CENTRAL POWER RESEARCH INSTITUTE
(Member of STL)

CPRI

Test Report

Date : 12 SEP 2016

Test Report No.	:	2016/STN-1/234
Name and Address of the customer	:	M/s Jodhpur Vidyut Vitran Nigam Limited Office Of The Superintending Engineer (MM&C) New Power House Premises, Industrial Area, Jodhpur
Name and address of the Manufacturer	:	M/s Rajasthan Powergen Transformer Pvt. Ltd. Karola- Bhinmal Road, Village- Karola, Sanchore Dist. Jallore, Rajasthan.
Particulars of Sample(s) Tested	:	5 MVA, 33/11kV, Power Transformer
Condition of sample(s) on receipt	:	New
Type	:	Outdoor
Designation	:	NIL
Serial Number(s)	:	RPTPL-01
Number of sample(s) Tested	:	One
Date(s) of Test(s)	:	12- August- 2016
CPRI sample code number(s)	:	STDSST116S0243
Sealing of the sample of any	:	Transformer was sealed by polycarbonate seal on Bearing Seal no. ME715335 to ME715342on all four corner of Top cover With Tank
Particulars of test(s) conducted	:	Thermal & Dynamic ability to withstand short- circuit
Test(s) in accordance with Standard/specification		As per clause 4.2 & 4.1 of IS: 2026 (Part-5) 2011 and as per customer requirement.
Sampling Plan	:	Not applicable
Customer's Requirement	:	Measurement of % Z and load loss at lowest and highest Taps is also required
Deviations, if any	:	NIL
Name of the witnessing persons		
Customer's Representatives	:	Mr. Anil B Shinde
Other than Customer's Representatives	:	Mr. Prakash Jain (XenScada)
Test subcontracted with name an address of the laboratory	:	NONE
Documents constituting this report (in words)		
No. of Sheet(s)	:	Eight
No. of Oscillogram(s)	:	Ten
No. of Graph(s)	:	NIL
No. of Photograph(s)	:	Two
No. of Test Circuit Diagram(s)	:	One
No. of Drawing(s)	:	Four

(Diptiranjan Sahoo)
TEST ENGINEER

(M.K. Wadhwani)
JOINT DIRECTOR

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DESCRIPTION OF SAMPLE TESTED

(Ratings assigned by manufacturer)

Test Sample	5MVA, 33/11 kV Power Transformer
Type	Outdoor
Serial Number	RPTPL-01
Rated Power(KVA)	5000 kVA
Rated voltage HV (Volts)	33000
LV (Volts)	11000
Rated Current HV (Amps)	87.47
LV (Amps)	262.43
Number of phases	3
Connection Vector group	Delta/Star Dyn-11
Type of Cooling	ONAN
Rated Frequency (Hz)	50
Temperature rise of oil/Winding (in Degree Centigrade)	45/50°c
Tapping Range	5% to- 10% (7 taps in 6 Steps of 2.5% each)
Apparent short circuit power behind transformer (inMVA)	1000
Type of Winding	Disc Winding
Winding material	Copper
Insulation level HV	Dry PF 70 kVrms/Impulse 170 Kvp
LV	Dry PF 28kVrms/Impulse 75 Kvp
Oil in liter	2550
Weight of Oil (Kg)	2142
Weight of oil core & winding (Kg)	7050
Total weight (Kg)	11392
Year of manufacture	2016

Tap No.	1	3	7
Primary Voltage (Volts)	34650	33000	29700
Secondary Voltage	11000	11000	11000
% Impedance	6.95	7.15	7.95
X/R Ratio	5.45	5.32	5.19
Guaranteed No Load Loss (Watts)	--	4000 (Max)	--
Guaranteed Load at 75 °C (Watts)	24900 (Max)	23000 (Max)	27000 (Max)
Guaranteed % Impedance at 75° C	6.79 ± 15%	7.15 ± 10%	7.86 ± 15%

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SUMMARY OF TEST

1.0 **Test Conducted** : **Short circuit dynamic and thermal withstand test.**
2.0 **Rating for which Tested** : **Verification of ability to withstand short circuit currents Calculated as per clause 4.1.2 of IS: 2026 (Part-5), 2011**

Tapping Position	%Z at 75 °C	% X at rated frequency	X/R	Required Short-circuit on LV (phase) with rated voltage applied to HV	
				kA peak	kA rms
Highest Tap	7.10	6.40	14.22	8.6575	3.3951
Principal Tap	7.22	6.60	14.35	8.5630	3.3580
Lowest Tap	7.86	7.33	14.37	8.0100	3.1412

Considering the source impedance based on 1000MVA 36kV and measured of impedances of the Sample tested

3.0 **Schedule of routine test results** : As per Sheet Nos. 6 of 8 and 7 of 8
4.0 **Schedule of short circuit test results** : As per sheet No. 5 of 8
5.0 **Oscillogram numbers** : STN1-160234S.2.3.4.6.7.8.10.11.12 and 14
6.0 **Test Circuit diagram number** : STN-1/TCD/TR.2

TEST ENGINEER

Test Report No: 2016/STN-1/234 **Date:** 12 SEP 2016

LIST OF DRAWINGS OF SAMPLE AND PHOTOGRAPHS

Drawings of the sample tested

The manufacturer has guaranteed that the equipment submitted for the test has been manufactured in Accordance with the following drawings. It is verified that these drawings adequately represent the apparatus tested.

Sample drawing Numbers

1	RPTPL- GA- 001- 5MVA
2	5000/CCA/02
3	RPTPL- RD- 001- 16
4	5000/CSFD/03

Total drawings (duly attested) : Four

Photographs of sample Tested

Photograph Numbers : P1- P2
Total photographs (duly embossed) : Two

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Test Report No: 2016/STN-1/234 **Date:** 12 SEP 2016

SCHEDULE OF SHORT CIRCUIT TEST RESULTS

Test conditions : Short circuit dynamic and withstand test
Test source Number of Phases : Three
Source frequency : 50 Hz. Tolerance as per standard
Condition of Sample Before Test : As such after routine tests
Test Connections HV terminals : Connected to source as per Test Circuit Diagrams No. STN-1/TCD/TR.2
LV terminals : Short circuited and earthed through shunts for current Measurement
Type of short circuit : Preset short circuit.

Oscillogram Number	Current kA (Peak)	Current kArms			Phase voltage kVrms			Duration (mSec)	% Change in % reactance	Tap No.
		(Iu)	(Iv)	(Iw)	(Uu)	(Uv)	(Uw)			
160234-2	Iu=8.8	3.4	3.4	3.4	18.8	18.8	18.7	519	-0.028	1
160234-3	Iu=8.8	3.4	3.4	3.4	18.8	18.8	18.7	532	-0.056	1
160234-4	Iu=8.8	3.4	3.4	3.4	18.8	18.8	18.7	521	-0.028	1
160234-6	Iv=8.7	3.3	3.4	3.4	17.9	17.8	17.8	527	-0.042	3
160234-7	Iv=8.7	3.3	3.4	3.4	17.9	17.8	17.8	517	-0.069	3
160234-8	Iv=8.7	3.3	3.4	3.4	17.9	17.8	17.8	524	-0.014	3
160234-10	Iw=8.2	3.1	3.1	3.2	15.8	15.7	15.8	513	0013	7
160234-11	Iw=8.2	3.1	3.1	3.2	15.8	15.7	15.8	520	0013	7
160234-12	Iw=8.2	3.1	3.1	3.2	15.8	15.7	15.8	523	0013	7
160234-14	Thermal	3.4	3.4	3.4	18.8	18.8	18.7	2023	0014	1

Observation during test : No abnormality noticed

Observation after untanking the transformer

Condition of Conductor Core and Clamping : intact No abnormality noticed

Condition of Spacers, end blocks : intact No abnormality noticed

Condition of Oil : No visual abnormality noticed

Conclusion : The test results comply with the requirement of the 4.2 & 4.1 of IS: 2026 (Part-5) 2011
As per Customer for the sample tested.

TEST ENGINEER

SWITCHGEAR TESTING & DEVELOPMENT STATION
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Test Report Number: 2016/STN-1/234 **Date:** 12 SEP 2016

SCHEDULE OF Routine Test results

Results of routine result conducted to verify condition of transformer prior to and after short circuit Test

1. Measurement of insulation resistance in Mega Ohms measured at 1000 volts

Before Short Circuit Test				After Short Circuit Test			
HV to LV	HV to Earth	LV to Earth	Temp °C	HV to LV	HV to Earth	LV to Earth	Temp °C
>2000	>2000	>2000	25	>2000	>2000	>2000	26

2. Measurement of winding resistance

	Before Short Circuit test					After Short Circuit Test				
	LV Winding milli Ω	HV Winding Ω			Temp °C	LV Winding milli Ω	HV Winding Ω			Temp °C
		Highest	Principal	Lowest			Highest	Principal	Lowest	
U-V	70.00	0.7949	0.7580	0.6813	25.5	70.94	0.8056	0.7682	0.6904	29.0
V-W	69.69	0.7960	0.7570	0.6806	25.5	70.63	0.8067	0.7672	0.6997	29.0
W-U	69.80	0.7958	0.7575	0.6809	25.5	70.74	0.8064	0.7677	0.6900	29.0

3. Measurement of no load current and loss

	Applied voltage in volts	Frequency (Hz)	Current in Amps				No load loss in Watts
			Iu	Iv	Iw	Iave	
Before test	11000	50	0.6216	0.4409	0.5573	0.5399	3959.40
After test	11000	50	0.6208	0.4397	0.5523	0.5376	3972.20

4. Measurement of load loss and % impedance

Tap Position	Before Short Circuit Test		After Short Circuit Test	
	% Z at 75 °C	Load loss at rated Current at 75 °C in watts	% Z at 75 °C	Load loss at rated Current at 75 °C in watts
Highest	6.85	22415	6.90	22436
Principal	7.05	22875	7.12	22949
Lowest	7.85	24831	7.90	24825

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5.0 Measurement of voltage ratio and check of voltage vector relationship

Tap No.	Before Short Circuit			After Short Circuit Test		
	UV-un	VW-vn	WU-wn	UV-un	VW-vn	WU-wn
1	5.345	5.3332	5.3276	5.3276	5.3332	5.3276
2	5.1987	5.2040	5.1981	5.1987	5.2040	5.1981
3	5.0697	5.0753	5.0697	5.0697	5.0753	5.0697
4	5.0590	5.0597	5.0560	5.0569	5.0582	5.0591
5	5.0619	5.0642	5.0651	5.0645	5.0663	5.0670
6	4.884	4.876	4.877	4.886	4.868	4.878
7	4.716	4.718	4.718	4.719	4.719	4..714

Transformer Connection symbol verified before and after short circuit test and found to be Dyn 11

6.0 Dielectric test : **Separate source voltage withstand test at 50 Hz for one minute**

	Test Voltage (kV rms)		Remarks
	Between HV & LV- Earth	Between LV & HV - Earth	
Before test	70.0	28.0	Withstood
After test	70.0	28.0	Withstood

7.0 Dielectric test : Induced over voltage withstand test

	Test voltage in V	Frequency in Hz	Duration in sec.	Remarks
Before test	22000	100	60	Withstood
After test	22000	100	60	Withstood

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TEST REPORT

Test Report No. : 2016/STN-1/234 **Date:** 12 SEP 2016

NOTE

a) The test results relate only to the sample (s) tested.

b) Publication or reproduction of this report / certificate in any form other than by complete set of the whole report and in the language written, is not permitted without the written consent of CPRI.

c) Any correction/erasure invalidates this test report/test certificate.

d) NABL has Accredited this laboratory as per ISO 17025-2005 Standard for tests carried out.

e) The verification of the sample drawing by CPRI is limited to dimensional checks only wherever possible.

f) Any anomaly/discrepancy in this test report/test certificate should be brought to our notice within 45 days from the date of issue.

g) CPRI issues two kinds of documents:

Test Report

The test report is issued when the sample is Tested for specific test required by the customer either in accordance with National/international standards or as per customer's requirement but on certification on the performance of the sample tested. The test report will contain the record of the values of test parameters as physical condition of the apparatus during/after the test (s),copy(ies) of Oscillogram(S) , record of supplementary test (s) if any conducted but no certification on the performance of the apparatus tested.

Type Test Certificate :

The test certificate is issued on request and payment of the prescribed charges only when the apparatus of particular type and rating has satisfactorily passed all the specified tests in compliance with condition stipulated in a published National/international standards.

h) All Documents constituting this test report/certificate are stitched together with a Continuous silk thread /silk ribbon, the two ends of which have been brought over the front sheet of this test report/certificate and sealed with a CPRI logo printed paper sticker/embossed

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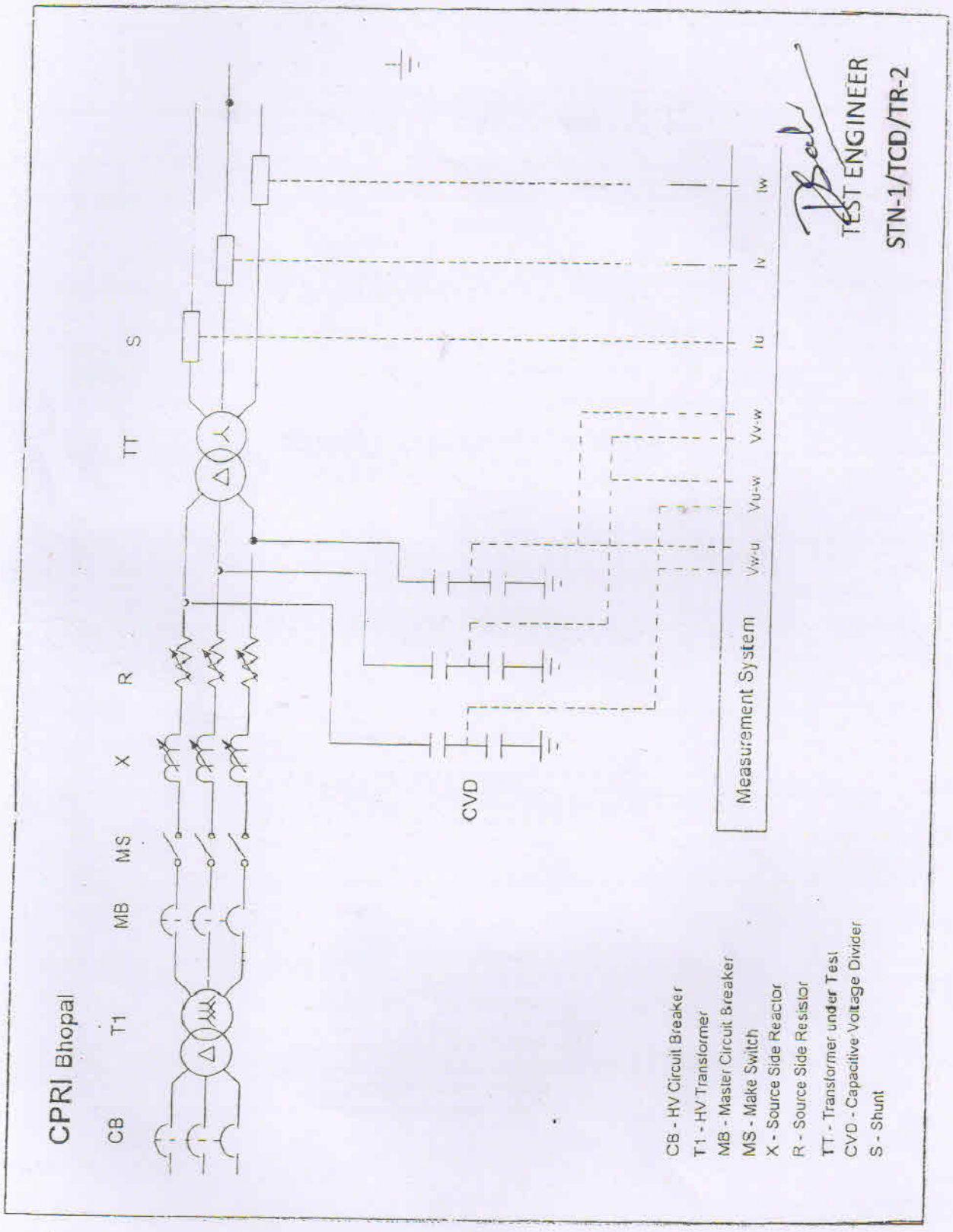

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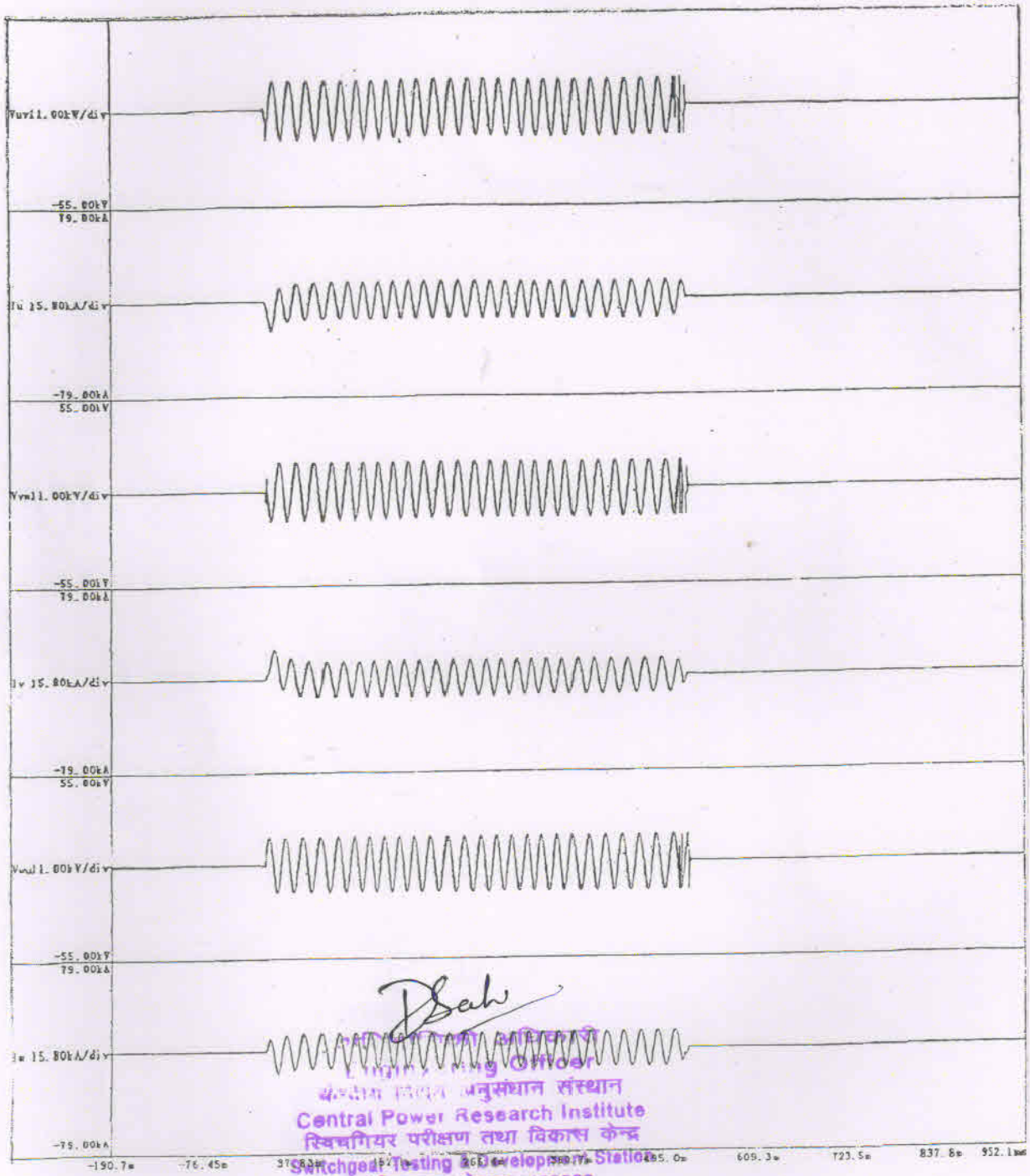

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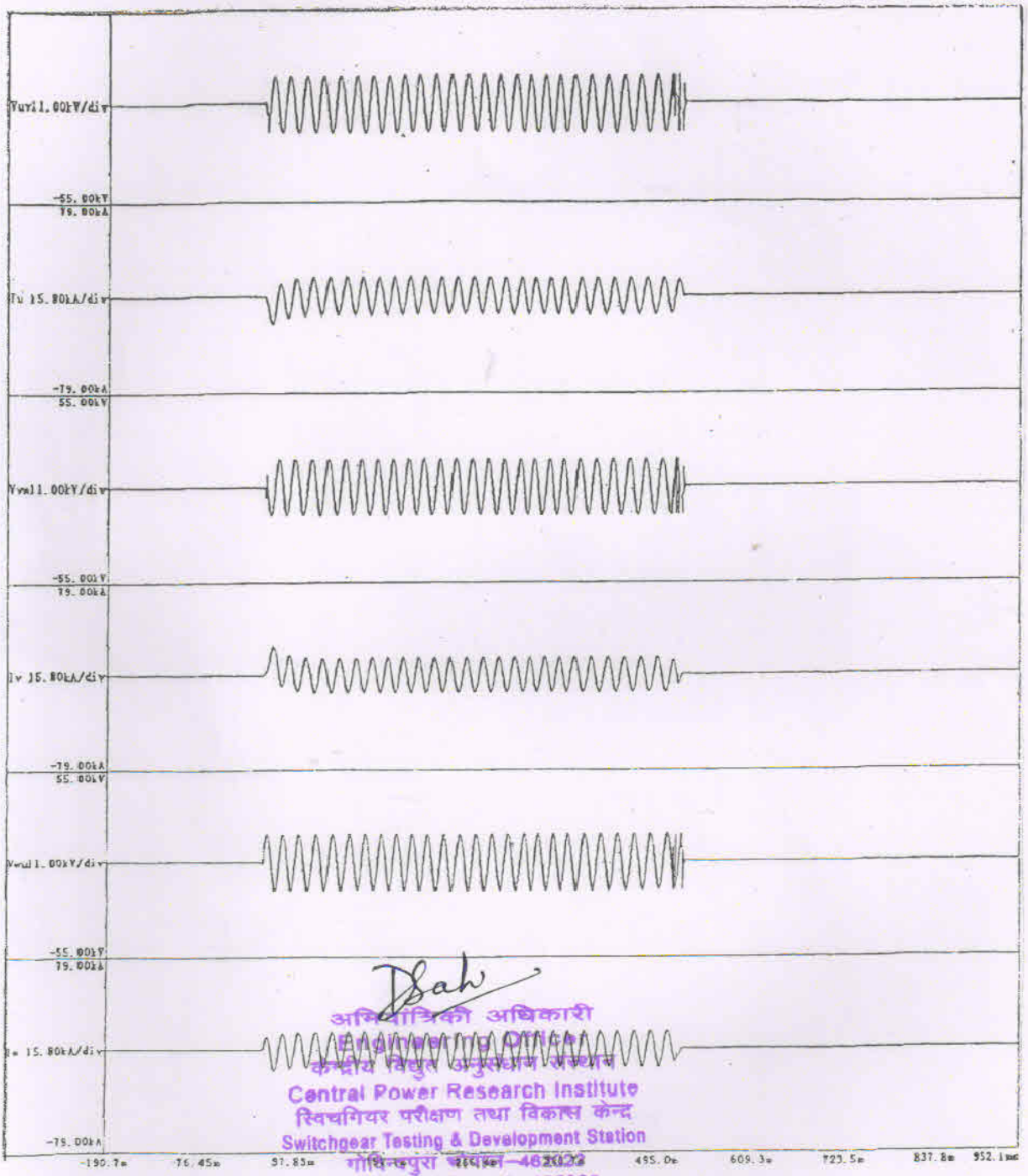

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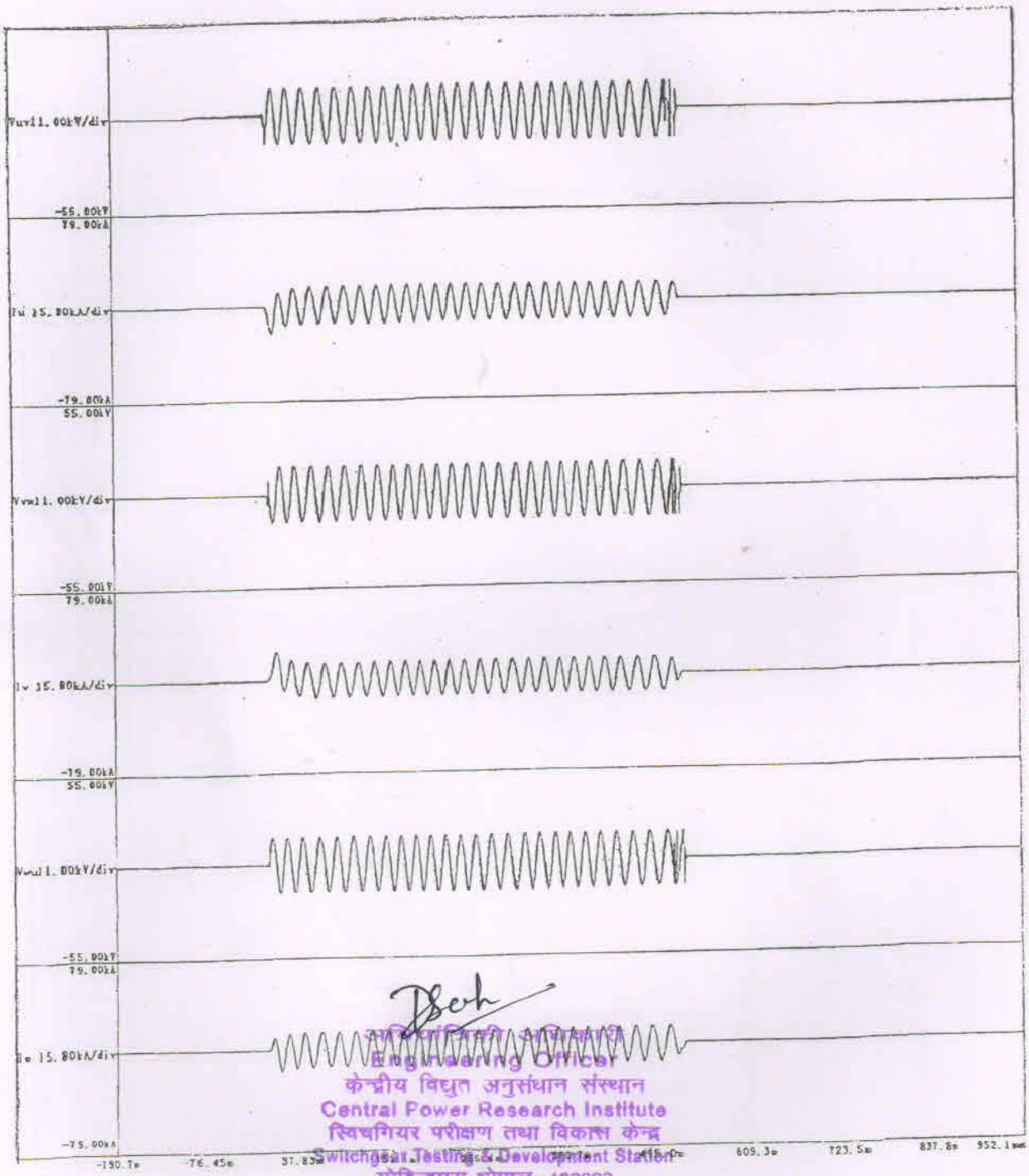

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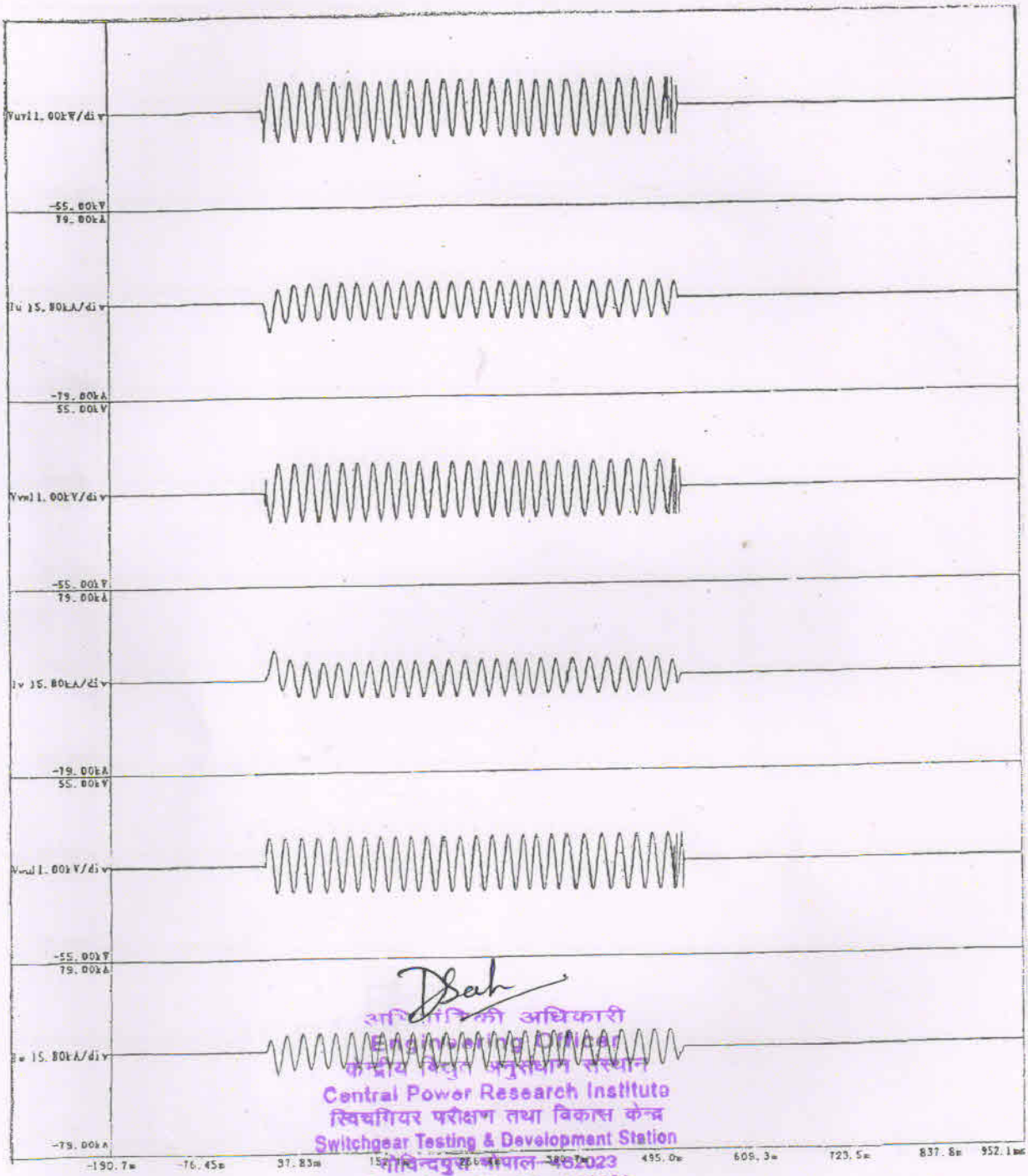

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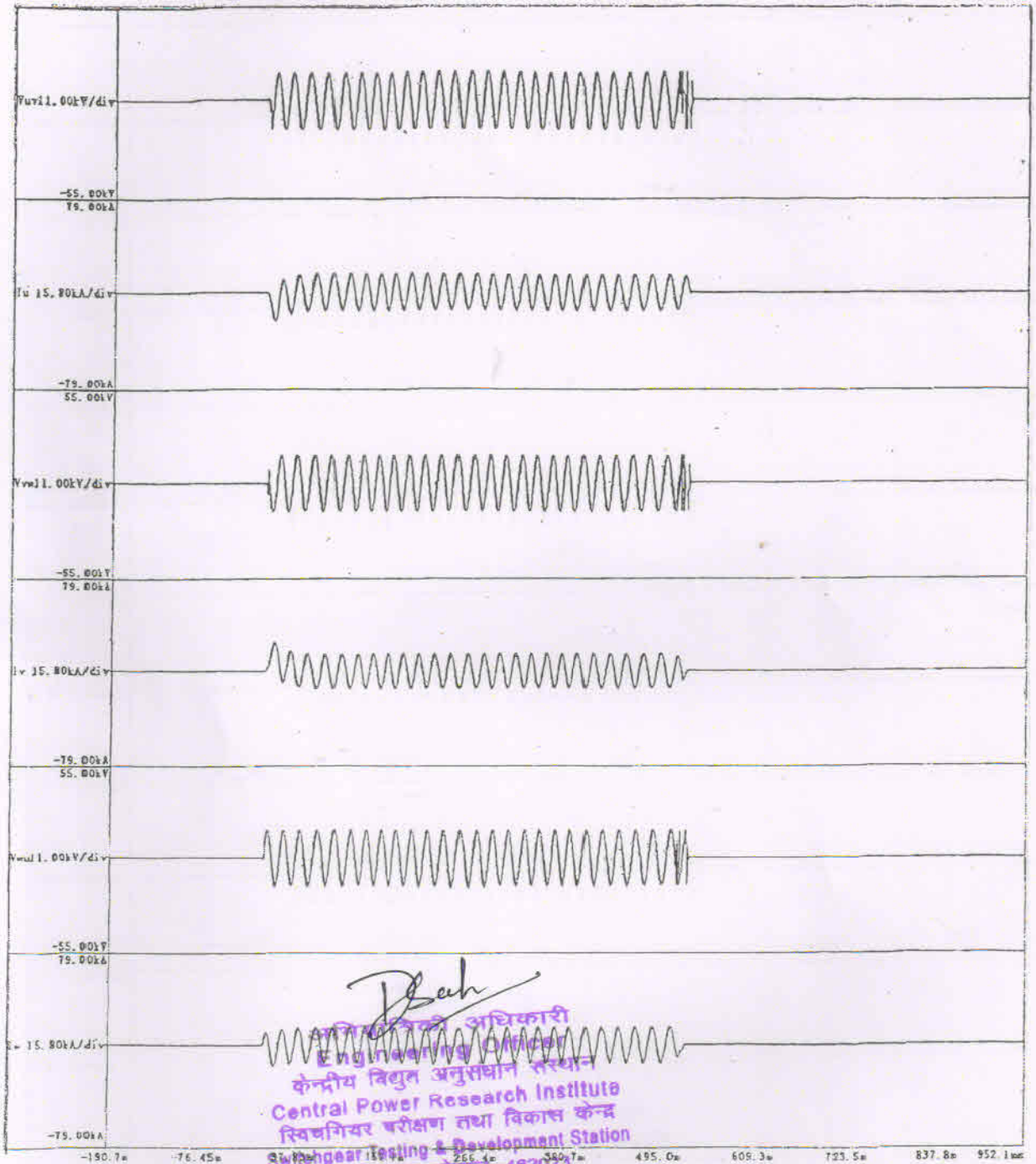

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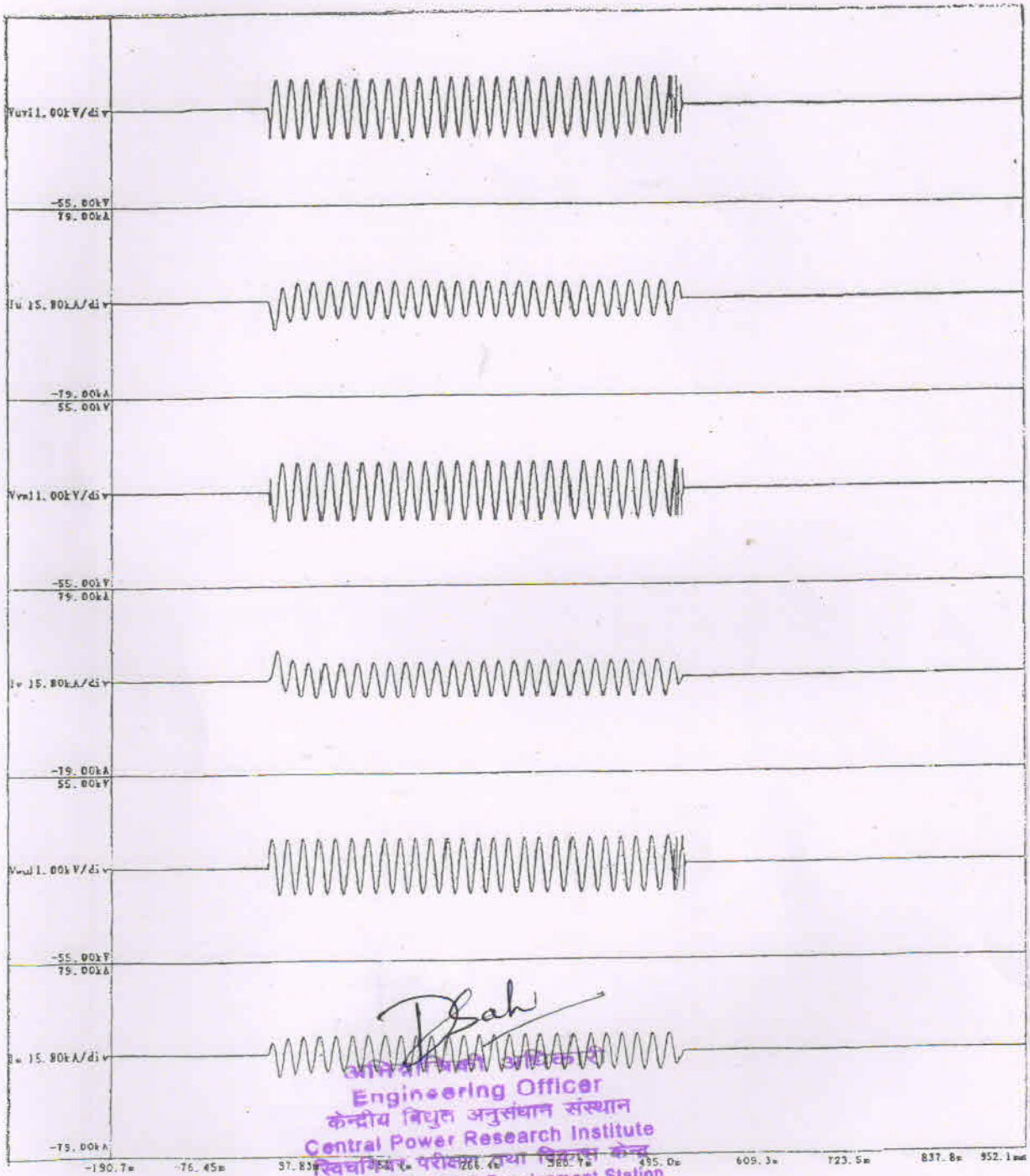

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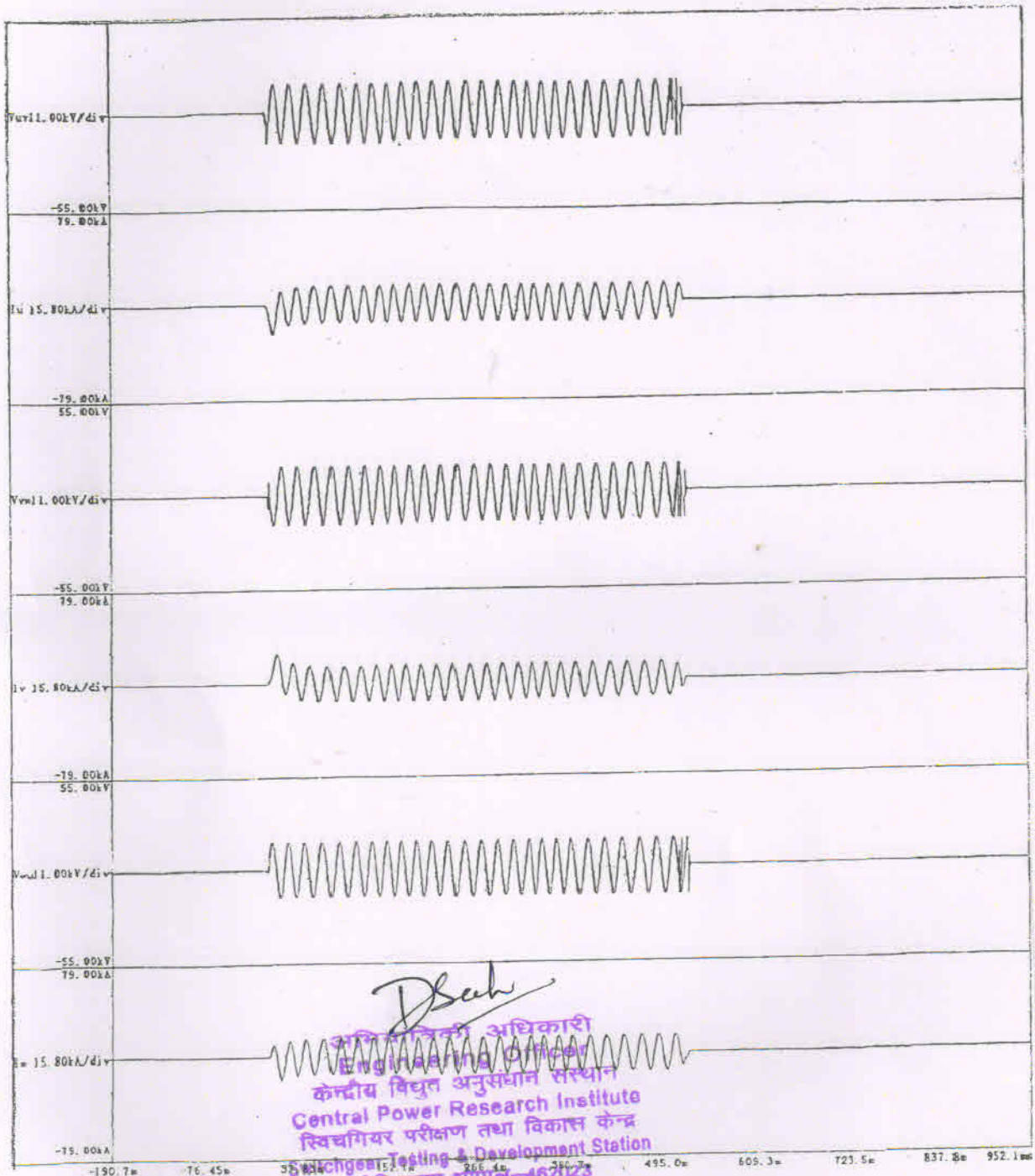

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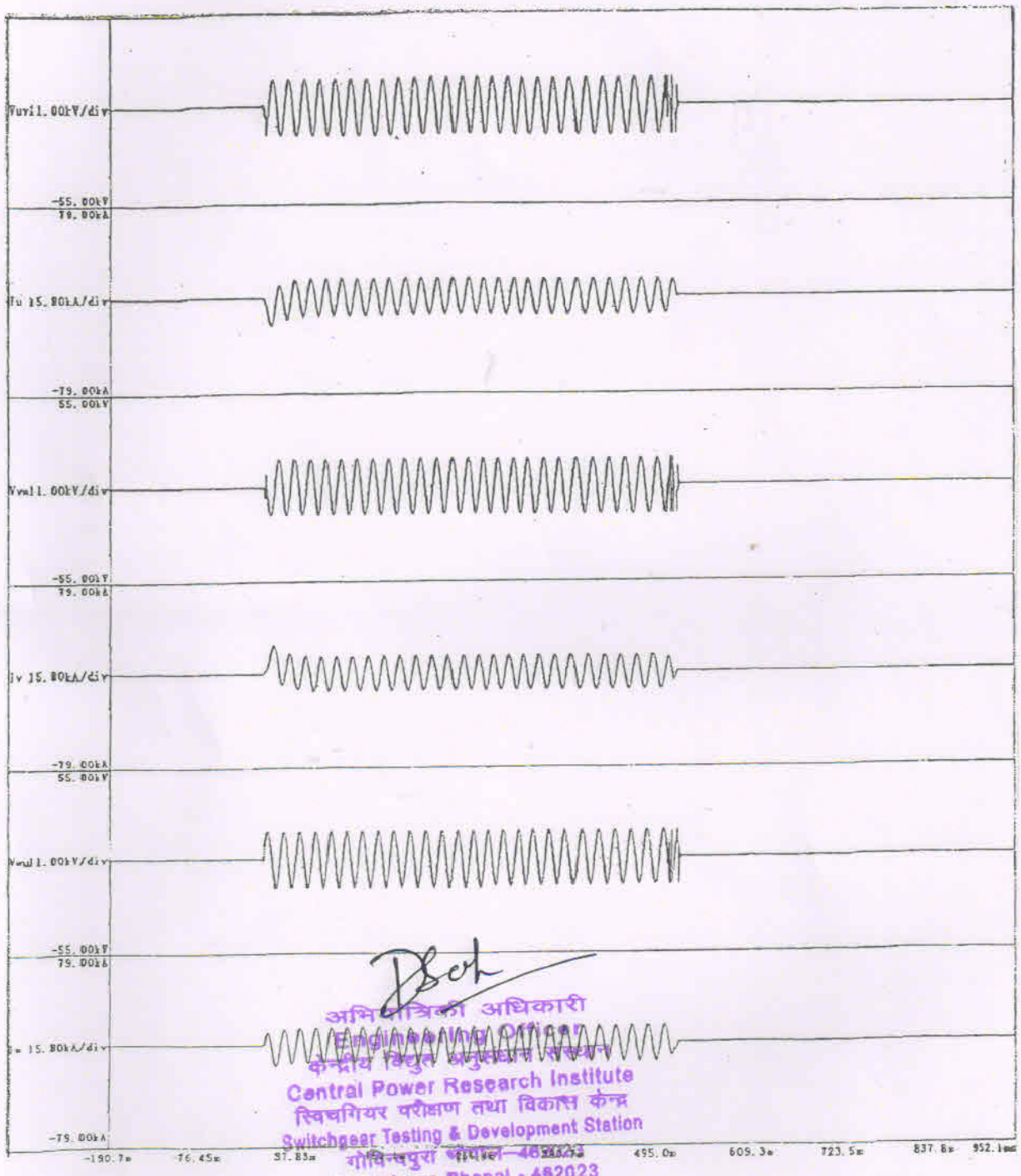

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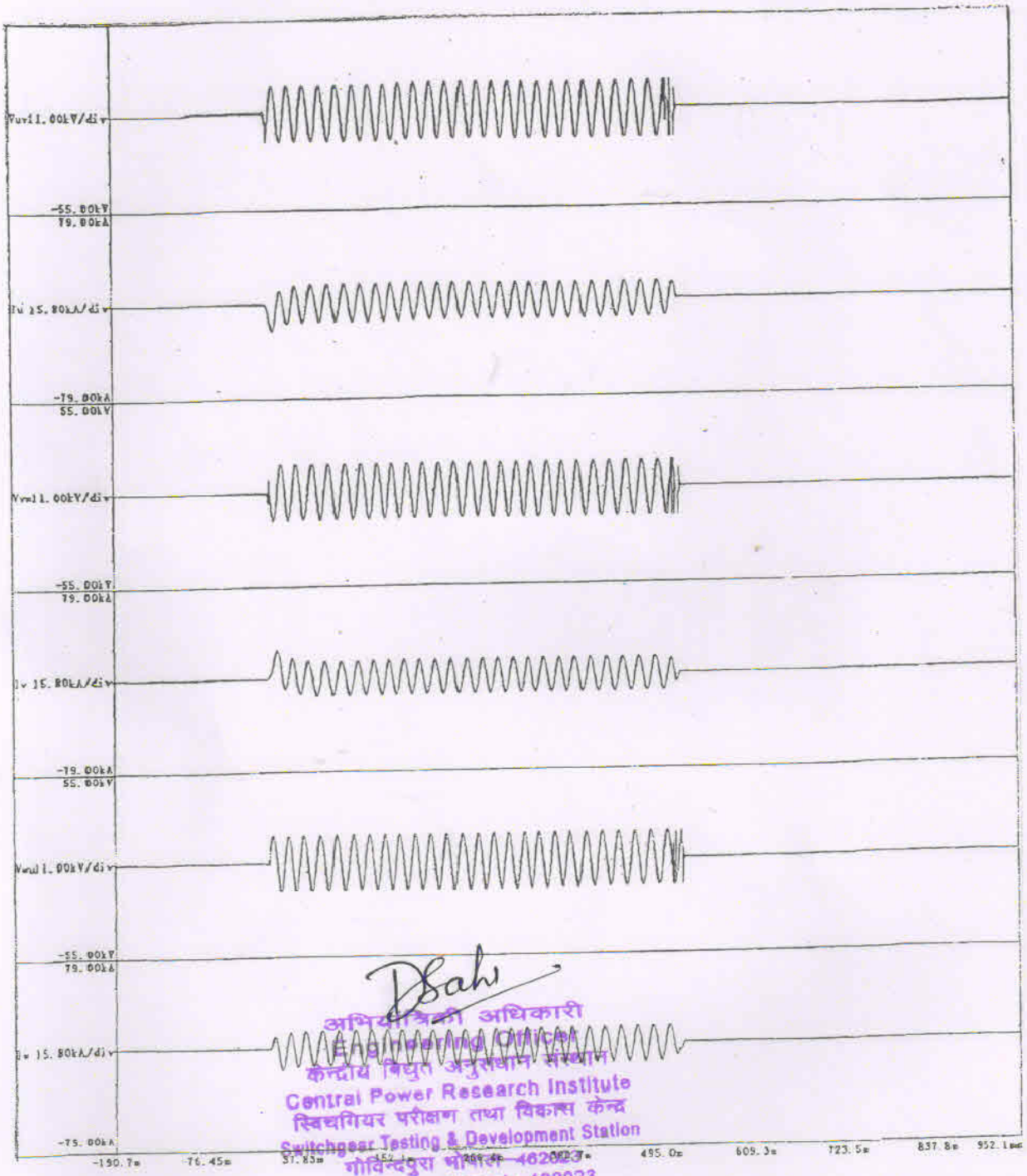

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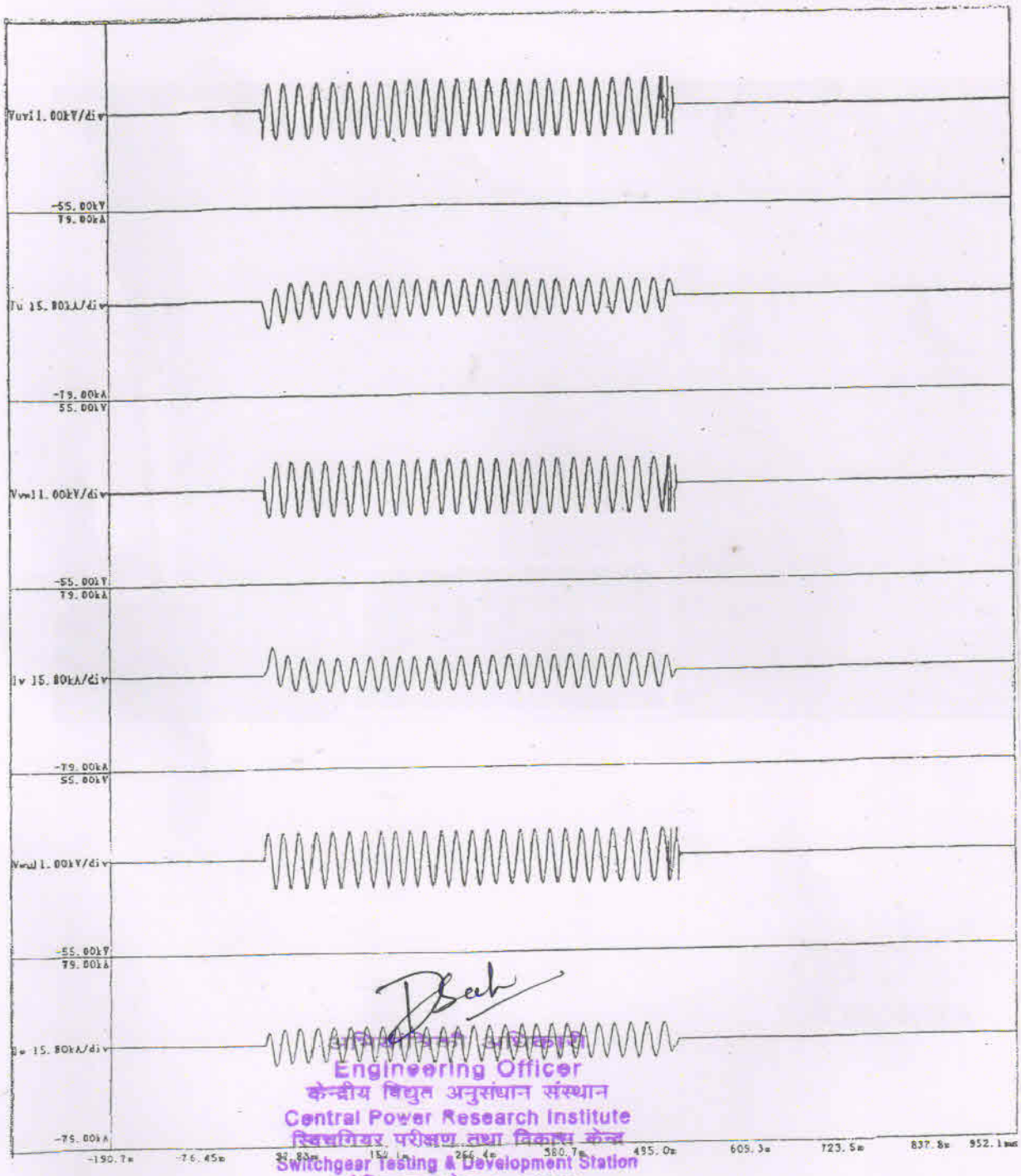

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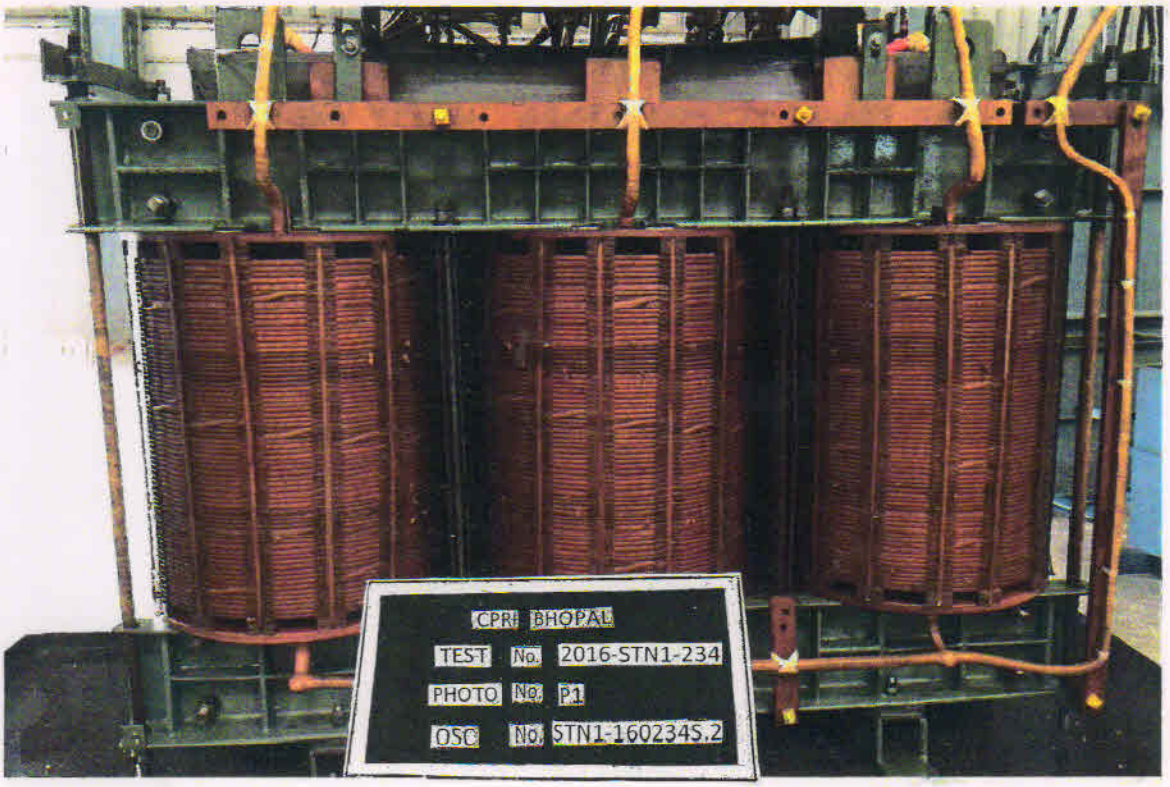

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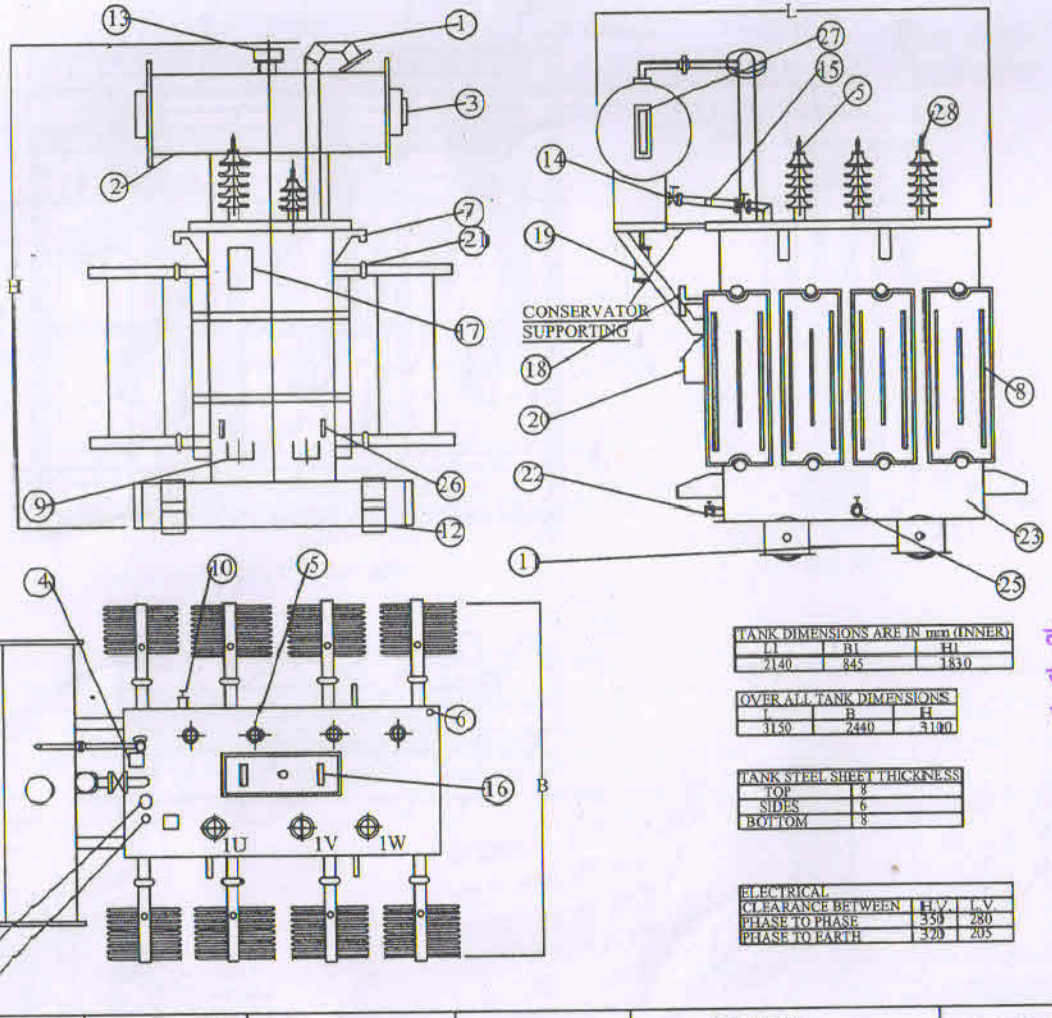


PART NO.	DESCRIPTION	QTY
1	EXPLOSION VENT	1
2	OIL CONSERVATOR WITH DRAIN VALVE	1
3	MAGNETIC OIL LEVEL GAUGE WITH LOW LEVEL ALARM CONTACTS	1
4	WTI CT TERMINAL (HV & LV)	2
5	LV BUSHING & HV BUSHING	7
6	THERMOMETER POCKET WITH PLUG.	2
7	LIFTING LUGS FOR TRANSFORMER	4
8	PRESS STEEL RADIATOR WITH AIR RELEASE AND DRAIN PLUG.	8
9	JACKING LUGS WITH PULLING HOLES	4
10	FILTER VALVE ON HV SIDE	1
11	UNDER BASE CHANNEL	2
12	TRANSFORMER ROLLERS BI-DIRECTIONAL	4
13	CONSERVATOR FILLING PIPE & CAP	1
14	OIL FEED PIPE WITH VALVE ON OTHER SIDE OF B-RELAY	2
15	BUCHHOLZ RELAY DOUBLE FLOAT TYPE ALARM & TRIP CONTACTS	1
16	INSPECTION OPENING WITH AIR RELEASE PLUG.	1
17	RATING & DIAGRAM PLATE	1
18	OFF CKT TAP SWITCH 33KV 7 POSITION	1
19	DEHYDRATING BREATHER SILICAGEL	1
20	MARSHALLING BOX	1
21	RADIATOR VALVE WITH OPEN & CLOSE POSITION	16
22	DRAIN VALVE WITH PLUG.	1
23	EARTHING TERMINAL	2
24	DIAL TYPE TEMPERATURE INDICATOR POCKET	1
25	FILTER VALVE HV SIDE BOTTOM	1
26	PULLING EYES	2
27	PRISMATIC OIL LEVEL GAUGE	1
28	BIMETALIC TERMINAL CONNECTOR	7

TANK DIMENSIONS ARE IN mm (INNER)		
L1	B1	H1
2140	845	1830

OVER ALL TANK DIMENSIONS		
L	B	H
3150	2440	3100

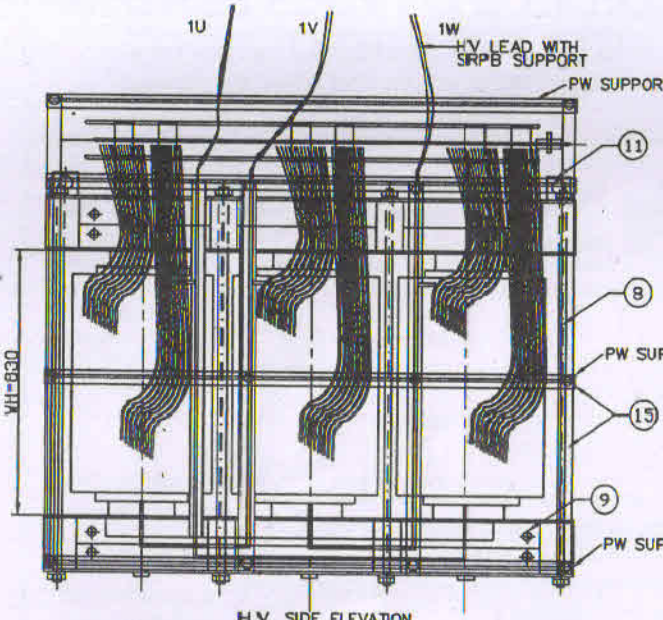
TANK STEEL SHEET THICKNESS	
TOP	8
SIDES	6
BOTTOM	8

ELECTRICAL CLEARANCE BETWEEN	H.V.	L.V.
PHASE TO PHASE	350	280
PHASE TO EARTH	320	205

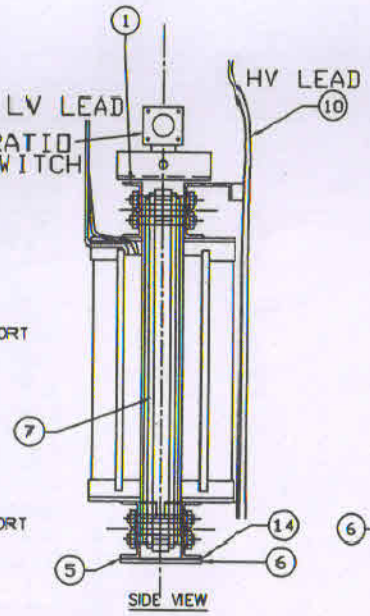
NOTE:-

1) CORE WINDING WEIGHT : 7050
2) TANK & FITTING WEIGHT :- 2200
3) WEIGHT OF OIL:- 2142 KG.
4) TOTAL WEIGHT :- 11392 K.G.
5) RADIATOR . - 8 NOS.
6) SHIPPING WEIGHT:- KG.
7) CONSERVATOR SIZE:-
9) VOLUME OF OIL:-
10) TOLERANCE ON WEIGHT & DIMENSIONS:- ±5%
11) TOTAL COOLING SURFACE:- 54.04 Mtr.sq. (TANK= 10.69 Mtr.sq. + RADIATOR= 43.35 Mtre.Sq.)
12) OIL QTY. IN RADIATOR:- 720 Ltr.
13) OIL QTY. IN CONSERVATOR:- 125 Ltr.

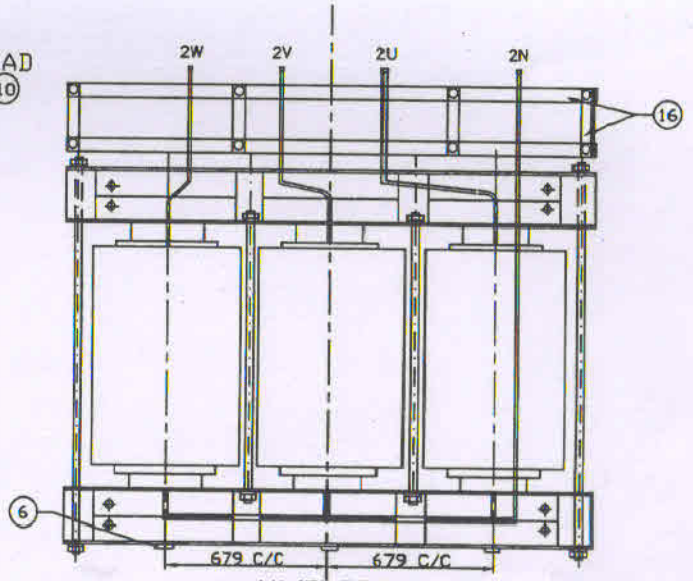
DRAWN BY	MP	CUSTOMER	J.d.V.V.N.L.	TN-2168	RAJASTHAN POWERGEN TRANSFORMER.PVT.LTD
CHECKED	SANJAY	14-08-16		5000 KVA,33/11 KV	BHINMAL-KAROLA ROAD.SANCHORE - RAJASTHAN
DESIGNED	SHANKAR	DATE	SCALE	N.T.S.	GENERAL ARRANGEMENT DRAWING RPTPL-GA-001-5MVA



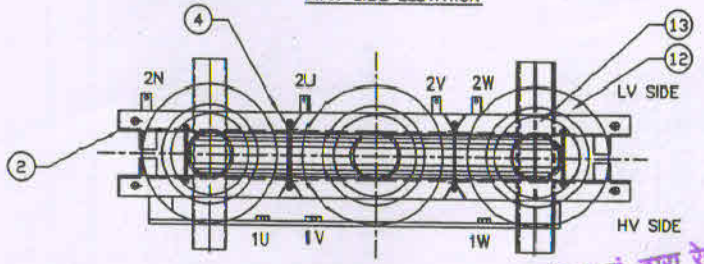
H.V. SIDE ELEVATION



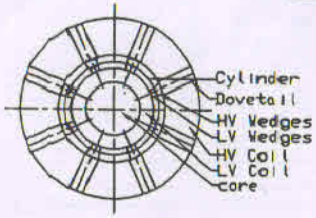
SIDE VIEW



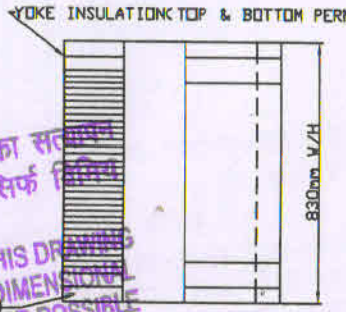
L.V. SIDE ELEVATION



TOP PLAN



BLOCK ARRANGEMENT



SECTIONAL ELEVATION COIL

SR.NO.	DESCRIPTION	MATERIAL	QTY.
16	L.T. LEAD INSULATION (40X30)	PERMA WOOD	2
15	H.T. LEAD INSULATION (40X30)	PERMA WOOD	8
14	GAP FILLING	MS CHANNEL/PRESS WOOD	–
13	L.V. COIL	CONT DISC COIL	3
12	H.V. COIL (86 DISC)	CONT DISC COIL	3
11	LIFTING LUG FOR ASSEMBLY	MS FLAT	2
10	H.T. LEAD INSULATION	SRBP TUBE/MPC	–
9	CORE STUD WITH SRBP TUBE	MS ROD ϕ24mm	8
8	TIE ROD WITH SRBP TUBE	MS ROD ϕ24mm	8
7	CORE CONSTRUCTION(M4 OR BETTER)	CRGO FULL MITRED	–
6	FOOT PLATE	MS FLAT (100X20)	3
5	FOOT PLATE INSULATION	PRESS BOARD	3
4	PHASE BARRIER	PC BOARD	4
3	YOKE INSULATION	PRESS BOARD	–
2	CORE CLAMP INSULATION	PRESS BOARD	4
1	CORE CLAMP	MS CHANNEL	4

DESCRIPTION	L.V.	H.V.
CONDUCTOR SIZE	15. 2X3. 1X3	8. 6X3. 7
TAPPING CONDUCTOR SIZE	–	7. 06X2. 8
I.D. OF COIL (MM)	379	523
O.D. OF COIL (MM)	493	661
AXIL OF COIL MM	685	720

DRAWN BY	SOMESH	TOLE.- +/-5%	DATE
CHECKED BY		SCALE-N.T.S.	
APPROVED BY	JdVVNL TN-2168		

RAJASTHAN POWERGEN TRANSFORMER PVT. LTD.

CORE COIL ASSEMBLY

5000KVA, 33/11KV

COPPER WOUND POWER TRANSFORMER

DRW No. : 5000/CCA/02

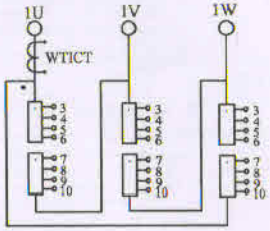
RAJASTHAN POWEREGEN TRANSFORMER PVT.LTD

BHINMAL-KAROL ROAD SANCHORE 343041
RAJASTHAN INDIA

TRANSFORMER NO		RPTPL-01	FREQUENCY			50
KVA		5000	TAP POSITION		MAX	NOR MIN
VOLTS AT NO LOAD	HV	33000	% IMPEDENCE AT 75°C GURANTEED		7.15	6.79 7.86
	LV	11000	LOAD LOSSES IN KW AT 75°C GURANTED			23 KW
AMPERES AT FULL LOAD	HV	87.47	NO LOAD LOSSES IN KW GURANTEED			4 KW
	LV	262.43	VECTOR GROUP			DYN-11
PHASES &CONNECTION	HV	3-DELTA	TYPE OF COOLING			ONAN
	LV	3-STAR	CORE & WDG.	KG.		7050
SPECIFICATION		S:2026	OIL	KG.		2142
YEAR OF MANUFACTURE		2016	TOTAL WEIGHT	KG.		11392
			OIL	Ltrs.		2550

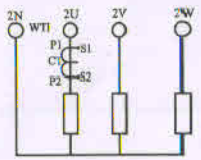
GTD. MAX. TEMP RISE IN OIL/WDG. OVER AMBIENT OF 50deg. °c: 45 | 50

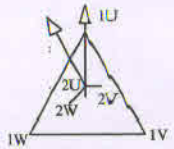
IMPULSE LEVEL HV/LV	170/75KV
SHORT CKT CURRENT	AMPS. FOR 0.5 SEC DYNAMIC & 2.0 SEC THERMAL
CUSTOMER SPEC./REF.	JdVVNL TN- 2168
GURANTEED PERIOD	36 MONTHS FOR THE DATE OF DISPATCH
DATE OF DISPATCH	G.P EXPIRY DATE



TABLE

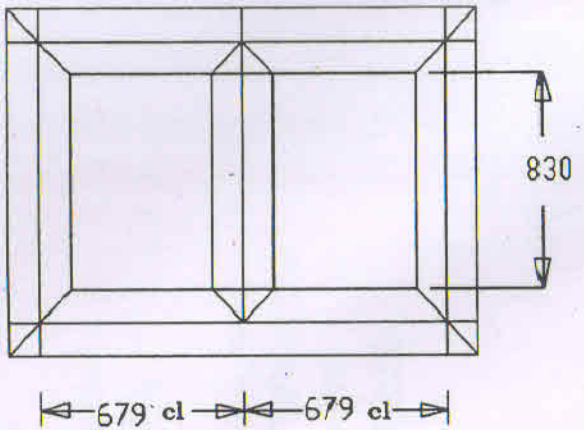
POSN.	CONNECT	HV VOLTS	HV AMPS.	LV VOLTS
1.	6 - 7	34650	83.314	
2.	7 - 5	33825	85.346	11000
3.	5 - 8	33000	87.479	
4.	8 - 4	32175	89.722	LV AMPS
5.	4 - 9	31350	92.084	
6.	9 - 3	30525	94.572	
7.	3 - 10	29700	97.199	
		WTI CT HV	200/2	15 VA
		WTICT LV	500/2	15 VA



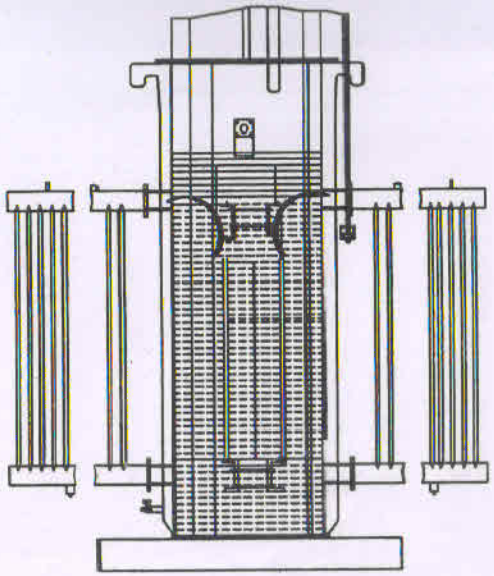


150

DRAWN BY	MP	RATING DIAGRAM PLATE	RAJASTHAN POWERGEN TRANSFORMER PVT.LTD BHINMAL-KAROLA ROAD SANCHORE -304143 RAJASTHAN
CHECKED	SANJAY		
DESIGNED	SHANKAR		
CUSTOMER	JdVVNL	5.MVA33/11 KV	RATING DIAGRAM PLATE RPTPL-RD-001-16
DATE	14-08-2016		
SCALE	NTS		

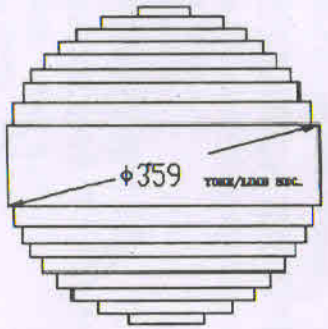


STEP REF.	STEP THICKNESS	WIDTH	AREA in sq.mm.
01	80.0	350	28000
02	35.5	340	12070
03	26.2	330	8646
04	21.4	320	6848
05	18.4	310	5704
06	16.2	300	4860
07	27.5	280	7700
08	22.9	260	5954
09	19.5	240	4680
10	16.7	220	3674
11	14.5	200	2900
12	12.5	180	2250
13	10.6	160	1696
14	09.3	140	1302
15	07.8	120	0936
16	06.5	100	0650
17	05.2	080	0416
18	0	0	0
		TOTAL	98286



COLLING SYSTEM

ASSY. ARRANGEMENTS



NET AREA- 98286 x 0.97 = 95337 Sq.mm

$$\text{FLUX DENSITY} = \frac{6350.85 \times 10^6}{4.44 \times 50 \times 190 \times 95337}$$

SAY = 1.58 Wb/Sq.mm

AJASTHAN POWERGEN TRANSFORMER PVT LTD.
BHINMAL-KAROLA ROAD,KAROLA, SANCHORE-343041. RAJASTHAN.

	DRN.-SOMESH	TOLE.-+/- 5%	PROJECT-FLUX DENSITY AND COLLING SYSTEM
	CHKED.-		TITLE- 5000 KVA,33/11 KV,3P,50Hz COPPER WOUND POWER TRANSFORMER
	APPRD.-	CLIENT-	
MODIFICATION	SCALE- N.T.S	DATE-	DRG.NO.- 5000/CSFD/03