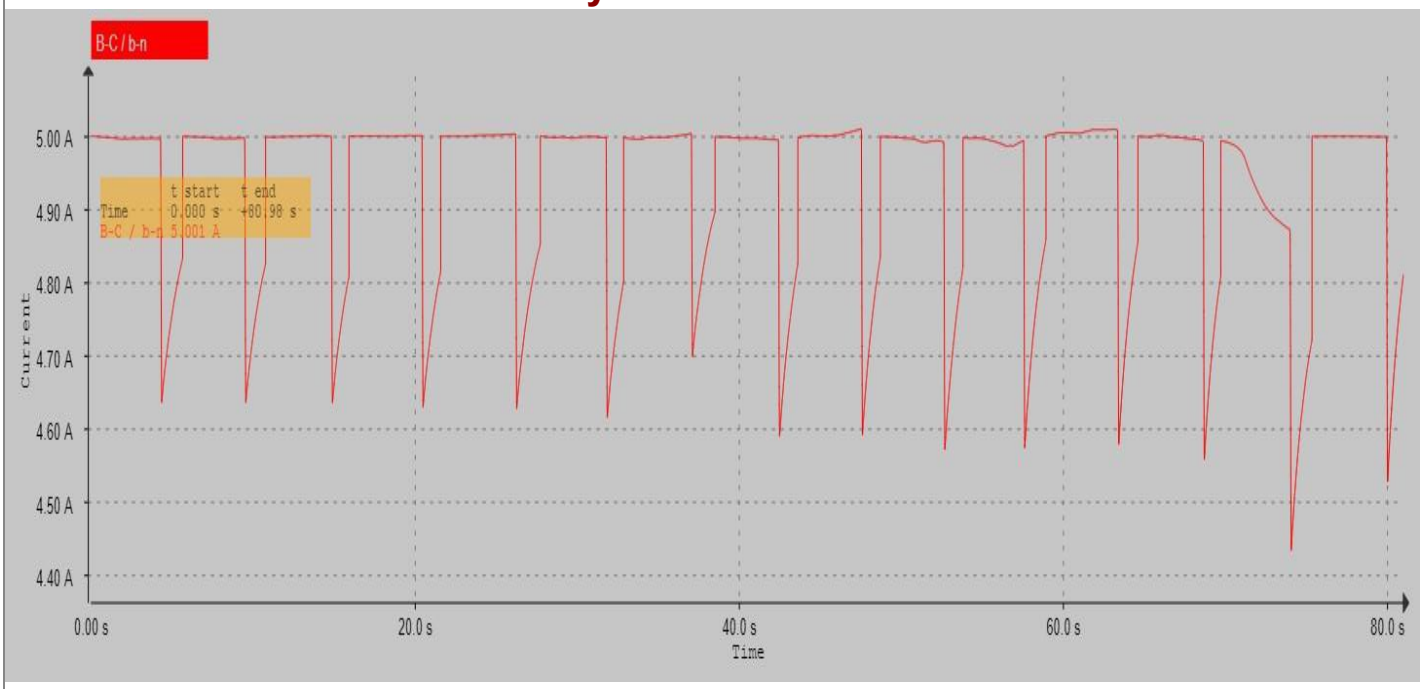
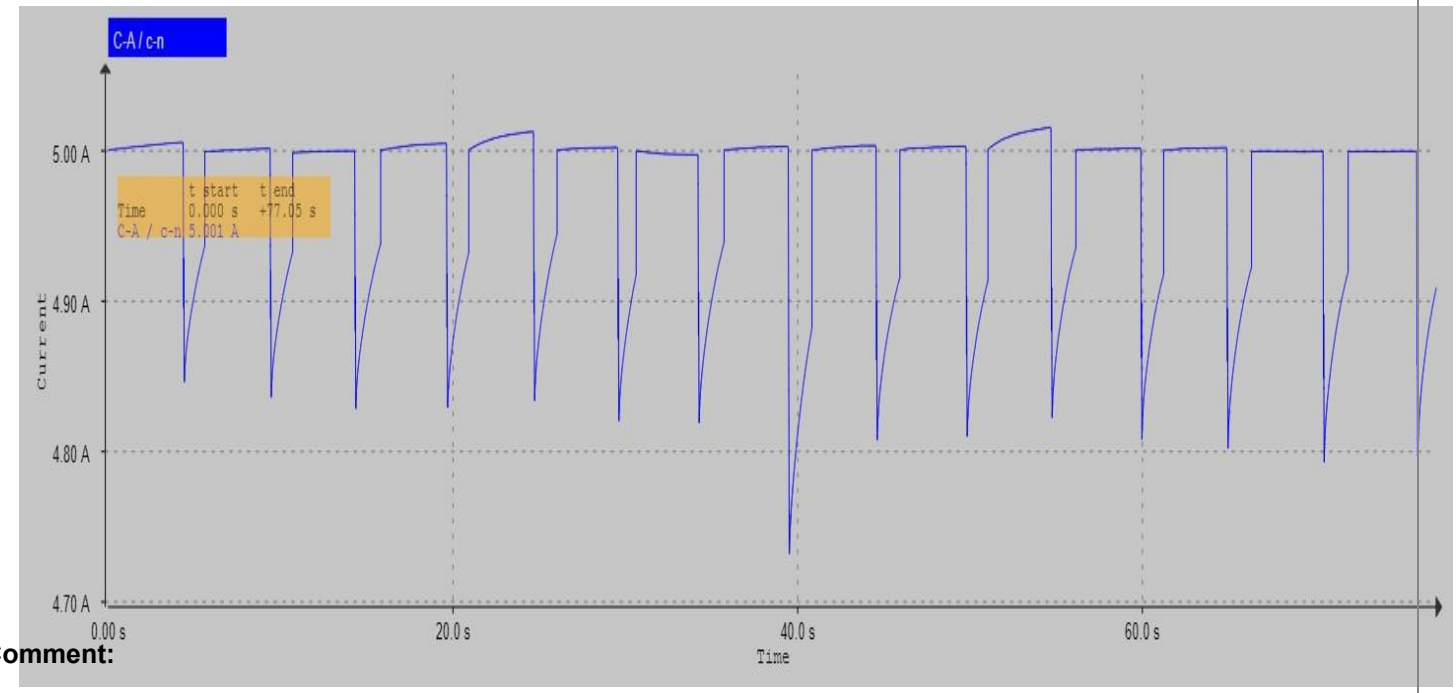


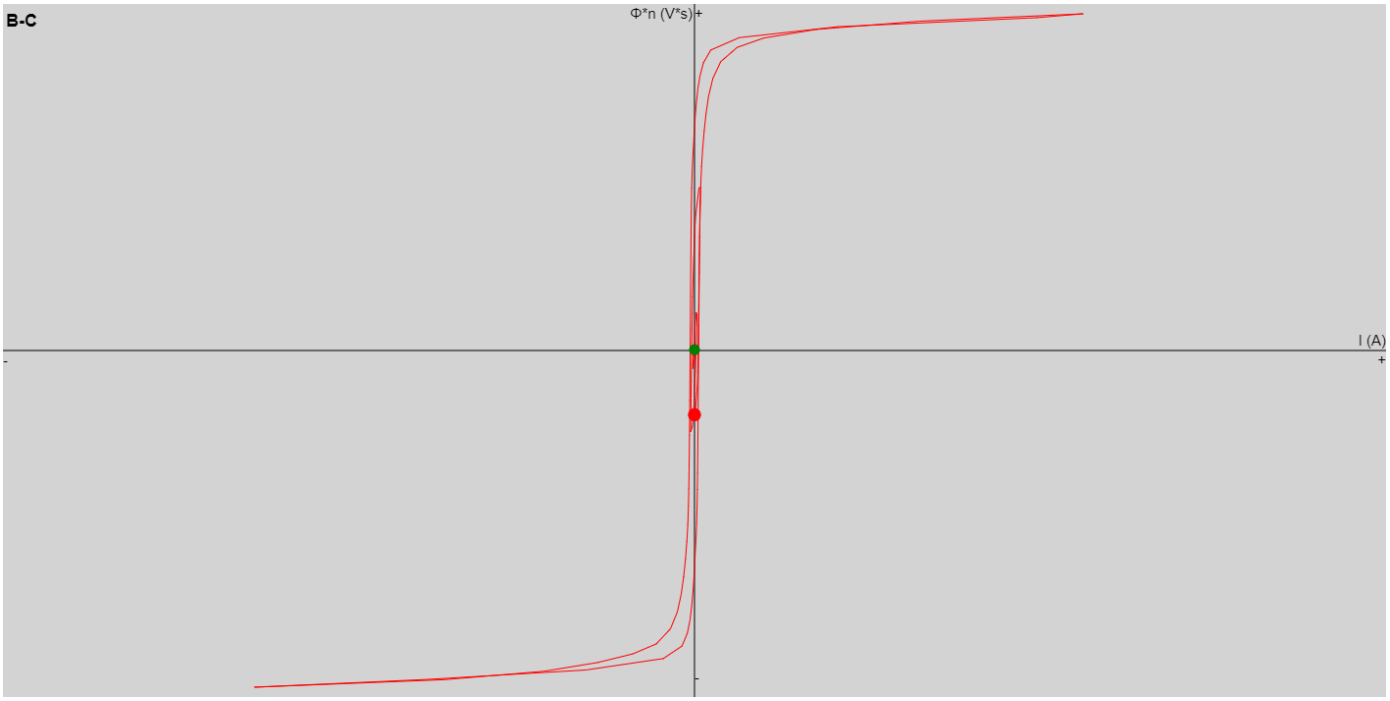
Dynamic Current



Comment:

Demag measurements

Designation	Current	Time	Remanence before demag	Remanence after demag
B-C	0.000 A	27.27 s	19.28 %	<1 %



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 :	PMU TAIPING INDUSTRI (TPID)	**Manufacture year:**	1997
Circuit :	33/11KV MTM TRANSFORMER :5	**Serial No.:**	P/194/30007

BAY ID: TX5

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 : 12.20 PM

Tested by:	Witnessed by:	Verified by :	ESE COMMENT:
Name: VICKNESH Dept: Tester	Name: Mr. ARIF Dept: TNB	Name: Dept:	
Date: 24/08/2024	Date: 24/08/2024	Date: 24/08/2024	

TRANSFORMER TESTING REPORTS

Location: PMU TPID

Job: T5 AFTER SERVICE

Date: 28/08/2024

TRANSFORMER NO	: 05
SERIAL NO	: P/194/30007
VOLTAGE	: 33000/11000
KVA	: 30000
MANUFACTURE	: MTM
YEAR	: 1997
TESTING DATE	: 28/08/2024

TEST PERFORMED

S.NO.	TITLE
1	FREQUENCY DOMAIN SPECTROSCOPY(FDS)
2	TANDELTA WINDING
3	EXCITATION CURRENT 10KV
4	TURN RATIO MEASUREMENT
5	DC WINDING RESISTANCE
6	OLTC DYNAMIC CURRENT MEASUREMENT
7	INSULATION RESISTANCE / POLARIZATION INDEX

TEST EQUIPMENT USED :

1. **MEGGER IDAX 300**
2. **MEGGER TDX 120**
3. **MEGGER TRAX 220**
4. **MEGGER MIT515 INSULATION TESTER**

TESTING PERFORMED BY:

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

TRANSFORMER FREQUENCY DOMAIN SPECTROSCOPY (FDS) TEST REPORT

IDAX Measurement Report

General

Company:	MTM
Division:	PERAK
Location:	PMU TPID T5
Date:	28/8/2024

Test conditions

Ambient temperature, °C:	36
Ambient %RH:	70
Object temperature, °C:	40
Weather:	SUNNY
Tester:	VICKNESH

Test object information

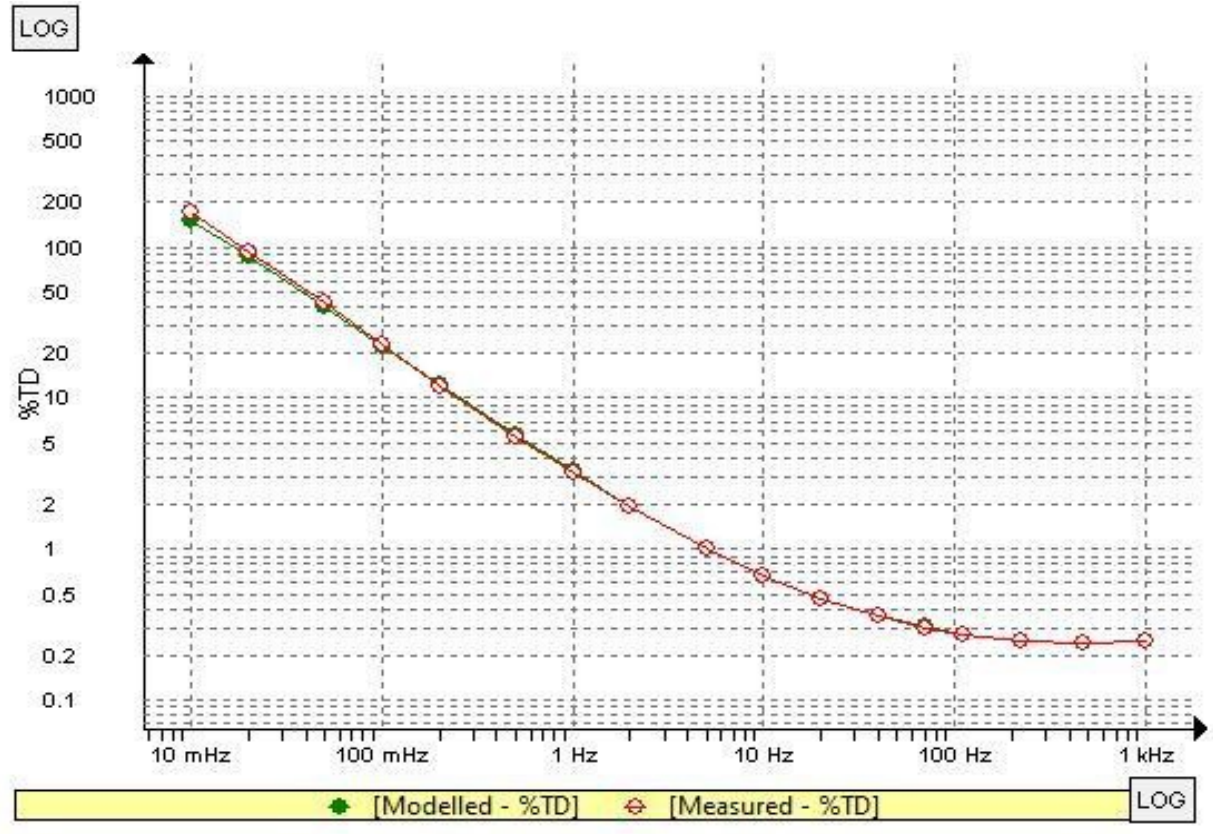
Test object:	Two Winding Transformer
Designation:	PMU TPID T5 AFTER
Manufacturer:	MTM
Type:	NT1
Core type:	Core
Serial no:	P/194/30007
Coolant:	Mineral Oil
Cooling class:	ONAN/ONAF
Voltage (kV):	33/11
MVA:	30
Vector group:	DYN11
Frequency:	50

Insulation assessment(CHG)

Measurement	Voltage (Vrms)	Freq (Hz)	C (pF)	%TD meas	%TD @ 20°C
CHG	140	50	2926	0.335	0.249

Analysis results

%TD @ 50 Hz & 20°C	Moisture %(wt/wt)	Liquid %TD @ 50 Hz & 25°C
0.249	**2.2**	**0.022**
< 0.30 % As new	< 1.0 % As new	< 0.0060 % As new
0.30 - 0.50 % Good	1.0 - 2.0 % Dry	0.0060 - 0.060 % Good
0.50 - 1.0 % Deteriorated	2.0 - 3.0 % Moderately wet	0.060 - 0.60 % Service aged
> 1.0 % Investigate	> 3.0 % Wet	> 0.60 % Deteriorated

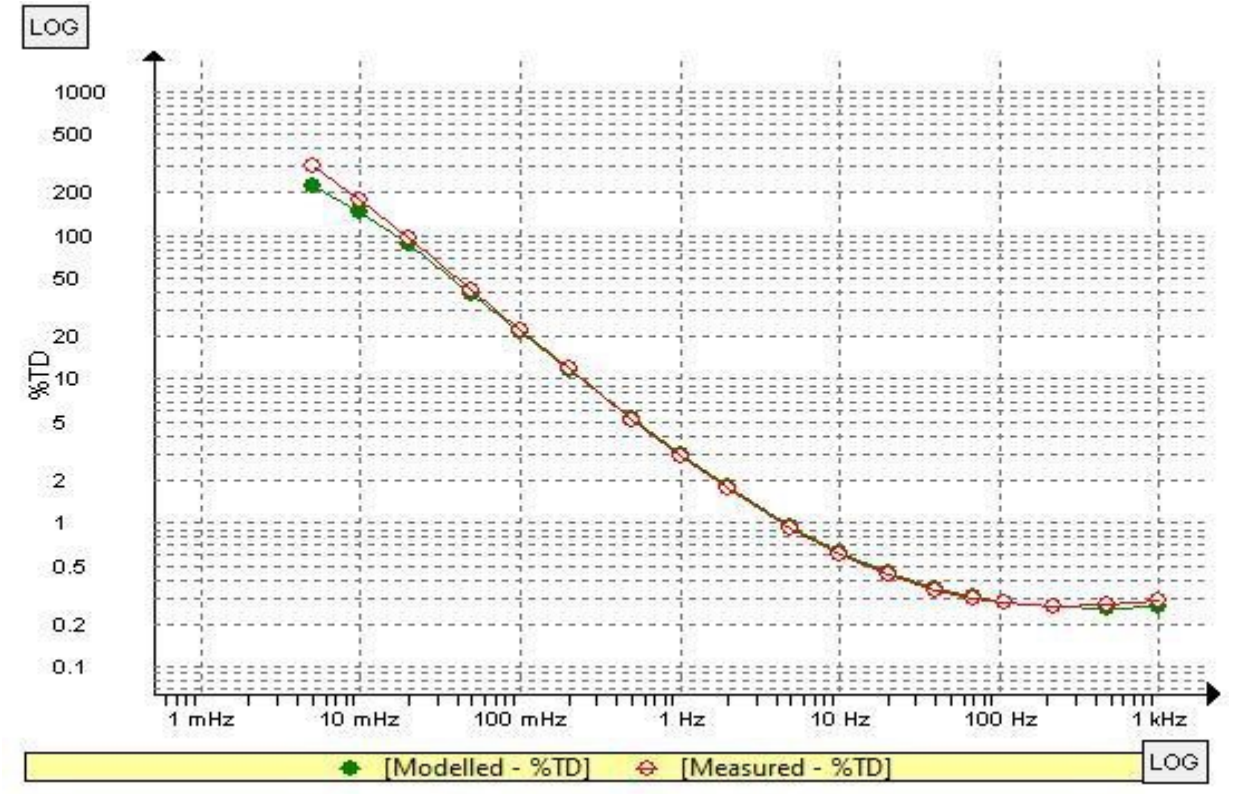


Insulation assessment(CHL)

Measurement	Voltage (Vrms)	Freq (Hz)	C (pF)	%TD meas	%TD @ 20°C
CHL	140	50	7072	0.325	0.262

Analysis results

%TD @ 50 Hz & 20°C	Moisture %(wt/wt)	Liquid %TD @ 50 Hz & 25°C
0.262	**1.9**	**0.024**
< 0.30 % As new	< 1.0 % As new	< 0.0060 % As new
0.30 - 0.50 % Good	1.0 - 2.0 % Dry	0.0060 - 0.060 % Good
0.50 - 1.0 % Deteriorated	2.0 - 3.0 % Moderately wet	0.060 - 0.60 % Service aged
> 1.0 % Investigate	> 3.0 % Wet	> 0.60 % Deteriorated

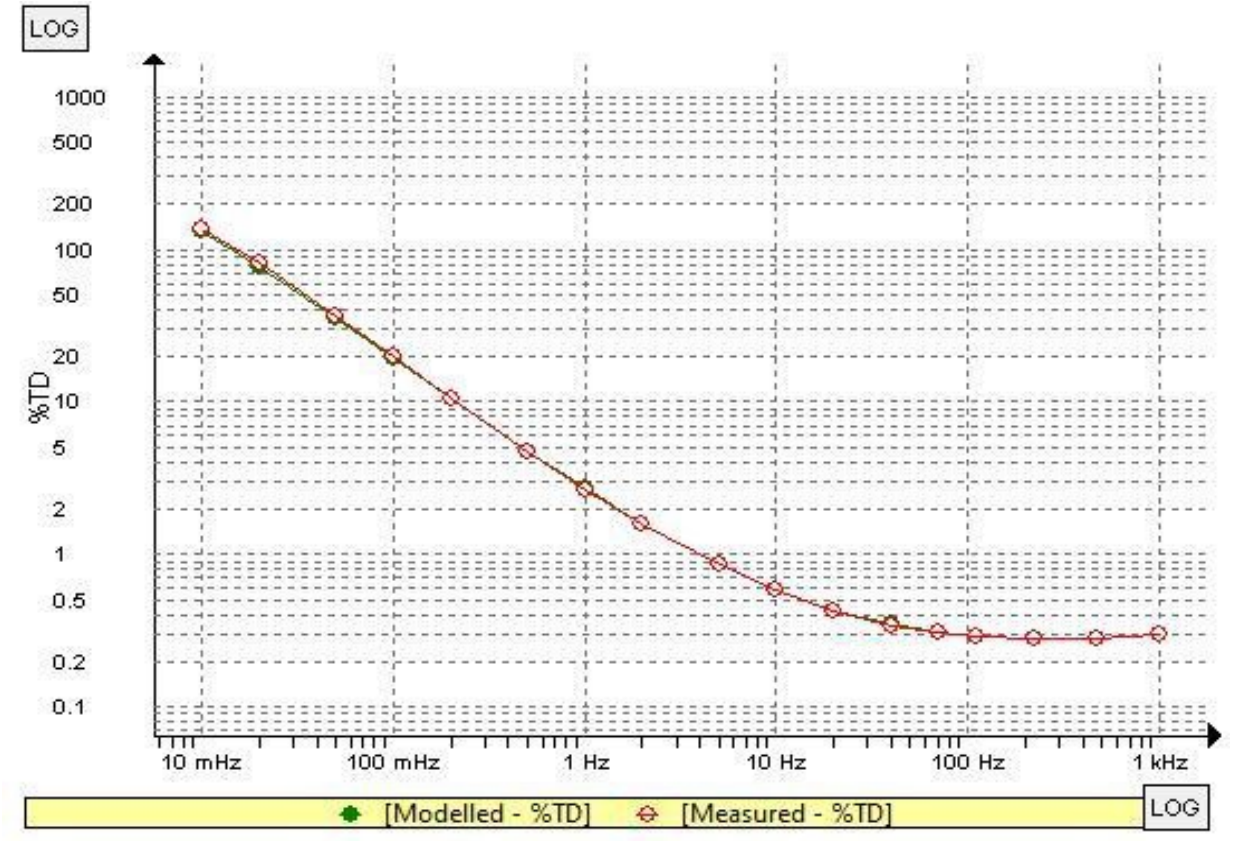


Insulation assessment(CLG)

Measurement	Voltage (Vrms)	Freq (Hz)	C (pF)	%TD meas	%TD @ 20°C
CLG	140	50	9301	0.328	0.289

Analysis results

%TD @ 50 Hz & 20°C	Moisture %(wt/wt)	Liquid %TD @ 50 Hz & 25°C
0.289	**1.7**	**0.024**
< 0.30 % As new	< 1.0 % As new	< 0.0060 % As new
0.30 - 0.50 % Good	1.0 - 2.0 % Dry	0.0060 - 0.060 % Good
0.50 - 1.0 % Deteriorated	2.0 - 3.0 % Moderately wet	0.060 - 0.60 % Service aged
> 1.0 % Investigate	> 3.0 % Wet	> 0.60 % Deteriorated



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PMU TPID T5 AFTER 2024-08-28 09.14

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CHG - (28/8/2024 10:14:27 AM)

Test Mode	Hum (50Hz)	Offset	Capacitance (930Hz, 140 (RMS))
UST-R	24 nA	-7.6 nA	7.0 nF
UST-B	--- ---	---	
UST-RB	24 nA*	-7.6 nA*	7.0 nF*
GST-G	48 nA*	3.5 nA*	10.0 nF
GSTG-R	72 nA*	-4.2 nA*	2.9 nF*
GSTG-B	48 nA*	3.5 nA*	10.0 nF*
GSTG-RB	72 nA	-4.2 nA	2.9 nF

*Estimated from measurements of other Test Modes

Hum current is peak value of the fundamental

1000	2.91279E-09	7.15627E-12	0.245684	0.245683
470	2.91594E-09	6.9705E-12	0.239048	0.239048
220	2.91898E-09	7.17434E-12	0.245783	0.245782
110	2.92198E-09	7.93242E-12	0.271474	0.271473
70	2.924E-09	8.8132E-12	0.301409	0.301408
40	2.92664E-09	1.0496E-11	0.358637	0.358635
20	2.93037E-09	1.38906E-11	0.474021	0.474015
10	2.93508E-09	1.9653E-11	0.669589	0.669574
5	2.94087E-09	2.97375E-11	1.01118	1.01113

2	2.9515E-09	5.58808E-11	1.8933	1.89296
1	2.96348E-09	9.46764E-11	3.19478	3.19315
0.5	2.98058E-09	1.65302E-10	5.54596	5.53745
0.2	3.00993E-09	3.63899E-10	12.09	12.0026
0.1	3.03684E-09	6.80952E-10	22.423	21.8797
0.05	3.06795E-09	1.30019E-09	42.3798	39.0203
0.02	3.20929E-09	3.01557E-09	93.9637	68.477
0.01	3.40883E-09	5.84689E-09	171.522	86.3898

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CHL - (28/8/2024 10:05:22 AM)

Test Mode	Hum (50Hz)	Offset	Capacitance (930Hz, 140 (RMS))
UST-R	21 nA	308 pA	7.0 nF
UST-B	--- ---	---	
UST-RB	21 nA*	308 pA*	7.0 nF*
GST-G	44 nA*	-1.0 nA*	10.0 nF
GSTg-R	65 nA*	-735 pA*	2.9 nF*
GSTg-B	44 nA*	-1.0 nA*	10.0 nF*
GSTg-RB	65 nA	-735 pA	2.9 nF

*Estimated from measurements of other Test Modes

Hum current is peak value of the fundamental

5	2.94087E-09	2.97375E-11	1.01118	1.01113

470	7.04741E-09	1.88324E-11	0.267225	0.267224
220	7.05545E-09	1.86166E-11	0.263861	0.26386
110	7.06274E-09	1.96754E-11	0.27858	0.278579
70	7.06795E-09	2.11524E-11	0.299272	0.29927
40	7.07436E-09	2.42694E-11	0.343061	0.343059
20	7.08304E-09	3.10011E-11	0.437681	0.437677
10	7.09307E-09	4.30847E-11	0.607419	0.607408
5	7.10537E-09	6.46988E-11	0.910562	0.910524
2	7.12654E-09	1.22424E-10	1.71786	1.71761
1	7.14815E-09	2.10592E-10	2.9461	2.94483
0.5	7.17728E-09	3.76865E-10	5.25081	5.24359
0.2	7.23344E-09	8.51201E-10	11.7676	11.6869
0.1	7.29784E-09	1.61574E-09	22.14	21.6166
0.05	7.39501E-09	3.10372E-09	41.9705	38.7001
0.02	7.73369E-09	7.45685E-09	96.4204	69.4105
0.01	8.26046E-09	1.44834E-08	175.334	86.865
0.005	9.1881E-09	2.78632E-08	303.253	94.9697

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CLG - (28/8/2024 10:20:01 AM)

Test Mode	Hum (50Hz)	Offset	Capacitance (930Hz, 140 (RMS))
UST-R	45 nA	-1.9 nA	7.0 nF
UST-B	--- ---	---	
UST-RB	45 nA*	-1.9 nA*	7.0 nF*

GST-G	24 nA*	2.0 nA*	16 nF
GSTG-R	69 nA*	163 pA*	9.3 nF*
GSTG-B	24 nA*	2.0 nA*	16 nF*
GSTG-RB	69 nA	163 pA	9.3 nF

*Estimated from measurements of other Test Modes

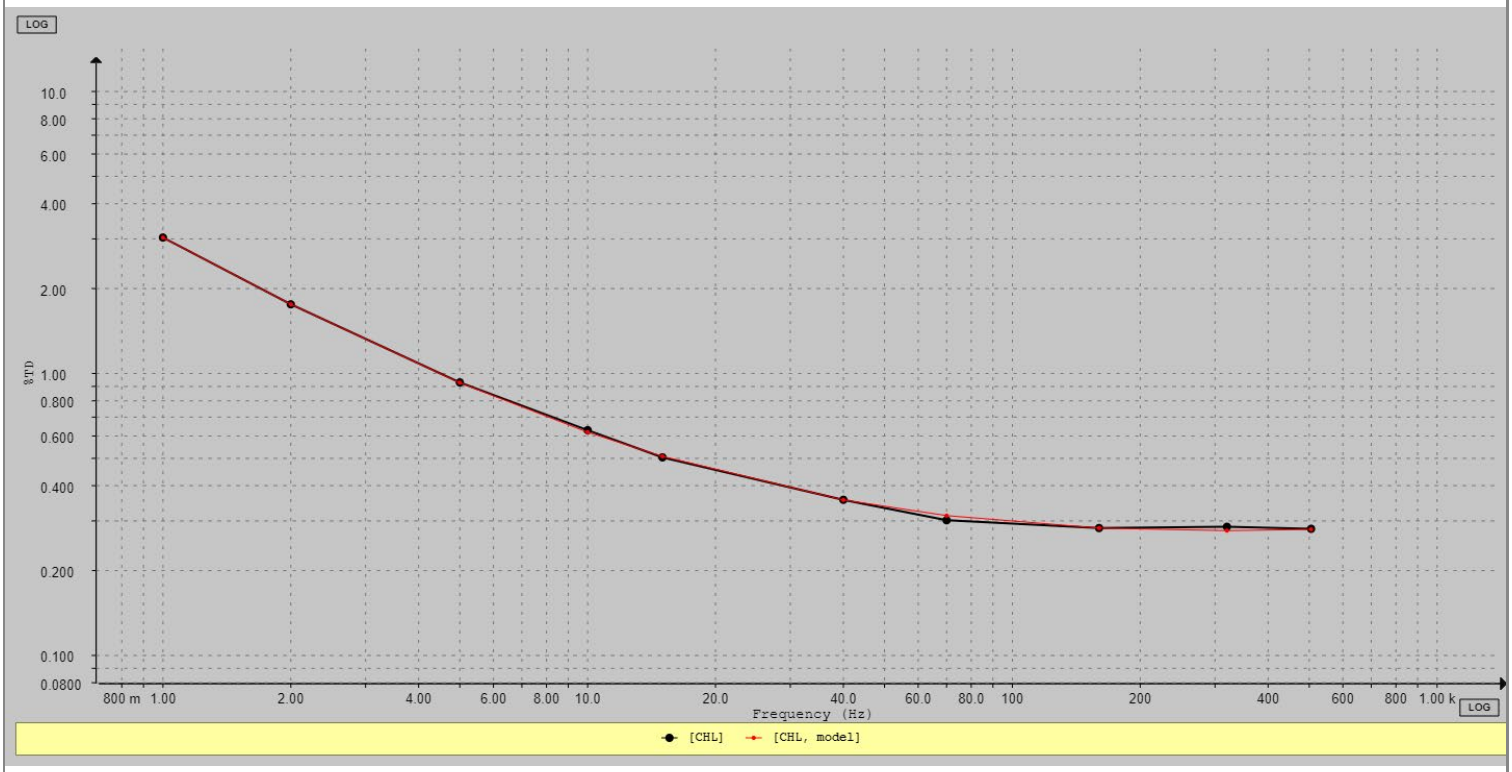
Hum current is peak value of the fundamental

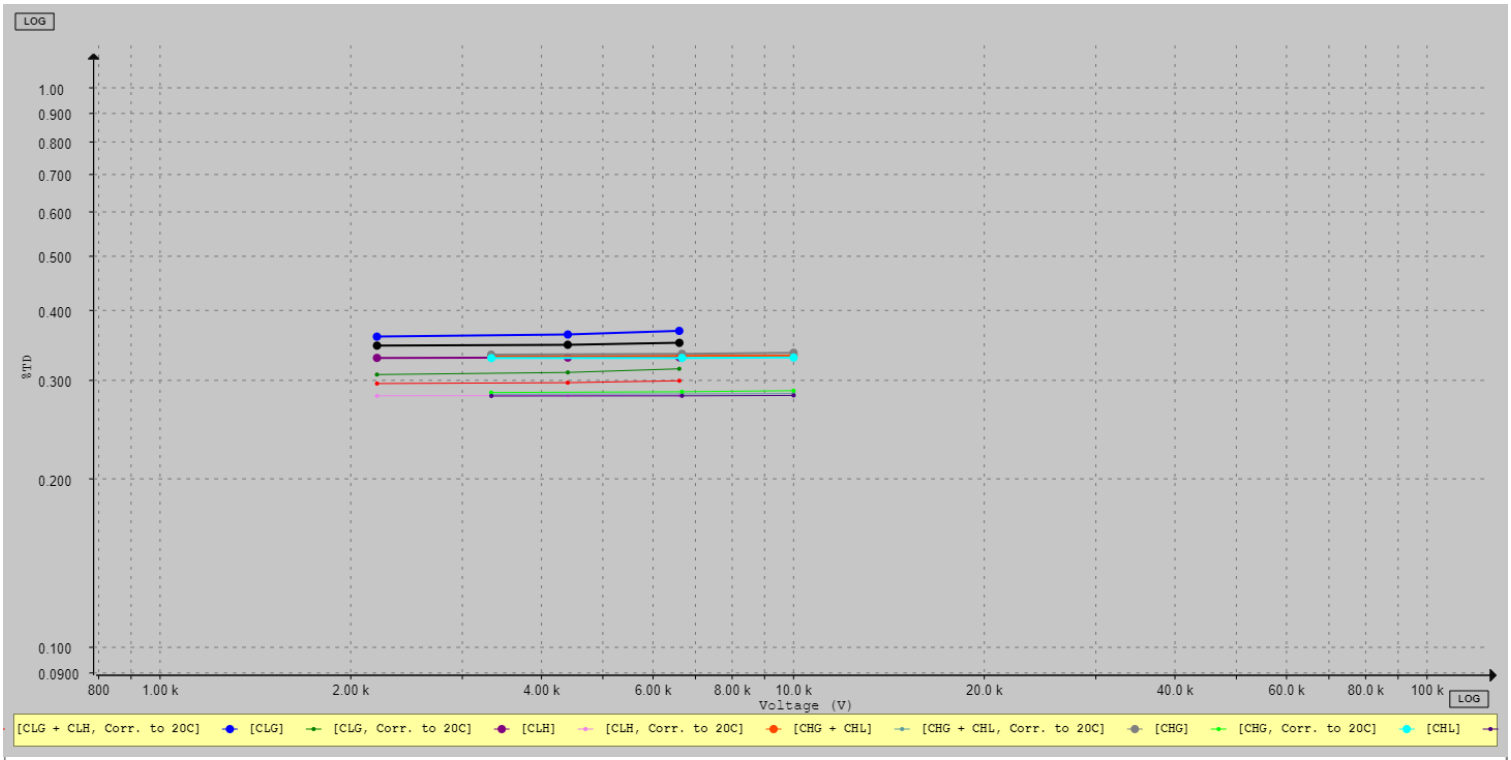
1000	9.25527E-09	2.75321E-11	0.297475	0.297474
470	9.2666E-09	2.60401E-11	0.28101	0.281009
220	9.27843E-09	2.56778E-11	0.276748	0.276747
110	9.28879E-09	2.67853E-11	0.288362	0.288361
70	9.29548E-09	2.84291E-11	0.305838	0.305837
40	9.30458E-09	3.19128E-11	0.34298	0.342978
20	9.31618E-09	3.96444E-11	0.425543	0.425539
10	9.32929E-09	5.38548E-11	0.577266	0.577257
5	9.34495E-09	7.92927E-11	0.848508	0.848478
2	9.37181E-09	1.47179E-10	1.57044	1.57025
1	9.39922E-09	2.50868E-10	2.66903	2.66808
0.5	9.43649E-09	4.45472E-10	4.72074	4.71549
0.2	9.50972E-09	9.9738E-10	10.488	10.4308
0.1	9.59831E-09	1.88398E-09	19.6283	19.2607
0.05	9.75636E-09	3.62349E-09	37.1398	34.8161
0.02	1.03372E-08	8.52178E-09	82.4382	63.6099
0.01	1.16569E-08	1.61236E-08	138.318	81.0391

TRANSFORMER TANDELTA TEST REPORT

Tan Delta - Power Transformer

Designation	Test Mode	f (Hz)	U	I eq	C	%TD at 38 °C	ITC2 Corr. Factor	Corr. %TD to 20°C	P eq at 38 °C	% VDF	ITC2
CHG + CHL	GST-GND	50.00	10.00 kV	31.41 mA	9.997 nF	0.333	0.856	**0.285**	1.045 W	0.01 %	
CHG	GSTg-RB	50.00	10.01 kV	9.198 mA	2.928 nF	0.337	0.856	**0.288**	309.7 mW	0.01 %	●
CHL	UST-R	50.00	10.00 kV	22.21 mA	7.069 nF	0.330	0.856	**0.282**	731.9 mW	0.01 %	
CLG + CLH	GST-GND	50.00	6.601 kV	49.10 mA	15.63 nF	0.350	0.856	**0.299**	1.716 W	0.02 %	
CLG	GSTg-RB	50.00	6.606 kV	26.89 mA	8.560 nF	0.366	0.856	**0.313**	984.6 mW	0.02 %	
CLH	UST-R	50.00	6.603 kV	22.21 mA	7.069 nF	0.330	0.856	**0.282**	732.3 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
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 38 °C
A-B	1	36 307	50.00	10.06 kV	69.79 mA	704.6 H	531.9 W
B-C	1	36 307	50.00	9.986 kV	31.35 mA	1.619 kH	244.2 W
C-A	1	36 307	50.00	10.00 kV	66.22 mA	769.4 H	517.0 W
A-B	2	35 756	50.00	10.01 kV	71.49 mA	686.6 H	544.2 W
B-C	2	35 756	50.00	9.977 kV	32.02 mA	1.592 kH	250.1 W
C-A	2	35 756	50.00	10.03 kV	67.46 mA	756.1 H	527.1 W
A-B	3	35 205	50.00	10.03 kV	73.25 mA	670.0 H	557.5 W
B-C	3	35 205	50.00	9.990 kV	32.74 mA	1.564 kH	256.4 W
C-A	3	35 205	50.00	10.03 kV	69.05 mA	740.9 H	540.5 W
A-B	4	34 654	50.00	10.03 kV	75.15 mA	653.9 H	572.6 W
B-C	4	34 654	50.00	9.993 kV	33.53 mA	1.536 kH	263.6 W
C-A	4	34 654	50.00	9.969 kV	70.87 mA	724.1 H	555.8 W
A-B	5	34 102	50.00	10.01 kV	77.17 mA	638.8 H	589.3 W
B-C	5	34 102	50.00	10.03 kV	34.33 mA	1.509 kH	270.9 W
C-A	5	34 102	50.00	9.982 kV	72.67 mA	708.8 H	571.3 W
A-B	6	33 551	50.00	10.02 kV	79.22 mA	624.2 H	606.3 W
B-C	6	33 551	50.00	10.03 kV	35.21 mA	1.483 kH	279.1 W
C-A	6	33 551	50.00	9.991 kV	74.54 mA	694.2 H	587.7 W
A-B	7	33 000	50.00	9.955 kV	81.54 mA	608.8 H	625.7 W
B-C	7	33 000	50.00	9.973 kV	36.22 mA	1.455 kH	288.6 W
C-A	7	33 000	50.00	10.03 kV	76.48 mA	680.4 H	605.0 W
A-B	8	32 449	50.00	10.01 kV	83.66 mA	595.9 H	643.8 W
B-C	8	32 449	50.00	9.977 kV	37.24 mA	1.429 kH	298.4 W
C-A	8	32 449	50.00	9.991 kV	78.65 mA	665.7 H	624.5 W
A-B	9	31 898	50.00	10.03 kV	85.91 mA	582.9 H	663.2 W
B-C	9	31 898	50.00	9.977 kV	39.87 mA	1.264 kH	309.1 W
C-A	9	31 898	50.00	10.03 kV	80.86 mA	651.6 H	644.4 W
A-B	10	31 347	50.00	10.01 kV	89.54 mA	549.6 H	682.8 W
B-C	10	31 347	50.00	9.949 kV	40.91 mA	1.235 kH	317.8 W
C-A	10	31 347	50.00	10.01 kV	84.59 mA	606.2 H	663.2 W
A-B	11	30 796	50.00	9.989 kV	92.08 mA	535.1 H	702.9 W
B-C	11	30 796	50.00	10.05 kV	41.90 mA	1.214 kH	326.8 W
C-A	11	30 796	50.00	10.01 kV	86.94 mA	592.7 H	683.7 W
A-B	12	30 245	50.00	10.02 kV	94.53 mA	523.7 H	724.0 W
B-C	12	30 245	50.00	10.01 kV	43.09 mA	1.188 kH	337.4 W

Connection	Tap	Tap Voltage (V)	f (Hz)	U	I eq	L	P eq at 38 °C
C-A	12	30 245	50.00	10.03 kV	89.34 mA	579.2 H	704.4 W
A-B	13	29 693	50.00	10.00 kV	97.35 mA	511.0 H	748.1 W
B-C	13	29 693	50.00	10.02 kV	44.34 mA	1.163 kH	348.7 W
C-A	13	29 693	50.00	9.986 kV	92.03 mA	565.8 H	728.3 W
A-B	14	29 142	50.00	9.995 kV	100.2 mA	498.7 H	771.9 W
B-C	14	29 142	50.00	9.974 kV	45.75 mA	1.136 kH	361.8 W
C-A	14	29 142	50.00	9.960 kV	94.89 mA	551.1 H	752.9 W
A-B	15	28 591	50.00	9.963 kV	103.4 mA	485.1 H	798.8 W
B-C	15	28 591	50.00	9.989 kV	47.21 mA	1.112 kH	375.5 W
C-A	15	28 591	50.00	10.02 kV	97.69 mA	539.8 H	778.9 W
A-B	16	28 040	50.00	10.04 kV	106.4 mA	474.1 H	826.0 W
B-C	16	28 040	50.00	10.04 kV	48.95 mA	1.086 kH	392.1 W
C-A	16	28 040	50.00	10.00 kV	100.9 mA	526.7 H	807.7 W

Comment:

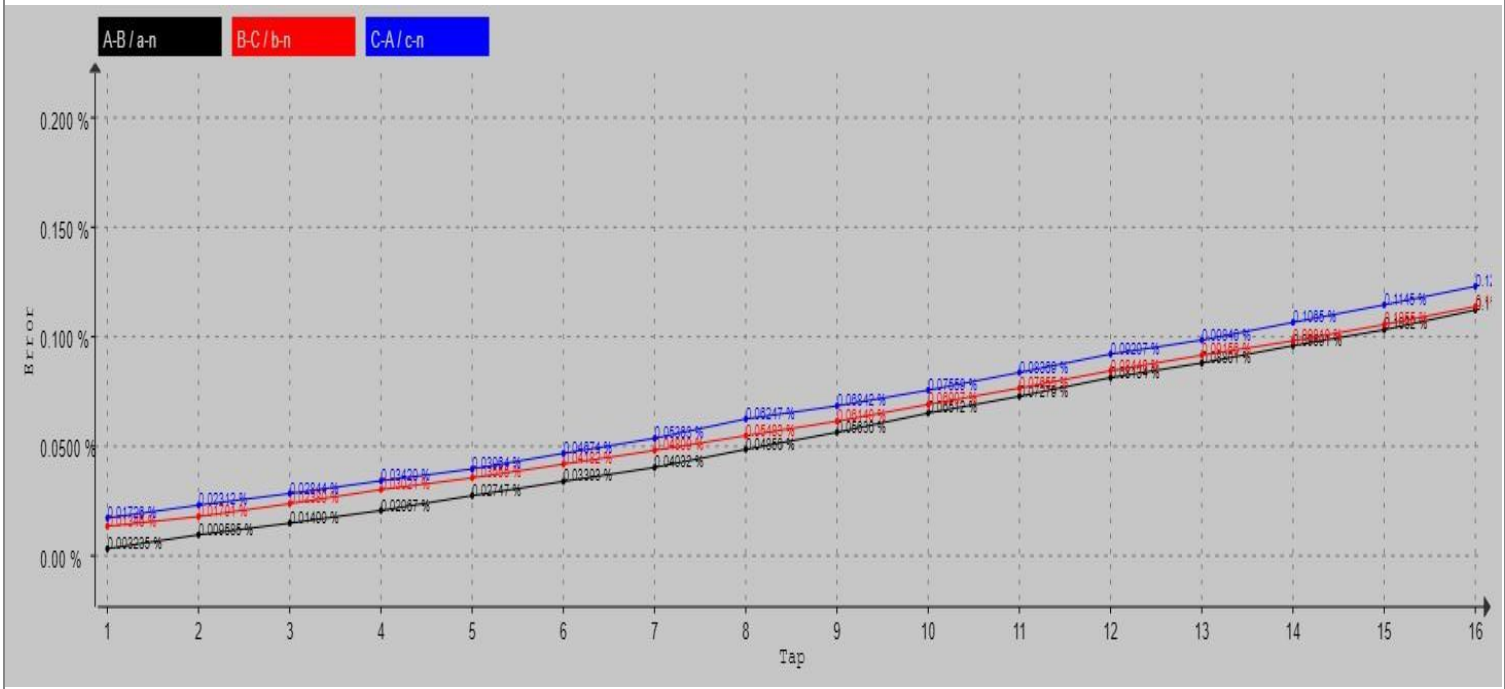
TRANSFORMER TURNS RATIO TEST REPORT

Turns ratio measurements

Connection	Tap (P)	Tap Voltage (V)	U	Test frequency	TTR	Measured TTR	Error	I Exc	Phase
A-B / a-n	1	36 307	125.0 V	50.00 Hz	5.717	5.717	0.00 %	2.892 mA	0.0 °
B-C / b-n	1	36 307	125.0 V	50.00 Hz	5.717	5.718	0.01 %	2.196 mA	0.0 °
C-A / c-n	1	36 307	125.0 V	50.00 Hz	5.717	5.718	0.02 %	3.063 mA	0.0 °
A-B / a-n	2	35 756	125.0 V	50.00 Hz	5.630	5.631	0.01 %	2.958 mA	0.0 °
B-C / b-n	2	35 756	125.0 V	50.00 Hz	5.630	5.631	0.02 %	2.256 mA	0.0 °
C-A / c-n	2	35 756	125.0 V	50.00 Hz	5.630	5.631	0.02 %	3.150 mA	0.0 °
A-B / a-n	3	35 205	125.0 V	50.00 Hz	5.543	5.544	0.01 %	3.046 mA	0.0 °
B-C / b-n	3	35 205	125.0 V	50.00 Hz	5.543	5.545	0.02 %	2.316 mA	0.0 °
C-A / c-n	3	35 205	125.0 V	50.00 Hz	5.543	5.545	0.03 %	3.223 mA	0.0 °
A-B / a-n	4	34 654	125.0 V	50.00 Hz	5.457	5.458	0.02 %	3.137 mA	0.0 °
B-C / b-n	4	34 654	125.0 V	50.00 Hz	5.457	5.458	0.03 %	2.378 mA	0.0 °
C-A / c-n	4	34 654	125.0 V	50.00 Hz	5.457	5.458	0.03 %	3.298 mA	0.0 °
A-B / a-n	5	34 102	125.0 V	50.00 Hz	5.370	5.371	0.03 %	3.211 mA	0.0 °
B-C / b-n	5	34 102	125.0 V	50.00 Hz	5.370	5.372	0.04 %	2.448 mA	0.0 °
C-A / c-n	5	34 102	125.0 V	50.00 Hz	5.370	5.372	0.04 %	3.393 mA	0.0 °
A-B / a-n	6	33 551	125.0 V	50.00 Hz	5.283	5.285	0.03 %	3.299 mA	0.0 °
B-C / b-n	6	33 551	125.0 V	50.00 Hz	5.283	5.285	0.04 %	2.516 mA	0.0 °
C-A / c-n	6	33 551	125.0 V	50.00 Hz	5.283	5.285	0.05 %	3.492 mA	0.0 °
A-B / a-n	7	33 000	125.0 V	50.00 Hz	5.196	5.198	0.04 %	3.406 mA	0.0 °
B-C / b-n	7	33 000	125.0 V	50.00 Hz	5.196	5.199	0.05 %	2.597 mA	0.0 °
C-A / c-n	7	33 000	125.0 V	50.00 Hz	5.196	5.199	0.05 %	3.574 mA	0.0 °
A-B / a-n	8	32 449	125.0 V	50.00 Hz	5.109	5.112	0.05 %	3.499 mA	0.0 °
B-C / b-n	8	32 449	125.0 V	50.00 Hz	5.109	5.112	0.05 %	2.669 mA	0.0 °
C-A / c-n	8	32 449	125.0 V	50.00 Hz	5.109	5.113	0.06 %	3.680 mA	0.0 °
A-B / a-n	9	31 898	125.0 V	50.00 Hz	5.023	5.025	0.06 %	3.621 mA	0.0 °
B-C / b-n	9	31 898	125.0 V	50.00 Hz	5.023	5.026	0.06 %	2.740 mA	0.0 °
C-A / c-n	9	31 898	125.0 V	50.00 Hz	5.023	5.026	0.07 %	3.806 mA	0.0 °
A-B / a-n	10	31 347	125.0 V	50.00 Hz	4.936	4.939	0.07 %	3.732 mA	0.0 °
B-C / b-n	10	31 347	125.0 V	50.00 Hz	4.936	4.939	0.07 %	2.812 mA	0.0 °
C-A / c-n	10	31 347	125.0 V	50.00 Hz	4.936	4.940	0.08 %	3.914 mA	0.0 °
A-B / a-n	11	30 796	125.0 V	50.00 Hz	4.849	4.853	0.07 %	3.834 mA	0.0 °
B-C / b-n	11	30 796	125.0 V	50.00 Hz	4.849	4.853	0.08 %	2.897 mA	0.0 °
C-A / c-n	11	30 796	125.0 V	50.00 Hz	4.849	4.853	0.08 %	4.017 mA	0.0 °
A-B / a-n	12	30 245	125.0 V	50.00 Hz	4.762	4.766	0.08 %	3.954 mA	0.0 °
B-C / b-n	12	30 245	125.0 V	50.00 Hz	4.762	4.766	0.08 %	2.996 mA	0.0 °
C-A / c-n	12	30 245	125.0 V	50.00 Hz	4.762	4.767	0.09 %	4.147 mA	0.0 °
A-B / a-n	13	29 693	125.0 V	50.00 Hz	4.675	4.680	0.09 %	4.089 mA	0.0 °
B-C / b-n	13	29 693	125.0 V	50.00 Hz	4.675	4.680	0.09 %	3.088 mA	0.0 °

Connection	Tap (P)	Tap Voltage (V)	U	Test frequency	TTR	Measured TTR	Error	I Exc	Phase
C-A / c-n	13	29 693	125.0 V	50.00 Hz	4.675	4.680	0.10 %	4.283 mA	0.0 °
A-B / a-n	14	29 142	125.0 V	50.00 Hz	4.589	4.593	0.10 %	4.216 mA	0.0 °
B-C / b-n	14	29 142	125.0 V	50.00 Hz	4.589	4.593	0.10 %	3.173 mA	0.0 °
C-A / c-n	14	29 142	125.0 V	50.00 Hz	4.589	4.594	0.11 %	4.401 mA	0.0 °
A-B / a-n	15	28 591	125.0 V	50.00 Hz	4.502	4.507	0.10 %	4.342 mA	0.0 °
B-C / b-n	15	28 591	125.0 V	50.00 Hz	4.502	4.507	0.11 %	3.272 mA	0.0 °
C-A / c-n	15	28 591	125.0 V	50.00 Hz	4.502	4.507	0.11 %	4.539 mA	0.0 °
A-B / a-n	16	28 040	125.0 V	50.00 Hz	4.415	4.420	0.11 %	4.492 mA	0.0 °
B-C / b-n	16	28 040	125.0 V	50.00 Hz	4.415	4.420	0.11 %	3.390 mA	0.0 °
C-A / c-n	16	28 040	125.0 V	50.00 Hz	4.415	4.421	0.12 %	4.697 mA	0.0 °

Comment:



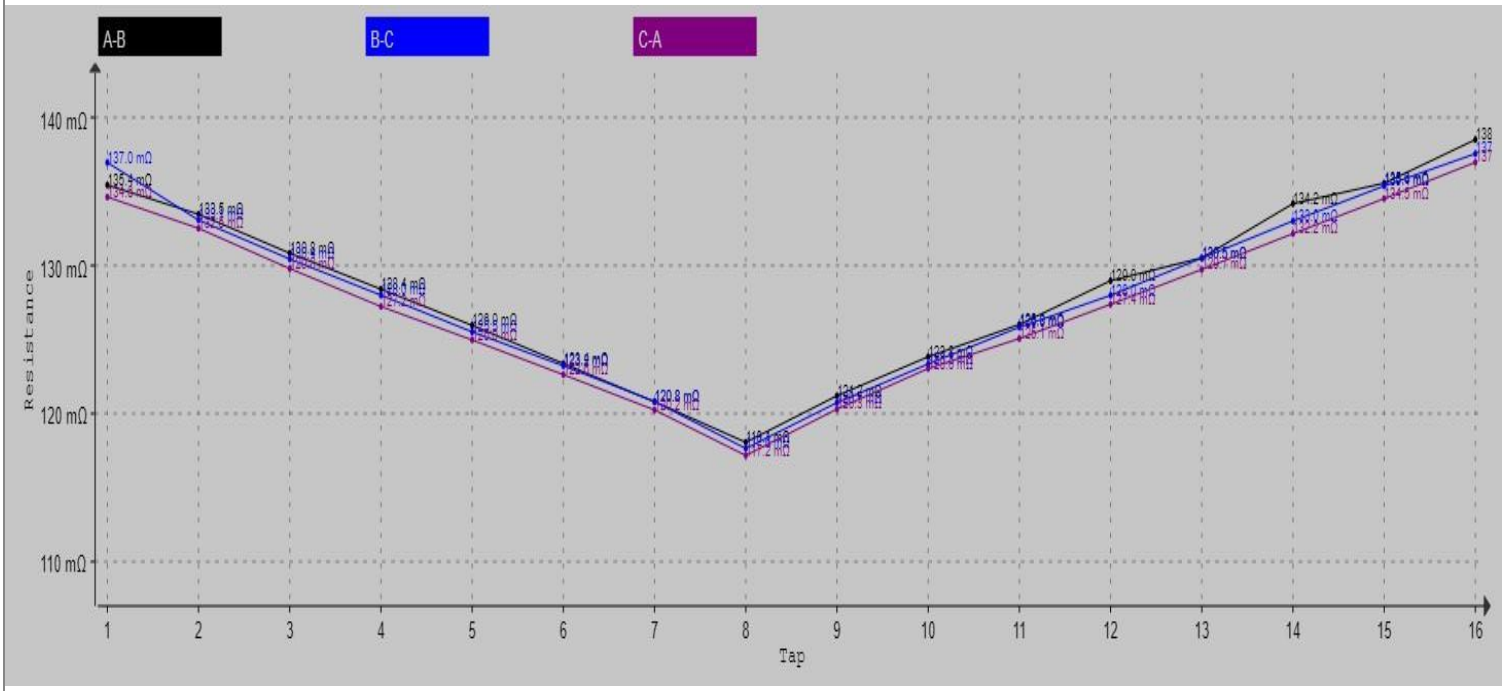
TRANSFORMER DC WINDING RESITANCE TEST REPORT

HV Winding resistance measurements

Connection	Tap (P)	Current	38°C Resistance corrected to 75°C	Stability	Variation	Continuity
A-B	1	10.01 A	153.8 mΩ	99.84 %	---	✓
B-C	1	10.00 A	155.5 mΩ	99.39 %	---	✓
C-A	1	10.00 A	152.9 mΩ	99.99 %	1.72 %	✓
A-B	2	10.01 A	151.6 mΩ	99.50 %	---	✓
B-C	2	10.01 A	151.1 mΩ	99.85 %	---	✓
C-A	2	10.00 A	150.5 mΩ	99.95 %	0.72 %	✓
A-B	3	10.00 A	148.6 mΩ	99.91 %	---	✓
B-C	3	10.00 A	148.1 mΩ	99.93 %	---	✓
C-A	3	10.00 A	147.4 mΩ	99.67 %	0.80 %	✓
A-B	4	10.00 A	145.8 mΩ	99.92 %	---	✓
B-C	4	10.01 A	145.3 mΩ	99.97 %	---	✓
C-A	4	10.00 A	144.5 mΩ	99.47 %	0.92 %	✓
A-B	5	10.00 A	143.0 mΩ	99.90 %	---	✓
B-C	5	10.00 A	142.5 mΩ	99.90 %	---	✓
C-A	5	10.00 A	141.9 mΩ	99.29 %	0.79 %	✓
A-B	6	10.01 A	140.1 mΩ	99.64 %	---	✓
B-C	6	9.999 A	139.9 mΩ	99.85 %	---	✓
C-A	6	9.999 A	139.2 mΩ	100.0 %	0.61 %	✓
A-B	7	10.00 A	137.2 mΩ	99.89 %	---	✓
B-C	7	10.00 A	137.2 mΩ	99.92 %	---	✓
C-A	7	10.00 A	136.5 mΩ	99.93 %	0.47 %	✓
A-B	8	10.00 A	134.1 mΩ	99.29 %	---	✓
B-C	8	10.01 A	133.6 mΩ	99.78 %	---	✓
C-A	8	10.00 A	133.0 mΩ	99.94 %	0.76 %	✓
A-B	9	10.00 A	137.6 mΩ	99.63 %	---	✓
B-C	9	10.00 A	137.1 mΩ	99.47 %	---	✓
C-A	9	10.00 A	136.6 mΩ	99.92 %	0.74 %	✓
A-B	10	10.00 A	140.6 mΩ	99.91 %	---	✓
B-C	10	10.00 A	140.1 mΩ	99.89 %	---	✓
C-A	10	10.00 A	139.7 mΩ	99.96 %	0.64 %	✓
A-B	11	10.00 A	143.1 mΩ	100.0 %	---	✓
B-C	11	10.00 A	142.9 mΩ	99.97 %	---	✓
C-A	11	9.999 A	142.0 mΩ	99.97 %	0.76 %	✓
A-B	12	10.02 A	146.5 mΩ	99.44 %	---	✓
B-C	12	10.00 A	145.3 mΩ	99.86 %	---	✓
C-A	12	10.00 A	144.6 mΩ	99.69 %	1.24 %	✓
A-B	13	10.01 A	148.2 mΩ	99.89 %	---	✓

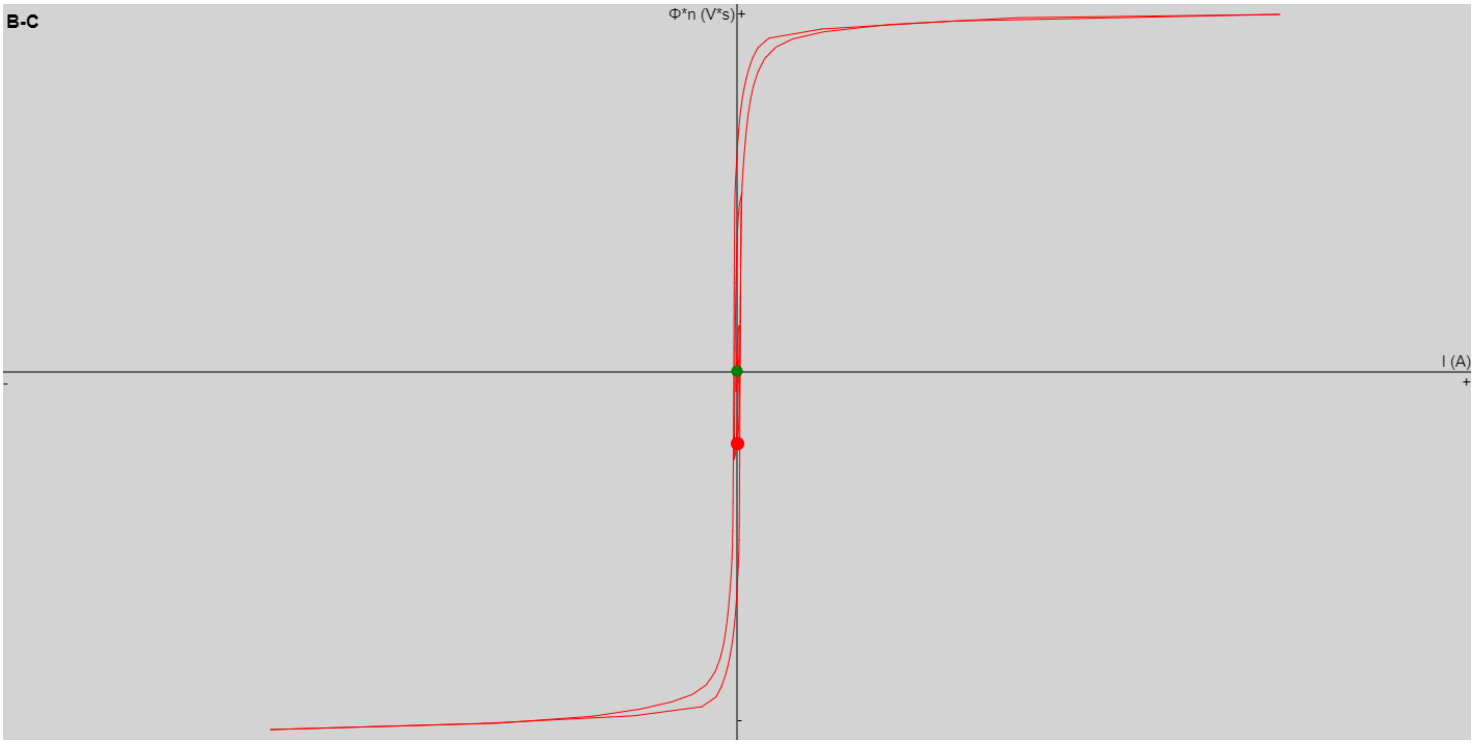
Connection	Tap (P)	Current	38°C Resistance corrected to 75°C	Stability	Variation	Continuity
B-C	13	10.00 A	148.2 mΩ	99.93 %	---	✓
C-A	13	10.00 A	147.3 mΩ	99.85 %	0.60 %	✓
A-B	14	9.992 A	152.4 mΩ	99.09 %	---	✓
B-C	14	10.01 A	151.0 mΩ	99.88 %	---	✓
C-A	14	10.00 A	150.1 mΩ	99.80 %	1.52 %	✓
A-B	15	9.997 A	153.9 mΩ	99.68 %	---	✓
B-C	15	10.00 A	153.7 mΩ	99.95 %	---	✓
C-A	15	10.00 A	152.8 mΩ	99.83 %	0.77 %	✓
A-B	16	10.00 A	157.3 mΩ	99.61 %	---	✓
B-C	16	9.998 A	156.2 mΩ	99.86 %	---	✓
C-A	16	10.00 A	155.5 mΩ	99.90 %	1.11 %	✓

Comment:



Demag measurements

Designation	Current	Time	Remanence before demag	Remanence after demag
B-C	0.000 A	34.30 s	20.17 %	<1 %



Comment:

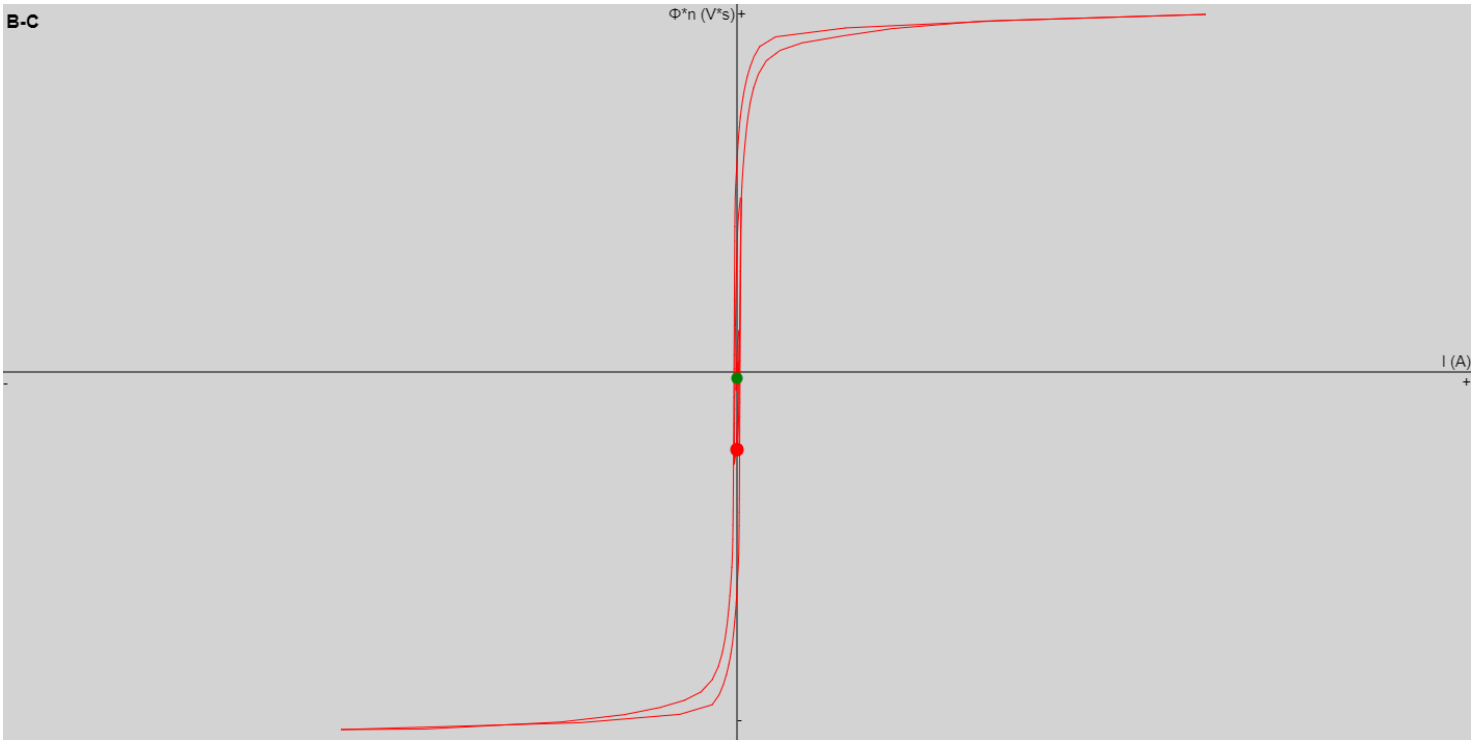
LV Winding resistance measurement

Connection	Tap (S)	Current	38°C Resistance corrected to 75°C	Stability	Variation
a-n	1	10.00 A	6.870 mΩ	98.78 %	---
b-n	1	9.990 A	6.962 mΩ	99.72 %	---
c-n	1	10.00 A	6.993 mΩ	99.35 %	1.82 %

Comment:

Demag measurements

Designation	Current	Time	Remanence before demag	Remanence after demag
B-C	0.000 A	37.60 s	21.26 %	1.351 %



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

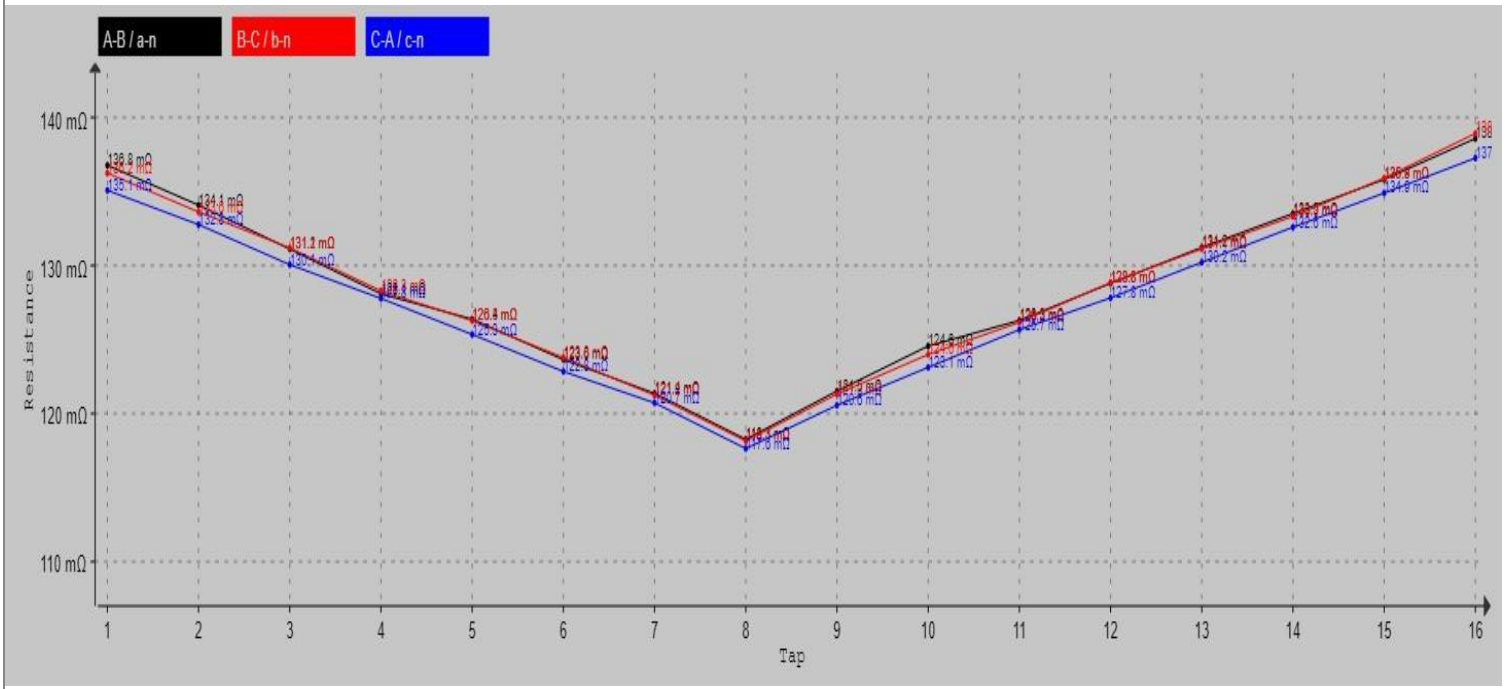
Connection	Transition	t start	t	Ripple	Slope	Continuity
A-B / a-n	1 → 2	4.101 s	61.7 ms	2.717 %	2.201 A/s	✓
A-B / a-n	2 → 3	3.524 s	60.7 ms	2.921 %	2.404 A/s	✓
A-B / a-n	3 → 4	3.519 s	60.4 ms	2.945 %	2.435 A/s	✓
A-B / a-n	4 → 5	3.544 s	60.2 ms	2.873 %	2.368 A/s	✓
A-B / a-n	5 → 6	3.532 s	59.6 ms	2.966 %	2.468 A/s	✓
A-B / a-n	6 → 7	3.528 s	60.4 ms	3.043 %	2.491 A/s	✓
A-B / a-n	7 → 8	3.52 s	60.2 ms	2.965 %	2.452 A/s	✓
A-B / a-n	8 → 9	3.532 s	59.9 ms	4.739 %	3.942 A/s	✓
A-B / a-n	9 → 10	3.536 s	61.6 ms	3.123 %	2.525 A/s	✓
A-B / a-n	10 → 11	3.532 s	59.1 ms	2.938 %	2.479 A/s	✓
A-B / a-n	11 → 12	3.532 s	61 ms	3.078 %	2.513 A/s	✓
A-B / a-n	12 → 13	3.545 s	59.9 ms	2.979 %	2.474 A/s	✓
A-B / a-n	13 → 14	3.525 s	59.6 ms	3.010 %	2.524 A/s	✓
A-B / a-n	14 → 15	3.538 s	60.5 ms	3.001 %	2.478 A/s	✓
A-B / a-n	15 → 16	3.542 s	59.8 ms	2.902 %	2.403 A/s	✓
A-B / a-n	--	---	---	---	---	✓
B-C / b-n	16 → 15	4.555 s	57.9 ms	10.86 %	9.363 A/s	✓
B-C / b-n	15 → 14	3.801 s	58.9 ms	10.82 %	9.194 A/s	✓
B-C / b-n	14 → 13	3.791 s	57.8 ms	10.36 %	8.950 A/s	✓
B-C / b-n	13 → 12	3.791 s	58.1 ms	10.27 %	8.816 A/s	✓
B-C / b-n	12 → 11	3.792 s	58 ms	10.10 %	8.715 A/s	✓
B-C / b-n	11 → 10	3.785 s	59 ms	10.01 %	8.481 A/s	✓
B-C / b-n	10 → 9	3.796 s	57.7 ms	9.524 %	8.243 A/s	✓
B-C / b-n	9 → 8	3.796 s	57.6 ms	9.387 %	8.149 A/s	✓
B-C / b-n	8 → 7	3.79 s	57 ms	7.875 %	6.950 A/s	✓
B-C / b-n	7 → 6	3.786 s	58.6 ms	9.249 %	7.876 A/s	✓
B-C / b-n	6 → 5	3.791 s	57.8 ms	9.014 %	7.790 A/s	✓
B-C / b-n	5 → 4	3.801 s	58.3 ms	9.039 %	7.752 A/s	✓
B-C / b-n	4 → 3	3.805 s	58.2 ms	8.924 %	7.668 A/s	✓
B-C / b-n	3 → 2	3.797 s	58.9 ms	8.892 %	7.549 A/s	✓
B-C / b-n	2 → 1	3.809 s	57.4 ms	8.491 %	7.392 A/s	✓
B-C / b-n	--	---	---	---	---	✓
C-A / c-n	1 → 2	3.929 s	62.7 ms	2.176 %	1.717 A/s	✓
C-A / c-n	2 → 3	3.512 s	59.5 ms	2.211 %	1.856 A/s	✓
C-A / c-n	3 → 4	3.523 s	59.8 ms	2.199 %	1.828 A/s	✓
C-A / c-n	4 → 5	3.530 s	59.9 ms	2.186 %	1.803 A/s	✓
C-A / c-n	5 → 6	3.534 s	60.5 ms	2.165 %	1.788 A/s	✓
C-A / c-n	6 → 7	3.511 s	59.7 ms	2.176 %	1.803 A/s	✓
C-A / c-n	7 → 8	3.525 s	59.1 ms	2.174 %	1.812 A/s	✓
C-A / c-n	8 → 9	3.520 s	59.8 ms	2.234 %	1.753 A/s	✓
C-A / c-n	9 → 10	3.518 s	61.7 ms	2.342 %	1.845 A/s	✓

Connection	Transition	t start	t	Ripple	Slope	Continuity
C-A / c-n	10 → 11	3.528 s	59 ms	2.322 %	1.719 A/s	✓
C-A / c-n	11 → 12	3.539 s	60.1 ms	2.344 %	1.678 A/s	✓
C-A / c-n	12 → 13	3.531 s	59.6 ms	2.344 %	1.664 A/s	✓
C-A / c-n	13 → 14	3.53 s	61.4 ms	2.189 %	1.514 A/s	✓
C-A / c-n	14 → 15	3.535 s	60.2 ms	2.276 %	1.591 A/s	✓
C-A / c-n	15 → 16	3.532 s	59.3 ms	2.154 %	1.492 A/s	✓
C-A / c-n	--	---	---	---	---	✓

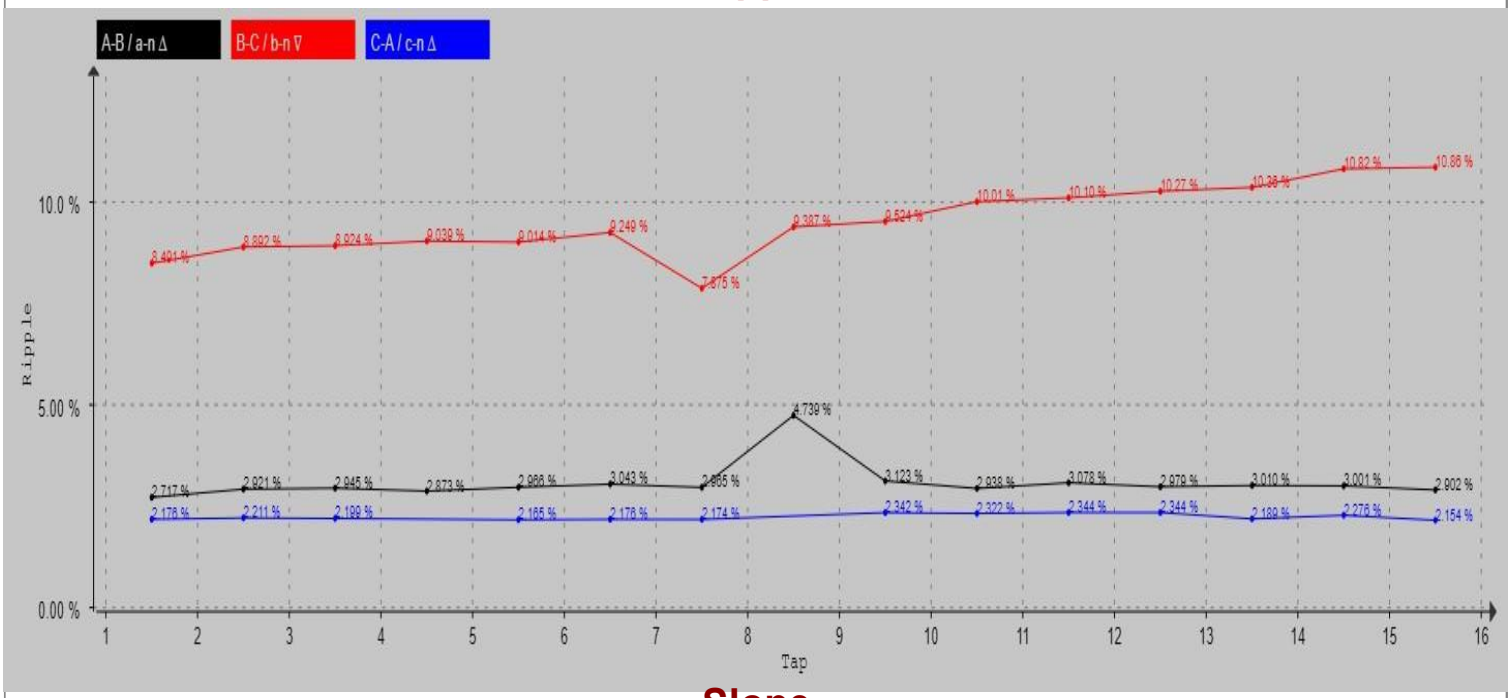
Connection	Tap (P)	Tap Voltage (V)	Current	40°C Resistance corrected to 75°C	Stability	Variation
A-B / a-n	1	36 307	5.000 A	154.2 mΩ	99.57 %	---
A-B / a-n	2	35 756	4.999 A	151.1 mΩ	99.47 %	---
A-B / a-n	3	35 205	5.000 A	147.8 mΩ	99.64 %	---
A-B / a-n	4	34 654	5.008 A	144.4 mΩ	98.22 %	---
A-B / a-n	5	34 102	5.000 A	142.5 mΩ	99.82 %	---
A-B / a-n	6	33 551	4.997 A	139.4 mΩ	99.62 %	---
A-B / a-n	7	33 000	5.000 A	136.8 mΩ	99.56 %	---
A-B / a-n	8	32 449	4.999 A	133.3 mΩ	99.19 %	---
A-B / a-n	9	31 898	5.000 A	137.0 mΩ	99.82 %	---
A-B / a-n	10	31 347	4.999 A	140.4 mΩ	99.01 %	---
A-B / a-n	11	30 796	4.998 A	142.4 mΩ	99.08 %	---
A-B / a-n	12	30 245	4.998 A	145.2 mΩ	99.40 %	---
A-B / a-n	13	29 693	5.000 A	147.9 mΩ	99.44 %	---
A-B / a-n	14	29 142	5.001 A	150.5 mΩ	99.72 %	---
A-B / a-n	15	28 591	5.001 A	153.1 mΩ	99.99 %	---
A-B / a-n	16	28 040	5.000 A	156.2 mΩ	99.74 %	---
B-C / b-n	16	28 040	5.000 A	156.6 mΩ	99.28 %	---
B-C / b-n	15	28 591	5.003 A	153.2 mΩ	99.66 %	---
B-C / b-n	14	29 142	5.001 A	150.3 mΩ	99.42 %	---
B-C / b-n	13	29 693	5.002 A	147.8 mΩ	99.98 %	---
B-C / b-n	12	30 245	5.000 A	145.2 mΩ	99.82 %	---
B-C / b-n	11	30 796	5.002 A	142.2 mΩ	99.88 %	---
B-C / b-n	10	31 347	5.000 A	139.8 mΩ	99.91 %	---
B-C / b-n	9	31 898	5.003 A	136.8 mΩ	99.65 %	---
B-C / b-n	8	32 449	4.999 A	133.2 mΩ	99.99 %	---
B-C / b-n	7	33 000	5.000 A	136.7 mΩ	99.85 %	---
B-C / b-n	6	33 551	5.001 A	139.5 mΩ	99.92 %	---
B-C / b-n	5	34 102	5.001 A	142.3 mΩ	99.94 %	---
B-C / b-n	4	34 654	5.000 A	144.6 mΩ	99.71 %	---
B-C / b-n	3	35 205	5.000 A	147.9 mΩ	99.96 %	---
B-C / b-n	2	35 756	5.001 A	150.6 mΩ	99.87 %	---

Connection	Tap (P)	Tap Voltage (V)	Current	40°C Resistance corrected to 75°C	Stability	Variation
B-C / b-n	1	36 307	5.002 A	153.6 mΩ	99.80 %	---
C-A / c-n	1	36 307	5.000 A	152.3 mΩ	99.95 %	1.24 %
C-A / c-n	2	35 756	4.998 A	149.7 mΩ	99.18 %	0.99 %
C-A / c-n	3	35 205	5.000 A	146.6 mΩ	99.82 %	0.87 %
C-A / c-n	4	34 654	4.998 A	144.0 mΩ	98.91 %	0.40 %
C-A / c-n	5	34 102	5.001 A	141.3 mΩ	99.75 %	0.82 %
C-A / c-n	6	33 551	4.998 A	138.5 mΩ	98.90 %	0.77 %
C-A / c-n	7	33 000	5.000 A	136.1 mΩ	98.90 %	0.53 %
C-A / c-n	8	32 449	5.001 A	132.6 mΩ	99.69 %	0.53 %
C-A / c-n	9	31 898	5.000 A	135.9 mΩ	99.57 %	0.79 %
C-A / c-n	10	31 347	5.000 A	138.8 mΩ	99.48 %	1.17 %
C-A / c-n	11	30 796	4.999 A	141.7 mΩ	99.19 %	0.49 %
C-A / c-n	12	30 245	4.999 A	144.1 mΩ	99.52 %	0.80 %
C-A / c-n	13	29 693	5.000 A	146.8 mΩ	99.42 %	0.77 %
C-A / c-n	14	29 142	4.999 A	149.5 mΩ	99.52 %	0.69 %
C-A / c-n	15	28 591	5.000 A	152.1 mΩ	99.57 %	0.74 %
C-A / c-n	16	28 040	5.000 A	154.7 mΩ	99.65 %	1.20 %

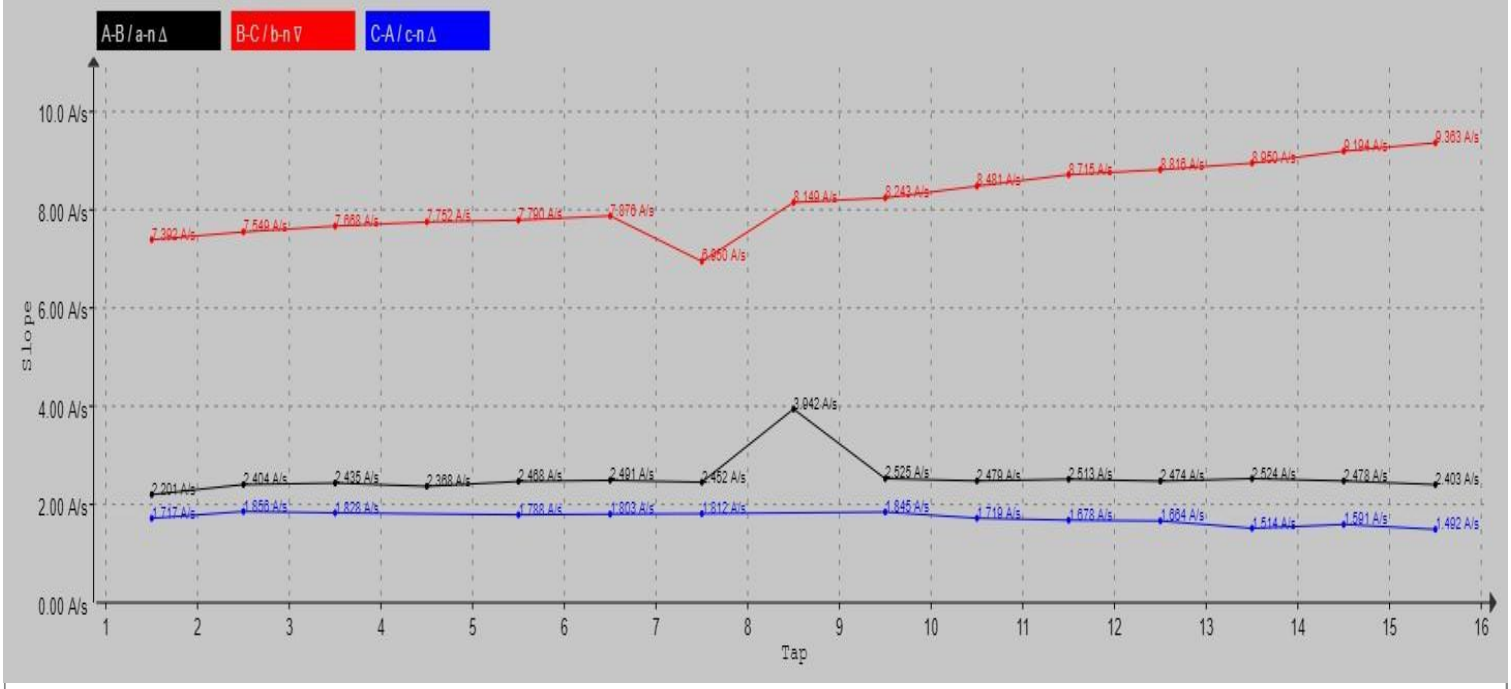
WRM



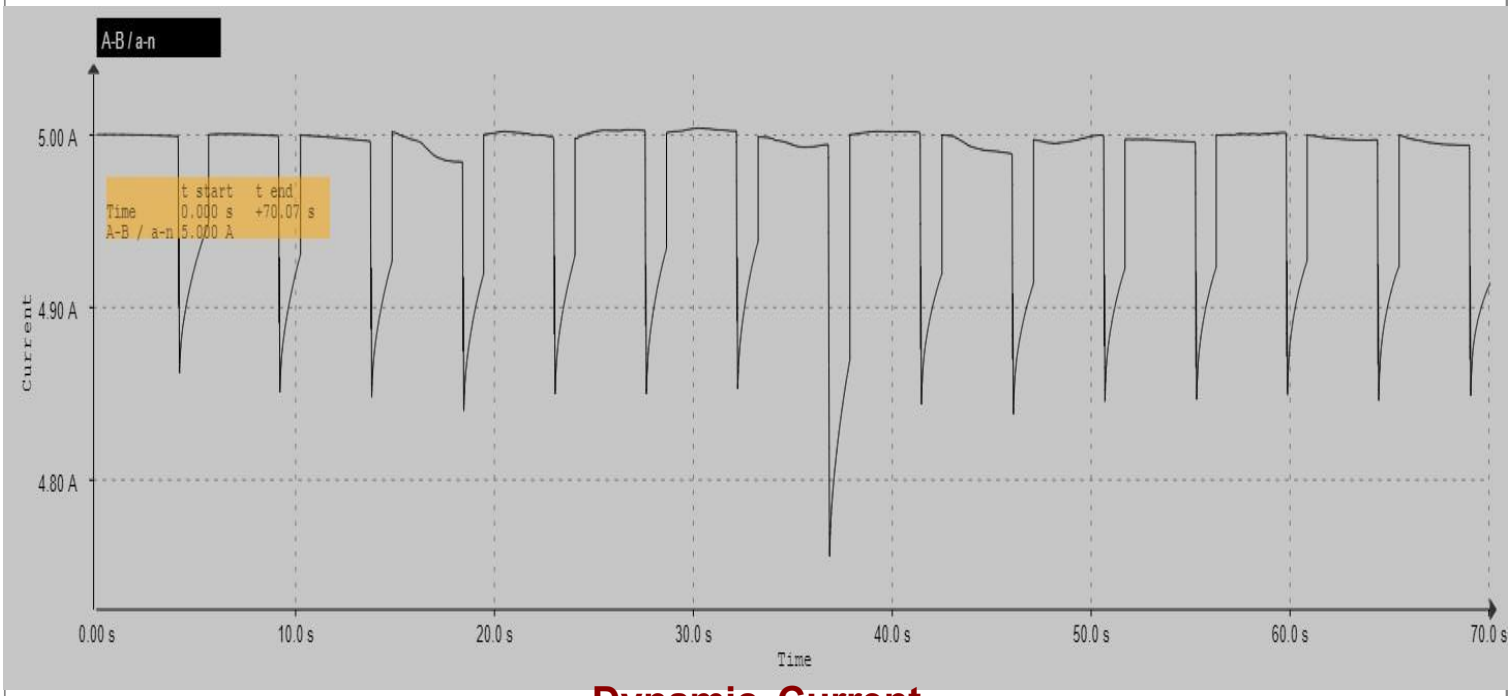
Ripple



Slope



Dynamic Current



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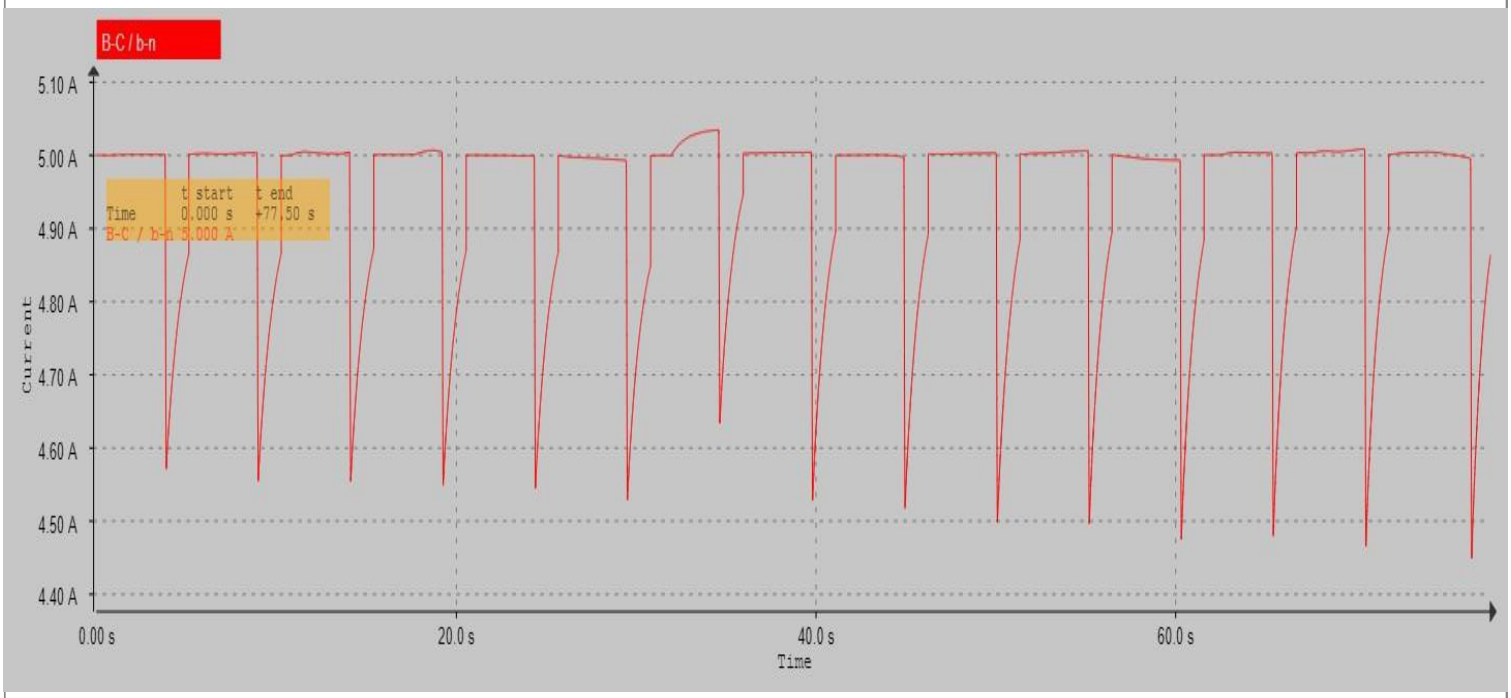

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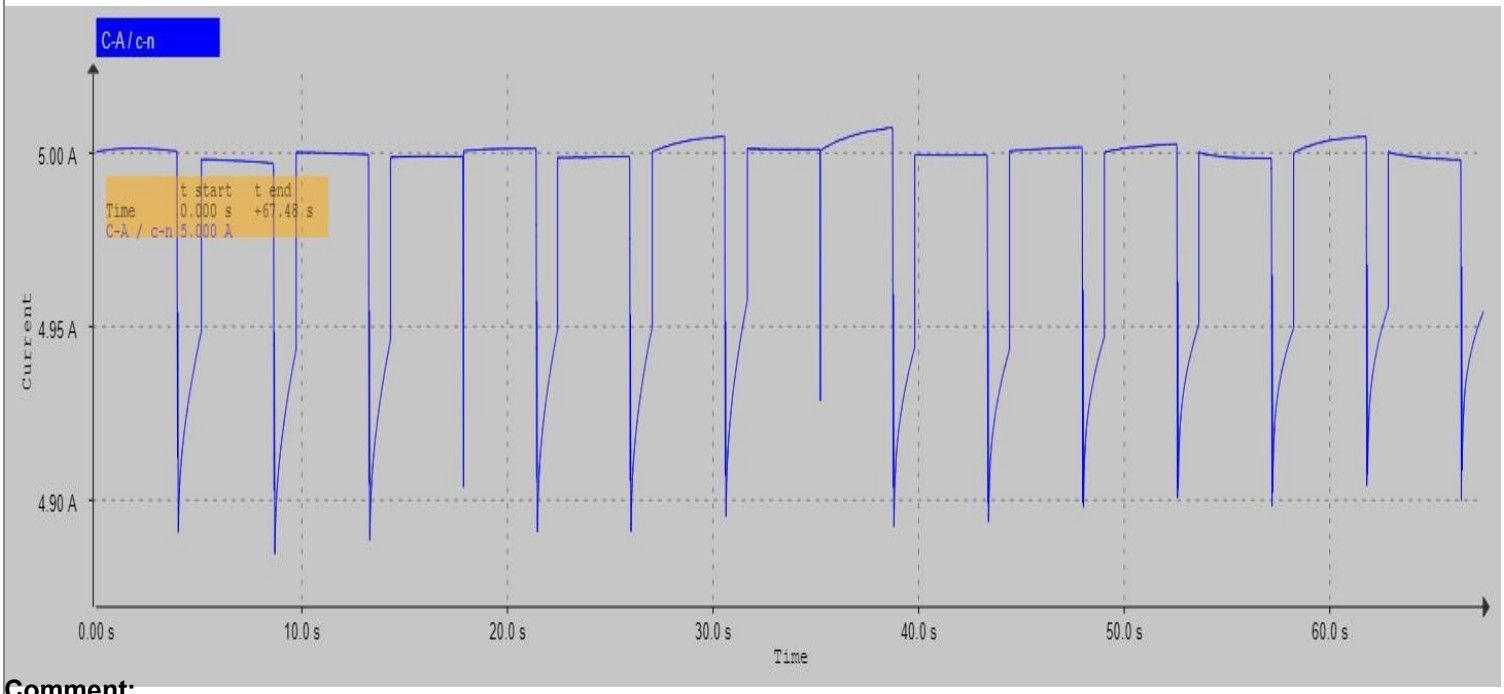
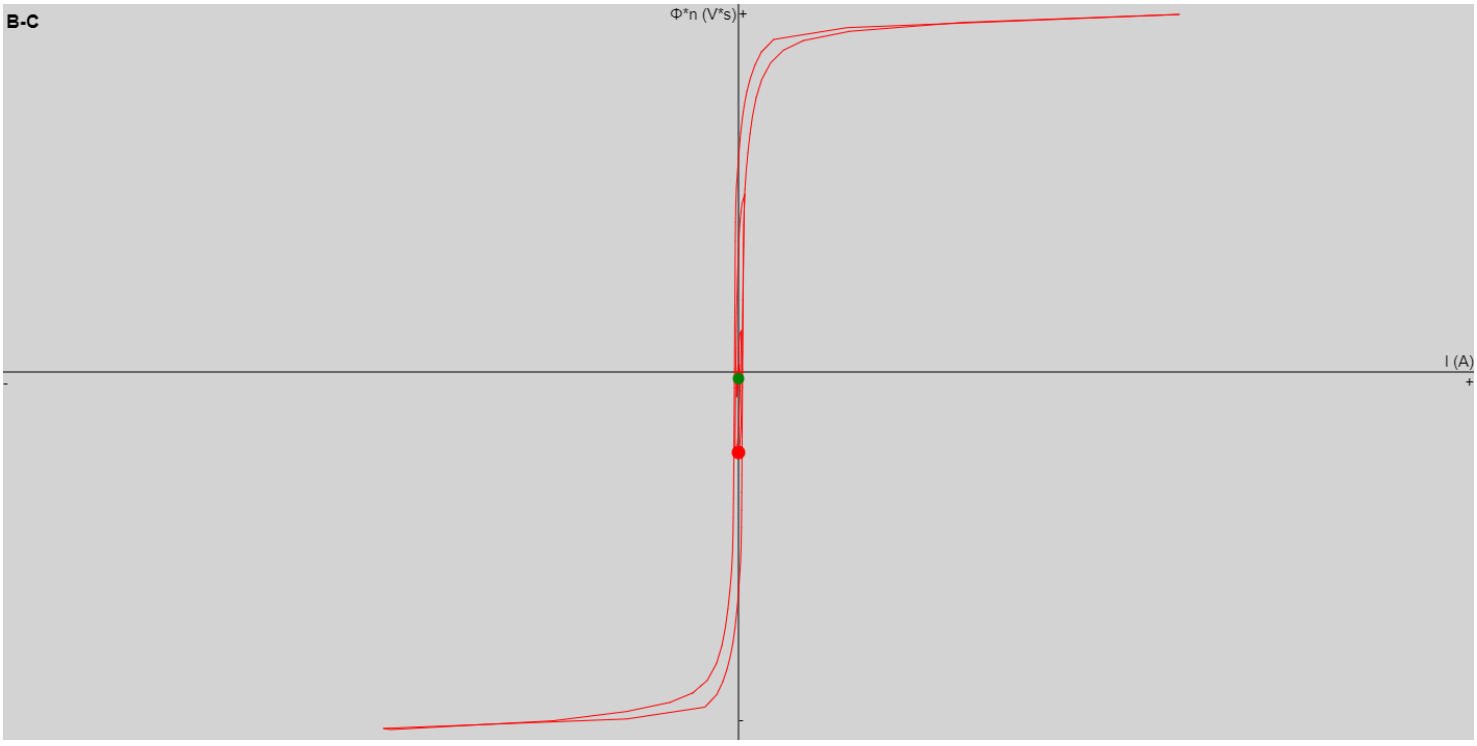


Comment:

Demag measurements

Designation	Current	Time	Remanence before demag	Remanence after demag
B-C	0.000 A	31.36 s	22.18 %	1.660 %



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 :	PMU TAIPING INDUSTRI (TPID)	**Manufacture year:**	1997
Circuit :	33/11KV MTM TRANSFORMER :5	**Serial No.:**	P/194/30007

BAY ID: **TX5**

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 :	1180	MΩ	HV To E :	1450	MΩ	1.228814
LV To E :	780	MΩ	LV To E :	980	MΩ	1.25641
HV To LV :	760	MΩ	HV To LV :	950	MΩ	1.25

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

TIME : 11.30 AM

Tested by:	Witnessed by:	Verified by :	ESE COMMENT:
Name: VICKNESH Dept: Tester	Name: Mr. ARIF Dept: TNB	Name: Dept:	
Date: 28/08/2024	Date: 28/08/2024	Date: 28/08/2024	