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# TEST REPORT



| **NAME & ADDRESS OF CUSTOMER** | **REPORT NO.:** RP-1819-010895<br>**DATE:** 21.06.2018 | |
|---|---|---|
| M/s. RAJASTHAN POWERGEN TRANSFORMER PVT.LTD.<br>KHASRA NO.911-914,<br>KAROLA-BHINMAL ROAD,<br>KAROLA,SANCHORE,-343041<br>RAJASTHAN. | **CUSTOMER REF. NO.**<br>RPTPL/Type Test/ ERDA/003 | **DATED:**<br>26.04.2018 |
| | **DATE OF SAMPLE RECEIPT:** | **DATE OF TESTING:** |
| | 26.04.2018 | 02.05.2018 to 17.05.2018 |

| **SAMPLE DESCRIPTION** | **SAMPLE IDENTIFICATION** |
|---|---|
| **5 kVA, Single Phase Distribution transformer (Sealed Type)**<br><br>11000/√3/240 Volts,<br><br>0.787/20.83 Amps.,<br><br>Oil filled,<br>**Energy efficiency level : 2**<br><br>Further details as per sheet No. 3 of 24 | **ERDA SAMPLE CODE NO.:** ERDA-00254271<br><br>**SERIAL NO.:** RPTPL/5KVA/AL/18-19/001<br><br>**YEAR OF MFG.:** 2018 |

**TEST DETAILS**
As per sheet 4 OF 24.

**TEST SPECIFICATIONS**
As per sheet 4 OF 24.

**ENCLOSURES:** As per sheet 2 OF 24.

**REMARKS:** On respective sheets from 5 OF 24 to 24 OF 24.

**PREPARED BY** | **CHECKED BY** | **APPROVED BY**
**Kapil J. Sharma**

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| Contents | |
|---|---|
| 1. Oscillogram No. | 0142/01 to 0142/05 |
| 2. Photograph No. | 1819-001541/0165 |
| 3. Test circuit diagram No. | OLSC/DTC/05 |
| 4. Drawing No. | 1) RPTPL/RP/05 Rev.:01 Sheet no.01<br>2) RPTPL/OGA/05 Rev.:01 Sheet no.01<br>3) RPTPL/IC/05 Rev.:01 Sheet no.01 |

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## TECHNICAL SPECIFICATIONS OF TEST OBJECT ASSIGNED BY CUSTOMER

| | |
|---|---|
| 1. Name of manufacturer | : **RAJASTHAN POWERGEN TRANSFORMER PVT.LTD.** |
| 2. Equipment | : **5 kVA Single Phase Distribution Transformer** |
| 3. Standard No. | : IS 1180 (Part 1): 2014 [Amendment No. 1& 2],IS 2026 (Part 1): 2011 & IS 2026 (Part 10): 2009 |
| 4. Serial No. | : RPTPL/5KVA/AL/18-19/001 |
| 5. Energy efficiency level | : 2 |
| 6. Type | : Outdoor, Oil cooled, Sealed Type |
| 7. kVA rating | : 5 |
| 8. Rated voltage H.V.(volts) | : 11000/√3 |
| L.V. (volts) | : 240 |
| 9. Rated current H.V. (Amp.) | : 0.787 |
| L.V.(Amp.) | : 20.83 |
| 10. Number of phases | : 1 |
| 11. Frequency (Hz.) | : 50 Hz |
| 12. Type of cooling | : ONAN |
| 13. Temperature rise of oil/winding | : 35°C/40°C |
| 14. Percentage Impedance | : 2.5% |
| 15. Primary winding conductor | : Polysterimide enamel (Class-H) Aluminium wire, Bare dia. 1.27 mm |
| 16. Secondary winding conductor | : DPC Aluminium Strip, Bare size (10.9 mm x 3.0 mm) |
| 17. Quantity of oil (Litre) | : 28 |
| 18. Weight of oil (kg.) | : 24 |
| 19. Weight of core coil assembly (kg.) | : 55 |
| 20. Total weight (kg.) | : 107 |
| 21. Polarity | : Subtractive |
| 22. Vector group | : Ii0/Single Phase |
| 23. Year of manufacture | : 2018 |
| 24. Insulation Level L.V. | : 03 kVrms |
| 25. Total losses at 75°C (Watts) | : 35 Max. (at 50 % load) |
| | : 95 Max. (at 100 % load) |

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**DATE** : 21.06.2018

| | 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. 8.8 of IS 1180 (Part 1):2014 |
| 4. | Total losses at 100 % load | As per cl.no. 8.8 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 IS1180(Part 1):2014 |
| 7. | Oil leakage test | As per cl.no.21.2.j of IS 1180 (Part 1):2014 |
| 8 | Pressure test (routine test) | As per cl.no.21.2.h of IS 1180 (Part 1):2014 |
| 9. | Pressure test (type test) | As per cl.no.21.3.d of IS 1180 (Part 1):2014 |
| 10. | 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 |
| 11. | 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 |
| 12. | Lightning impulse test | As per cl.no.21.3.a of IS 1180 (Part 1):2014 And test voltage specified by the customer(Test procedure was followed as per cl.no.14 of IS 2026 (Part 3) : 2009 |
| 13. | Short-circuit withstand test | As per cl.no.17 & 21.3 c of IS 1180 (Part 1) :2014 |
| 14. | Paint Adhesion test | As per cl.no.21.4 d of IS 1180 (Part 1): 2014 |

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**DATE** : 21.06.2018

| Sr. No. | Particulars of test and Cl. No. | Requirement as per specification | Obtained Value | Remarks |
|---|---|---|---|---|
| 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) | | | --- |
| | **At 50% load :** Tested with **0.39388** Amps (on HV side) Frequency : **50.042** Hz Top oil temperature : **36.5**°C | | | |
| | **Test current** (Amps) | | 0.39388 | |
| | **Impedance voltage** (Volts) | | 78.040 | |
| | **Measured load loss** (Watts) | | 12.499 | |
| | **Impedance voltage** (%) (Computed to 50% load) | | | |
| | At 36.5°C | | 1.229 | |
| | At 75°C | --- | 1.236 | |
| | **Load loss** (Watts) (Computed to 50% load) | | | |
| | At 36.5°C | | 12.507 | |
| | At 75°C | --- | 14.323 | |
| | **At 100% load :** Tested with **0.7867** Amps (on HV side) Frequency : **50.045** Hz Top oil temperature : **36.5**°C | | | |
| | **Test current** (Amps) | | 0.7867 | |
| | **Impedance voltage** (Volts) | | 155.95 | |
| | **Measured load loss** (Watts) | | 49.87 | |
| | **Impedance voltage** (%) (Computed to 100% load) | | | |
| | At 36.5°C | | 2.466 | |
| | At 75°C | 2.5 (±10%) | 2.526 | **Conforms** |
| | **Load loss** (Watts) (Computed to 100% load) | | | |
| | At 36.5°C | | 50.289 | |
| | At 75°C | -- | 57.555 | |

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| Sr. No. | Particulars of test and Cl. No. | Requirement as per specification | Obtained Value | Remarks |
|---|---|---|---|---|
| 2. | **Measurement of no-load loss and current :**<br>(As per cl.no.21.2.d of IS 1180 (Part 1): 2014)<br>Tested with average **240.35** Volts (on LV side)<br>Frequency : **50.056** Hz<br>**RMS voltage** (Volts)<br>**No-load current** (Amps)<br>**Measured no-load loss** (Watts)<br>**Corrected no-load loss** (Watts) | <br><br><br><br><br><br><br><br>-- | <br><br><br><br><br><br><br>240.20<br>0.07795<br>17.19<br>17.201 | -- |
| 3. | **Total losses at 50 % load (Watts) :**<br>(As per cl.no.8.8 of IS 1180 (Part 1):2014) | Max. 35 | 31.524 | **Conforms** |
| 4. | **Total losses at 100 % load (Watts) :**<br>(As per cl.no.8.8 of IS 1180 (Part 1):2014) | Max. 95 | 74.756 | **Conforms** |
| 5. | **No load current at 112.5 percent Voltage :**<br>(As per cl.no.21.4.c of IS: 1180 PART 1-2014)<br><br>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.<br>**Test voltage** (Volts)<br>**No load current** (Amps)<br>**No Load Current** (%) | <br><br><br><br><br><br><br><br><br><br><br><br><br><br>Max. 6.0 | <br><br><br><br><br><br><br><br><br><br><br><br><br>270.18<br>0.09161<br>0.44 | **Conforms** |

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| Sr. No. | Particulars of test and Cl. No. | Requirement as per specification | Obtained value | Remarks |
|---|---|---|---|---|
| 6. | **Temperature-rise test :**<br>(As per customer's requirement, testing procedure followed as per Cl.no.21.3.b of IS1180(Part 1):2014)<br><br>Before starting test, the dimensions of tank were measured & recorded.<br><br>Size of tank :<br>H-615 mm, Diameter-325 mm<br><br>**Specified losses fed for temperature-rise test were 95 Watts.**<br><br>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.<br>At the shutdown, the hot windings resistance were measured and temperature-rise calculated.<br>A) Top oil temperature-Rise :<br>B) Winding Temperature Rise (Resistance method)<br>1) HV Winding :<br>2) LV Winding :<br><br>C) Ambient temperature at shutdown :<br>D)Time of Shutdown(Hrs) : | <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>Max. 35°C<br><br>Max. 40°C<br>Max. 40°C | <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>12.0°C<br><br>17.7°C<br>17.1°C<br><br>29.4°C<br>7:30 | **Conforms** |

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| Sr. No. | Particulars of test and Cl. No. | Requirement as per specification | Obtained Value | Remarks |
|---|---|---|---|---|
| **7.** | **Oil leakage test :**<br>(As per cl.no.21.2.j of IS 1180 (Part1: 2014))<br>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 6 hours. | There should be no leakage at any point | No leakage observed. | **Conforms** |
| **8.** | **Pressure test (routine test) :**<br>(As per cl.no.21.2.h of IS 1180 (Part 1: 2014)<br>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** |
| **9.** | **Pressure test (Type test) :**<br>(As per cl.no.21.3.d of IS 1180 (Part 1: 2014)<br>The transformer was tested at an air pressure OF 100 kPa above atmosphere pressure maintained inside the tank for 30 min. | There should be no leakage at any point & no deformation of tank | No leakage & No deformation of tank observed. | **Conforms** |

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**Particulars of Tests & Cl. No.:**
**10) Determinations of sound levels** [A- Weighted Sound Power Level Measurement]
[As per customer's request, testing procedure followed as per 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<br>**Meter Type:** Type 1 **Serial No.:** I.62852<br>**Calibration Report No. & Date:** NCQC-M/141117/01, Dt. 27/11/2017 |

**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 | 45.6 | 45.8 |
| 2 | B | 45.2 | 45.3 |
| 3 | C | 45.3 | 45.6 |
| 4 | D | 45.7 | 45.7 |
| 5 | E | 45.1 | 45.3 |
| 6 | F | 44.9 | 44.7 |
| 7 | G | 44.8 | 44.9 |
| 8 | H | 45.5 | 45.5 |
| 9 | I | 44.8 | 45.1 |
| 10 | J | 44.7 | 45.2 |
| | **Arithmetic Average $\overline{L_{bgA}}$** | **45.2** | **45.3** |

**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 | 46.8 |
| 2 | B | 47.2 |
| 3 | C | 48.4 |
| 4 | D | 47.0 |
| 5 | E | 48.4 |
| 6 | F | 46.4 |
| 7 | G | 46.9 |
| 8 | H | 47.4 |
| 9 | I | 47.3 |
| 10 | J | 47.3 |
| | **Arithmetic Average $\overline{L_{pA0}}$** | **47.4** |

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**DATE: 21.06.2018** **SHEET:** 10 OF 24

**TEST PARAMETERS:**

**Measurement distance :** 1 m,

**Microphone Spacing:** 1 m

**Measurement made :** Half of the height of the transformer tank

**Method followed:** Sound pressure measurement as per Cl. No. 11, 11.3 & Table 2 of IS 2026 (Part 10): 2009.

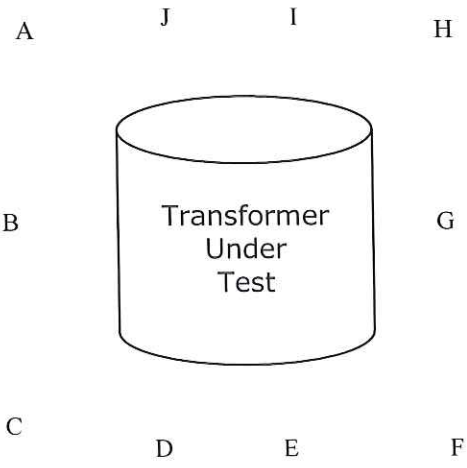
**Length of prescribed contour:** 9.92 m

**Transformer Tank Height:** 0.615 m

**Person present during sound level measurement:** 3

| | |
|---|---|
| **A-Weighted sound pressure level ($\overline{L_{pA0}}$):** | 47.4 dB(A) |
| **Corrected average A-weighted sound pressure level ($\overline{L_{pA}}$):** | 43.4 dB(A) |
| **Calculated A- weighted sound power level ($L_{WA}$) :** | 52.2 dB(A) |

**REMARKS:** 1) Guaranteed value of sound pressure level is considered as 48 db (A) as mentioned in customer's letter.
2)Transformer conforms to the requirement of guaranteed value of sound pressure level




**Sketch showing the locations of sound measurement**

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| Sr. No. | Particulars of test and clause no. | Requirement as per specification. | Obtained value | Remarks |
|---|---|---|---|---|
| 11 | **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 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. 240 V<br><br>Current THD: 27.4%<br><br>Voltage THD: 0.83% | --- |

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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 % |
|---|---|---|---|
| 1 | 100.00 | 0.0730 | 100.00 |
| 2 | 7.00 | 0.0051 | 0.02 |
| 3 | 24.53 | 0.0179 | 0.16 |
| 4 | 3.73 | 0.00272 | 0.02 |
| 5 | 8.50 | 0.00620 | 0.60 |
| 6 | 1.27 | 0.00093 | 0.00 |
| 7 | 0.77 | 0.00056 | 0.35 |
| 8 | 0.49 | 0.00036 | 0.02 |
| 9 | 0.58 | 0.00042 | 0.08 |
| 10 | 0.15 | 0.00011 | 0.02 |
| 11 | 1.45 | 0.00106 | 0.25 |
| 12 | 0.16 | 0.00012 | 0.02 |
| 13 | 1.90 | 0.00139 | 0.24 |
| 14 | 0.38 | 0.00028 | 0.04 |
| 15 | 0.52 | 0.00038 | 0.05 |
| 16 | 0.15 | 0.00011 | 0.02 |
| 17 | 1.70 | 0.00124 | 0.02 |
| 18 | 0.16 | 0.00012 | 0.01 |
| 19 | 0.77 | 0.00056 | 0.07 |
| 20 | 0.21 | 0.00015 | 0.02 |
| 21 | 0.53 | 0.00039 | 0.05 |
| 22 | 0.19 | 0.00014 | 0.00 |
| 23 | 0.85 | 0.00062 | 0.05 |
| 24 | 0.21 | 0.00015 | 0.02 |
| 25 | 0.58 | 0.00042 | 0.03 |
| THD % | 27.40 | | 0.83 |
| Parameter measured | 0.08 A | | 240.50 V |

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**12.Lightning Impulse Test (As per Cl. No.21.3.a of IS 1180 (part 1) : 2014 Amendment 1 & 2 & test procedure was followed as per IS : 2026-(part- III), 2009 cl. No. 14**

| Waveform | Comment | Ut / kVp | T1 / µs | T2 / µs | Tc / µs |
|---|---|---|---|---|---|
| **1.1 POLE** | | | | | |
| 1 | LI RW | -47.762 | 1.357 | 45.764 | |
| 2 | 100% LI FW | -73.863 | 1.353 | 45.909 | |
| 3 | LI CRW | -47.666 | 1.342 | | 2.504 |
| 4 | 110% LI CFW | -83.086 | 1.350 | | 3.101 |
| 5 | 110% LI CFW | -83.963 | 1.336 | | 2.545 |
| 6 | 100% LI FW | -73.431 | 1.350 | 45.901 | |
| 7 | 100% LI FW | -75.631 | 1.351 | 45.911 | |

**REMARKS:** From the observation of enclosed oscillographic records , it is concluded that the transformer **conforms** to the requirements of the above mentioned standard with respect to the test carried out.

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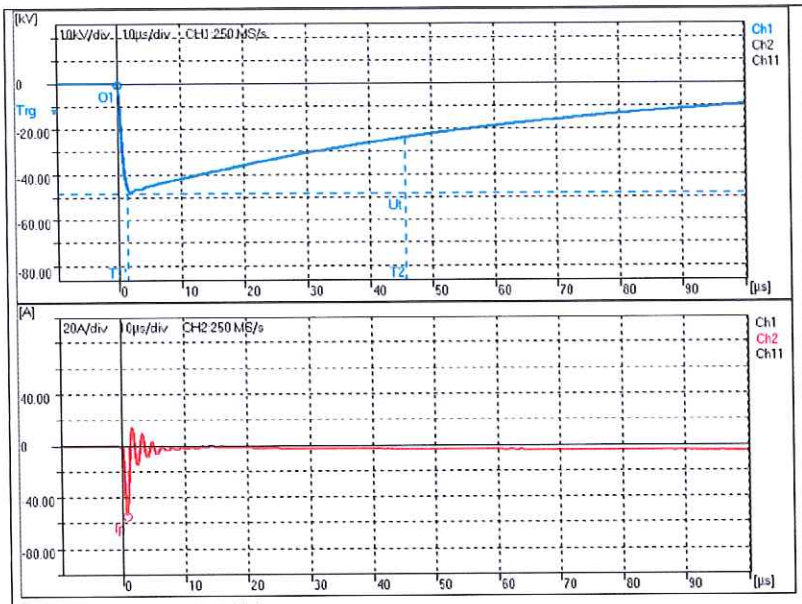
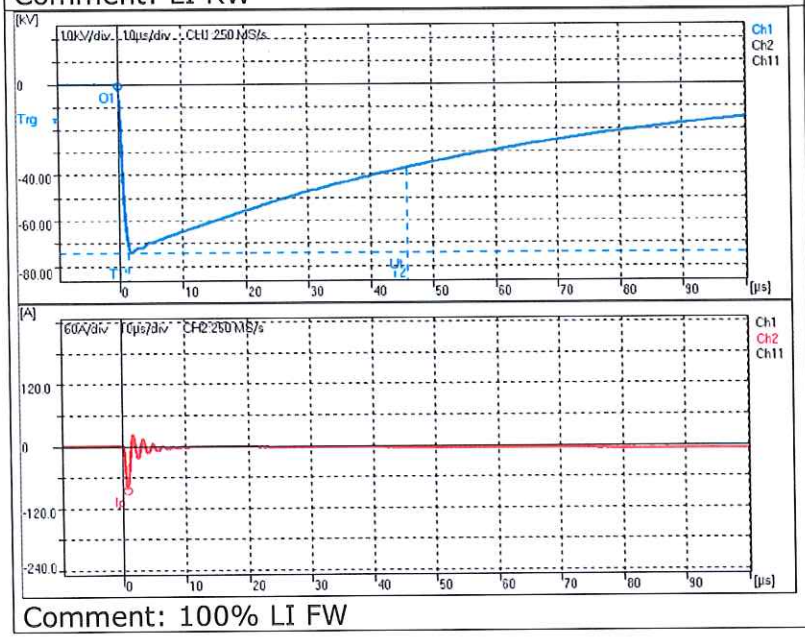



Comment: LI RW

Fig.: 1
$U_p$ = -47.76 kV
$T_1$ = 1.36 µs
$T_2$ = 45.76 µs
$T_c$ = µs




Comment: 100% LI FW

Fig.: 2
$U_p$ = -73.86 kV
$T_1$ = 1.35 µs
$T_2$ = 45.91 µs
$T_c$ = µs

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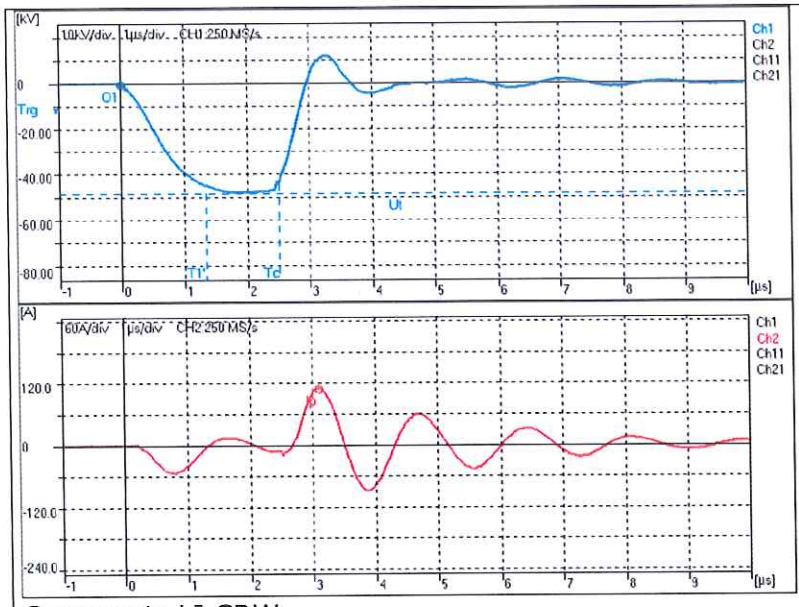
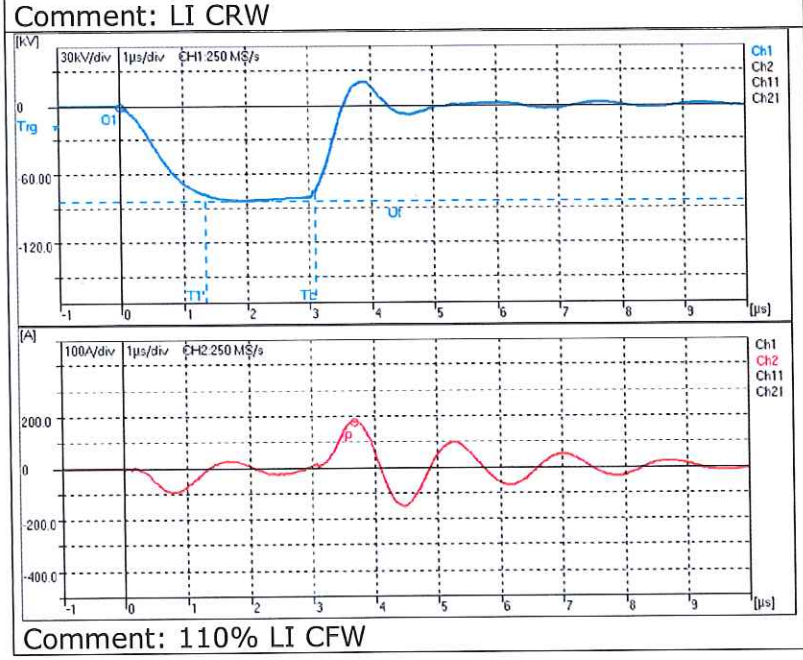



Comment: LI CRW

Fig.: 3
$U_p$ = -47.67 kV
$T_1$ = 1.34 µs
$T_2$ = µs
$T_c$ = 2.50 µs




Comment: 110% LI CFW

Fig.: 4
$U_p$ = -83.09 kV
$T_1$ = 1.35 µs
$T_2$ = µs
$T_c$ = 3.10 µs

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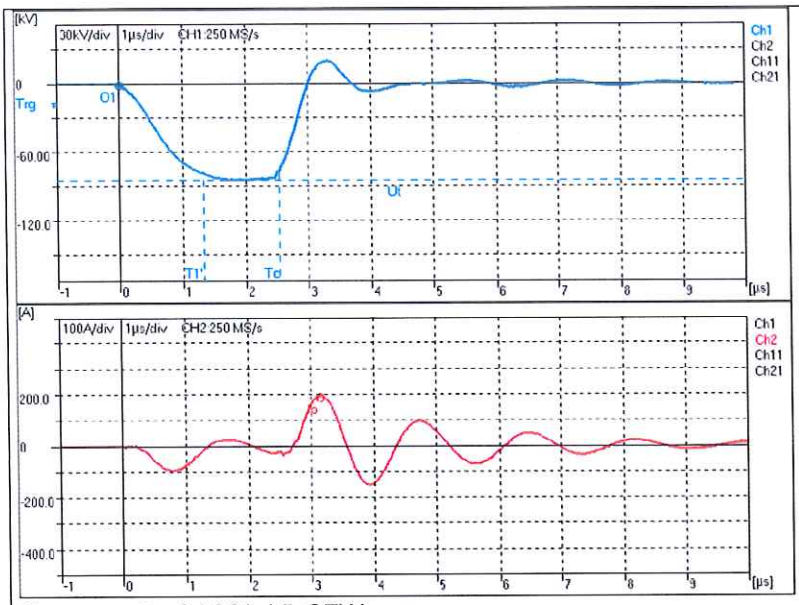
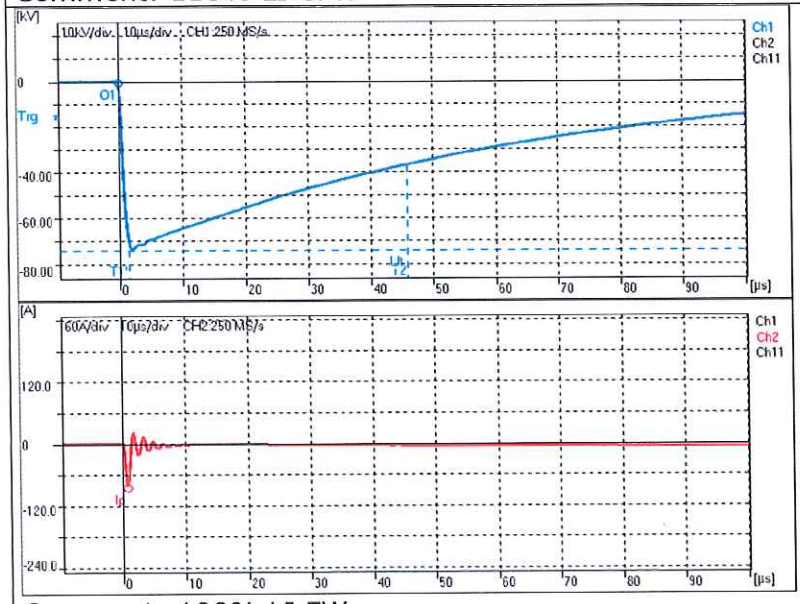



Comment: 110% LI CFW

Fig.: 5
$U_p$ = -83.96 kV
$T_1$ = 1.34 µs
$T_2$ = µs
$T_c$ = 2.55 µs




Comment: 100% LI FW

Fig.: 6
$U_p$ = -73.43 kV
$T_1$ = 1.35 µs
$T_2$ = 45.90 µs
$T_c$ = µs

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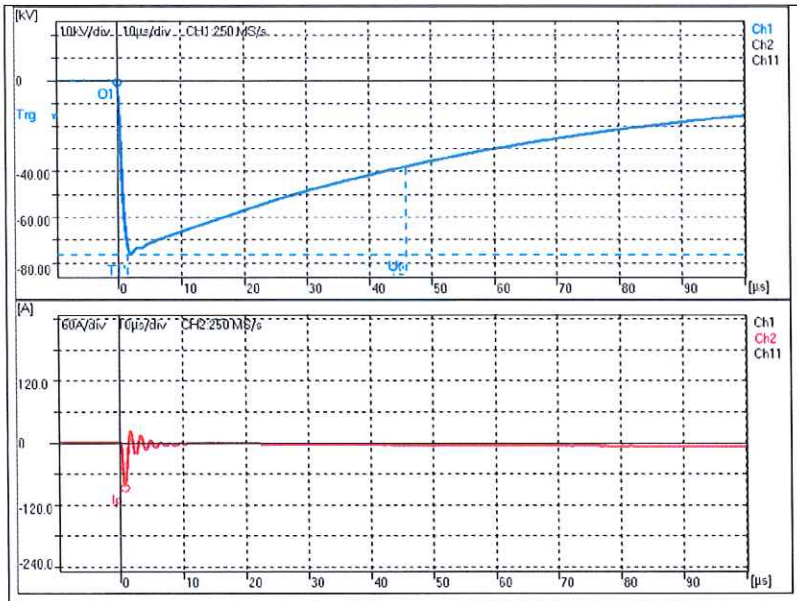


Comment: 100% LI FW

Fig.: 7
$U_p$ = -75.63 kV
$T_1$ = 1.35 µs
$T_2$ = 45.91 µs
$T_c$ = µs

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## 13. Short-circuit withstand test
## (As per Cl. No. 17 & 21.3 c of IS 1180 (Part 1): 2014)

## ROUTINE TEST RESULTS BEFORE SHORT CIRCUIT

a) MEASUREMENT OF WINDING RESISTANCE

| Measurement at oil temperature: 35.3°C | |
|---|---|
| LV Winding resistance (mΩ) | HV Winding resistance (Ω) |
| 2.1-2.2(n) | 1.1-1.2(N) |
| 49.902 | 43.784 |

b) MEASUREMENT OF VOLTAGE RATIO AND CHECK OF POLARITY

**Polarity:** Subtractive was verified

| Measured turns ratio between Terminals | Rated turns Ratio | Difference (%) |
|---|---|---|
| 1.1-1.2(N)/2.1-2.2(n) | | |
| 26.404 | 26.463 | -0.223 |

c) MEASUREMENT OF SHORT-CIRCUIT IMPEDANCE AND LOAD LOSS **(at 100 % load)**

Oil temperature: 35.9°C

| Test current (Amp.) | Impedance voltage (V) | Frequency (Hz.) | Load loss measured (Watts) | Impedance Voltage (%Z) at 50 Hz. | Load loss computed at 75°C (Watts) | %Z at 75°C |
|---|---|---|---|---|---|---|
| 0.786 | 154.999 | 49.751 | 49.475 | 2.456 | 57 | 2.518 |

d) MEASUREMENT OF LOAD LOSS **(at 50 % load)**

Oil temperature: 35.9°C

| Test current (Amp.) | Impedance voltage (V) | Frequency (Hz.) | Load loss measured (Watts) | Load loss computed at 75°C (Watts) |
|---|---|---|---|---|
| 0.392 | 77.225 | 49.757 | 12.281 | 14 |

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e) MEASUREMENT OF NO-LOAD LOSS AND CURRENT

Oil temperature: 35.9°C

| Applied Voltage (V) | Current (Amp.) | Frequency (Hz.) | Losses Measured (Watts) |
|---|---|---|---|
| 240.037 | 0.079 | 50.017 | 17 |

- Total losses at 75°C: 31 Watts (at 50 % load)
- Total losses at 75°C: 74 Watts (at 100% load)

f) MEASUREMENT OF INSULATION RESISTANCE

Oil temperature: 35.3°C

| | Applied DC Voltage (V) | IR value (MΩ) |
|---|---|---|
| HV to LV winding | 2500 | > 2000 |
| HV winding to LV + EARTH | 2500 | > 2000 |
| LV winding to HV + EARTH | 500 | > 2000 |

g) INDUCED OVER-VOLTAGE WITHSTAND TEST

| Sr. No. | Test | Applied voltage (V) | Applied Freq. (Hz.) | Duration (sec.) | Remarks |
|---|---|---|---|---|---|
| 1. | Between LV windings with HV terminal open & neutral terminal earthed. | 756 | 150 | 40 | Withstood |

h) SEPARATE-SOURCE VOLTAGE WITHSTAND TEST

| Sr. no. | Test | Applied voltage (kV) | Duration (sec.) | Remarks |
|---|---|---|---|---|
| 1. | Between HV winding and LV winding connected to the tank and earth | 03 | 60 | Withstood |
| 2. | Between LV winding and HV winding connected to the tank and earth | 03 | 60 | Withstood |

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## SHORT-CIRCUIT WITHSTAND TEST:

The verification of short-circuit withstand test was performed on the transformer by connecting the secondary winding to single phase of the source and primary winding short circuited using synchronization switch. The test conducted with short circuiting of primary winding; follow the application of the voltage to the secondary winding of transformer as per schematic circuit diagram No. OLSC/DTC/05.

Condition of the equipment under test: As after routine tests.

Supply Frequency: 50 Hz.

| Test No. | Oscillo-gram No. | Applied voltage (Vrms) | Short circuit current on LV (A) | | Duration (sec.) | Remarks |
|---|---|---|---|---|---|---|
| | | | Peak | RMS | | |
| 1. | 0142/01 | - | 1182 | 655 | 0.1 | Calibration Shot |
| 2. | 0142/02 | 240 | 1470 | 848 | 0.5 | No Abnormality |
| 3. | 0142/03 | 240 | 1438 | 851 | 0.5 | No Abnormality |
| 4. | 0142/04 | 240 | 1410 | 815 | 0.5 | No Abnormality |
| 5. | 0142/05 | 240 | 1421 | 827 | 2.0 | Thermal shot No Abnormality |

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## Measurement of the % reactance during the short circuit test

LV winding was short circuited. AC supply was connected to HV winding to pass test current. Before the short circuit test and after each shot, the percentage reactance was measured.

| Sr. No. | Measurement performed | | Measured value of % reactance at 50 Hz. | %Change in % reactance |
|---|---|---|---|---|
| 1. | Before test | | 2.24 | - |
| 2. | After the test no. | 2. | 2.28 | 1.79 |
| 3. | After the test no. | 3. | 2.28 | 1.79 |
| 4. | After the test no. | 4. | 2.28 | 1.79 |
| 5. | After the test no. | 5. | 2.28 | 1.79 |

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## ROUTINE TEST RESULTS AFTER SHORT CIRCUIT

a) MEASUREMENT OF WINDING RESISTANCE

| Measurement at oil temperature: 37.3°C | |
|---|---|
| LV Winding resistance (mΩ) | HV Winding resistance (Ω) |
| 2.1-2.2(n) | 1.1-1.2(N) |
| 50.705 | 44.264 |

b) MEASUREMENT OF VOLTAGE RATIO AND CHECK OF POLARITY

**Polarity:** Subtractive was verified

| Measured turns ratio between Terminals | Rated turns Ratio | Difference (%) |
|---|---|---|
| 1.1-1.2(N)/2.1-2.2(n) | | |
| 26.406 | 26.463 | -0.215 |

c) MEASUREMENT OF SHORT-CIRCUIT IMPEDANCE AND LOAD LOSS **(at 100 % load)**

Oil temperature: 37.1°C

| Test current (Amp.) | Impedance voltage (V) | Frequency (Hz.) | Load loss measured (Watts) | Impedance Voltage (%Z) at 50 Hz. | Load loss computed at 75°C (Watts) | %Z at 75°C |
|---|---|---|---|---|---|---|
| 0.783 | 157.229 | 49.903 | 49.526 | 2.493 | 57 | 2.553 |

d) MEASUREMENT OF LOAD LOSS **(at 50 % load)**

Oil temperature: 37.1°C

| Test current (Amp.) | Impedance voltage (V) | Frequency (Hz.) | Load loss measured (Watts) | Load loss computed at 75°C (Watts) |
|---|---|---|---|---|
| 0.390 | 78.259 | 49.927 | 12.263 | 14 |

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e) MEASUREMENT OF NO-LOAD LOSS AND CURRENT

Oil temperature: 37.1°C

| Applied Voltage (V) | Current (Amp.) | Frequency (Hz.) | Losses Measured (Watts) |
|---|---|---|---|
| 240.131 | 0.075 | 50.031 | 17 |

- Total losses at 75°C: 31 Watts (at 50 % load)
- Total losses at 75°C: 74 Watts (at 100% load)

f) MEASUREMENT OF INSULATION RESISTANCE

Oil temperature: 37.1°C

| | Applied DC Voltage (V) | IR value (MΩ) |
|---|---|---|
| HV to LV winding | 2500 | > 2000 |
| HV winding to LV + EARTH | 2500 | > 2000 |
| LV winding to HV + EARTH | 500 | > 2000 |

g) INDUCED OVER-VOLTAGE WITHSTAND TEST

| Sr. No. | Test | Applied voltage (V) | Applied Freq. (Hz.) | Duration (sec.) | Remarks |
|---|---|---|---|---|---|
| 1. | Between LV windings with HV terminal open & neutral terminal earthed. | 756 | 150 | 40 | Withstood |

h) SEPARATE-SOURCE VOLTAGE WITHSTAND TEST

| Sr. no. | Test | Applied voltage (kV) | Duration (sec.) | Remarks |
|---|---|---|---|---|
| 1. | Between HV winding and LV winding connected to the tank and earth | 03 | 60 | Withstood |
| 2. | Between LV winding and HV winding connected to the tank and earth | 03 | 60 | Withstood |

**Observation after test:** The transformer was untanked and inspected.
1) Condition of conductor, core and clamping:
- No visible damage, deformation or displacement.
2) Condition of oil : Clear

**Results:** 1) % Change in % reactance is within tolerance limits as per standard.
2) The results of routine tests carried out before and after the short-circuit withstand test found within limits as per standard.

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| Sr. No. | Particular of Tests and Cl. No. | Requirements as per specification | Obtained value | Remarks |
|---|---|---|---|---|
| 14. | Paint Adhesion Test at 37°C & 12 % RH<br>Test Method A – X-cut tape test (Test procedure followed as per ASTM D 3359-2017, Cl. No. 8) Cl. No. 21.4.d of IS 1180 (Part 1): 2014<br><br>- Adhesion strength of pressure sensitive tape 6.7 N/cm. | -- | Observation 1- 5A – No peeling or removal was observed at the location.<br><br>Observation 2- 5A – No peeling or removal was observed at the location.<br><br>Observation 3- 5A – No peeling or removal was observed at the location. | -- |

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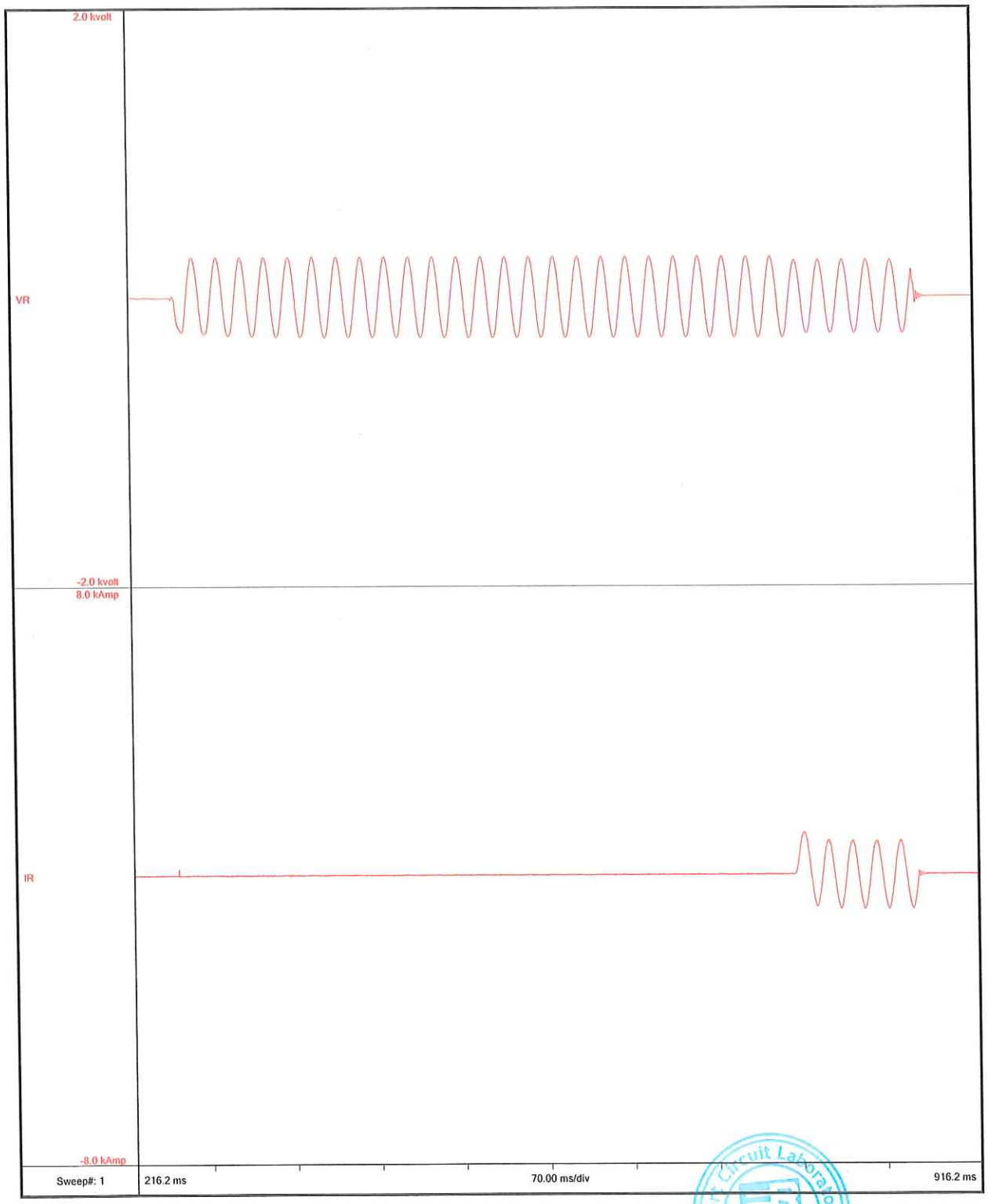


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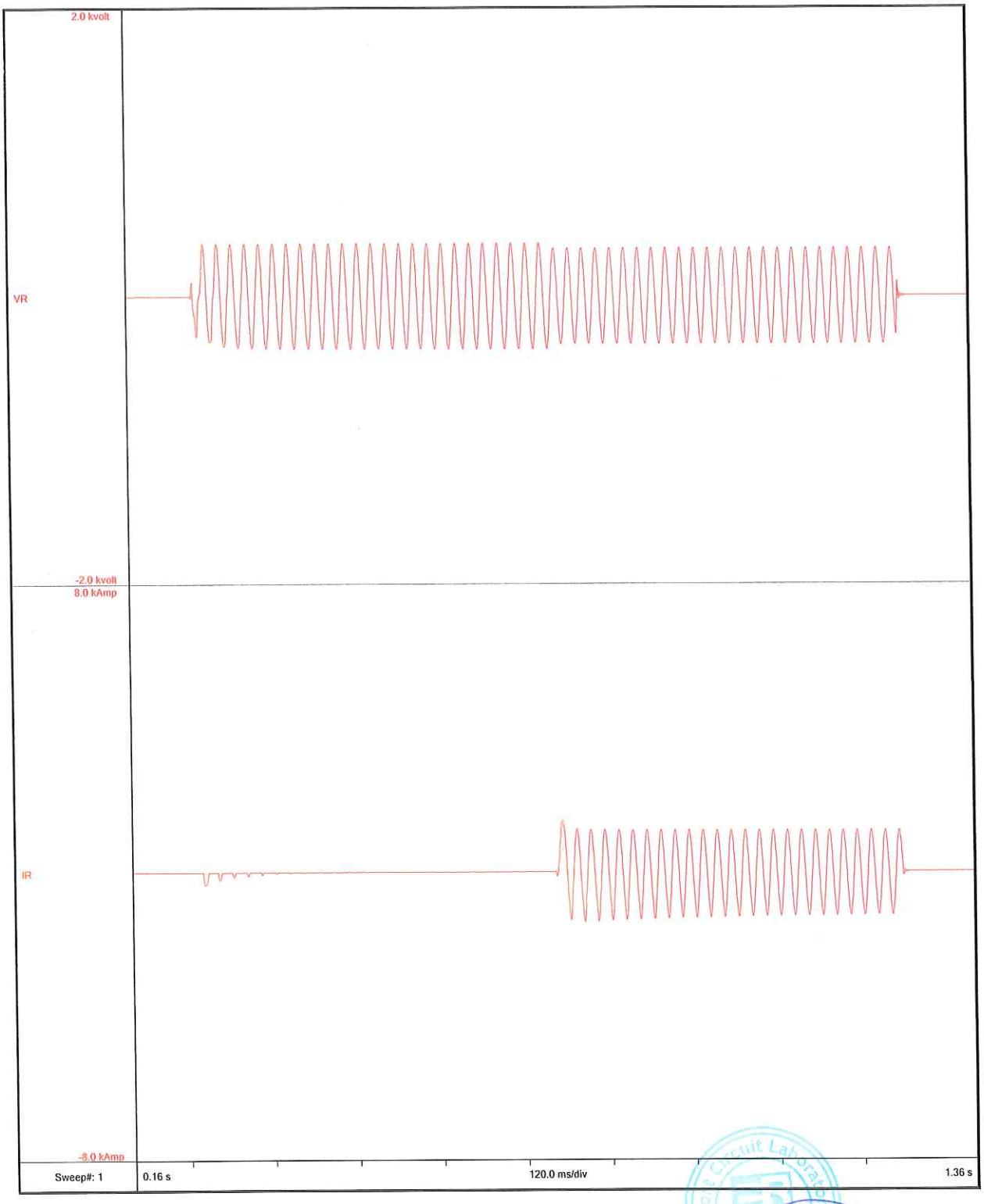


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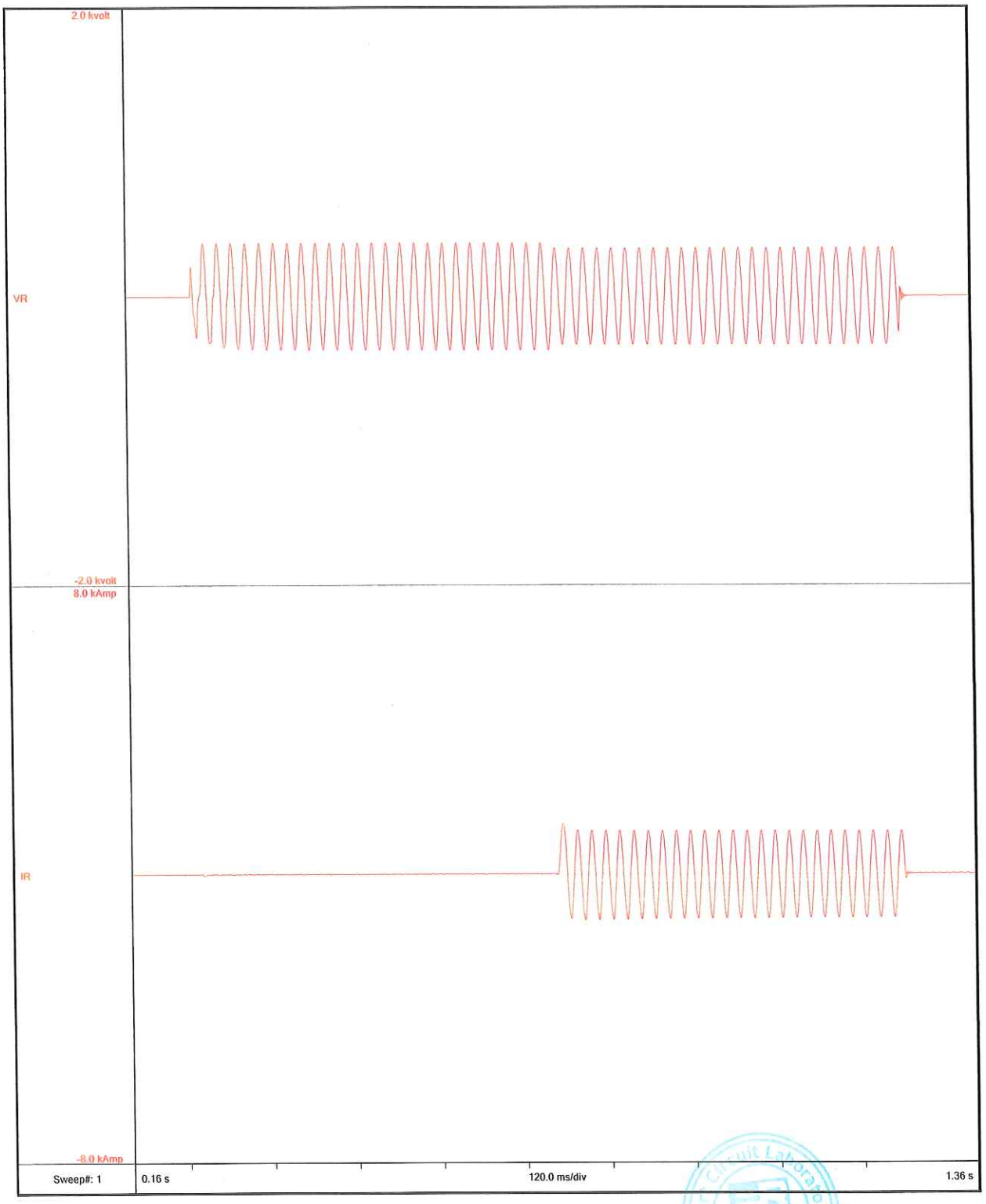


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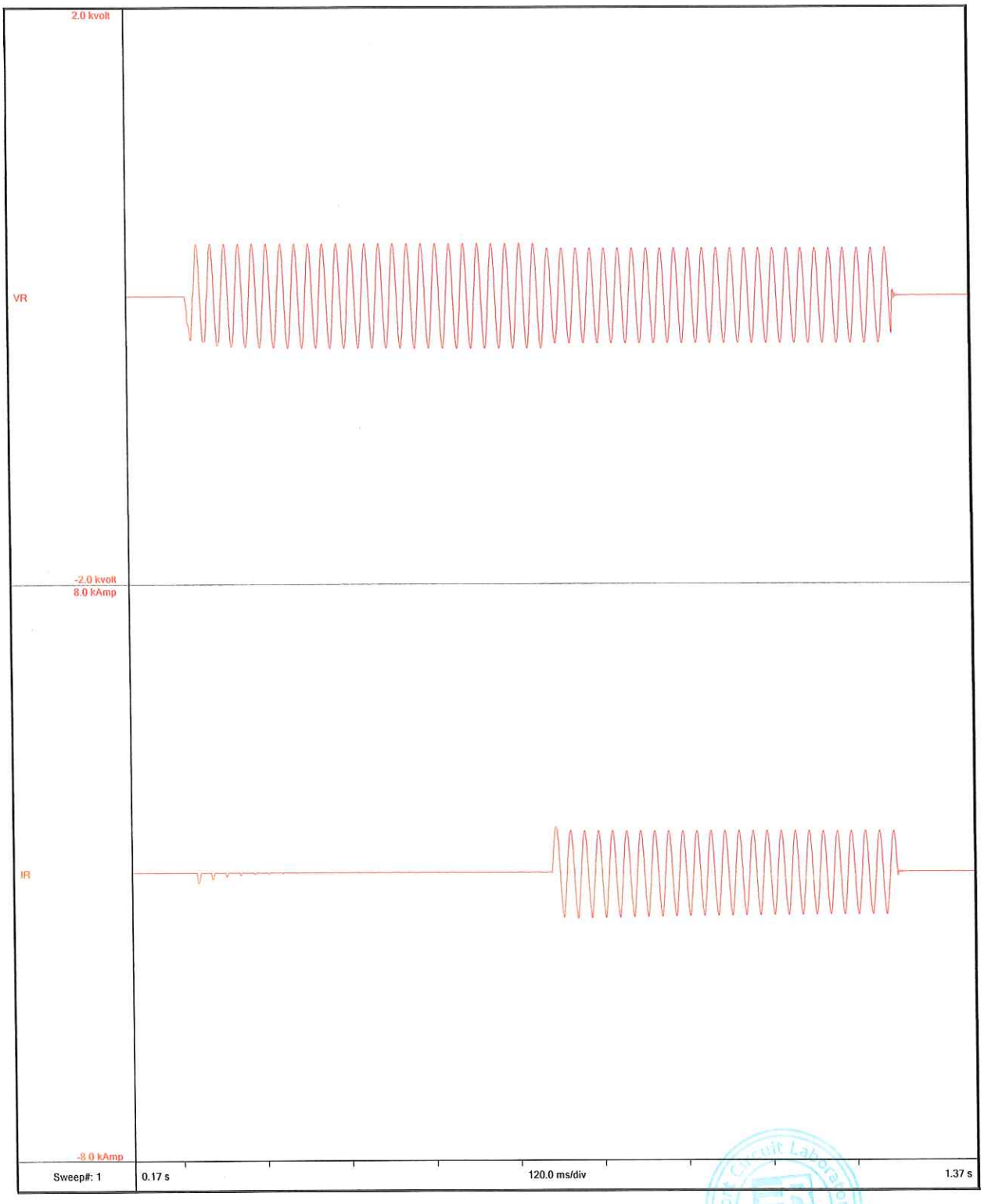


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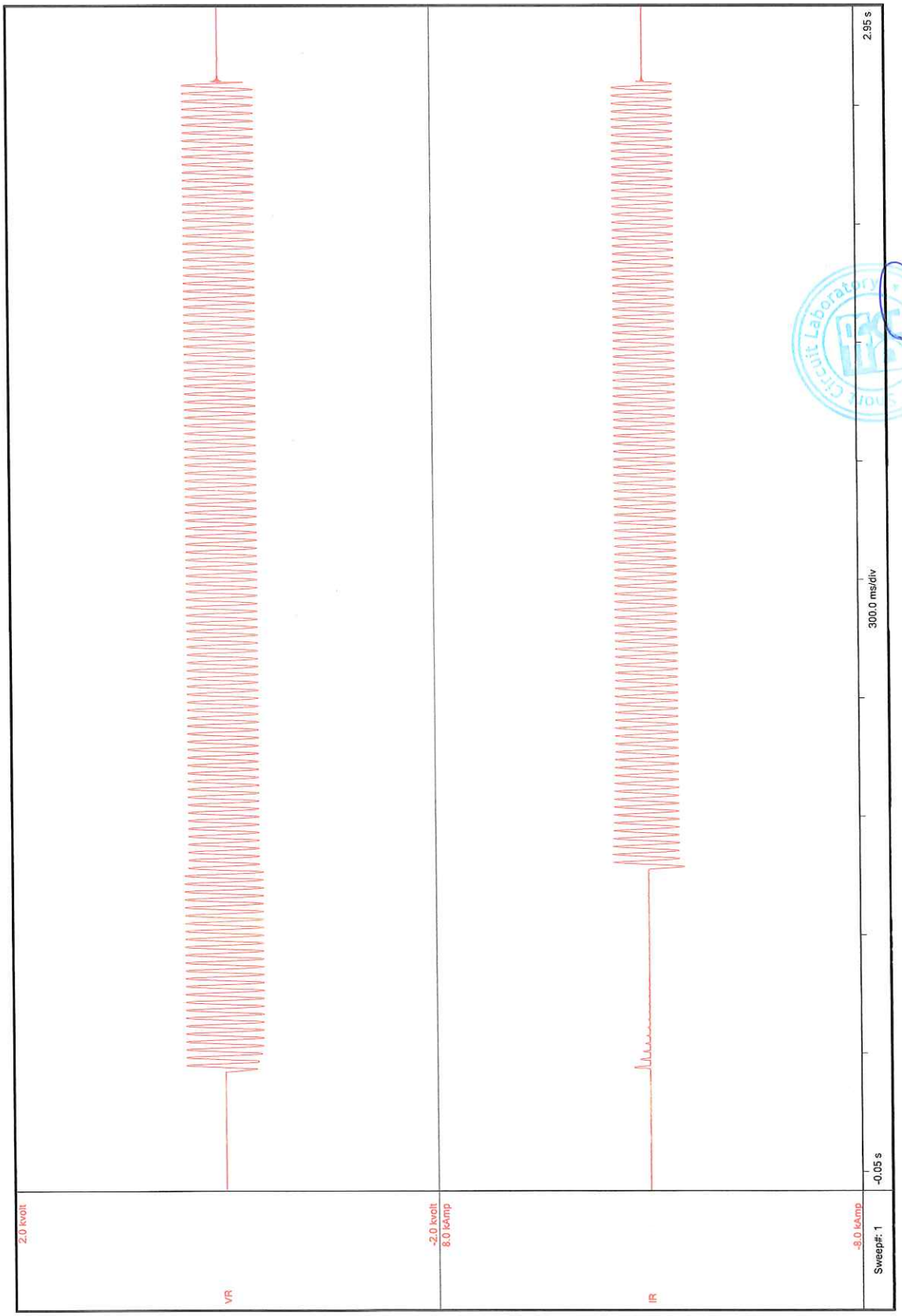


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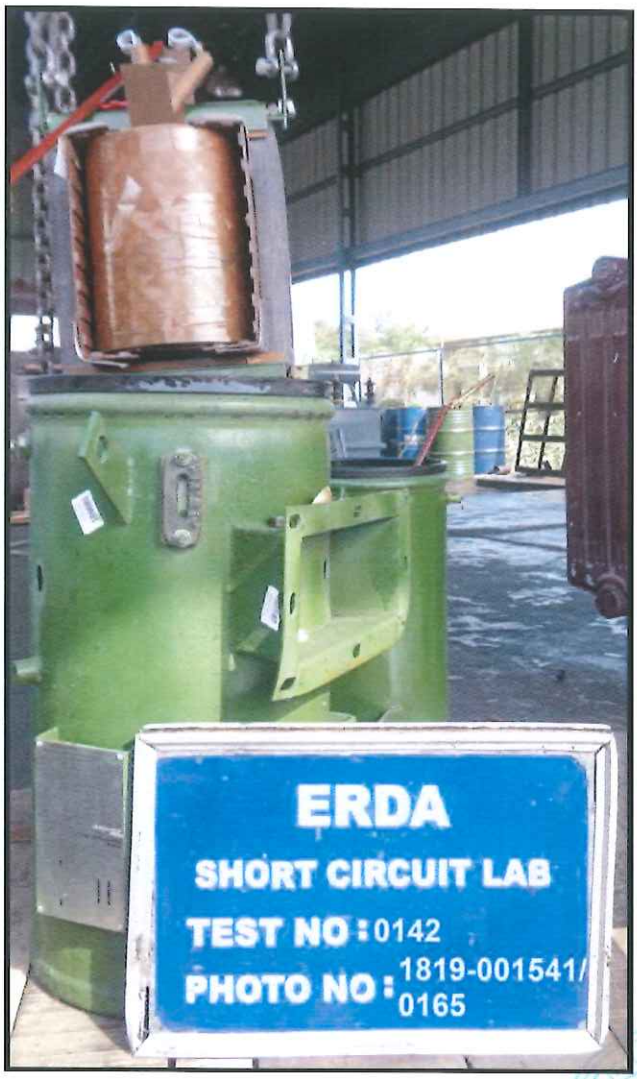
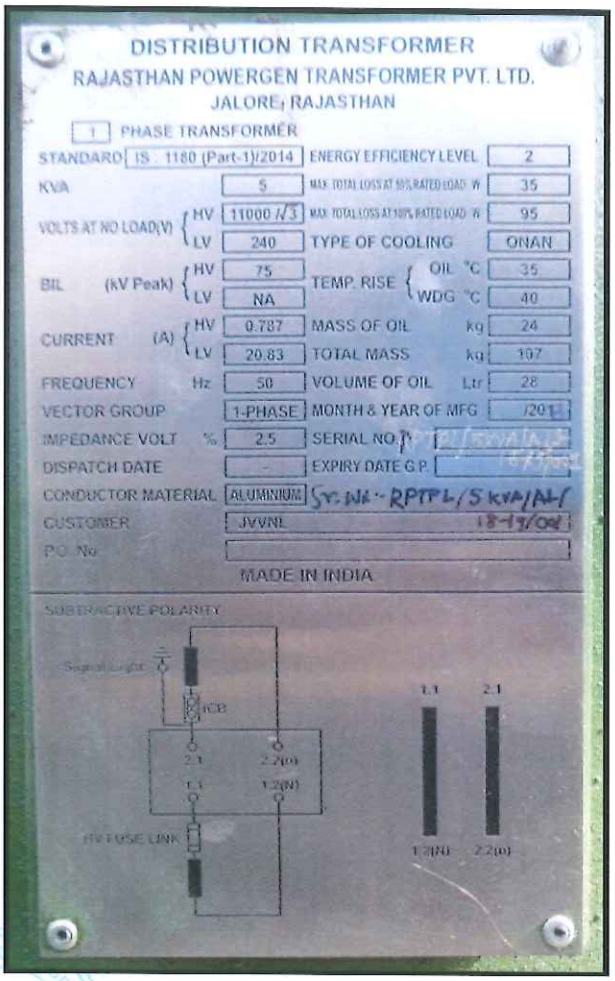
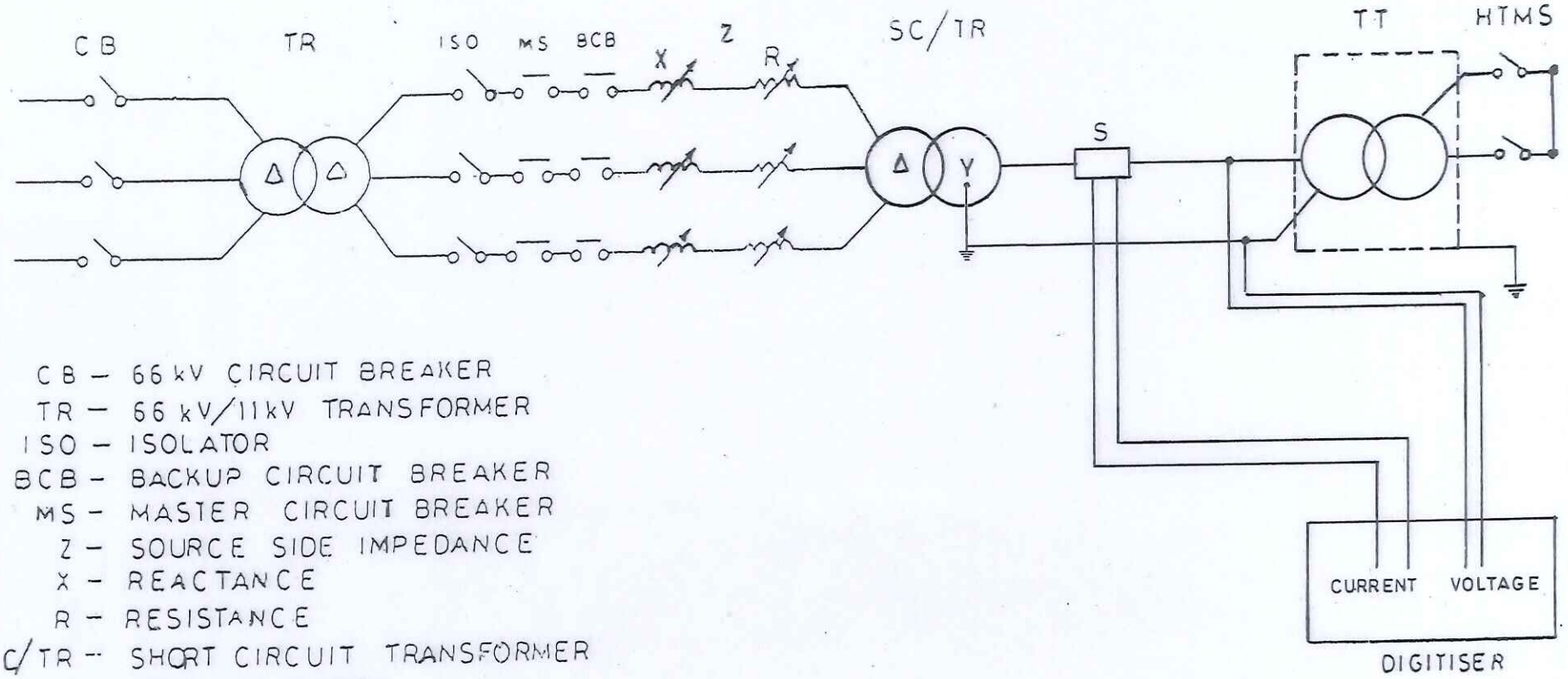
E-mail : erda@erda.org
Web : http://www.erda.org

**REPORT NO.:** RP-1819-010895 **DATE:** 21.06.2018




TC 2546900




CB – 66 kV CIRCUIT BREAKER
TR – 66 kV/11kV TRANSFORMER
ISO – ISOLATOR
BCB – BACKUP CIRCUIT BREAKER
MS – MASTER CIRCUIT BREAKER
Z – SOURCE SIDE IMPEDANCE
X – REACTANCE
R – RESISTANCE
SC/TR – SHORT CIRCUIT TRANSFORMER
HTMS – H.T. MAKE SWITCH
T.T. – TEST TRANSFORMER
S – CURRENT MEASURING DEVICE

**REPORT NO.:** PI-1819-0108J5
**DATE :** 21.06.2018

ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

SCHEMATIC CIRCUIT DIAGRAM

| DRN. BY | CKD. | DATE | DRG. NO. |
|---|---|---|---|
| S.B.S. | A.V.R. | 30.9.01 | OLSC/DTC/05 |

4 HOLES
of Ø3.6mm

## DISTRIBUTION TRANSFORMER

RAJASTHAN POWERGEN TRANSFORMER PVT LTD
JALORE, RAJASTHAN

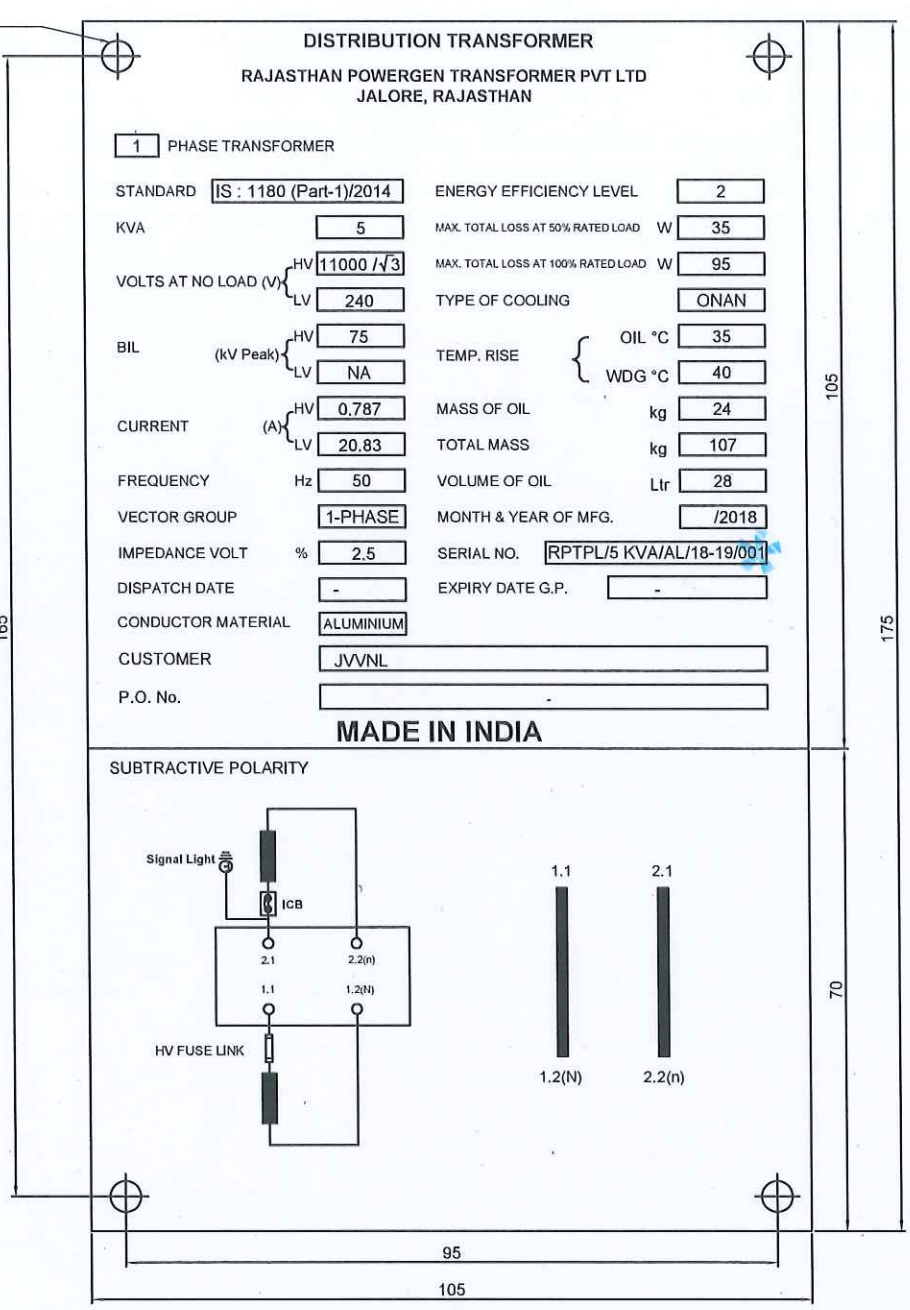
1 PHASE TRANSFORMER

| | | | |
|---|---|---|---|
| STANDARD | IS : 1180 (Part-1)/2014 | ENERGY EFFICIENCY LEVEL | 2 |
| KVA | 5 | MAX. TOTAL LOSS AT 50% RATED LOAD W | 35 |
| VOLTS AT NO LOAD (V) HV | 11000 /√3 | MAX. TOTAL LOSS AT 100% RATED LOAD W | 95 |
| VOLTS AT NO LOAD (V) LV | 240 | TYPE OF COOLING | ONAN |
| BIL (kV Peak) HV | 75 | TEMP. RISE OIL °C | 35 |
| BIL (kV Peak) LV | NA | TEMP. RISE WDG °C | 40 |
| CURRENT (A) HV | 0.787 | MASS OF OIL kg | 24 |
| CURRENT (A) LV | 20.83 | TOTAL MASS kg | 107 |
| FREQUENCY Hz | 50 | VOLUME OF OIL Ltr | 28 |
| VECTOR GROUP | 1-PHASE | MONTH & YEAR OF MFG. | /2018 |
| IMPEDANCE VOLT % | 2.5 | SERIAL NO. | RPTPL/5 KVA/AL/18-19/001 |
| DISPATCH DATE | - | EXPIRY DATE G.P. | - |
| CONDUCTOR MATERIAL | ALUMINIUM | | |
| CUSTOMER | JVVNL | | |
| P.O. No. | - | | |

**MADE IN INDIA**

SUBTRACTIVE POLARITY




Test Report No. RP-1819-0100291
Date 21.06.2018
Product 5 KVA DT
Verified by
Verification of this drawing by ERDA is limited to relevant dimensional checks only. Verified dimensions are marked with '*'

Short Circuit Laboratory ERDA Vadodara

NOTES :-
1- '*' MARKED ITEMS SHOULD BE PUNCHED AT THE TIME OF DISPATCH.
2- ALL LETTERS, FIGURES ETC. TO BE ENGRAVED & POLISHED BLACK.
3- MATERIAL - STAINLESS STEEL 0.9 WITH TOLERANCE ± 0.1 MM. THICK.
4- ALL DIMENSIONS ARE IN MM.

| Rev | Date | Draw | Checked | Approved | Description |
|---|---|---|---|---|---|
| 01 | 28.05.18 | | | | |
| 00 | 01.02.18 | | | | ORIGINAL ISSUE. |

Title : RATING & DIAGRAM PLATE

Work Order : ----

Rating : 5 KVA, 11/√3/0.240 KV, 1Ø, 50 Hz, TRF.

Drawing No. : RPTPL/RP/05 Rev. : 01

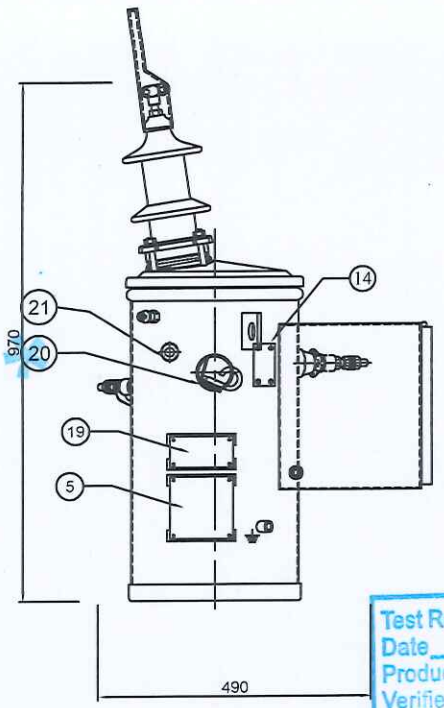
Sheet No. : 01

Total Sheets: 01

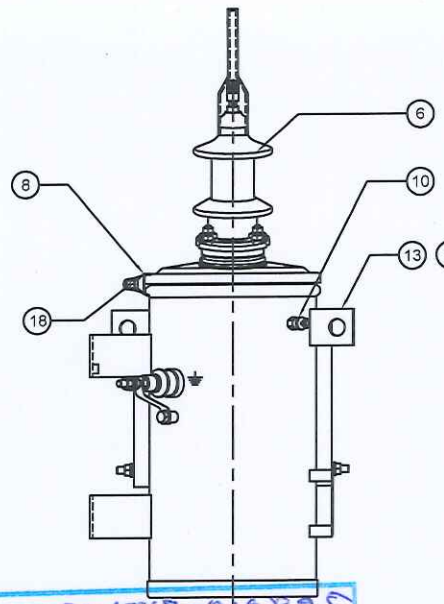
RAJASTHAN POWERGEN TRANSFORMER P. LTD.
Karola – Bhinmal Road, Karola, Sanchore – 343041 Dist – Jalore, Rajasthan ( India )

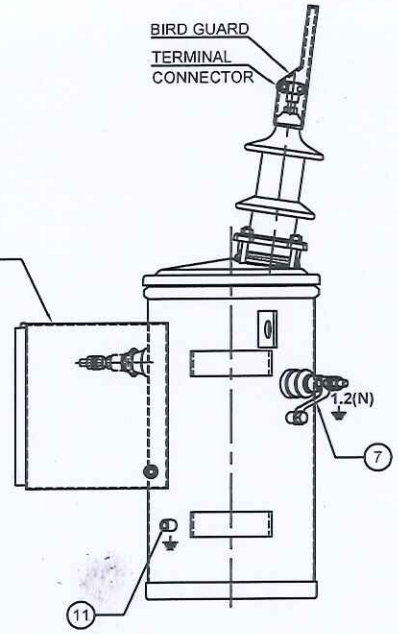
All dimensions are in millimeters unless otherwise stated. If in doubt - Please Ask !

Scale : NTS

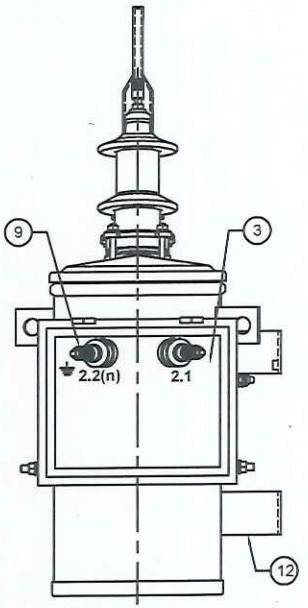



HV SIDE



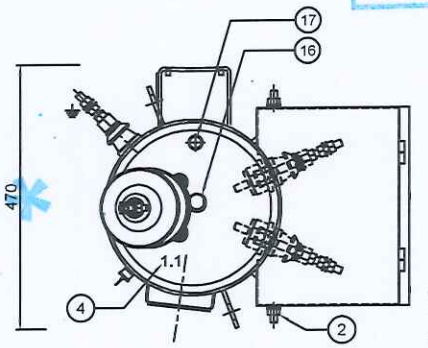



SIDE VIEW
(MOUNTING)




LV SIDE

Test Report No: BP-1819-0108295
Date: 21.06.2018
Product: 5 KVA DT
Verified by:
Verification of this drawing by ERDA is limited to relevant dimensional checks only.
Verified dimensions are marked with '*'




PLAN

| Tank dia | 325 mm |
|---|---|
| Tank height | 615 mm |

| WEIGHTS / QTY. | | |
|---|---|---|
| TRANSFORMER OIL | Ltrs. | 28 |
| TOTAL TRANSFORMER | Kg. | 107 |
| TRANSFORMER OIL | Kg. | 24 |
| TANK & FITTINGS | Kg. | 28 |
| CORE COIL ASSY | Kg. | 55 |

| AIR CLEARANCES (MM) | | |
|---|---|---|
| VOLTAGE | H.V. | L.V. (enclosed) |
| PHASE TO PHASE | NA | NA |
| PHASE TO EARTH | 140 | 20 |

Notes :-
1- All dimensions are in mm. Tolerance ±5%
2- This drawing shows only general disposition of fittings.
3- Tank side plate - 2.0 mm. Thk.M.S.
Top & bottom - 2.5 mm. Thk.M.S.
4- Paint Shade : Olive Green Color conforming to No. 220 of IS : 5 / 1961
* Not provided at the time of Type Testing

| S. No. | Description | Qty. |
|---|---|---|
| 21 | Signal light* | 1 |
| 20 | Internal Circuit Breaker handle* | 1 |
| 19 | TECHNICAL PLATE* | 1 |
| 18 | TOP COVER ANTI THEFT BOLT | - |
| 17 | THERMOMETER POCKET WITH CAP | 1 |
| 16 | OIL FILLING HOLE WITH WELDED COVER AND WITH EXTENDED PIPE as per IS 1 1/4" | 1 |
| 15 | - | - |
| 14 | OIL LEVEL GUAGE | 1 |
| 13 | Lifting lugs for complete unit | 2 |
| 12 | Pole mounting bracket (as per spec) | 2 |
| 11 | Tank Earthing terminal | 2 |
| 10 | Pressure relief device | 1 |
| 9 | L.V. Bushing | 2 |
| 8 | Top cover rim | - |
| 7 | H.V. Neutral bushing | 1 |
| 6 | H.V. Bushing | 1 |
| 5 | Rating & terminal marking plate | 1 |
| 4 | H.V. Terminal marking | 1 set |
| 3 | L.V. Terminal marking | 1 set |
| 2 | Earthing terminal (LV box) | 2 |
| 1 | LV cable box* | 1 |

| Rev | Date | Draw | Checked | Approved | Description |
|---|---|---|---|---|---|
| 01 | 28.05.18 | | | | |
| 00 | 01.02.18 | | | | ORIGINAL ISSUE. |

Title : OUTLINE GENERAL ARRANGEMENT

Work Order : ---

Rating : 5 KVA, 11/√3/0.240 KV, 1Ø, 50 Hz, TRF.

Drawing No. : RPTPL/OGA/05 Rev. : 01

Sheet No. : 01 Total Sheets: 01

Scale : N.T.S

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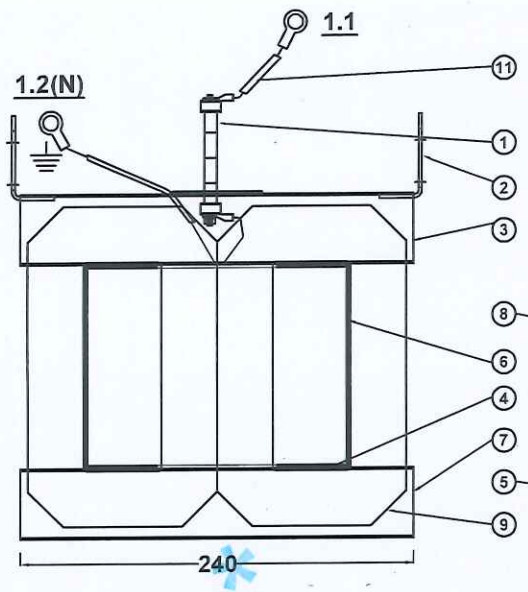
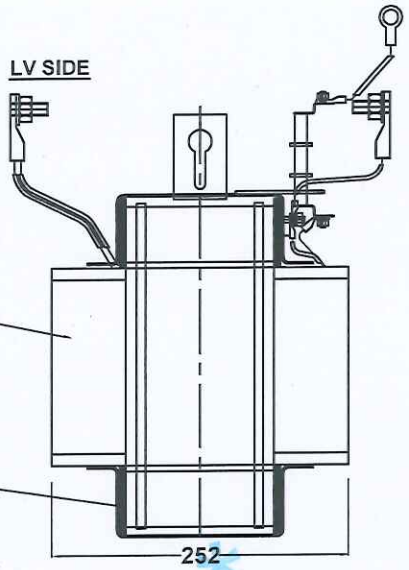
Karola – Bhinmal Road, Karola, Sanchore – 343041 Dist – Jalore, Rajasthan ( India )

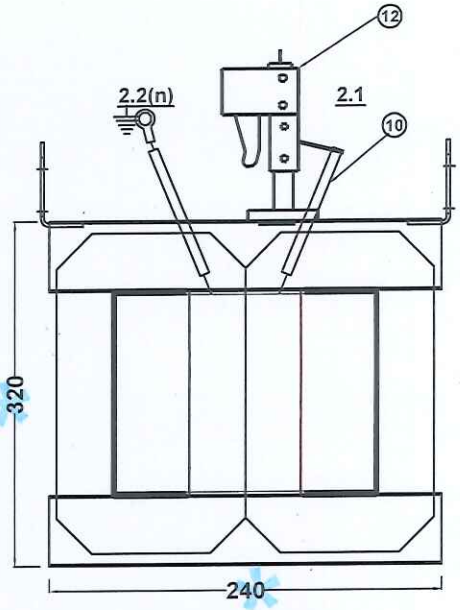
All dimensions are in millimeters unless otherwise stated. If in doubt - Please Ask !




H.V. SIDE VIEW




SIDE VIEW




L.V. SIDE VIEW

| Conductor sizes | | |
|---|---|---|
| | LV | HV |
| Bare | 10.9 x 3.0 | 1.27 Dia |
| Covered | 11.3 x 3.4 | 1.35 Dia |
| Aluminium | DPC | Polyesterimide enamel Class H |

| | |
|---|---|
| Core Window Ht. : | 241 mm |
| Core build up : | 2 x 30 mm |
| Core Sheet width : | 135 mm |

| COIL DIMENSIONS | | |
|---|---|---|
| | LV | HV |
| ID | 66 x 141 | 120 x 192 |
| OD | 112 x 184 | 180 x 252 |
| AXIAL HT. | 231 | |

| SL.No. | LIST OF FITTINGS | Qty. |
|---|---|---|
| 12 | INTERNAL CIRCUIT BREAKER* | 1 |
| 11 | HV LEAD | - |
| 10 | LV LEAD | - |
| 9 | CRGO WOUND CORE | 2 |
| 8 | LV & HV COIL (Aluminium) | 1 set |
| 7 | BOTTOM CORE CLAMP | 1 |
| 6 | COIL SEPARATOR | 1 set |
| 5 | CHANNEL SEPARATOR | 1 set |
| 4 | END INSULATION | 1 set |
| 3 | TOP CORE CLAMP | 1 |
| 2 | LOCKING CUM LIFTING LUG | 2 |
| 1 | HV FUSE LINK* | 1 |

**Notes :-**

1- All dimensions are in mm. Tolerance ±5%

2- This drawing shows only general disposition of fittings.

* Not provided at the time of Type Testing

Test Report No. RP-1819-016895
Date 21.06.2018
Product 5 KVA M
Verified by
Verification of this drawing by ERDA is limited to relevant dimensional checks only. Verified dimensions are marked with *

Short Circuit Laboratory ERDA Vadodara

| Rev | Date | Draw | Checked | Approved | Description |
|---|---|---|---|---|---|
| 01 | 28.05.18 | | | | |
| 00 | 01.02.18 | | | | ORIGINAL ISSUE. |

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Karola – Bhinmal Road, Karola, Sanchore – 343041 Dist – Jalore, Rajasthan ( India )

Title : INTERNAL CONSTRUCTIONAL DETAIL DRAWING

Work Order : ---

Rating : 5 KVA, 11/√3/0.240 KV, 1Ø, 50 Hz, TRF.

Drawing No. : RPTPL/IC/05 Rev. : 01

Sheet No. : 01 Total Sheets: 01

All dimensions are in millimeters unless otherwise stated. If in doubt - Please Ask !

Scale : N.T.S