

## **Technical Specification for Fully Automatic Tan Delta and Capacitance Test Kit**

### ***Scope:***

This specification covers Design, Manufacture, Testing, Supply, Delivery and demonstration of fully Automatic Tan Delta and Capacitance Test set and associated accessories suitable to measure capacitance and tan delta of EHV class transformer windings, condenser bushings, Shunt reactor winding and other electrical equipments up to 765KV Voltage Class.

### ***Functional Requirement :***

- The instrument should be suitable for offline measurement of Capacitance and Tan Delta of EHV class transformer windings, condenser bushings, Shunt reactor winding and other electrical equipments on site by applying voltage up to 12KV automatically.
- Instrument should have wide frequency range 10-400Hz at 500V for measuring individual and accurate temperature correction factor.
- The test results should have repeatability, consistency & immunity to electromagnetic interference in live switchyard up to 765 kV level
- Automated interference suppression circuits should be provided to suppress and cancel interference.
- Provision shall be made for the measurement of ambient temperature & relative humidity with inbuilt/external arrangement.
- External temperature sensor shall be provided for sensing ambient temperature.
- The instrument shall measure and display the leakage current.
- The test set shall be able to perform all standard ungrounded specimen tests(UST) and grounded specimen tests (GST) , with or without a guard circuit.
- The standard ready test templates for different test specimens such as transformer , CT's, CVTs, PTs, bushings etc should be built in the instrument for testing purpose there by reducing the test time, including voltage rise.

### ***Voltage Measurement :***

Range : 0-12 KV

Accuracy:  $\pm 1\%$   $\pm 1$  digit.

Resolution : 1.0V

### ***Current Measurement :***

Range : 0-200mA

Accuracy:  $\pm 1\%$   $\pm 1$  digit.

Resolution : 1mA

### ***Power Factor :***

Range : 0 - 100%

Accuracy:  $\pm 1\%$  of the reading .

Resolution : 0.00001

***Dissipation Factor (Tan Delta):***

Range : 0 – 100%

Accuracy:  $\pm 1\%$  of the reading

Resolution :0 .00001

***Capacitance :***

Range : 1pF – 1.0 $\mu$ F

Accuracy:  $\pm 0.2\%$  of the reading  $\pm 1$ pF

Resolution :0 .01pF

***Test Frequency :***

45-70 Hz (12KV)

1-400 Hz (500V)

***Test Leads and accessories :***

1. Calibrator Box with one standard Capacitor & three Tan Delta Taps, Test Voltage 2KV AC.
2. Cables: HV Cable-20Meter, LV Cable- 20Meter, Ground Cable and Interconnecting cables.
3. Temperature & Humidity Meter.
4. Carrying Cases: Foam Padded Carrying Cases for Bridge & Power supply, Carry Bag for Cables
5. Laptop with accessories having original latest operating software.
6. Windows based software CD
7. Operational Manual CD
8. Application Notes CD
9. Traceable calibration certificate

***Design & Engineering :*** The complete equipment along with accessories must be designed/engineered by Original Equipment Manufacturer.

***Type Testing:*** The test kit shall be type tested for Environmental Tests, EMI-EMC & Safety Tests as per relevant IEC Standard. The type test report from NABL accredited lab should be submitted along with the offer.

***Power Supply :***

It shall work on single phase 230 Volts  $\pm 10\%$ , 50 Hz  $\pm 5\%$  supply with standard socket.

The kit shall have inbuilt security and safety circuits for variations in input supply and shall perform satisfactorily without the use of any external stabilizers.

***Protection Control :***

The kit shall have protection against short circuit, over load, improper ground connection, over temperature, over voltage/transient surges, Zero start etc. The instrument should have alarm/cut-off settings to protect the instrument. Also the kit facility of discharging the specimen when test is completed or when current cable is accidentally disconnected or

when instrument power supply is lost. The kit should have built in rapid discharge circuit for automatically discharging the stored energy in the transformer at the end of each test. The kit should have the indication of showing the status of discharge. The kit shall have HV interlock facility.

***Operating Temperature*** : 0 to +50 deg C

***Relative Humidity*** : Max. 95% non-condensing.

***Cooling Arrangement*** :

Built in cooling shall be provided. No external cooling/ accessory shall be required to dissipate the heat.

***Temperature correction*** :

Temperature correction as per IEC for tan delta.

Provision to do individual and accurate temperature correction using latest dielectric frequency response technique, which estimates actual temperature dependence of the test object and calculates the temperature correction factor depending on insulating material condition is preferred.

***Software*** :

Suitable windows software should be provided for storing, downloading of data files, Data trending, predictive failure analysis and database management. Software should have facility for plotting graphs of voltage vs Tandelata, Tandelata vs frequency. The kit shall display both the measured value and the temperature corrected value. The test record shall be able to download via USB port to a PC in windows Excel/equivalent format. All tests can also run on windows version 7 or higher software . Software of the kit should be Windows based, Menu driven and user friendly. It should have all the templates/features required for complete testing of and facility for comparison of past template of the tested unit.

***Laptop*** :

One number of compatible of IBM/HP/DELL make Laptop loaded with user application software for controlling, supervising the test system and displaying all measurement values in addition to error and data management shall be provided with each testing kit.

***Minimum Specification*** :

Processor : Intel core i5

Operating System : Original latest operating System compatible to the kit.

Hard Disk : 320GB

RAM : 4 GB

CD Drive : DVD and CD with Read/Write facility

USB Ports : 3 Nos

LAN : 10/100/100GB Ethernet cord

Antivirus with one year validity

Guarantee : 3 years from the successful demonstration at site.

***Display :***

If operated through inbuilt LCD screen, it must be visible in bright sunlight and must have backlight display. The size of the font shall be of sufficient size to make the same clearly legible. The touch screen in the display shall be sensitive and accurate, to enable user to enter the data smoothly. Graphical representation of voltage vs Tan Delta to know the Tan delta gradient & data analysis for comparison with old results and manufacturer's data.

***Storage/Memory :***

It should store/record minimum 10000 test records in kit or Laptop.

***Printer :*** built in printer or on site printout with USB interface.

***Applicable Standards :***

The equipment shall comply with the requirements laid down in internationally acceptable standards . The test set should meet the requirements of both the IEC1010 and the CE mark specifications. The kit should also meet the shock and vibration requirements of IEC and ASTM D999.75 standard.

Instrument should meet EMC standards EN 61326:1997/A1:1998/A2:2001/A3:2003 IEC/EN 61000-4-2/3/4/5/6/8/11 IEC /EN 61000-6.600 44.

***Warranty/Guarantee :***

Kit shall be guaranteed for any defects for minimum 36 months from date of successful demonstration at site. If the kit needs to be shifted to suppliers works for repairs, supplier will have to bear the cost of, spares, software, transportation etc of kit for repair at test lab/works. The commencement of warranty period will start after the successful and final demonstration, inclusive of repetitive if any, of kit at site. All the materials, including accessories, cables, laptops (wherever supplied) etc. are to be covered under warranty/guarantee period.

1. If any problem in the kit is reported in the guarantee period, then the kit shall be collected by the firm within ten days of the report of problem for free repairs and the transportation/transit insurance cost shall also be borne by the supplier .
2. Repair period shall be maximum of one month from the date of kit collected by the firm.

Any period over and above (as 1 & 2 above), stipulated time shall be liable to extend the guarantee period for the delay period for which firm shall arrange to extend the Bank Guarantee.

***Portability:***

It should be easily portable. Carrying case with wheels & pulling handle should be provided.

***Training :***

Supplier shall have to ensure that the kit is made user friendly. Apart from detailed demonstration at site, the supplier shall also have to arrange necessary training to end user engineers at different sites of destination.

***Calibration Certificate :***

Unit shall be duly calibrated before supply and the date of calibration shall not be older than two month from the date of supply of Kit.

***Commissioning, Handing over the Instrument:***

Successful bidder will have to commission the instrument to the satisfaction of end user.

***Service :***

Bidder will have to submit the documentary evidences of having established mechanism for prompt services in India as required as per the specifications. The service support including supply of spares shall be ensured for a period of minimum 10 years.



