Distribution Transformer Testing as per IS 1180 : 2014

Electrical Research and Development Association

Credentials

Organization Structure

- **Autonomous in nature.**
- **Policies, strategies and compliance overseen by Managing Committee comprising elected/nominated personnel from central and state govts., PSUs, utilities and industries**
- **Headed and managed by highly qualified technical personnel and experienced professionals with core objectives of:**

  - ✓ **Achieving Excellence.**
  - ✓ **Thrust on Research & Development & Innovation.**
  - ✓ **Customer Service.**
  - ✓ **Establishing and Following well laid Procedures & Systems.**
  - ✓ **Emphasis on Transparency & High Ethical Standards.**

Credentials

Organization Structure

- **Classified into three verticals:**
  - ✓ **Testing and Evaluation**
  - ✓ **Field Services**
  - ✓ **R&D and Expert Services**

- **Dedicated customer relationship management team at each center.**

- **Employing 385 skilled and technical personnel with cumulative evaluation experience of more than 3000 years**

CREDENTIALS

Infrastructure

- **24 classified state of art evaluation facilities.**
- **Certification, calibration, evaluation of wide range of electrical products.**
- **Evaluation as per national and international standards.**
- **Technology Development Centre with thrust on R&D, innovation and new product development.**
- **Dedicated specialty center for diagnostics of power plant equipment.**

Credentials

Infrastructure

- **Regional centers at Navi-Mumbai, Gurgaon and Rajahmundry- better customer reach and service.**
- **Mobile laboratory for on-site condition monitoring of transformers and energy meters.**
- **Center of excellence for rotating machines-facilitates improvements in design and its validation.**
- **Ultramodern evaluation facility for CRGO and insulating materials.**
- **Largest on-line (570 V, 120 kA) short circuit laboratory.**
- **Accredited by NABL, BIS, BEE, Intertek.**

Milestones

Started with 1 center & 2 Product testing

1983

Established first Short Circuit Lab

1998

Established largest on line short Circuit Lab in Savli

2007

Established EMI-EMC specialty center

2012

Established COE for Rotating machines

2013

Grown over 40 years with 24 centers spread over 5 locations

2015

ERDA's Facility for IS 1180-2014

- ISI marking is mandatory for transformers up to 2.5 MVA according to IS 1180-2014

- ERDA laboratories have been carrying out transformer testing since the last 40 years.

- BIS accredited DT Testing (as per IS:1180-2014) Laboratory at :
  - ERDA Makarpura, Vadodara (upto 2.5 MVA, 33 KV)
  - ERDA (West), Rabale , Navi Mumbai (upto 200 KVA, 33 KV)

- Testing Capacity at
  - ERDA Makarpura, Vadodara - 140 nos. Transformers per month
  - ERDA (West) , Rabale – 10 nos. Transformers per month

- The facilities have been accredited by NABL, BIS, BEE (Vadodara)

Temperature rise, Routine and Special Test Facilities for Transformers

ERDA has four test beds to carry out temperature rise and routine tests.

Maximum rating of transformers which can be tested at ERDA, Makarpura are up to and including 33 kV, 2500 kVA.

- ERDA has facility to carry out Special tests:
  - Pressure test (Type & Routine)
  - Magnetic balance test
  - Zero sequence impedance
  - Over fluxing & flux density
  - Oil Leakage test
  - Paint adhesion test
  - Determination of sound level
  - BDV & Moisture content in oil

Temperature Rise Test

Short Circuit Test Facility at ERDA

ERDA has three short circuit test laboratories.

Maximum rating of transformers which can be tested at ERDA, Makarpura are:

- 11/0.433 kV, 1600 kVA
- 22/0.433 kV, 500 kVA
- 33/0.433 kV, 500 kVA

Maximum rating of transformer can be tested at ERDA, Savli are:

- 11/0.433 kV, 1000 kVA
- 22/0.433 kV, 1000 kVA
- 33/0.433 kV, 4000 kVA

Short Circuit Test Laboratory

Impulse Tests on Transformers

- ERDA has three Impulse Laboratories
- 2 nos. of 1600 kVp and one of 800kVp
- ERDA can test up to 160 MVA, 400 kV class transformers.

Impulse Laboratory

Transformer Test Facility At ERDA (West)

- Accredited by BIS for transformer testing as per IS: 1180-2014
- Distribution transformers up to 33kV, 200kVA
- All tests can be carried out except for Short Circuit Test
- ERDA arranges for the transportation to and from ERDA (West) to Vadodara
- ERDA (West) can carry out testing of 10 transformers per month

Routine & type testing of transformers up to 100 MVA, 220kV at site

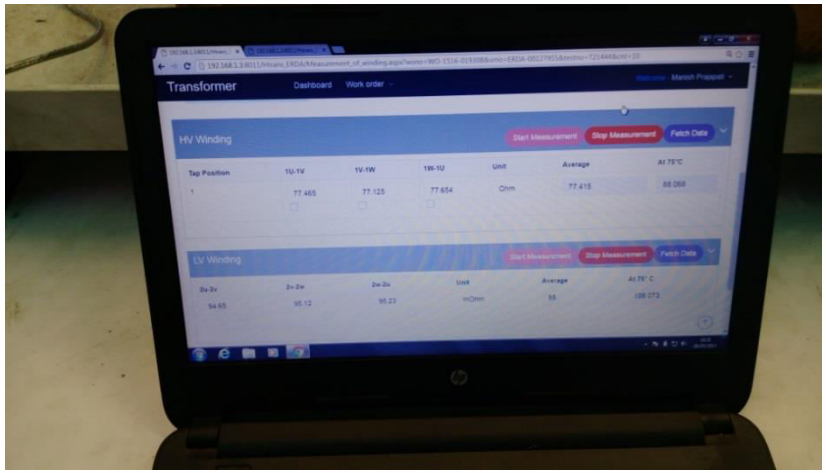
- Tests carried out ERDA's calibrated instruments.
  - DC winding resistance measurement
  - Measurement of voltage ratio and vector relation
  - Load losses and impedance voltage measurement
  - No load losses and current measurement
  - Insulation resistance measurement
  - Temperature rise

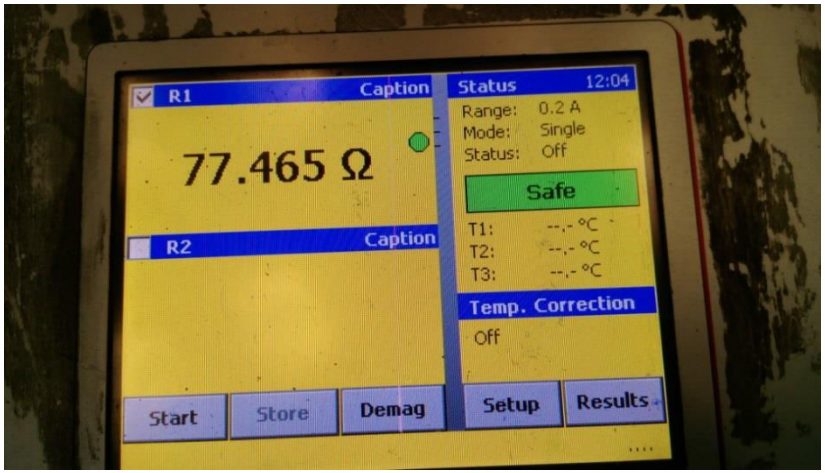
Automatic Transformer Test System

The testing of transformers is carried out using an automatic data capturing and reporting system developed by ERDA. The benefits of the system are:

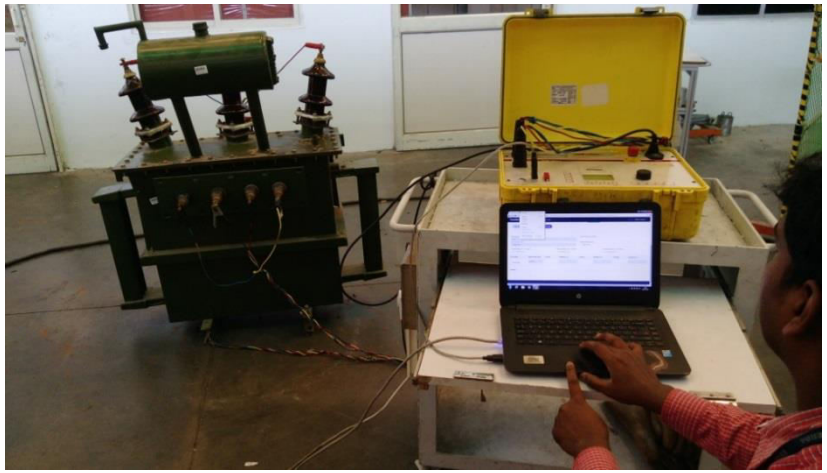
- Testing Quality Assurance
- No Manual Recording. All data are automatically transferred to computer. It is not possible to edit or change the test data.
- Better accuracy of measuring system
- Automatic test report generation after testing
- Enhanced reliability of test report
- Reduction in turnaround time
- Build Customer trust and credibility
- Easily programmable test routines
- System covers full in-house testing range up to 2.5 MVA, 33 kV Transformer

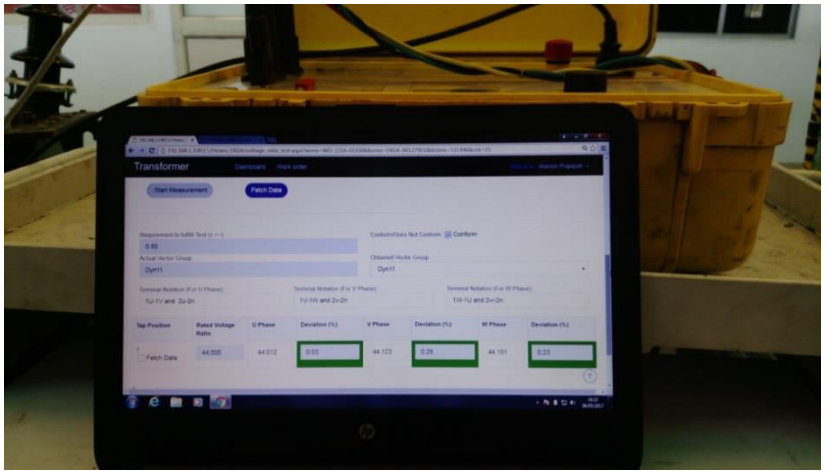
Automatic Transformer Test System (Winding Resistance Measurement)

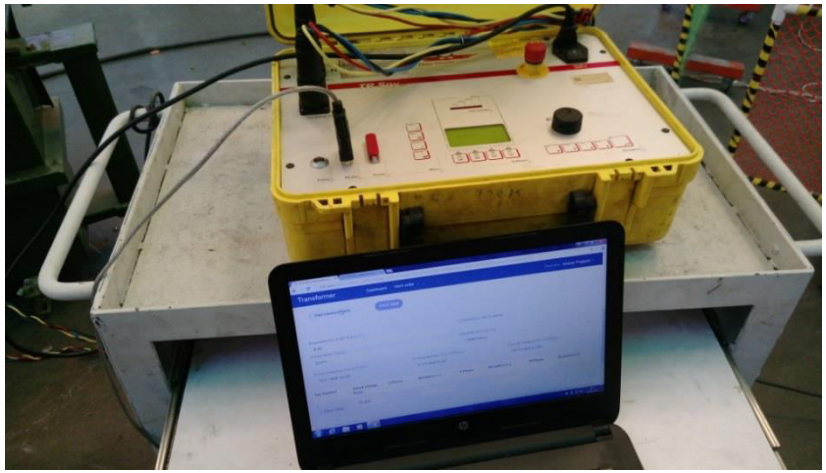




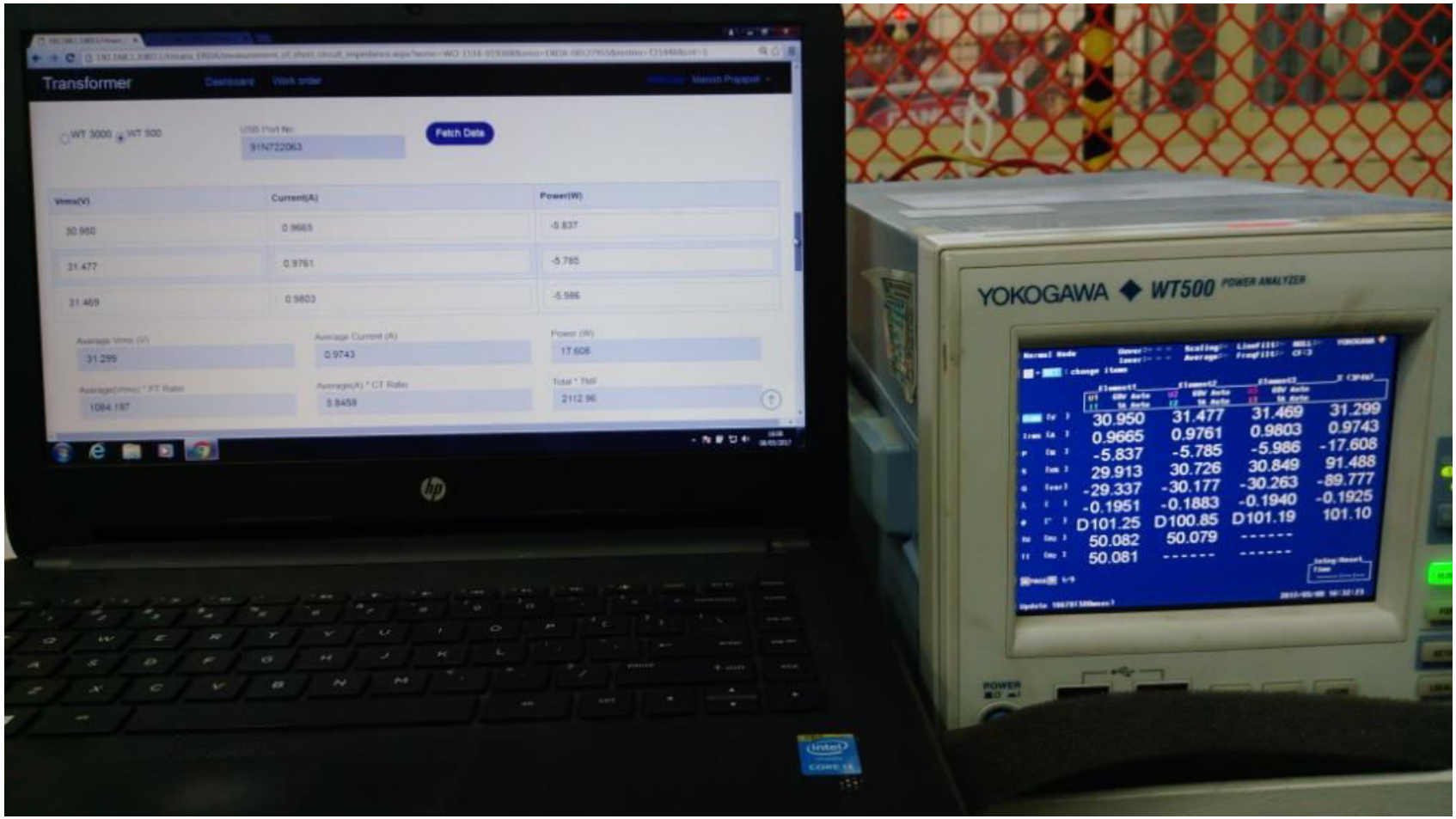
Automatic Transformer Test System (Voltage Ratio Measurement)







Automatic Transformer Test System (Load Loss & Impedance Voltage Measurement)



BIS Testing Summary as per IS:1180-2014
(up to 29-08-2017)

Sr. No.	Year	Quantity
1	2014-15	4
2	2015-16	125
3	2016-17	234
4	2017-18	70
	Report issued	433
	Under progress	11
	Total samples	444

Rating of Transformers Tested for BIS in 2014-15

Sr. No.	kVA Ratings	Quantity
1	10	1
2	63	1
3	200	2
	Total	**4**

Rating of Transformers Tested for BIS in 2015-16

Sr. No.	kVA Ratings	Quantity
1	10	1
2	16	1
3	25	9
4	63	7
5	100	28
6	160	4
7	200	65
8	315	1
9	400	2
10	500	1
11	630	1
12	1000	1
13	1600	1
14	2500	3
	Total	**125**

Rating of Transformers Tested for BIS in 2016-17

Sr. No.	kVA Ratings	Quantity
1	5	2
2	10	1
3	16	15
4	25	8
6	63	2
7	100	41
8	160	11
9	200	108
10	250	6
11	315	5
12	400	2
13	500	13
14	630	7
15	1000	3
16	1600	1
17	2000	2
18	2500	7
	Total	**234**

Rating of Transformers Tested for BIS in 2017-18

Sr. No.	kVA Ratings	Quantity	Under Testing
1	16	3	0
2	25	5	0
3	40	0	1
4	63	2	0
6	100	13	3
7	160	3	0
8	200	29	5
9	250	4	0
10	500	3	0
11	630	4	0
12	1000	2	0
13	1250	0	1
14	1600	0	1
15	2500	2	0
	Total	**70**	**11**

Average Time taken for Testing

Sr.	Year	Time from Receipt of all Clarifications to Dispatch of Test Report (Days)	Time from Receipt of Sample to Dispatch of Test Report (Days)
1	2015-16	20	28
2	2016-17	15	23
3	2017-18	15	23

Average Time for Testing

Sr.	Activity	Duration
1	Time taken to allot test dates	2-3 days
2	Time taken to start testing for samples from BIS	2-3 days
3	Time taken to start testing for samples from manufacturers	2-3 weeks
4	Average number of samples tested per month at Vadodara	140 nos
5	Average number of samples tested per month at Rabale	10 nos

Testing Time for IS: 1180-2014

Day	Tests
Day 1, 2	Routine tests, Short circuit test, Post routine tests
Day 3	Impulse test
Day 4	Temperature rise test
Day 5	Oil leakage test
Day 6	Air pressure test (Routine & Type test),
Day 7	Flux density test, Physical verification
Day 8-12	Reporting

ERDA's Experience: IS 1180

- Non conformances observed in following tests:
  - Temperature Rise
  - Short Circuit
  - Impulse tests
  - Polarity and voltage ratio
  - Induced over-voltage test
  - Minimum clearances in air
  - Constructional requirements and fittings
    - Rating and terminal marking plates not provided
    - Air release plugs
    - Base channels etc

Factors attributing to delay in testing

- Specifications are incomplete or wrongly filled to carry out the tests.
- Specifications are not meeting the requirements mention in standard
- Mismatching of transformer sr. no in drawing, technical form and on actual transformer.
- Basic Insulation level (kVp) in test request, drawing & nameplate is different.
- Accessories are not provided or do not meet requirements of the standard.

Factors attributing to delay in testing

- Specifications are above the minimum requirements of the standard.
- Energy Level, temperature rise limits etc.
- Name plates are not as per IS: 1180 2014.
- Name plates, drawings and sample do not match.
- Drawings are not legible, without drawing numbers
- Requirement of Stacking factor for flux density measurement not specified
- Polarity of Single Phase Transformer is not given.
- Thermometer pocket not provided to measure the oil temperature.

Thank You

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