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# TEST REPORT



| | |
|---|---|
| **NAME & ADDRESS OF CUSTOMER**<br><br>**RAJASTHAN POWERGEN TRANSFORMER PVT. LTD.**<br>Khasra No. 911-914,<br>Karola – Bhinmal Road, Karola,<br>Sanchore, Rajasthan-343041<br>(India) | **REPORT NO.:** RP-1718-055680<br>**DATE:** 07.02.2018<br>**CUSTOMER REF. No.:** RPTPL/ERDA/TT/37/ 2017-18 — **DATED:** 01.01.2018<br>**DATE OF SAMPLE RECEIPT:** 02.01.2018 — **DATE OF TESTING:** 10.01.2018 to 02.02.2018 |
| **SAMPLE DESCRIPTION**<br><br>**16 kVA Distribution Transformer**<br><br>11000/433 Volts,<br><br>0.84/21.33 Amp.,<br><br>Oil filled,<br><br>Vector Group: Dyn-11,<br><br>**ENERGY EFFICIENCY LEVEL:** 2<br><br>Further details as per sheet No. 3 of 9. | **SAMPLE IDENTIFICATION**<br><br>**ERDA SAMPLE CODE NO.:** ERDA-00234414<br><br>**SERIAL NO.:** RPTPL-001<br><br>**DRAWING NO.:**<br>RPTPL/RP16/01/02/18 01 of 02 REV.NO.01<br>RPTPL/RP16/02/02/18 02 of 02 REV.NO.02<br>RPTPL-GA-16-02-18 REV. NO. 01<br>RPTPL-IA-16-003-14 REV. NO. 01<br>RPTPL-TD-16-004-14 REV. NO. 01<br><br>**YEAR OF MFG.:** 2018 |
| **TEST DETAILS**<br>Short-circuit withstand test<br>[Cl. No. (17 & 21.3 c)] | **TEST SPECIFICATIONS**<br>IS 1180 (Part 1): 2014<br>[Amendment No. 1 & 2] |

**ENCLOSURES:**

| | |
|---|---|
| Number of oscillograms | : Eleven |
| Number of photograph | : One |
| Number of test circuit diagram | : One |
| Number of drawings | : Five |

**REMARKS:** The sample **conforms** to the requirements of standard for short-circuit withstand test.

**PREPARED BY** **CHECKED BY** **K. B. PATEL**
**APPROVED BY**

**NOTE:**
1. This report relates only to the particular sample received for testing in good condition at ERDA.
2. This report cannot be reproduced in part under any circumstances.
3. Publication of this report requires prior permission in writing from Director, ERDA.
4. Only test asked for by customer have been carried out.
5. In case of any dispute, Vadodara will be the exclusive jurisdiction & shall be construed as where the cause has arised.

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| 1. | Technical specifications of test object assigned by customer | Sheet No. 3 of 9 |
| 2. | Routine test results before short circuit | Sheet No. 4 of 9 to 5 of 9 |
| 3. | Short-circuit withstand test | Sheet No. 6 of 9 to 7 of 9 |
| 4. | Routine test results after short circuit | Sheet No. 8 of 9 to 9 of 9 |
| 5. | Oscillogram No. | 1537/01 to 1537/11 |
| 6. | Photograph No. | 1718-016517/1463 |
| 7. | Test circuit diagram No. | OLSC/DTC/01 |
| 8. | Drawing No. | RPTPL/RP16/01/02/18 01 of 02 REV.NO.01<br>RPTPL/RP16/02/02/18 02 of 02 REV.NO.02<br>RPTPL-GA-16-02-18 REV. NO. 01<br>RPTPL-IA-16-003-14 REV. NO. 01<br>RPTPL-TD-16-004-14 REV. 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 | : **16 kVA Distribution Transformer** |
| 3. | Standard No. | : [Cl. No. (17 & 21.3 c)] of IS 1180 (Part 1): 2014 [Amendment No. 1 & 2] |
| 4. | Serial No. | : RPTPL-001 |
| 5. | Energy efficiency level | : 2 |
| 6. | Type | : Outdoor, Oil Cooled |
| 7. | kVA rating | : 16 |
| 8. | Rated voltage H.V. (Volts) | : 11000 |
| | L.V. (Volts) | : 433 |
| 9. | Rated current H.V. (Amp.) | : 0.84 |
| | L.V. (Amp.) | : 21.33 |
| 10. | Number of phases | : 3 |
| 11. | Connection H.V./L.V. | : Delta/Star |
| 12. | Frequency (Hz.) | : 50 |
| 13. | Type of cooling | : ONAN |
| 14. | Temperature rise of oil/winding | : 35°C/40°C |
| 15. | Percentage Impedance | : 4.5% |
| 16. | Primary winding conductor | : SE Aluminium wire, bare dia. 0.92mm |
| 17. | Secondary winding conductor | : DPC Aluminium strip, bare size (3.4mm x 5.75mm) |
| 18. | Quantity of oil (Litre) | : 82 |
| 19. | Weight of oil (kg.) | : 70 |
| 20. | Weight of core and winding (kg.) | : 105 |
| 21. | Total weight (kg.) | : 303 |
| 22. | Vector group | : Dyn-11 |
| 23. | Year of manufacture | : 2018 |
| 24. | Insulation level H.V. | : 28 kVrms |
| 25. | Insulation level L.V. | : 03 kVrms |
| 26. | Total losses at 75°C (Watts) | : 135 Max. (at 50 % load) |
| 27. | Total losses at 75°C (Watts) | : 440 Max. (at 100 % load) |

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## ROUTINE TEST RESULTS BEFORE SHORT CIRCUIT

a) MEASUREMENT OF WINDING RESISTANCE

| Measurement at average oil temperature: 27.6°C | | | | | |
|---|---|---|---|---|---|
| LV Winding resistance (mΩ) | | | HV Winding Resistance (Ω) | | |
| u – v | v – w | w – u | U – V | V – W | W – U |
| 165.93 | 166.16 | 166.16 | 124.57 | 124.03 | 124.69 |

b) MEASUREMENT OF VOLTAGE RATIO AND CHECK OF PHASE DISPLACEMENT

Vector group: Dyn-11 was verified.

| Rated turns Ratio | Measured turns ratio between Terminals | | | | | |
|---|---|---|---|---|---|---|
| | U-V/u-n | Difference % | V-W/v-n | Difference % | W-U/w-n | Difference % |
| 44.001 | 44.020 | 0.043 | 44.027 | 0.059 | 44.039 | 0.086 |

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

Average oil temp.: 26.8°C

| Test current (Amp.) Iavg | Impedance voltage (V) Vavg. | Frequency (Hz.) | Load loss measured (Watts) | Impedance Voltage (%Z) at 50 Hz. | Load loss computed at 75°C (Watts) | %Z at 75°C |
|---|---|---|---|---|---|---|
| 0.837 | 505.796 | 49.994 | 250.027 | 4.616 | 297 | 4.720 |

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

Average oil temp.: 26.8°C

| Test current (Amp.) Iavg. | Impedance voltage (V) Vavg. | Frequency (Hz.) | Load loss measured (Watts) | Load loss computed at 75°C (Watts) |
|---|---|---|---|---|
| 0.419 | 253.240 | 50.003 | 62.782 | 74 |

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e) MEASUREMENT OF NO-LOAD LOSS AND CURRENT

Average oil temp.: 26.8°C

| Applied Voltage (V) Vavg. | Current (Amp.) Iavg. | Frequency (Hz.) | Losses Measured (Watts) |
|---|---|---|---|
| 433.112 | 0.334 | 50.006 | 57 |

- Total losses at 75°C: 131 Watts (at 50 % load)
- Total losses at 75°C: 354 Watts (at 100% load)

f) MEASUREMENT OF INSULATION RESISTANCE

Average oil temp.: 27.6°C, Measured at Voltage: 1000 V DC

| | IR value (MΩ) |
|---|---|
| HV to LV winding | > 2000 |
| HV winding to LV + EARTH | > 2000 |
| LV winding to HV + EARTH | > 2000 |

g) INDUCED OVER-VOLTAGE WITHSTAND TEST

| Sr. No. | Test | Applied voltage (V) | Applied Freq. (Hz.) | Duration (sec.) | Remarks |
|---|---|---|---|---|---|
| 1. | Between LV windings with tank connected to earth. | 866 | 100 | 60 | 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 | 28 | 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 the short-circuit withstand test was performed on the high voltage winding connected to three phase-balanced source and low voltage winding short circuited through current measuring instruments. Test conducted with pre set short circuit as per schematic circuit diagram No.: OLSC/DTC/01.

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

Supply Frequency: 50 Hz.

| Test No. | Oscillogram No. | Applied voltage (kVrms) | Short circuit current on LV (A) | | | Duration (sec.) | Remarks |
|---|---|---|---|---|---|---|---|
| | | | Peak | RMS | Avg. | | |
| 1. | 1537/01 | - | -<br>651<br>- | 355<br>363<br>347 | 355 | 0.1 | Calibration shot |
| 2. | 1537/02 | 11 | -<br>857<br>- | 452<br>461<br>441 | 451 | 0.5 | No Abnormality |
| 3. | 1537/03 | 11 | -<br>843<br>- | 453<br>461<br>440 | 451 | 0.5 | No Abnormality |
| 4. | 1537/04 | 11 | -<br>853<br>- | 452<br>462<br>441 | 452 | 0.5 | No Abnormality |
| 5. | 1537/05 | 11 | 859<br>-<br>- | 452<br>460<br>439 | 450 | 0.5 | No Abnormality |
| 6. | 1537/06 | 11 | 790<br>-<br>- | 449<br>460<br>439 | 449 | 0.5 | No Abnormality |
| 7. | 1537/07 | 11 | 809<br>-<br>- | 448<br>459<br>438 | 448 | 0.5 | No Abnormality |
| 8. | 1537/08 | 11 | -<br>-<br>847 | 450<br>457<br>436 | 448 | 0.5 | No Abnormality |
| 9. | 1537/09 | 11 | -<br>-<br>846 | 450<br>458<br>437 | 448 | 0.5 | No Abnormality |
| 10. | 1537/10 | 11 | -<br>-<br>851 | 450<br>458<br>437 | 448 | 0.5 | No Abnormality |
| 11. | 1537/11 | 11 | -<br>836<br>- | 447<br>458<br>437 | 447 | 2.0 | Thermal Shot<br>No Abnormality |

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

LV winding was short circuited. Three phase 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 | | |
|---|---|---|---|---|---|---|---|---|
| | | | U | V | W | U | V | W |
| 1. | Before test | | 4.38 | 4.39 | 4.37 | - | - | - |
| 2. | After the test no. | 2. | 4.37 | 4.39 | 4.37 | -0.23 | 0.00 | 0.00 |
| 3. | After the test no. | 3. | 4.38 | 4.39 | 4.37 | 0.00 | 0.00 | 0.00 |
| 4. | After the test no. | 4. | 4.38 | 4.39 | 4.37 | 0.00 | 0.00 | 0.00 |
| 5. | After the test no. | 5. | 4.38 | 4.39 | 4.37 | 0.00 | 0.00 | 0.00 |
| 6. | After the test no. | 6. | 4.38 | 4.39 | 4.37 | 0.00 | 0.00 | 0.00 |
| 7. | After the test no. | 7. | 4.38 | 4.39 | 4.37 | 0.00 | 0.00 | 0.00 |
| 8. | After the test no. | 8. | 4.38 | 4.39 | 4.37 | 0.00 | 0.00 | 0.00 |
| 9. | After the test no. | 9. | 4.38 | 4.39 | 4.37 | 0.00 | 0.00 | 0.00 |
| 10. | After the test no. | 10. | 4.37 | 4.39 | 4.37 | -0.23 | 0.00 | 0.00 |
| 11. | After the test no. | 11. | 4.38 | 4.39 | 4.37 | 0.00 | 0.00 | 0.00 |

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## ROUTINE TEST RESULTS AFTER SHORT CIRCUIT

a) MEASUREMENT OF WINDING RESISTANCE

| Measurement at average oil temperature: 29.3°C | | | | | |
|---|---|---|---|---|---|
| LV Winding resistance (mΩ) | | | HV Winding Resistance (Ω) | | |
| u – v | v – w | w – u | U – V | V – W | W – U |
| 171.15 | 171.29 | 171.33 | 127.98 | 127.41 | 128.07 |

b) MEASUREMENT OF VOLTAGE RATIO AND CHECK OF PHASE DISPLACEMENT

Vector group: Dyn-11 was verified.

| Rated turns Ratio | Measured turns ratio between Terminals | | | | | |
|---|---|---|---|---|---|---|
| | U-V/u-n | Difference % | V-W/v-n | Difference % | W-U/w-n | Difference % |
| 44.001 | 44.022 | 0.048 | 44.028 | 0.061 | 44.040 | 0.089 |

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

Average oil temp.: 29.5°C

| Test current (Amp.) Iavg | Impedance voltage (V) Vavg. | Frequency (Hz.) | Load loss measured (Watts) | Impedance Voltage (%Z) at 50 Hz. | Load loss computed at 75°C (Watts) | %Z at 75°C |
|---|---|---|---|---|---|---|
| 0.837 | 507.945 | 50.085 | 256.563 | 4.626 | 303 | 4.729 |

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

Average oil temp.: 29.5°C

| Test current (Amp.) Iavg. | Impedance voltage (V) Vavg. | Frequency (Hz.) | Load loss measured (Watts) | Load loss computed at 75°C (Watts) |
|---|---|---|---|---|
| 0.419 | 254.174 | 50.091 | 64.308 | 76 |

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e) MEASUREMENT OF NO-LOAD LOSS AND CURRENT

Average oil temp.: 29.5°C

| Applied Voltage (V) Vavg. | Current (Amp.) Iavg. | Frequency (Hz.) | Losses Measured (Watts) |
|---|---|---|---|
| 433.216 | 0.330 | 50.07 | 56 |

- Total losses at 75°C: 132 Watts (at 50 % load)
- Total losses at 75°C: 359 Watts (at 100% load)

f) MEASUREMENT OF INSULATION RESISTANCE

Average oil temp.: 29.3°C, Measured at Voltage: 1000 V DC

| | IR value (MΩ) |
|---|---|
| HV to LV winding | > 2000 |
| HV winding to LV + EARTH | > 2000 |
| LV winding to HV + EARTH | > 2000 |

g) INDUCED OVER-VOLTAGE WITHSTAND TEST

| Sr. No. | Test | Applied voltage (V) | Applied Freq. (Hz.) | Duration (sec.) | Remarks |
|---|---|---|---|---|---|
| 1. | Between LV windings with tank connected to earth | 866 | 100 | 60 | 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 | 28 | 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 spacers : Intact
3) 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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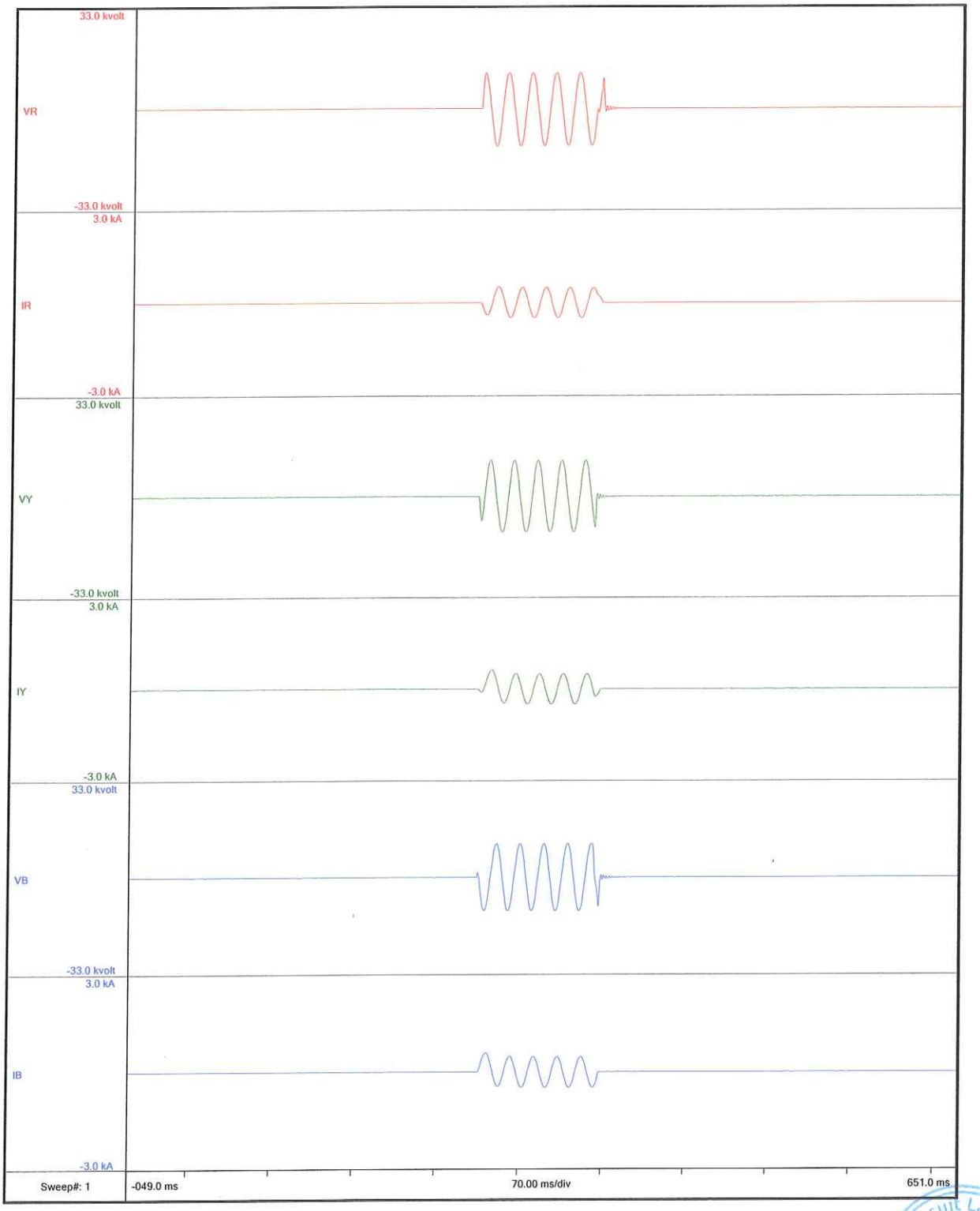


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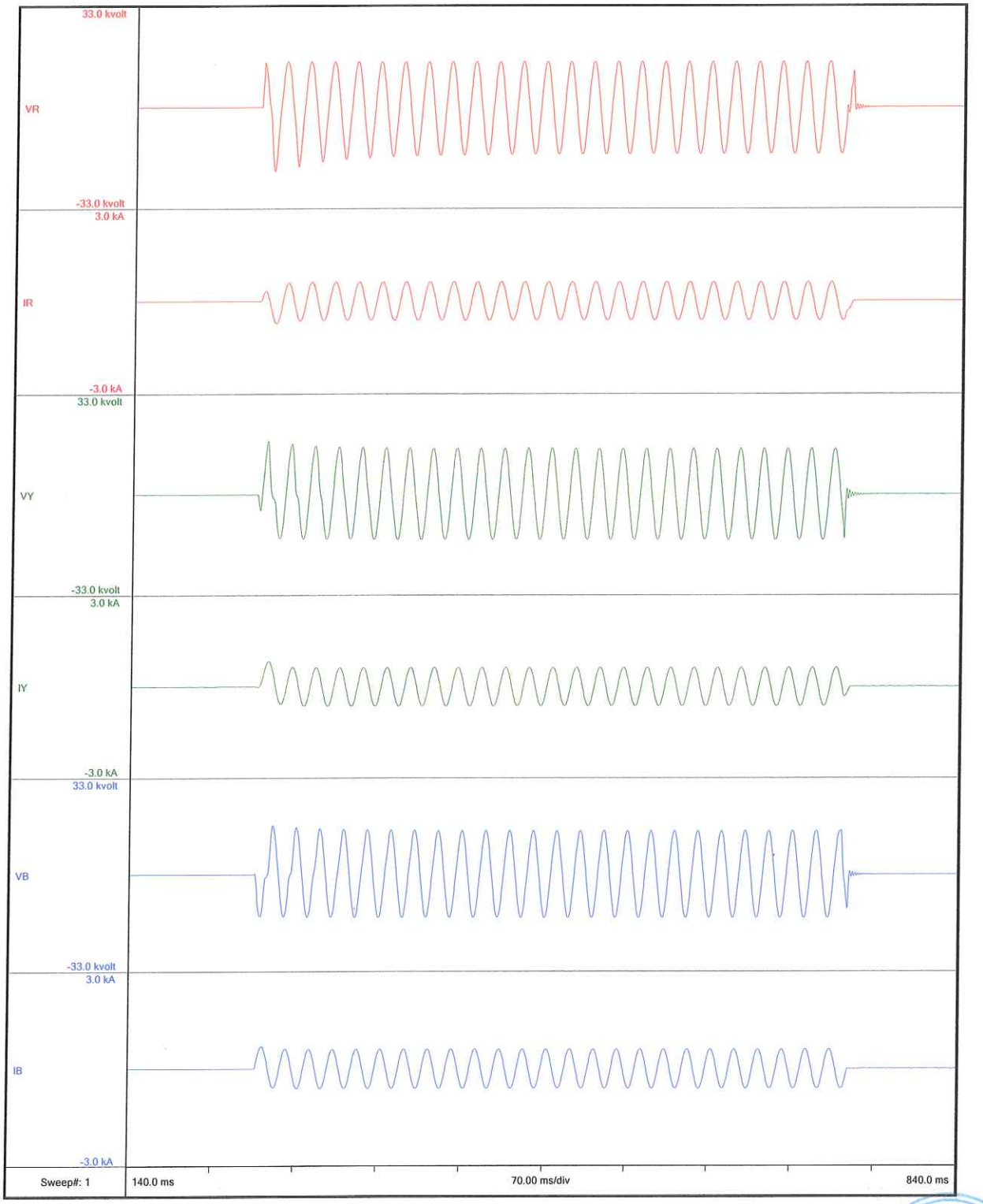


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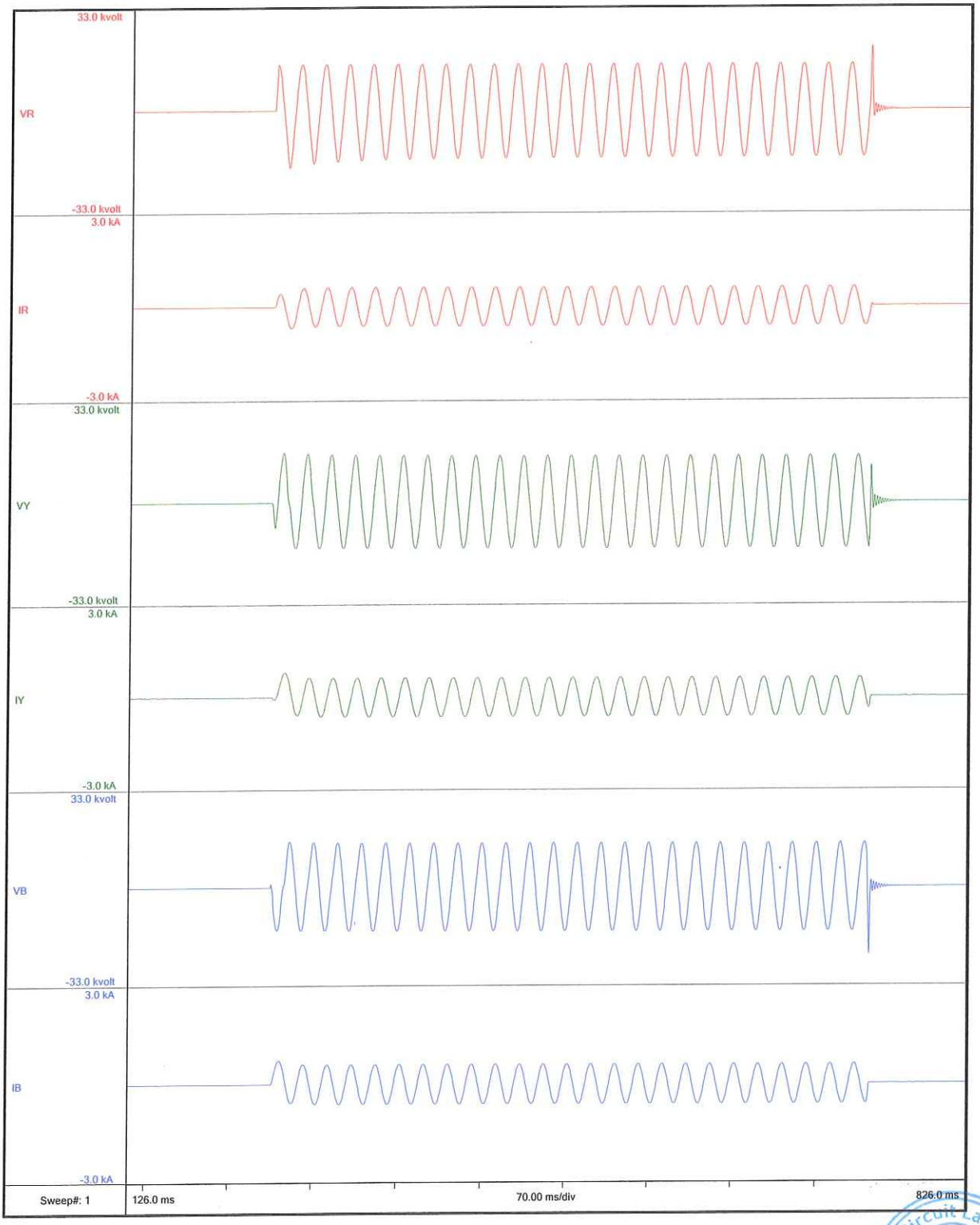


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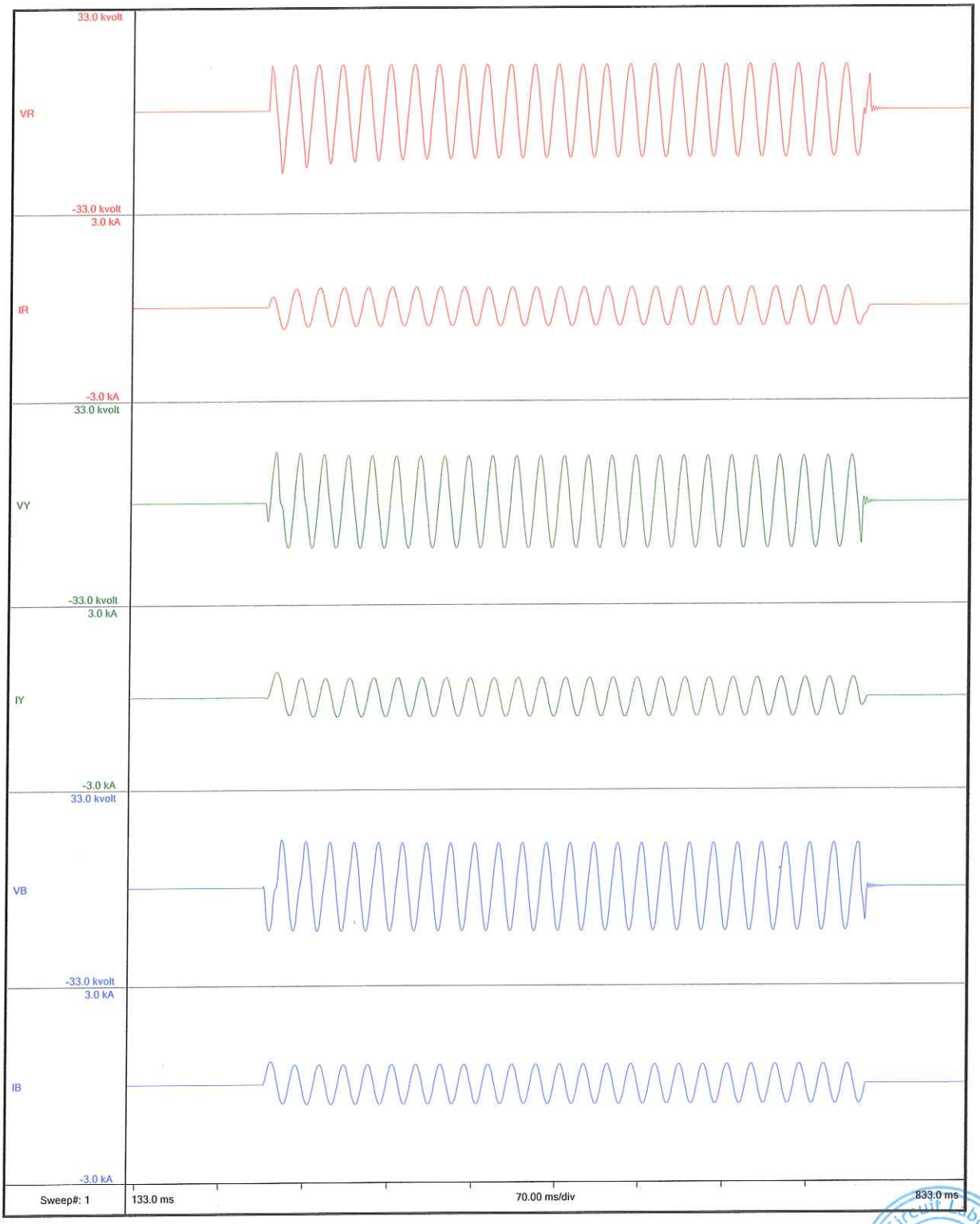


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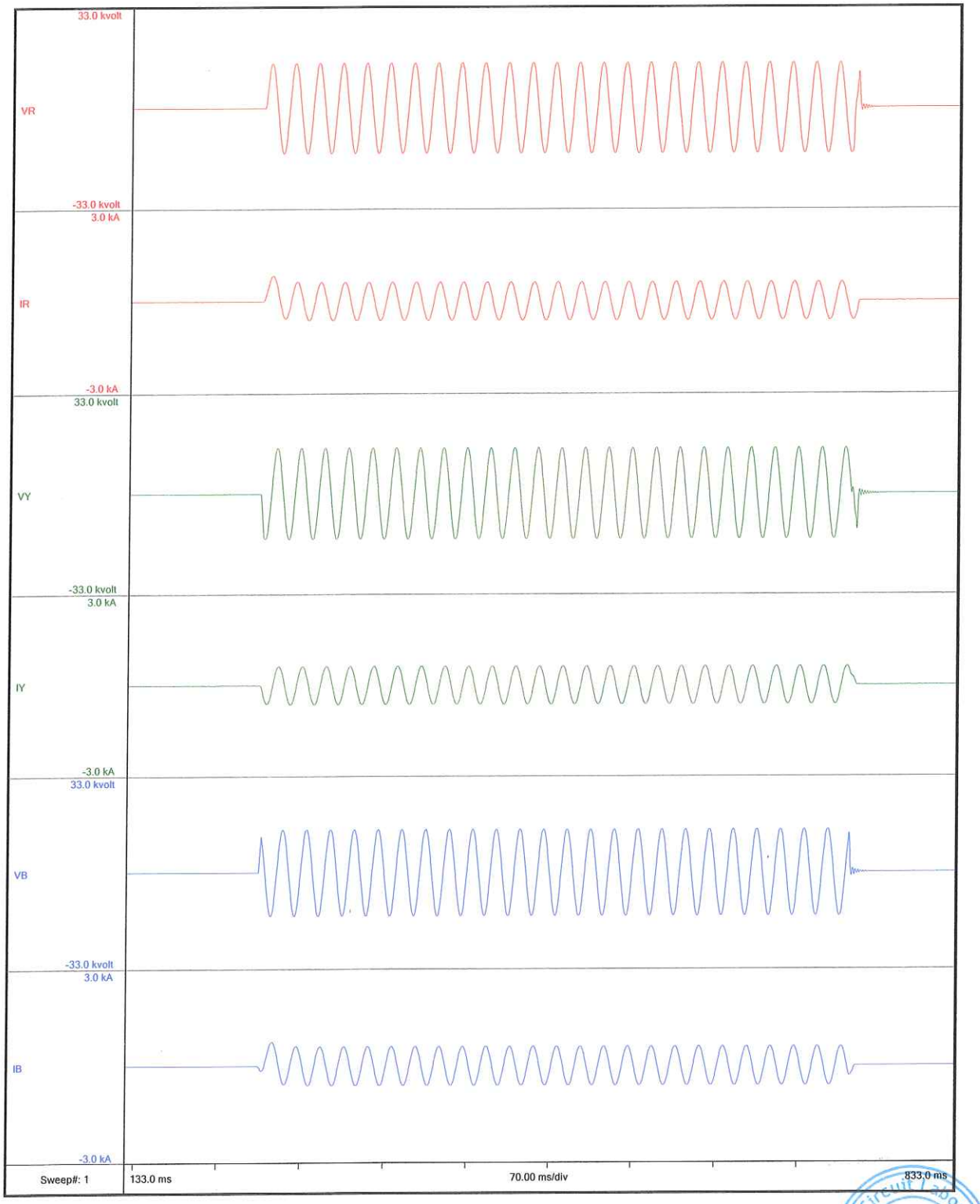


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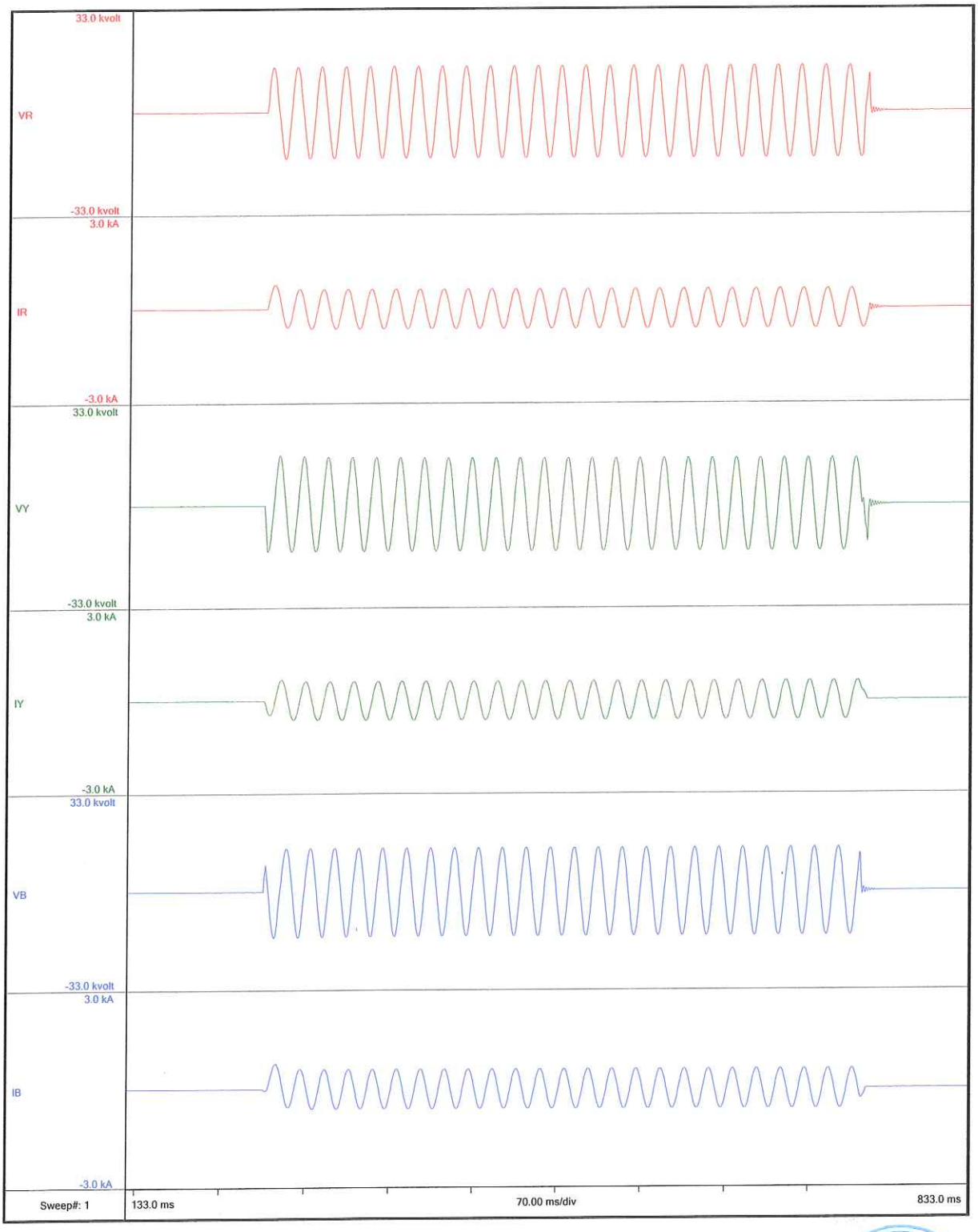
(Accredited by the National Accreditation Board for Testing and Calibration Laboratories, Govt. of India)
ERDA Road, Makarpura Industrial Estate, Vadodara-390 010, India.
EPABX : +91 (0265) 2642942, 2642964, 2642377, 3043128 / 29 / 30 / 31 / 33
Fax : +91 (0265) 2638382
E-mail : erda@erda.org
Web : http://www.erda.org

**REPORT NO.:** RP-1718-055680 **DATE:** 07.02.2018




OSCILLOGRAM NO. : 1537/06

Short Circuit Laboratory Vadodara

TC 2425976

Certificate No. : TC-5389

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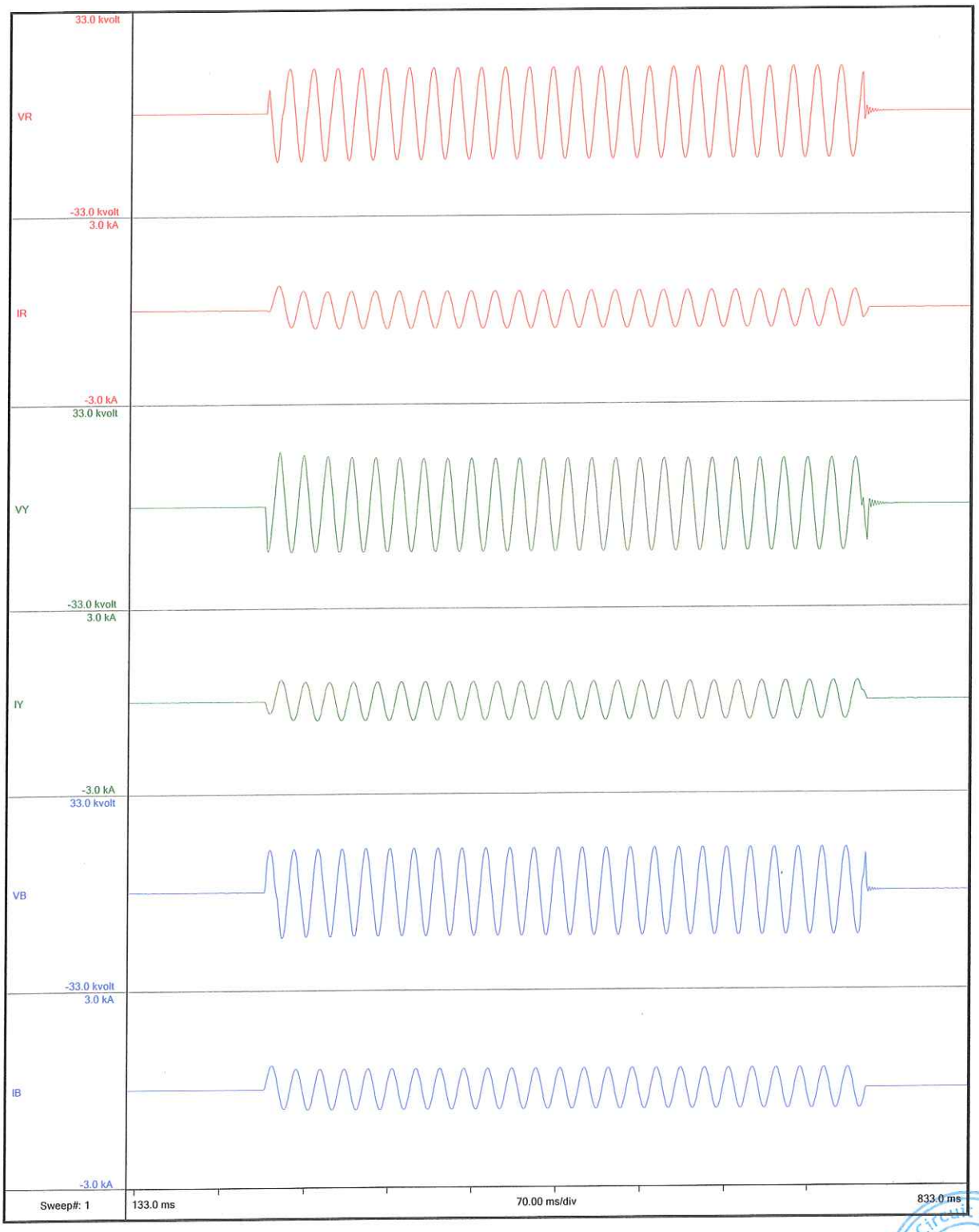
**REPORT NO.:** RP-1718-055680 **DATE:** 07.02.2018




OSCILLOGRAM NO. : 1537/07

TC 2425977

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Certificate No. : TC-5389

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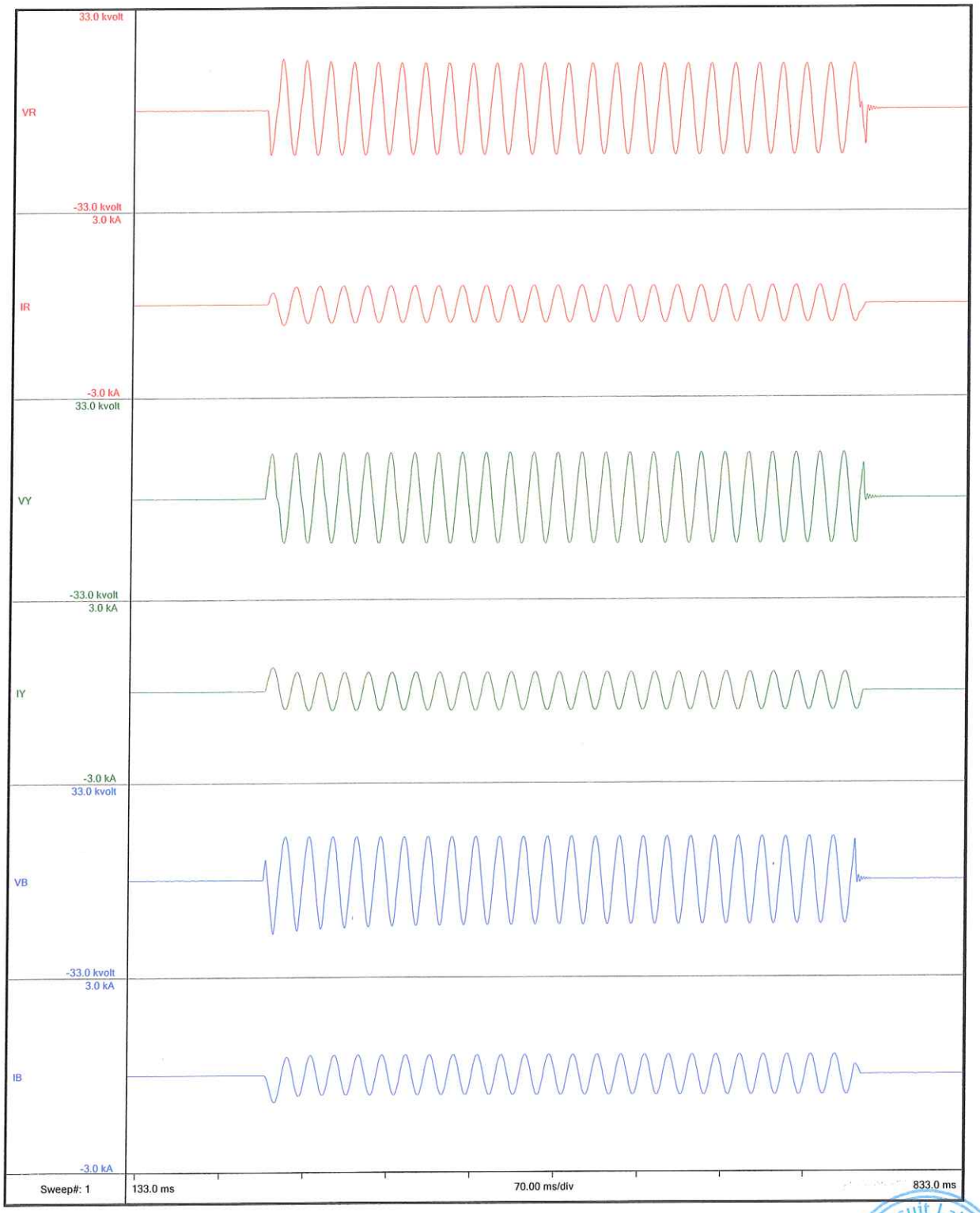
**REPORT NO.:** RP-1718-055680 **DATE:** 07.02.2018




OSCILLOGRAM NO. : 1537/08

Short Circuit Laboratory Vadodara

TC 2425986

Certificate No. : TC-5389

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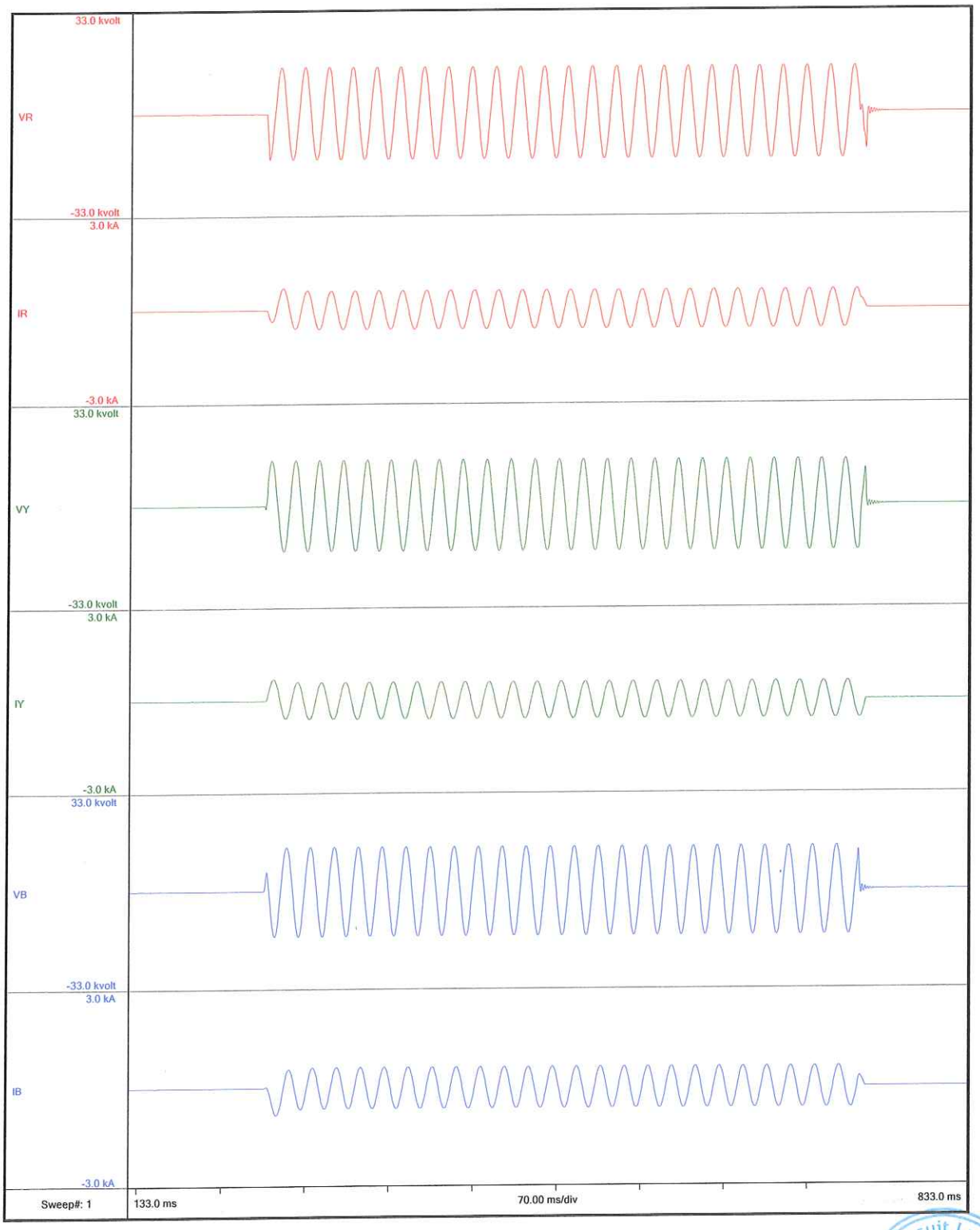
**REPORT NO.:** RP-1718-055680 **DATE:** 07.02.2018




OSCILLOGRAM NO. : 1537/09

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TC 2425978

Certificate No. : TC-5389

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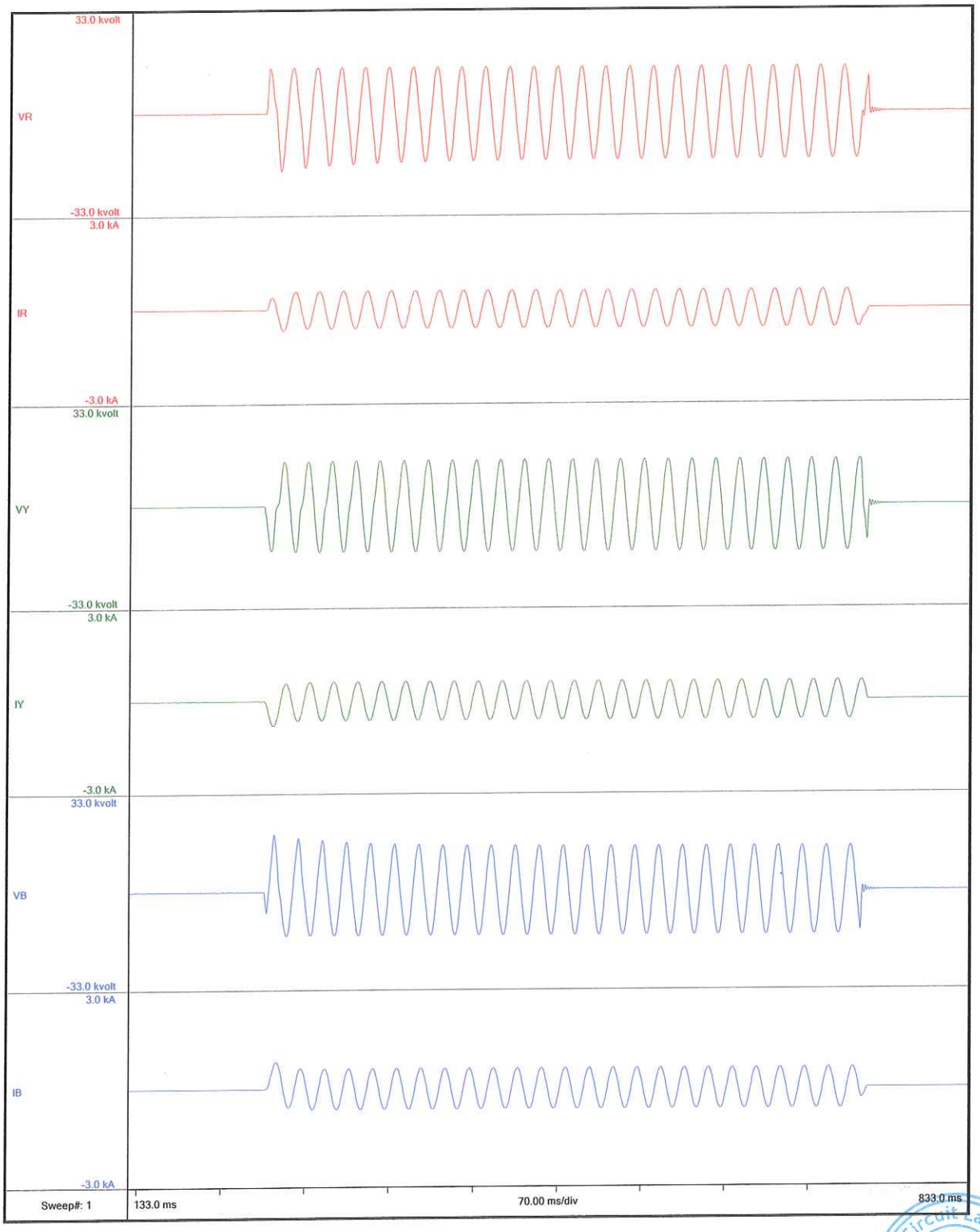
**REPORT NO.:** RP-1718-055680 **DATE:** 07.02.2018




OSCILLOGRAM NO. : 1537/10

TC 2425979

Short Circuit Laboratory Vadodara

Certificate No. : TC-5389

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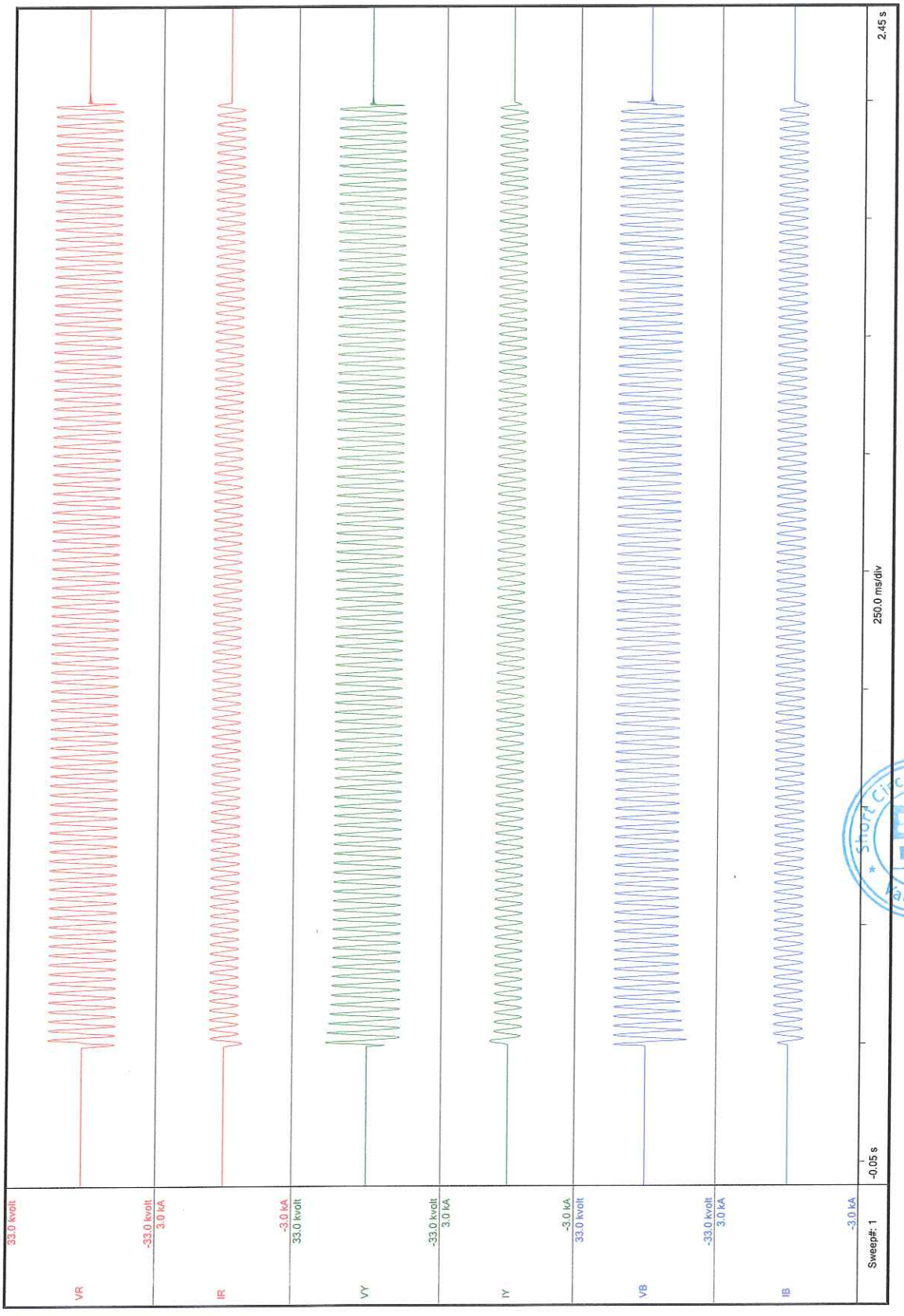


OSCILLOGRAM NO.: 1537/11

Short Circuit Laboratory Vadodara

TC 2425984

Certificate No. : TC-5389

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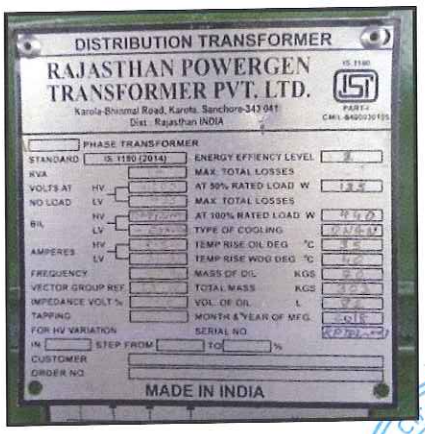
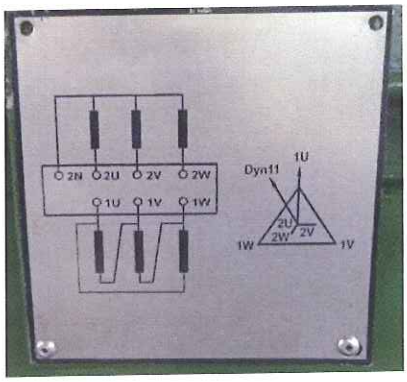
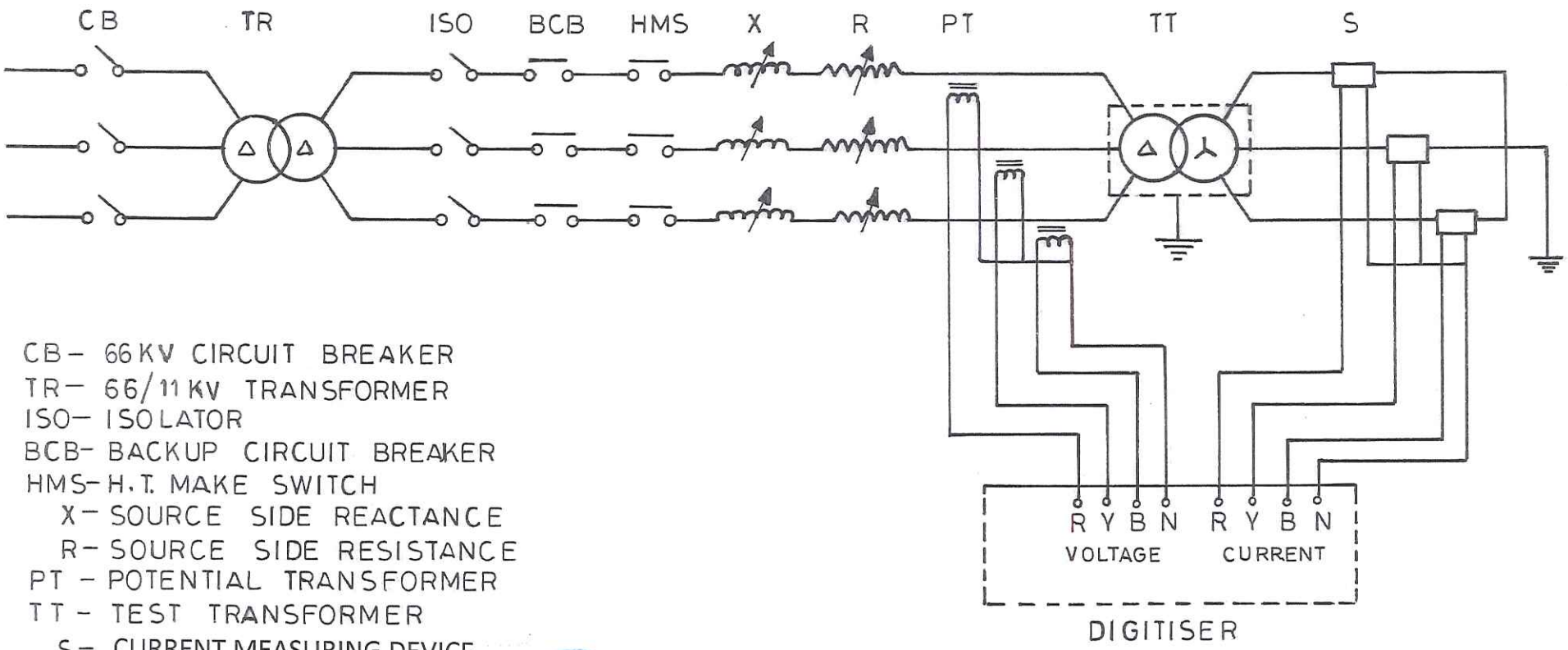



TC 2450660




CB – 66 KV CIRCUIT BREAKER
TR – 66/11 KV TRANSFORMER
ISO – ISOLATOR
BCB – BACKUP CIRCUIT BREAKER
HMS – H.T. MAKE SWITCH
X – SOURCE SIDE REACTANCE
R – SOURCE SIDE RESISTANCE
PT – POTENTIAL TRANSFORMER
TT – TEST TRANSFORMER
S – CURRENT MEASURING DEVICE

Short Circuit Laboratory
Vadodara

**REPORT NO.:** RP-1718-055680
**DATE :** 7/2/18

ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

SCHEMATIC CIRCUIT DIAGRAM

| DRN. BY | CKD. | DATE | DRG. NO. |
|---|---|---|---|
| S.B.S. | M.B.M | 27-1-98 | OLSC/DTC/01 |

Test Report No RP-1718-0006D
Date 07.02.2018
Product 16 KVA DT
Verified by PRS
Verification of this drawing by ERDA is limited to relevant dimensional checks only.
Verified dimensions are marked with '*'

Short Circuit Laboratory ERDA Vadodara

# DISTRIBUTION TRANSFORMER

## RAJASTHAN POWERGEN TRANSFORMER PVT.LTD

BHINMAL–KAROLA ROAD KAROLA SANCHORE
RAJASTHAN. (INDIA)

IS: 1180
PART-I
CM/L-8400030105

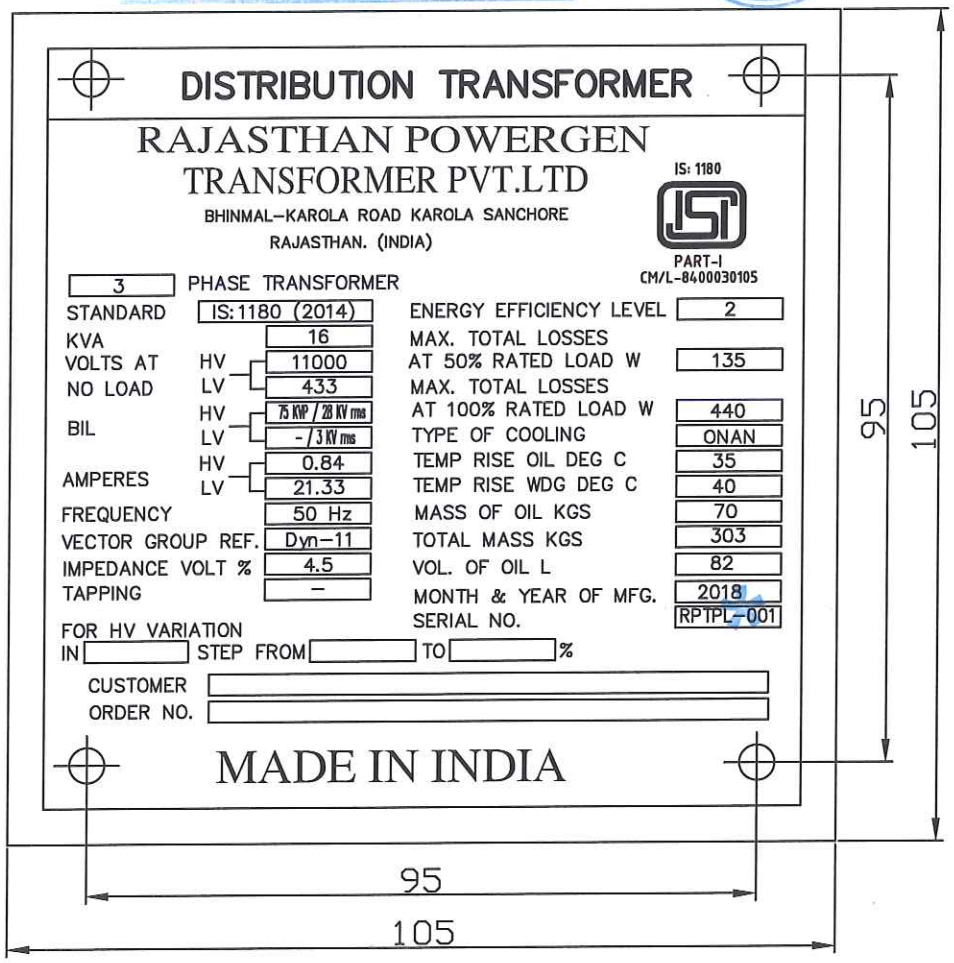
3 PHASE TRANSFORMER

| | | | | | |
|---|---|---|---|---|---|
| STANDARD | | IS:1180 (2014) | ENERGY EFFICIENCY LEVEL | | 2 |
| KVA | | 16 | MAX. TOTAL LOSSES | | |
| VOLTS AT NO LOAD | HV | 11000 | AT 50% RATED LOAD W | | 135 |
| | LV | 433 | MAX. TOTAL LOSSES | | |
| BIL | HV | 75 KVP / 28 KV rms | AT 100% RATED LOAD W | | 440 |
| | LV | - / 3 KV rms | TYPE OF COOLING | | ONAN |
| AMPERES | HV | 0.84 | TEMP RISE OIL DEG C | | 35 |
| | LV | 21.33 | TEMP RISE WDG DEG C | | 40 |
| FREQUENCY | | 50 Hz | MASS OF OIL KGS | | 70 |
| VECTOR GROUP REF. | | Dyn–11 | TOTAL MASS KGS | | 303 |
| IMPEDANCE VOLT % | | 4.5 | VOL. OF OIL L | | 82 |
| TAPPING | | – | MONTH & YEAR OF MFG. | | 2018 |
| | | | SERIAL NO. | | RPTPL–001 |

FOR HV VARIATION IN [ ] STEP FROM [ ] TO [ ] %

CUSTOMER
ORDER NO.

MADE IN INDIA




SIZE: 105x105 mm HOLE CENTER: 95x95 mm

NOTE:
* SERIAL NO ,ACTUAL IMPEDANCE(%) VOLTAGE , YEAR OF MANUFACTURE & MONTH OF MANUFACTURE WILL BE PUNCHED AT THE TIME OF DESPATCH
MATERIAL : ANODISED ALUMINIUM SHEET
THICKNESS : 0.9 mm

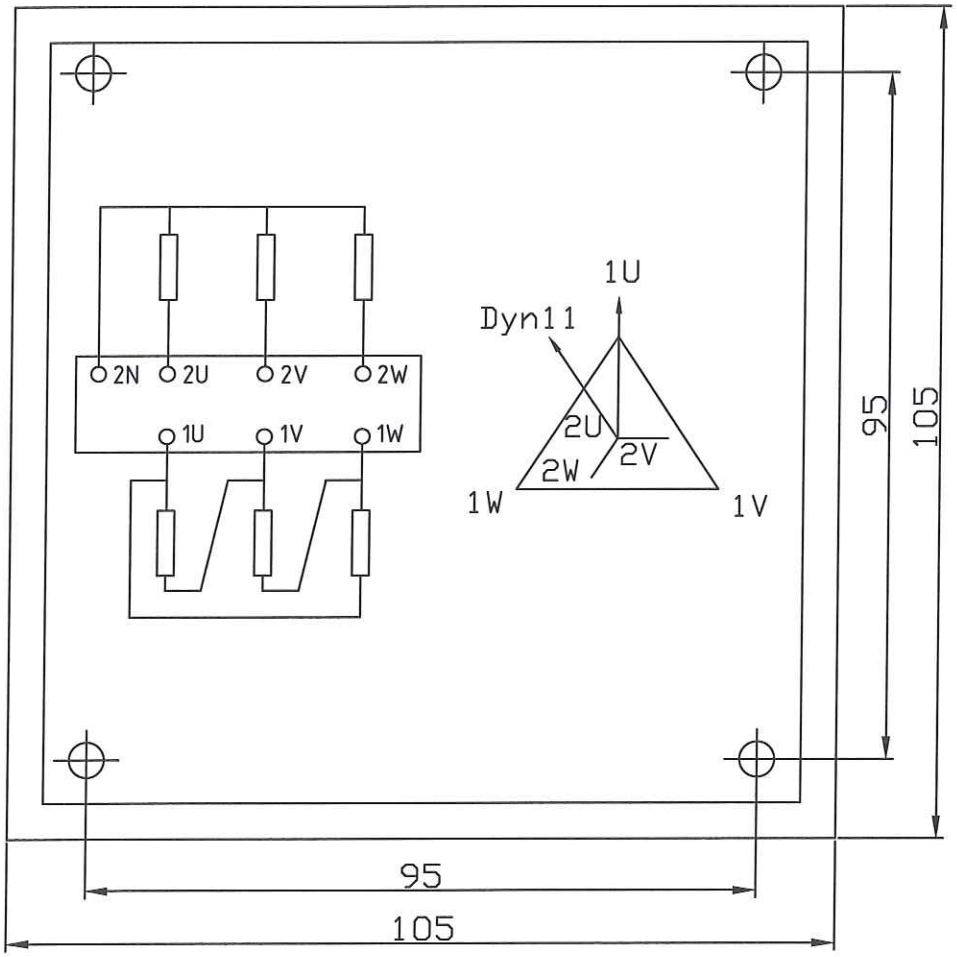
RAJASTHAN POWERGEN TRANSFORMER PVT.LTD
BHINMAL–KAROLA ROAD KAROLA SANCHORE
RAJASTHAN. (INDIA)

| | | | |
|---|---|---|---|
| DRN BY | | RATING & TERMINAL MARKING PLATE FOR | |
| CHD BY | S.G.M. | 16 KVA ,11/0.433 KV DISTRIBUTION TRANSFORMER | |
| APPD BY | J.P.C. | 3 PHASE, ENERGY EFFICIENCY LEVEL–2 | |
| DATE 03.02.2018 | BRIEF DESCRIPTION | DRG. NO. RPTPL/RP16/01/02/18 | REV. NO. 01 |

01 of 02

Test Report No: RP-1718-055680
Date: 07-02-2018
Product: 16 KVA DT
Verified by: RJ
Verification of this drawing by ERDA is limited to relevant dimensional checks only.
Verified dimensions are marked with "*"

Short Circuit Laboratory ERDA Vadodara

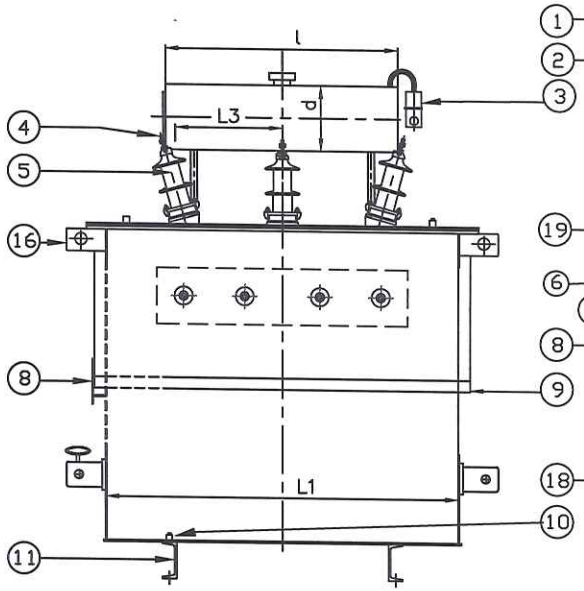



SIZE: 105x105 mm HOLE CENTER: 95x95 mm

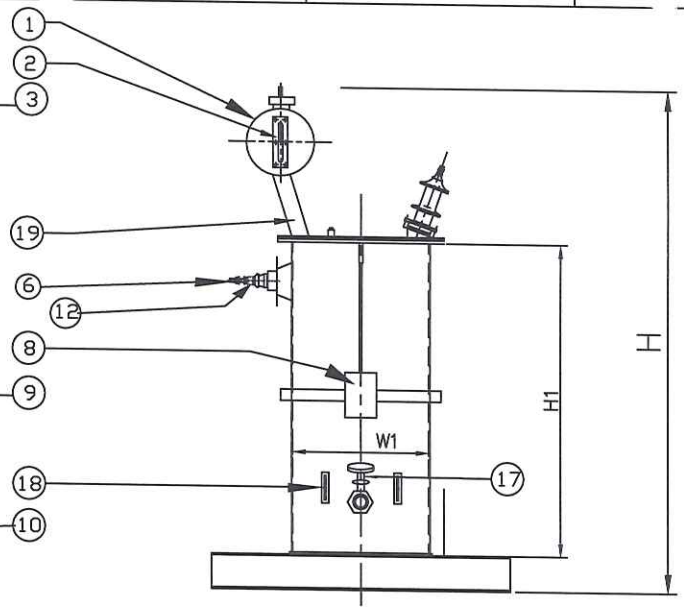
NOTE:
* SERIAL NO ,ACTUAL IMPEDANCE(%) VOLTAGE , YEAR OF MANUFACTURE & MONTH OF MANUFACTURE WILL BE PUNCHED AT THE TIME OF DESPATCH
MATERIAL : ANODISED ALUMINIUM SHEET
THICKNESS : 0.9 mm

RAJASTHAN POWERGEN TRANSFORMER PVT.LTD
BHINMAL–KAROLA ROAD KAROLA SANCHORE
RAJASTHAN. (INDIA)

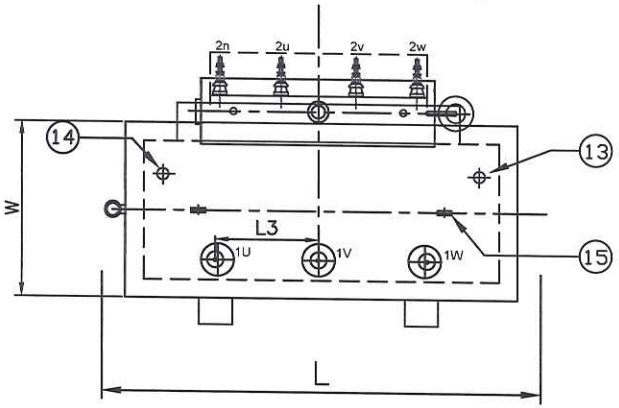
| | | | |
|---|---|---|---|
| DRN BY | | RATING & TERMINAL MARKING PLATE FOR 16 KVA ,11/0.433 KV DISTRIBUTION TRANSFORMER 3 PHASE, ENERGY EFFICIENCY LEVEL–2 | |
| CHD BY | S.G.M. | | |
| APPD BY | J.P.C. | | |
| 02 of 02 | | | |
| DATE 03.02.2018 | BRIEF DESCRIPTION | DRG. NO. RPTPL/RP16/02/02/18 | REV. NO. 02 |




ELEVATION




SIDE VIEW




PLAN

| SR.NO. | ACCESSORIES | QTY. | TECHNICAL DETAILS AS PER SPEC. | AS PER OFFER |
|---|---|---|---|---|
| 1 | CONSERVATOR (ø130) WITH OIL FILLING HOLE (32mm) WITH CAP & DRAIN PLUG (12 mm) | 1 | M.S. | M.S. |
| 2 | OIL LEVEL GAUGE WITH 3 POSITION (-5°, -30° & 95°C) | 1 | — | AL. |
| # 3 | SILICAGEL BREATHER (500 Grams.) | 1 | AL. DYE CAST | AL. DYE CAST |
| 4 | H.V. TERMINAL 12m.m. DIA.WITH NUT | 3 | BRASS | BRASS |
| 5 | H.V. BUSHING | 3 | PORCELAIN | PORCELAIN |
| 6 | L.V. TERMINAL 12 m.m. DIA. | 4 | BRASS TINNED | BRASS TINNED |
| 7 | COOLING RADIATOR m. m. THICK | 0 | — | NA. |
| 8 | RATING &TERMINAL MARKING PLATE | 1 | ANODISED | ANODISED |
| 9 | REIN-FORCING ANGLE SIZE ( 40x40x6 mm. ) | 4 | M.S. | M.S. |
| 10 | EARTHING TERMINAL WITH LUGS SIZE( 16 Amp. ) | 2 | M.S. | M.S. |
| 11 | BASE CHANNELS 75x40x460mm. LONG. | 2 | M.S. | M.S. |
| 12 | L.T. BUSHING 1.1KV/250A | 4 | PORCELAIN | PORCELAIN |
| 13 | THERMOMETER POCKET | 1 | M.S. | M.S. |
| 14 | AIR RELEASE PLUG | 1 | M.S. | M.S. |
| 15 | LIFTING LUGS FOR COVER (8 m.m.) | 2 | . | N.A. |
| 16 | LIFTING LUGS FOR TANK WITH FLAT (8 m.m.) | 2 | M.S. | M.S. |
| 17 | DRAIN VALVE | 1 | M.S. | M.S. |
| 18 | PULLING LUG (8 m.m.) | 4 | M.S. | M.S. |
| 19 | CONSERVATOR PIPE (ø30mm MIN) | 2 | M.S. | M.S. |

| COOLING DETAILS | | |
|---|---|---|
| 1 | TOTAL SURFACE AREA :1.239 mm2. | |
| 2 | TOTAL NUMBER OF COOLING TUBES | N. A. |
| 3 | LX B X H OF TUBE | N. A. |

| | | | |
|---|---|---|---|
| 1 | WEIGHTS IN KGS. | | DIMENSIONS IN m.m. |
| | CORE | 70 | TRANSFORMER OVERALL |
| | WINDINGS | 35 | L = 860 |
| | TANK&FITTINGS with all accesso | 128 | W = 570 |
| | OIL | 70 | H = 1270 |
| | TOTAL WEIGHT | 303 | TRANSFORMER TANK |
| 2 | THICKNESS IN m.m. | | L1 = 635 |
| | TANK SIDE PLATES (MIN.) | 3. 15 | W1 = 250 |
| | TOP & BOTTOM PLATES (MIN.) | 5 | H1 = (AVG.) 700 |
| 3 | TOLERANCE | | BUSHING CLEARANCES WITH ANGLE |
| | T/F OIL QUANTITY | as.per spec | L3 ( H.V.) 255 PHASE TO PHASE |
| | MAIN TANK DIMENSIONS | +/- 5 % | L4 ( L.V.) 75 PHASE TO PHASE |
| | OVERALL DIMENSIONS | +/- 5 % | L5 ( H.V.) 140 PHASE TO EARTH |
| 4 | DIMENSIONS OF CONSERVATOR | | L6 ( L.V.) 40 PHASE TO EARTH |
| | d) INSIDE DIAMETER IN mm. | 130 | BUSHING HEIGHT IN mm |
| | l) LENGTH IN mm. | 600 | |
| | c) CAPACITY IN LTRS. | 7 | |

ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE STATED.

Test Report No. RT-1718-033680
Date 02.02.2018
Product 16 KVA 11
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

NOTE
1 SHAPE OF TANK: RECTANGULAR SHAPE
2 PAINT: AS PER IS
3 ALL DIMENSIONS ARE IM mm UNLESS OTHERWISE STATED.
# NOT PROVIDED DURING TESTING

SIGNATURE OF AUTHORISED PERSON & STAMP OF THE FIRM

| REV. NO. | DATE & SIGN | BRIEF DESCRIPTION |
|---|---|---|
| | | |
| | | |
| | | |

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

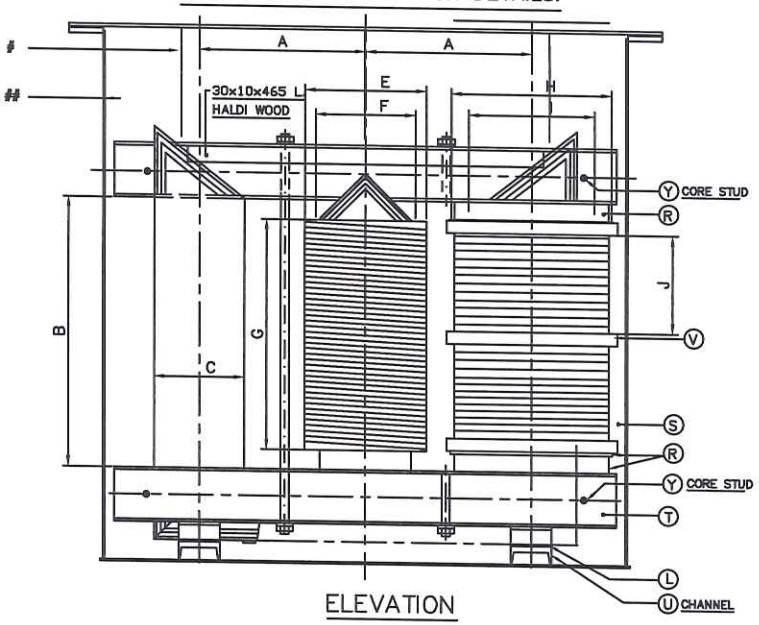
| | | |
|---|---|---|
| DRN BY | | |
| CHD BY | S.G.M. | |
| APPD BY | J.P.C. | |
| DATE | 03.02.2018 | |
| SCALE | | |

GENERAL ARRANGEMENT OF TRANSFORMER OF 16 KVA 11/ 0.433 KV DISTRIBUTION TRANSFORMER Energy Efficiency Level - 2

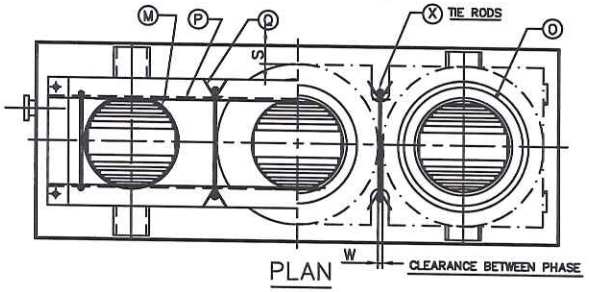
DRG. NO. RPTPL-GA-16-02-18

REV. NO. 01

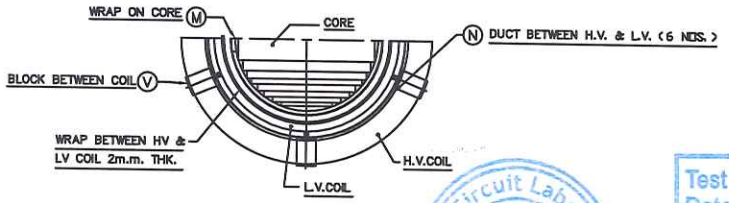
## WINDING & CONSTRUCTION DETAILS.




ELEVATION




PLAN




| CORE | DESCRIPTION | | AS PER TECH. SPECIFICATION | AS PER OFFER |
|---|---|---|---|---|
| A | LEG CENTRES | m.m. | - | 211 |
| B | WINDOW HEIGHT | m.m. | - | 298 |
| C | CORE CIRCLE | m.m. | - | 76 |
| D | NO. OF STEPS | NOS. | - | 7 |
| | EFFECTIVE CORE AREA | $Cm^2$ | - | 41.50 |
| L.V.COIL | | | | |
| E | OUTER DIAMETER | m.m. | - | 113 |
| F | INSIDE DIAMETER | m.m. | - | 83 |
| G | AXIAL LENGTH | m.m. | - | 286 |
| | CONDUCTOR CROSS SECTION | $m.m^2$ | - | 19 |
| | CONDUCTOR INSULATION | m.m. | DPC | DPC |
| H.V.COIL | | | | |
| | NO. OF H.V. COILS PER PHASE 4/6/8/10 | | - | 2 |
| H | OUTER DIAMETER | m.m. | - | 201 |
| I | INSIDE DIAMETER | m.m. | - | 135 |
| J | AXIAL LENGTH (EACH) | m.m. | - | 127 |
| | CONDUCTOR CROSS SECTION | $m.m^2$ | - | 0.6647 |
| | CONDUCTOR INSULATION | m.m. | SE | SE |
| | | | | |
| INSU. | INSULATION BETWEEN | | | |
| K | (TAP COILS) | m.m. | N.A. | N.A. |
| L | BASE FLAT INSULATION | m.m. | - | 2 |
| M | WRAP (GAP) ON CORE | m.m. | 3.5 | 3.5 |
| N | WEDGES BETWEEN H.V. & L.V. COILS Nos. | | 6 | 6 |
| O | GAP BETWEEN H.V.& L.V. | m.m. | 11 | 11 |
| P | FRAME CHANNEL INSULATION | m.m. | - | 2 |
| Q | PHASE BARRIER | m.m. | 2x1 | 2x1 |
| R | END INSULATION BLOCK | m.m. | 25 | 25 |
| S | CLEARANCE TO TANK WALL FROM H.V.WINDING | m.m. | 30 | 30 |
| T | BOTTOM FRAME SIZE ISMC mm x mm. | | 75X40 | 75X40 |
| U | BASE CHANNEL SIZE mm. x mm. | | - | 75x40 |
| V | NOS.OF SPACERS BETWEEN H.V.AXIAL COIL (PERIPHERAL) | | - | 6 NOS. |
| W | INTER PHASE CLEARANCE | m.m. | MIN. 10mm. | MIN. 10mm. |
| | THICKNESS OF SPACERS | m.m. | - | 7mm. |
| X | TIE RODS SIZE & NOS. | m.m./Nos. | - | 4 Nos. of 12m.m. |
| Y | CORE STUD SIZE & NOS. | m.m./Nos. | - | 4 Nos. of 12m.m. |
| # | . | | | . |
| ## | . | | | . |

Short Circuit Laboratory * ERDA * Vadodara

Test Report No. RL-1718-0556PO
Date 07.02.2018
Product 16 KVA D1
Verified by
Verification of this drawing by ERDA is limited to relevant dimensional checks only. Verified dimensions are marked with *

# RAJASTHAN POWERGEN TRANSFORMER PVT. LTD.

| | | |
|---|---|---|
| DRN BY | A.V.P. | SCALE |
| CHD BY | S.G.M. | |
| APPD BY | J.P.C. | |
| DATE | 03.02.2018 | |

INTERNAL ARRANGEMENT OF
16KVA, 11/0.433KV, E.E.L-2
DIST TRANSFORMER

DRG. NO. RPTPL-IA-16-003-14

REV. NO. 01

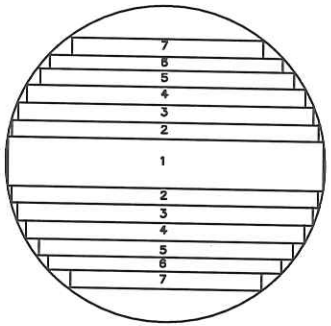
| SR. NO. | | TECHNICAL DETAILS | |
|---|---|---|---|
| | | AS PER SPEC. | AS PER OFFER |
| 1. | PRIMARY VOLTAGE ( KV ) | 11 | 11 |
| 2. | SECONDARY VOLTAGE ( KV ) | 0. 433 | 0. 433 |
| 3. | RATING ( KVA ) | 16 | 16 |
| 4. | VECTOR GROUP | Dyn 11 | Dyn 11 |
| 5. | CONFORMING TO I.S.S. | IS: 2026, 1180 | IS: 2026, 1180 |
| 6. | PERMISSIBLE VOLTAGE FLUCTUATION % | 12. 5 | 12. 5 |
| 7. | TEMPERATURE OF TOP OIL ( MAX. ) °C | 35 | 35 |
| 8. | TEMPERATURE OF WINDING ( MAX. ) °C | 40 | 40 |
| 9. | CORE DETAILS | | |
| | a) CORE MATERIAL | CRGO Annealed steeel | |
| | b) PRINCIPAL SOURCE OF CORE MATERIAL | -- | U.S.A. |
| | c) GRADE OF LAMINATION | -- | M4 OR BETTER |
| | e) FLUX DENSITY $W/m^2$ | 1. 6 Max. | 1. 51 |
| | d) NO. OF STEPS OF CORE ( NOS. ) | - | 7 |
| 10. | % IMPEDANCE | 4. 5 | 4. 5 |
| 11. | CORE DIMENSIONS | , | , |

| Step No. | H | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| L mm. | 75 | 70 | 65 | 60 | 55 | 50 | 40 | 30 | 0 |
| W mm. | 15.1 | 2X7.9 | 2x4.75 | 2x3.55 | 2x2.85 | 2x2.35 | 2x3.65 | 2x2.6 | 0 |
| Cross Sect. $Cm.^2$ | 11.325 | 11.06 | 6.175 | 4.26 | 3.135 | 2.35 | 2.92 | 1.56 | 0 |

Total Cross Sect. Area $Cm.^2$ 42.785

EFFECTIVE
CORE AREA = 42.785 X 0.97

= 41.50 $Cm.^2$




| SR. NO. | | As Specified | | As Offered | |
|---|---|---|---|---|---|
| | | H.V. | L.V. | H.V. | L.V. |
| 12 | WINDING | | | | |
| | a) MATERIAL | ALUMINIUM | ALUMINIUM | ALUMINIUM | ALUMINIUM |
| | b) SPECIFIC CONDUCTIVITY | -- | -- | | |
| | c) CONDUCTOR SIZE mm.xmm.(Bare) | -- | -- | 0. 92 | 3. 4 X 5. 75 |
| | d) CONDUCTOR CROSS SECTION $mm.^2$ | | | 0. 6647 | 19 |
| | e) INSULATION MATERIAL | SE | DPC | SE | DPC |
| | f) CURRENT DENSITY $A/mm.^2$ | 1. 6 | 1. 6 | 0. 7294 | 1. 1228 |
| | g) NO. OF TURNS | | | 7920 | 180 |
| | h) OUTER DIAMETER mm. | -- | -- | 201 | 113 |
| | i) INSIDE DIAMETER mm. | -- | -- | 135 | 83 |
| | j) AXIAL LENGTH mm. | -- | -- | 127 | 286 |
| | k) NO. OF COILS PER PHASE NO. | 2 | 1 | 2 | 1 |
| | | | | | |
| 13 | BUSHING | As Specified | | As Offered | |
| | MINIMUM CREEPAGE DISTANCE | 25 mm/KV | | 300 mm AS PER IS-3347 | |
| 14 | LOSSES | | | | |
| | TOTAL LOSSES Watts AT 50% 75°C | 135 | | 135 | |
| | TOTAL LOSSES Watts AT 100% 75°C | 440 | | 440 | |
| 15 | TANK | | | | |
| | SIDE WALL THICKNESS mm. | - | | 3. 15 | |
| | TOP & BOTTOM PLATE THICKNESS mm. | - | | 5 | |
| 16 | OIL USED | | | | |
| | NAME OF MANUFACTURER | | | APAR | |
| | GRADE | IS-335 | | EHV GRADE CONFORMING TO IS-335 | |
| | VOLUME ( LITRES ) | | | | |
| | IN TANK | - | | 79 | |
| | IN CONSERVATOR | - | | 3 | |
| | TOTAL | - | | 82 | |
| 17 | BREATHER | | | | |
| | MAKE | | | APPROVED | |
| | CAPACITY | | | 500 gms. | |
| 18 | RADIATOR | | | | |
| | MAKE : - | | | N. A. | |
| | DETAILED HEAT DISSIPATION CALCULATION | TO BE ENCLOSSED | | TO BE ENCLOSSED | |

Short Circuit Laboratory * Vadodara *

Test Report No. RP-1718-0556PO
Date 07.02.2018
Product 16 KVA DT
Verified by
Verification of this drawing by ERDA is limited to relevant dimensional checks only. Verified dimensions are marked with ***

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

| | | | |
|---|---|---|---|
| DRN BY | A.V.P. | SCALE | TECHNICAL DETAILS FOR 16KVA, 11/0.433KV, E.E.L-2 DIST. TRANSFORMER |
| CHD BY | S.G.M. | | |
| APPD BY | J.P.C. | | |
| DATE | 03.02.2018 | | |

DRG. NO. RPTPL-TD-16-004-14
REV. NO. 01