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TEST REPORT

ULR-TC538919000026152F

Sheet : 1 of 14

NAME AND ADDRESS OF CUSTOMER RAJASTHAN POWERGEN TRANSFORMER PVT. LTD. KHASRA NO.911-914, KAROLA-BHINMAL ROAD, KAROLA, SANCHORE, RAJASTHAN - 343 041 INDIA	REPORT NO.: RP-1920-019587 DATE : 26.08.2019	
	CUSTOMER REF. NO.	DATE
	LETTER	31.07.2019
	DATE OF SAMPLE RECEIPT	DATE OF TESTING
12.07.2019	14.08.2019 to 22.08.2019	
SAMPLE DESCRIPTION DISTRIBUTION TRANSFORMER (NON-SEALED TYPE) Manufactured by : RAJASTHAN POWERGEN TRANSFORMER PVT. LTD. Rating : 160 kVA Volts : 11000/433 V (at no-load) Current : 8.40/213.34 Amps Phases : 3/3 Vector group : Dyn11 Energy efficiency level : 2 Further details as per sheet no.2	SAMPLE IDENTIFICATION ERDA sample code number : ERDA-00324652 Manufacturer serial number: RPTPL/01 Year of manufacture : 2019 Enclosed drawing numbers : 1) NP/160/08 2) RPTL-OGA-160-07	
TEST DETAILS As per sheet 3 of 14.	TEST SPECIFICATION As per sheet 3 of 14.	
TEST RESULTS : As per sheets from 4 of 14 to 13 of 14.		
ENCLOSURE : Photographs of test sample - As per sheet 14 of 14.		
REMARKS : 1) The transformer conforms to the guaranteed requirement as per above mentioned test specification for above mentioned test nos.3 to 6,10 to 13. 2) Criteria limit has not been specified for test nos. 1,2,7,8,9 & 14.		
PREPARED BY	CHECKED BY	APPROVED BY (Kapil J. Sharma)
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TECHNICAL SPECIFICATIONS OF TEST OBJECT ASSIGNED BY CUSTOMER

1.	Name of Manufacturer	RAJASTHAN POWERGEN TRANSFORMER PVT. LTD.
2.	Sr.No.	RPTPL/01
3.	kVA rating	160
4.	Rated Voltage H.V.(Volts)	11000
5.	Rated Voltage L.V.(Volts)	433
6.	Rated Current H.V.(Amp.)	8.40
7.	Rated Current L.V.(Amp.)	213.34
8.	Number of phases	3
9.	Energy Efficiency level	2
10.	Vector Group	Dyn11
11.	Winding Material	Aluminium
12.	Type of Cooling	ONAN
13.	Frequency (Hz)	50
14.	Guaranteed Percentage impedance(%)	4.5
15.	Total losses at 50 % load (Watts)	670
16.	Total losses at 100 % load (Watts)	1950
17.	Guaranteed temperature rise of oil/Winding	35/40°C
18.	Year of Manufacture	2019
19.	Standard no.	IS 1180 (PART-1) 2014 with amendment no. 1, 2 & 3, IS 2026, CBIP manual & customer's requirement.

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Sr. No.	TEST DETAILS	TEST SPECIFICATION
1.	Measurement of short-circuit impedance and load loss at 50 percent and 100 percent load	As per cl.no.21.2.c of IS 1180 (Part 1):2014
2.	Measurement of no-load loss and current	As per cl.no.21.2.d of IS 1180 (Part 1):2014
3.	Total losses at 50 % load	As per cl.no. 6.8 of IS 1180 (Part 1):2014
4.	Total losses at 100 % load	As per cl.no. 6.8 of IS 1180 (Part 1):2014
5.	No load current at 112.5 percent voltage	As per cl.no.21.4.c of IS 1180 (Part 1):2014
6.	Temperature rise test	As per customer's requirement, testing procedure followed as per cl.no.21.3.b of IS 1180 (Part 1):2014
7.	Magnetic balance test	As per CBIP manual; Publication no.317-2013
8.	Measurement of unbalance current	As per customer's requirement
9.	Measurement of zero-sequence impedance(s) on three-phase transformers.	As per customer's requirement, testing procedure followed as per cl.no.10.7 of IS 2026 (Part 1): 2011
10.	Oil leakage test	As per cl.no.21.2.j of IS 1180 (Part 1):2014
11.	Pressure test (routine test)	As per cl.no.21.2.h of IS 1180 (Part 1):2014
12.	Pressure test (type test)	As per cl.no.21.3.d of IS 1180 (Part 1):2014
13.	Determinations of sound levels	As per customer's requirement, testing procedure followed as per cl. no. 21.4.a of IS 1180 (Part 1) : 2014 & cl. No.13 of IS 2026(Part 10): 2009
14.	Measurement of the Harmonics of the No-load current	As per customer's requirement testing procedure followed as per cl.no.10.6. of IS: 2026 (PART 1)-2011
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DATE : 26.08.2019				
Sr. No.	Particulars of test and Cl. No.	Requirement as per specification	Obtained Value	Remarks
2.	Measurement of no-load loss and current : (As per cl.no.21.2.d of IS 1180 (Part 1): 2014) Tested with average 433.54 Volts (on LV side) Frequency : 50.004 Hz <div style="text-align: right;"> RMS voltage (Volts) No-load current (Amps) Measured no-load loss (Watts) Corrected no-load loss (Watts) </div>		 432.84 0.7264 269.33 269.76	---
3.	Total losses at 50 % load (Watts) : (As per cl.no.6.8 of IS 1180 (Part 1):2014)	Max. 670	644.38	Conforms
4.	Total losses at 100 % load (Watts) : (As per cl.no.6.8 of IS 1180 (Part 1):2014)	Max. 1950	1761.46	Conforms
5.	No load current at 112.5 percent voltage : (As per cl.no.21.4.c of IS 1180 (Part 1) : 2014) Test voltage of 112.5 percent of rated voltage at rated frequency was applied to the L.V. winding terminals and H.V. winding terminals were kept open circuited. No load current was recorded. <div style="text-align: right;"> Test voltage (Volts) No load current (Amps) No load current (%) </div>	 Max. 6.0	486.99 1.4842 0.70	Conforms
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Sr. No.	Particulars of test and Cl. No.	Requirement as per specification	Obtained value	Remarks
6.	<p>Temperature-rise test : (As per customer's requirement, testing procedure followed as per cl.no.21.3.b of IS 1180 (Part 1) : 2014)</p> <p>Before starting test, the dimensions of tank with radiators were measured & recorded.</p> <p>Size of tank : L-1000 mm, W-410 mm, H1-915 mm & H2-900 mm Fins details:L-600 mm, W-300 mm, Number of radiator: 02 Number of fins per radiator: 06</p> <p>Total losses fed for temperature-rise test were 1950 Watts. (As specified by customer)</p> <p>Specified losses were fed to the transformer (i.e. Supply was connected to HV winding and LV winding kept short-circuited) till steady state temperature-rise was attained. Top oil temperature was recorded hourly. After steady state condition, the losses were brought down in reference to the rated current one hour prior to shut down.</p> <p>At the shutdown, the hot windings resistance were measured and temperature-rise calculated.</p> <p>A) Top oil temperature-Rise : Max. 35°C</p> <p>B) Winding Temperature Rise (Resistance method)</p> <p>1) HV Winding : Max. 40°C</p> <p>2) LV Winding : Max. 40°C</p> <p>C) Ambient temperature at shutdown : 28.5°C</p> <p>D)Time of Shutdown(HRS) : 23:00</p>			Conforms

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Sr. No.	Particulars of test and Cl. No.			Requirement as per specification	Obtained Value	Remarks
7.	Magnetic balance test : (As per CBIP manual; Publication no.317 - 2013)					---
	Voltage Applied Between	Applied Voltage (Volts)	Measured Voltage Between			
	2u & 2n	100.11	2v & 2n	---	71.05	
			2w & 2n	---	28.86	
	2v & 2n	100.03	2u & 2n	---	50.87	
			2w & 2n	---	49.02	
	2w & 2n	100.33	2u & 2n	---	31.22	
			2v & 2n	---	68.99	
8.	Measurement of unbalance current : (As per customer's requirement) All the three terminals of the secondary (LV) winding shorted together, except neutral terminal. Ammeter was connected between short circuited secondary (LV) windings and neutral terminal for measurement of unbalance current. 3-phase voltage was applied to the primary (HV) winding for circulating rated current in both the windings and measured unbalance current.					---
	a) Rated secondary (LV) winding current (A):				213.34	
	b) Measured unbalance current (A) :				0.60	
	c) Measured unbalance current (%) :			---	0.281	

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Sr. No.	Particulars of test and Cl. No.	Requirement as per specification	Obtained Value	Remarks
9.	Measurement of zero-sequence impedance(s) on three-phase transformers : (As per customer's requirement, testing procedure followed as per cl.no.10.7 of IS 2026 (Part 1) : 2011) The 2u, 2v and 2w terminals of LV winding shorted together. A test current (i.e. 1/3 rd of rated current) was circulated between shorted terminals and 2n and measured a voltage across them. The obtained values are tabulated as below: Test current (Amps) 70.434 Measured Voltage (Volts) 1.293 $Z_{ps} = \frac{3V}{I}$ (Ω /Phase) 0.055 $Z_{ps} = \frac{3V \times kVA}{I \times 10 (kV)^2}$ (%) 4.7	---		---
10.	Oil leakage test : (As per cl.no.21.2.j of IS 1180 (Part1): 2014) The assembled transformer with all fittings including bushings in position was tested at a pressure at the top equivalent to the head that was available at the base of the tank for 8 hours.	There should be no leakage at any point	No leakage observed.	Conforms
11.	Pressure test (routine test) : (As per cl.no.21.2.h of IS 1180 (Part 1: 2014) The transformer was tested at an air pressure of 35 kPa above atmosphere pressure maintained inside the tank for 10 min.	There should be no leakage at any point.	No leakage observed.	Conforms
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Sr. No.	Particulars of test and Cl. No.	Requirement as per specification	Obtained Value	Remarks																																									
12.	<p>Pressure test (type test) : (As per cl.no.21.3.d of IS 1180 (Part 1) : 2014)</p> <p>➤ The transformer tank was subjected to air pressure of 80 kPa for 30 minutes. The permanent deflection of flat plates were recorded, after pressure has been released.</p> <table><tr><th>Deflection Measured at</th><th>Length of plate (mm)</th><th></th><th></th></tr><tr><td>HV side</td><td>1000</td><td>Max. 6.5 mm</td><td>1.7 mm</td></tr><tr><td>LV side</td><td>1000</td><td>Max. 6.5 mm</td><td>1.9 mm</td></tr><tr><td>Side A</td><td>410</td><td>Max. 5.0 mm</td><td>0.2 mm</td></tr><tr><td>Side B</td><td>410</td><td>Max. 5.0 mm</td><td>0.3 mm</td></tr></table> <p>➤ The transformer tank was subjected to vacuum of 250 mm of Mercury for 30 minutes. The permanent deflection of flat plates were recorded, after vacuum has been released.</p> <table><tr><th>Deflection Measured at</th><th>Length of plate (mm)</th><th></th><th></th></tr><tr><td>HV side</td><td>1000</td><td>Max. 6.5 mm</td><td>1.5 mm</td></tr><tr><td>LV side</td><td>1000</td><td>Max. 6.5 mm</td><td>1.7 mm</td></tr><tr><td>Side A</td><td>410</td><td>Max. 5.0 mm</td><td>0.4 mm</td></tr><tr><td>Side B</td><td>410</td><td>Max. 5.0 mm</td><td>0.4 mm</td></tr></table> <div><div>HV SIDE</div><div>SIDE A SIDE B</div><div>LV SIDE</div></div>	Deflection Measured at	Length of plate (mm)			HV side	1000	Max. 6.5 mm	1.7 mm	LV side	1000	Max. 6.5 mm	1.9 mm	Side A	410	Max. 5.0 mm	0.2 mm	Side B	410	Max. 5.0 mm	0.3 mm	Deflection Measured at	Length of plate (mm)			HV side	1000	Max. 6.5 mm	1.5 mm	LV side	1000	Max. 6.5 mm	1.7 mm	Side A	410	Max. 5.0 mm	0.4 mm	Side B	410	Max. 5.0 mm	0.4 mm				Conforms
Deflection Measured at	Length of plate (mm)																																												
HV side	1000	Max. 6.5 mm	1.7 mm																																										
LV side	1000	Max. 6.5 mm	1.9 mm																																										
Side A	410	Max. 5.0 mm	0.2 mm																																										
Side B	410	Max. 5.0 mm	0.3 mm																																										
Deflection Measured at	Length of plate (mm)																																												
HV side	1000	Max. 6.5 mm	1.5 mm																																										
LV side	1000	Max. 6.5 mm	1.7 mm																																										
Side A	410	Max. 5.0 mm	0.4 mm																																										
Side B	410	Max. 5.0 mm	0.4 mm																																										
		There should be no air leakage at any point.	No air leakage observed.																																										

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Particulars of Tests & Cl. No.:

13) Determinations of sound levels [A- Weighted Sound Power Level Measurement]

[As per customer's request, testing procedure followed as per Cl. No. 21.4.a of IS 1180 (Part 1):2014 & Cl. No. 13 of IS 2026 (Part 10): 2009]

Condition of transformer : Transformer was energized at no load condition & excited at the rated voltage of sinusoidal waveform & rated frequency.

Details of equipment used : Name: Sound level meter Make: Lutron
Meter Type: Type 1 Serial No.: I.62852
Calibration Report No. & Date: V-181201-1-4 DTD. 01.12.2018

TEST RESULTS:

A-Weighted sound pressure levels of the background noise

Sr. No.	Measurement Locations (Refer Sketch Below)	At the start of test dB(A)	At the end of test dB(A)
1	A	48.4	48.5
2	B	48.5	48.6
3	C	48.4	48.5
4	D	48.6	48.6
5	E	48.5	48.5
6	F	48.7	48.5
7	G	48.6	48.6
8	H	48.5	48.6
9	I	48.5	48.5
10	J	48.6	48.6
Arithmetic Average $\overline{L_{bgA}}$		48.5	48.6

A-Weighted sound pressure levels at energized condition L_{pAi}

Sr. No.	Measurement Locations (Refer Sketch Below) dB(A)	L_{pAi} dB(A)
1	A	51.6
2	B	51.8
3	C	51.7
4	D	51.9
5	E	51.6
6	F	51.6
7	G	51.9
8	H	51.7
9	I	51.7
10	J	51.6
Arithmetic Average $\overline{L_{pAi}}$		51.7

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



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REPORT NO.: RP-1920-019587

Date: 26.08.2019

Sr. No.	Particulars of test and clause no.	Requirement as per specification.	Obtained value	Remarks
14	Measurement of the Harmonics of the No-load current (As per customer's request testing procedure followed as per cl. no. 10.6 of IS 2026 (Part 1):2011)	The harmonics of the no-load current in the three phases shall be measured and magnitude of the harmonics shall be expressed as a percentage of the fundamental component.	Refer table 1 for individual current harmonics components & individual voltage harmonics components measured at LV side at rated voltage i.e. 433 V Current THD: R-ph: 19.53% Y-ph: 21.5% B-ph: 16.88% Voltage THD: R-ph: 1.04% Y-ph: 1.2% B-ph: 1.37%	---
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TABLE-1 : Harmonics in voltage and current (as a percentage of fundamental)

Harmonic order	Current I _R in %	Current I _R in Amps	Voltage V _{RY} in %	Current I _Y in %	Current I _Y in Amps	Voltage V _{YB} in %	Current I _B in %	Current I _B in Amps	Voltage V _{BR} in %
1	100.00	0.68	100.00	100.00	0.65	100.00	100.00	0.80	100.00
2	0.42	0.00	0.01	0.38	0.00	0.06	0.25	0.00	0.03
3	2.56	0.02	0.48	4.50	0.03	0.63	4.59	0.04	0.88
4	0.25	0.00	0.02	0.29	0.00	0.03	0.18	0.00	0.00
5	18.27	0.13	0.48	19.57	0.13	0.32	15.24	0.12	0.38
6	0.16	0.00	0.03	0.06	0.00	0.04	0.19	0.00	0.02
7	6.31	0.04	0.46	7.61	0.05	0.63	5.54	0.04	0.49
8	0.09	0.00	0.03	0.03	0.00	0.02	0.06	0.00	0.01
9	0.35	0.00	0.29	0.18	0.00	0.44	0.19	0.00	0.50
10	0.03	0.00	0.02	0.02	0.00	0.01	0.04	0.00	0.01
11	0.83	0.01	0.45	0.48	0.00	0.47	0.63	0.01	0.59
12	0.03	0.00	0.02	0.02	0.00	0.03	0.03	0.00	0.02
13	0.44	0.00	0.15	0.52	0.00	0.06	0.49	0.00	0.18
14	0.01	0.00	0.02	0.02	0.00	0.01	0.01	0.00	0.02
15	0.09	0.00	0.11	0.11	0.00	0.18	0.04	0.00	0.17
16	0.04	0.00	0.02	0.03	0.00	0.02	0.06	0.00	0.02
17	0.20	0.00	0.19	0.21	0.00	0.24	0.06	0.00	0.16
18	0.07	0.00	0.03	0.03	0.00	0.01	0.09	0.00	0.03
19	0.10	0.00	0.04	0.03	0.00	0.12	0.09	0.00	0.08
20	0.03	0.00	0.01	0.03	0.00	0.00	0.05	0.00	0.02
21	0.03	0.00	0.14	0.03	0.00	0.10	0.04	0.00	0.10
22	0.04	0.00	0.02	0.02	0.00	0.02	0.04	0.00	0.02
23	0.06	0.00	0.07	0.03	0.00	0.08	0.06	0.00	0.09
24	0.06	0.00	0.03	0.06	0.00	0.03	0.06	0.00	0.01
25	0.03	0.00	0.05	0.06	0.00	0.08	0.06	0.00	0.06
THD %	19.53		1.04	21.50		1.20	16.88		1.37
Parameter measured	0.70 A		428.71 V	0.67 A		433.91 V	0.81 A		435.24 V
<div> <div>Prepared by</div> <div>Checked by</div> </div>									

TC 2841837





Certificate No. : TC-5389

ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

(Accredited by the National Accreditation Board for Testing and Calibration Laboratories, Govt. of India)

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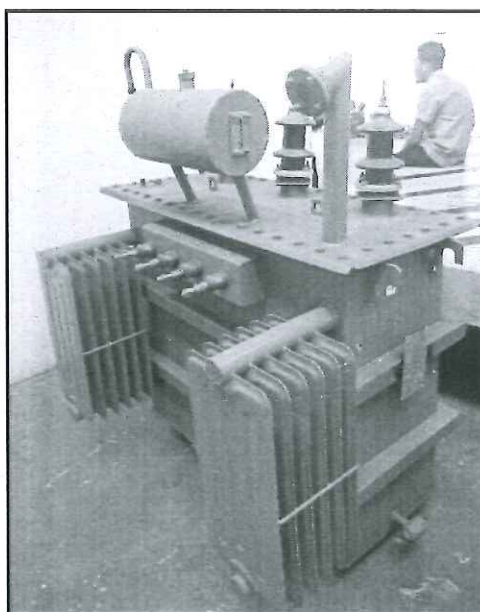
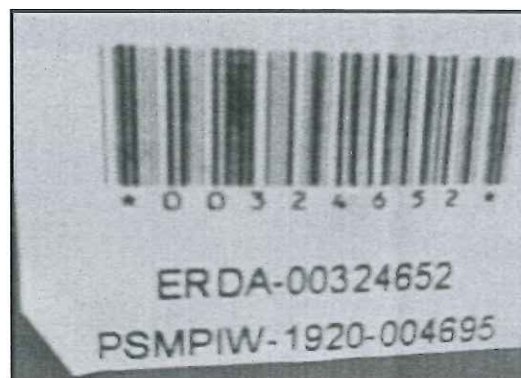
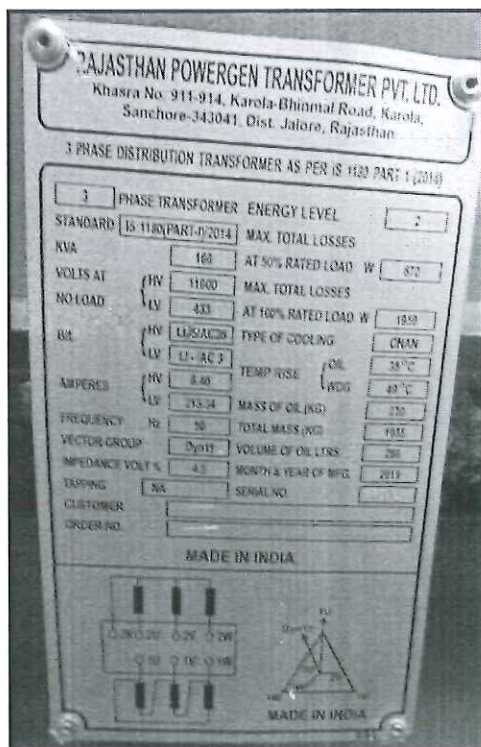
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REPORT NO.: RP-1920-019587

Sheet : 14 of 14

DATE : 26.08.2019

PHOTOGRAPHS OF TEST SAMPLE



PREPARED BY

CHECKED BY



TC 2841825

105

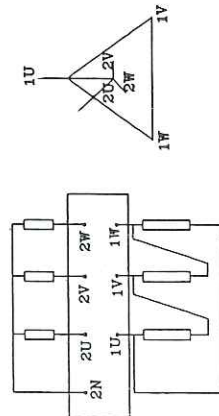
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DISTRIBUTION TRANSFORMER

Rajasthan Powergen Transformer Pvt. Ltd
Khasra No. 911-914, Karola-Bhinmal Road, Karola,
Sanchores-343041, Dist. Jalore, Rajasthan

3 PHASE TRANSFORMER ENERGY LEVEL 2
STANDARD 5110(PART-1)/2014 MAX. TOTAL LOSS W 670
KVA 160 MAX. TOTAL LOSS W 1950
VOLTS AT HV 11000 TYPE OF COOLING ONAN
NO LOAD LV 433 TEMP. RISE OIL 35° C
BIL HV 1195/AC28 MASS OF OIL(KG) 230
AMPERES HV 8.40 TOTAL MASS (KG) 1035
FREQUENCY HZ 50 VOLUME OF OIL LTRS 280
VECTOR GROUP Dyn11 MONTH & YEAR OF MFG 2019
IMPEDANCE VOLT % 4.5
TAPPING NA SERIAL NO. RP/1920-0719387
CUSTOMER
ORDER NO.

MADE IN INDIA



MADE IN INDIA

Test Report No. RP/1920-0719387
Date: 26.08.2019
Product: 160 KVA DTL
Verified by: [Signature]
Verification of this drawing by ERDA is
limited to relevant dimensional checks only.
Verified dimensions are marked with **

RAJASTHAN POWERGEN TRANSFORMER PVT. LTD
KHASRA No. 911-914, KAROLA-BHINMAL ROAD, KAROLA,

SANCHOORE-343041, DIST. JALORE, RAJASTHAN

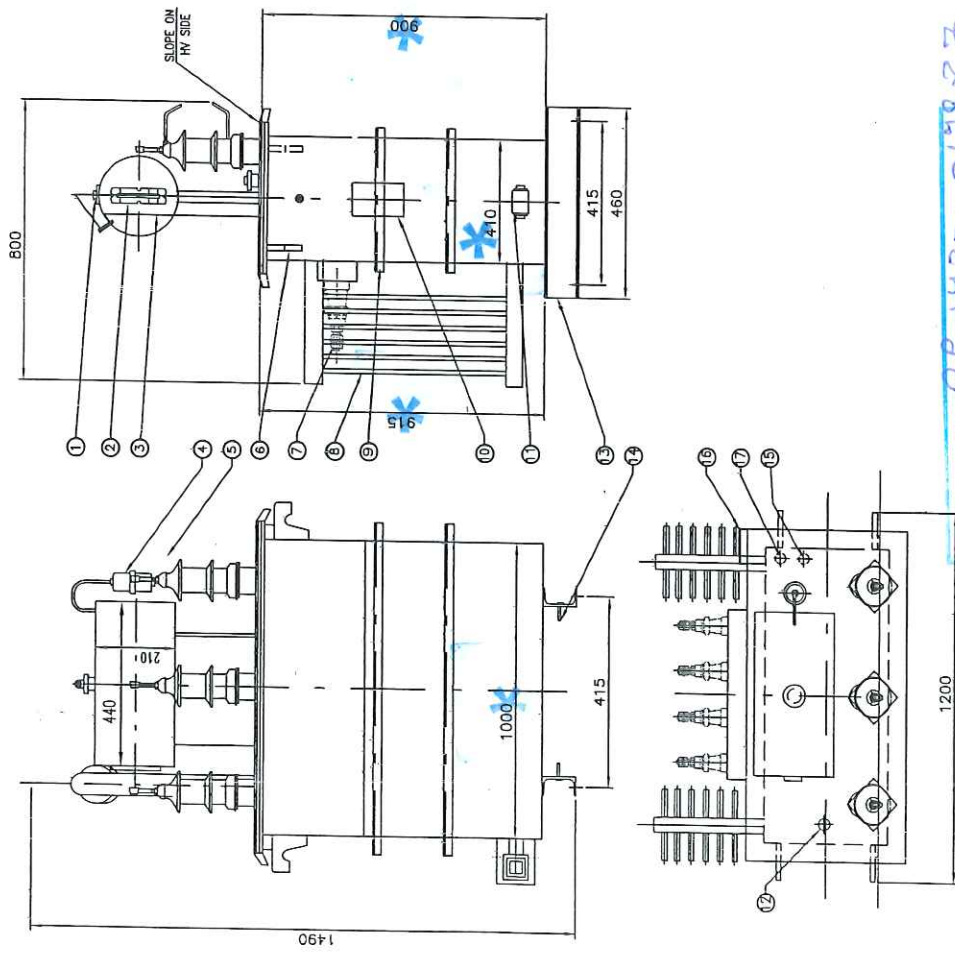
TITLE: — NAME PLATE DRAWING OF 160 KVA, 11/0.433KV
ALUMINIUM WOUND ENERGY EFFICIENCY LEVEL-2 TRANSFORMER

CUSTOMER ---

T.S.No. ---

SCALE N T S

DRG. No. NP/160/08



Test Report No. RP-1420-018877
 Date: 26.08.2019
 Product: 160 kVA
 Verified by: [Signature]
 Verification of this drawing by ERDA is limited to relevant dimensional checks only.
 Verified dimensions are marked with *.

NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. TOLERANCES ON OVERALL DIMENSION, TANK & WEIGHT ARE $\pm 10\%$
3. (*) ACCESSORIES NOT PROVIDED DURING TESTING

WEIGHT CHART		
1. CORE & WINDING	570 Kgs.	
2. TANK & FITTING	235 Kgs.	
3. WEIGHT OF OIL	230 Kgs.	
4. TOTAL WEIGHT	1035Kgs.	
5. VOLUME OF OIL	280 Ltrs.	

MIN ELECTRICAL CLEARANCE IN AIR		
PH. TO PH.	PH. TO EARTH	
HV 255	HV 140	
LV 75	LV 40	

TANK THICKNESS	
SIDE WALL	4.0mm
TOP&BOTTOM	5.0mm

S.No.	DESCRIPTIONS	QTY.
17.	THERMOMETER POCKET	1
16.	IDENTITY PLATE	1
15.	AIR RELEASE PLUG	1
14.	EARTHING TERMINALS	2
13.	UNDER BASE CHANNELS (100mm x 50 mm)	2
12.	EXPLOSION VENT	1
11.	DRAIN CUM SAMPLING VALVE 20mm	1
10.	NAME RATING & DIAGRAM PLATE	1
9.	STIFFNER (50 mm x 50 mm x 6 mm THICK)	2
8.	PRESS STEEL RADIATOR (600C/CX300W)-6FINS	2
7.	L.V. BUSHING	4
6.	TRANSFORMER LIFTING LUGS 8 mm THICK	4
5.	H.V. BUSHING WITH ARKING HORN & BINETALIC CONNECTOR	3
4.	SILICAGEL BREATHER 500 Grm.	1
3.	OIL CONSERVATOR WITH DRAIN PLUG	1
2.	OIL LEVEL INDICATORS	1
1.	OIL FILLING HOLE WITH CAP	1

RAJASTHAN POWERGEN TRANSFORMER PVT LTD
 KHASRA NO. 911-914, KAROLA-BHINMAL ROAD, KAROLA,
 SANCHORE-343041, Dist. JALORE, RAJASTHAN

TITLE:- OUTLINE G.A. DRAWING OF 160KVA,11/0.433KV
 ALUMINIUM WOUND ENERGY EFFICIENCY LEVEL-2 TRANSFORMER

DRN.	2222	CUSTOMER	---
		T.S.No.	---
		SCALE	N T S
DATE	10-07-2019	DRG. No.	RPTL-OGA-160--07