Eltel Automatic Capacitance & Tan Delta test sets Model ACTS-12K Plus / ACTS-5K Plus are instruments designed to conduct Power Factor tests on electrical insulation. The test set are capable of automatically measuring the insulation Power Factor of multi-terminal equipment at voltages ranging from less than 1kV upto 12kV. (upto 5kV on ACTS - 5K Plus). Being equipped with two measuring leads, the test sets can measure all the quantities associated with multi-terminal electrical power equipment.

In addition to measuring the Capacitance and Power Factor of insulation, the test sets can measure the excitation current of transformers and other equipments.

**Features**
- Aesthetically designed Single Unit consisting of Measuring Bridge, Power Supply with in-built Standard Capacitor. Ideal for field/portable applications.
- Highly compact & Portable – Approx 66Kgs only.
- Advanced Protection Circuitry – specially suitable for 400kV s/s applications.
- Successfully passed all required EMI/EMC Tests at SAMEER Chennai IEC 61000-4-2; IEC 61000-4-3; IEC 61000-4-4; IEC 61000-4-5; IEC 61000-4-11;
- Improved Plug-in type of ‘Power In’ and ‘Gnd’ connectors.
- Preo 2 Stage RF Power line Filters incorporated for 230V Power Input and Bridge Power Input for improved EMI Power line Protection
- Improved 2 sets of LV measuring cables.
- Improved HV cable outer covering hosepipe for rugged field use
- Larger diameter Teflon ring on the HV Cable at specimen end – thus increasing distance between HV & Guard/Gnd points & greatly minimizing shorting possibilities.
- Improved front panel sensing type keypad – when keys are pressed, they can be sensed – thus avoiding keys being pressed twice.
- USB Printer Interface for printer connectivity.
- Conveniently located user controls – including ‘HV ON’ indicating Lamp which is visible from a distance.
- Front Panel based Test Set. Laptop/PC not needed for routine operation.
- Alphanumeric characters
**PRINCIPLE**

The Eltel Automatic Capacitance and Tan Delta Test Sets operate on the transformer ratio arm bridge principle. The current from the device under test is compared to the current of an internal reference capacitor. The residual of this comparison is measured and resolved into in-phase (watt loss) and quadrature current components. The test voltage and total specimen current are also measured. From these measured quantities, Power Factor and Capacitance are calculated and displayed along with the test voltage, current and power loss.

**APPLICATION**

Model ACTS - 12K Plus / ACTS - 5K Plus Automatic Capacitance and Tan Delta Test Sets can be used for shop or field testing of electrical insulation at voltages up to 12kV, (5kV on ACTS - 5K Plus) where the need for portability and simple operation is required. Examples of equipment that can be tested include: Power, Generator, Distribution & Instrument Transformers, Bushings, Bus & Line CVTs, EHV Class Transformer windings, shunt reactor windings, grading Capacitors of CBs, motor coils, Generators / HT Motors, cables & Transformer Oils (with optional accessories). The Capacitance & Tan Delta measurements are carried out at line frequency. The test voltage has to be applied using the variac on the front panel.

**INTERFERENCE SUPPRESSION**

The Test set has a fully Automatic Interference measurement and suppression circuitry. When activated by the operator, the circuitry automatically measures and suppresses the interference, which enables accurate measurements in HV Switchyards where interference levels are normally high. Interference Suppression in the Model ACTS-12K Plus is derived from a Phase locked Oscillator that provides separate Capacitance & Tan Delta adjustments. This Oscillator can be phase locked to the Line Frequency. The Interference is measured and displayed either in % or directly in milli Ampere.

**Advanced Protection Circuitry**

The ACTS-12K Plus incorporates advanced in-built Protection for the ALTERA, DSP section & associated circuitry to safeguard the measurement circuitry in case of flash-over.

**SPECIFICATIONS**

**CAPACITANCE**

- Range: 0 to 0.26 μF (Bridge range).
- (ACTS-12K Plus with the 12kV/200mA Power Supply we can test a Max. Capacitance of up to 0.06 μF @ 10kV, 50Hz or 0.05 μF @ 10kV, 60Hz).
- (ACTS-5K Plus with the 5kV/200mA Power Supply we can test a Max. Capacitance of up to 0.12 μF @ 5kV, 50Hz or 0.1 μF @ 5kV, 60Hz).
- Accuracy: ± 0.2% of reading ± 1 pF (UST).
- ± 0.2% of reading ± 10 pF (GST).
- Resolution: 4 digits

**DISSIPATION FACTOR (TAN DELTA)**

- DF Range: 0 to ± infinity
- Accuracy: ± 1% of reading ± 0.05%
- Readout: 5 digits
- Highest Resolution: 0.00001

**POWER FACTOR**

<table>
<thead>
<tr>
<th>Range</th>
<th>± 1% of reading ± 0.05%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>± 0.2% of reading ± 10 pF (GST).</td>
</tr>
<tr>
<td>Highest Resolution</td>
<td>0.00001</td>
</tr>
</tbody>
</table>

**INTERFERENCE CURRENT**

- Range: 0 to 100 mA
- Accuracy: ± 1% of reading
- Best Resolution: 1 micro ampere

**POWER**

- Range: 0 to ± 2 kW
- Accuracy: ± 1% of reading
- Readout: 4 digits
- Highest Resolution: 1 micro watt

**VOLTAGE**

- Range: 0-12000 V
- 0-5000V (ACTS-5K Plus)
- Test Voltage is continuously variable.
- Accuracy: ± 1% of reading, RMS responding
- Resolution: 1 volt

**CURRENT**

- Range: 0 to 2000 mA
- (Upto 5A when used with the set of Compensating Reactors and Range extension Transformer).
- Accuracy: ± 0.2% of reading
- Resolution: 1 micro ampere

**FREQUENCY**

- Operating Range: 45 to 65 Hz
- Accuracy: ± 0.02 Hz
- Resolution: 0.01 Hz

**DATA STORAGE FACILITY**

Can store upto a maximum of 100 readings & the data is retained in memory even when the instrument is switched OFF.

**INDICATION**

240 x 128 dot matrix LCD panel with back light.

**INTERFACE**

RS232C serial interface to PC for full control.

**KEYBOARD**

20 keys, membrane keyboard on front panel.
### Standard Capacitor

**Capacitance:** 200pF Air Capacitor with guard

**Accuracy:** ±0.5%

**Tan Delta:** ±2 x 10⁻⁴

Max Voltage rating: Upto 12kV.

### Power Input

**ACTS - 12K Plus**

- 0 - 12kV Tap
  - 0 - 12kV @ 100mA continuous
  - 0 - 12kV @ 200mA intermittent

- 0 - 2.4kV Tap
  - 0 - 2.4kV @ 500mA continuous
  - 0 - 2.4kV @ 1000mA intermittent

**ACTS - 5K Plus**

- 0 - 5kV
  - 0 - 5kV @ 100mA continuous
  - 0 - 5kV @ 200mA intermittent

### Power Output

**ACTS - 12K Plus**

- 0 - 12kV Tap
  - 0 - 12kV @ 100mA continuous
  - 0 - 12kV @ 200mA intermittent

**ACTS - 5K Plus**

- 0 - 5kV
  - 0 - 5kV @ 100mA continuous
  - 0 - 5kV @ 200mA intermittent

### Power Supply Rating / Max. Capacitance Measuring Ranges

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>ACCESSORY</th>
<th>TEST VOLTAGE</th>
<th>MAX CAPACITANCE (50 Hz)</th>
<th>MAX CAPACITANCE (60 Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTS-12K Plus</td>
<td>-</td>
<td>10kV</td>
<td>0.06 µF</td>
<td>0.05 µF</td>
</tr>
<tr>
<td>ACTS-12K Plus</td>
<td>CTS-RE</td>
<td>10kV</td>
<td>0.06 µF</td>
<td>0.05 µF</td>
</tr>
<tr>
<td>ACTS-12K Plus</td>
<td>CTS-RE</td>
<td>2.4kV</td>
<td>1.2 µF</td>
<td>1.0 µF</td>
</tr>
<tr>
<td>ACTS-12K Plus</td>
<td>CTS-RE</td>
<td>10kV</td>
<td>0.36 µF</td>
<td>0.3 µF</td>
</tr>
<tr>
<td>ACTS-5K Plus</td>
<td>CTS-RE</td>
<td>CTS-100 (1No. of 0.1µF)</td>
<td>0.5 µF</td>
<td>0.5 µF</td>
</tr>
<tr>
<td>ACTS-5K Plus</td>
<td>CTS-RE</td>
<td>CTS-100 (1No. of 0.5µF)</td>
<td>1.0 µF</td>
<td>1.0 µF</td>
</tr>
<tr>
<td>ACTS-5K Plus</td>
<td>CTS-RE</td>
<td>CTS-100 (5Nos. of 0.2µF)</td>
<td>1.0 µF</td>
<td>1.0 µF</td>
</tr>
</tbody>
</table>

### Applicable Standards

- The ACTS-12K Plus meets the EMI/EMC Test requirements as per:
  1. IEC 61000-4-3 - Radiated Susceptibility Test
  2. IEC 61000-4-4 - Electrical Fast Transient Immunity Test
  3. IEC 61000-4-2 - Electrostatic Discharge Immunity Test
  4. IEC 61000-4-5 - High Energy Surge Immunity Test
  5. IEC 61000-4-11 - Voltage Dips and Interruption Test

### Mechanical Data

**ACTS - 12K Plus**

- **Weight:** Approx. 66 Kgs
- **Size:** 760mm x 410mm x 630mm (LxBxH)
- **Cable Box:** 600 x 400 x 340 mm (LxBxH)

**ACTS - 5K Plus**

- **Weight:** Approx. 55 Kgs
- **Size:** 760mm x 410mm x 630mm (LxBxH)

**Temperature Range:** -10 to 50 deg C

**Humidity:** Ambient to 90%, RH

### Safety Features

- Zero start control and interlock for HV output.
- Double grounded connections needed to operate set with an open ground indicating lamp.
- All operator controls are at earth potential.
- External interlock must be manually closed for HV output.
- A interlock is provided to actuate safety barrier, warning light, etc.
- No energised terminals accessible from outside of modules.
- Protective Circuit Breaker and Transformer Thermal Sensor to guard against sustained overloading of the power supply.
- Short Circuit Protection.
- Indicating lamps for power supply & for HV ‘ON’.
- Reset switch provided for disabling short-circuit and over voltage indicators.

### Front Panel & Controls
STANDARD ACCESSORIES

CABLES
- High voltage cable (12kV / 5kV) of 20m length double screened and equipped with clips and hooks.
- Two low voltage leads of screened cable of 20m length equipped with clips and hooks.
- Foot switch used for safety of operator while handling high voltage; equipped with 5m length cable.
- Printer Cable for Printer - 2m
- Mains connecting cable of 10m length.
- Two grounding cables of 20 & 10m length equipped with clips.
- Transport Cases - ACTS-12K PLUS / ACTS-5K PLUS & Cables
- Operation Manual
- RS232 Cable for PC Interface - 2m

OPTIONAL ACCESSORIES FOR TESTING LARGE GENERATORS AND MOTORS USING MODEL ACTS-12K PLUS

Range Extension Transformer to extend the Bridge Capacitance range up to 2.6μF. The 10kV Capacitance value that can be measured will depend on the number of Compensating Reactors used. Compensating reactors to boost the power supply rating which enables measuring a Capacitance of up to 1.1μF at 10kV, 50 Hz OR 1μF at 10kV, 60 Hz.

OPTIONAL ACCESSORIES
- 10kV Oil Test Cell - Measurements at ambient temperature only.
- Calibrator for Capacitance and Tan Delta - Provides One Capacitance & three Tan Delta values.
- Windows Analysis & Interface Software: This is a Windows based software. The software can be operated on any Windows platform.
- External Temperature & Humidity Indicator.

Windows Analysis & Interface Software Features and Sample Graphs

Features
- Add New Specimen
- New Test Conducting
- Quick Measurements for selected SP #
- Stored Data Retrieval
- Manual Data Entry
- Viewing Test Settings/Details
- Deleting Test Settings/Details
- Advanced Delete
- Saving Data
- Copying the Selection to Clipboard (Excel/Word)
- Export All Grid Data to Excel
- Exporting the results to Excel after Live test
- Print Data/Graph
- Applying Temperature Correction
- Plot PF/DF Vs Voltage
- Compare PF/DF with previous values
- Plot Capacitance Vs Voltage
- Compare Capacitance with Previous Values
- Print Settings
- Record Temperature
- Add New Temperature corrections to Std List
- Instrument Selection Screen

Windows Analysis & Interface Software Features and Sample Graphs

- Plot of CAPACITANCE vs VOLTAGE
- Plot of DISSIPATION FACTOR vs VOLTAGE
- Plot of POWER FACTOR vs VOLTAGE

ELTEL INDIANIES
311 EMBASSY CENTRE, CRESCENT ROAD, BANGALORE-560 001, INDIA
TEL.: 91-80-22255467, 22256086, 22284253, 22284298 FAX: 91-80-22252733
E-mail: marketing@eltelindustries.com
Web site: http://www.eltelindustries.com

Works: Plot No. 39, KIADB Industrial Area, Veerapura, Doddaballapura, Bengaluru – 561 203. INDIA.
TEL.: 91-80-27630366, 27630367, 27630356 FAX: 91-80-27630351
- CHENNAI: 044-24339075
- KOLKATA: 033-24765536 FAX: 24752394
- MUMBAI: 022 - 21713579 FAX: 21713496
- NOIDA: 0120 - 24511141, FAX: 0120-2451142

(SPECIFICATIONS OF TEST SETS & SOFTWARE FEATURES SUBJECT TO CHANGE WITHOUT NOTICE)