

# Automatic Capacitance & Tan Delta Test Sets

**ACTS-12K PLUS**



## 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 & Temperature entry from front panel keypad.**

Etel 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.



**ACTS-5K PLUS**

## 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 upto 12kV, (5kV on ACTS - 5KPlus) 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.

## 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 Amperes.

## 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 F (Bridge range). (ACTS-12K Plus with the 12kV/200mA Power Supply we can test a Max. Capacitance of upto 0.06 F @ 10kV, 50Hz or 0.05 F @ 10kV, 60Hz). (ACTS-5K Plus with the 5kV/200mA Power Supply we can test a Max. Capacitance of upto 0.12 F @ 5kV, 50Hz or 0.1uF @ 5kV, 60 Hz).
Accuracy	: $\pm 0.2\%$ of reading $\pm 1$ pF (UST). $\pm 0.2\%$ of reading $\pm 10$ pF (GST).
Resolution	: 4 digits

### DISSIPATION FACTOR (TAN DELTA)

DF Range	: 0 to $\pm$ infinity
Accuracy	: $\pm 1\%$ of reading $\pm 0.05\%$
Readout	: 5 digits
Highest Resolution	: 0.00001

### INTERFERENCE CURRENT

Range	: 0 to 100 mA
Accuracy	: $\pm 1\%$ of reading
Best Resolution	: 1 micro ampere

### POWER

Range	: 0 to $\pm 2$ kW
Accuracy	: $\pm 1\%$ of reading
Readout	: 4 digits
Highest Resolution	: 1 micro watt

The watts /mWatts are calculated and displayed automatically. The watts /mWatts in a C& DF Test measures the total losses in the insulation. These values can be added or subtracted to cross-verify measurements on multi-terminal equipments.

### EQUIVALENT READINGS

Provides printout for equivalent values at 2.5 or 10 kV readout as selected by operator

### POWER FACTOR

Range	: 0 to 100% (Positive or Negative) PF display in absolute value & in %. It will display (0 to 0.99999) with a 5 digits resolution
Accuracy	: $\pm 1\%$ of reading $\pm 0.05\%$
Highest Resolution	: 0.00001

### INDUCTANCE

Range	: Infinity upto 40H (50Hz) & 27H (60Hz)
Accuracy	: $\pm 0.2\%$ of reading
Resolution	: 0.01H

Inductance measurement is carried out only when the Excitation Test is carried out.

### VOLTAGE

Range	: 0-12000 V 0-5000V (ACTS-5K Plus) Test Voltage is continuously variable.
Accuracy	: $\pm 1\%$ 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	: $\pm 1\%$ of reading
Highest Resolution	: 1 micro ampere

### FREQUENCY

Operating Range	: 45 to 65 Hz
Accuracy	: $\pm 0.02$ Hz
Resolution	: 0.01 Hz

### DATA STORAGE FACILITY

Can store upto a maximum of 70 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.  
USB printer interface.

### KEYBOARD

20 keys, membrane keyboard on front panel.

STANDARD CAPACITOR	
CAPACITANCE	200pF Air Capacitor with guard
<b>ACCURACY :</b>	
CAPACITANCE	±0.5%
TAN DELTA	±2 x 10 <sup>-4</sup>
Max Voltage rating	Upto 12kV.

**POWER SUPPLY RATING / MAX. CAPACITANCE MEASURING RANGES  
GENERATORS / MOTOR TESTING**

EQUIPMENT	ACCESSORY	TEST VOLTAGE	MAX CAPACITANCE (50 Hz)	MAX CAPACITANCE (60 Hz)
ACTS-12K Plus	-	10kV 2.4kV	0.06 F 0.26 F	0.05 F 0.2 F
ACTS-12K Plus	CTS-RE	10kV 2.4kV	0.06 F 1.2 F	0.05 F 1.0 F
ACTS-12K Plus	CTS-RE CTS-100 (1No. of 0.1 F) CTS-50 (1No. of 0.2 F)	10kV	0.36 F	0.3 F
ACTS-12K Plus	CTS-RE CTS-100 (1No. of 0.1 F) CTS-50 (5Nos. of 0.2 F)	10kV	1.1 F	1.0 F

**POWER OUTPUT**

**ACTS - 12K PLUS**

- A) 0 - 12 kV Tap    0 - 12kV @ 100mA continuous  
                          0 - 12kV @ 200mA intermittent
- B) 0 - 2.4kV Tap    0 - 2.4kV @ 500mA continuous  
                          0 - 2.4kV @ 1000mA intermittent

**ACTS - 5K PLUS**

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

**POWER INPUT**

**ACTS - 12K PLUS**

230V ±10%, 50 Hz, 1.2 kVA (2.4 kVA intermittent) OR  
110V ±10%, 60Hz    1.2kVA (2.4 kVA intermittent)

**ACTS - 5K PLUS**

230V ±10%, 50 Hz, 500 VA (1000 VA intermittent) OR  
110V ±10%, 60 Hz, 500 VA (1000 VA intermittent)

**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

**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.

**MECHANICAL DATA**

**ACTS - 12K PLUS**

**ACTS 12K Plus Weight** : Approx. 66 Kgs  
**Size** : 760mm x 410mm x 630mm (LxBxH)

**ACTS - 5K PLUS**

**ACTS - 5K PLUS Weight** : Approx. 55 Kgs  
**Size:** 760mm x 410mm x 630mm (LxBxH)

**Cable Box** : 600 x 400 x 340 mm (LxBxH)    **Weight** : Approx. 20 Kgs.

**Temperature Range** : -10 to 50 deg C    **Humidity** : Ambient to 90%, RH



FRONT PANEL & CONTROLS



BACK PANEL

**CABLES & HOOKS**



## 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
- One set of interconnecting cables. ■ Mains connecting cable of 10m length. ■ Two grounding cables of 20 & 10m length equipped with clips.
- Transport Cases - Bridge, Power Supply & 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 upto 2.6 F. 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 upto 1.1 F at 10kV, 50 Hz OR 1 F at 10kV, 60 Hz.



RANGE EXTENSION TRANSFORMER CTS-RE COMPENSATING REACTOR CTS-50 / CTS-100

H V CALIBRATOR

10 kV OIL CELL

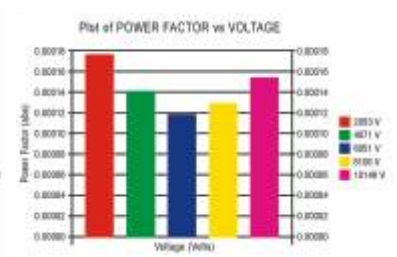
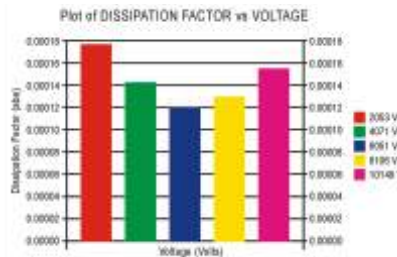
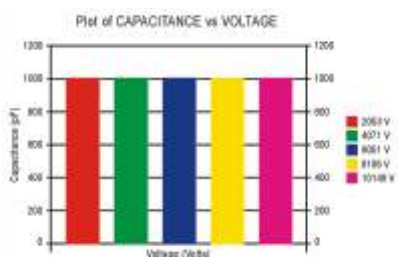
### OPTIONAL ACCESSORIES

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



## ELTEL INDUSTRIES

311 EMBASSY CENTRE, CRESCENT ROAD, BANGALORE-560 001, INDIA  
 TEL. : 91-80-22255467, 22205686, 22284253, 22284298 FAX : 91-80-22252733  
 E-mail: marketing@eltelindustries.com Web site: http://www.eltelindustries.com



- CHENNAI: 044-24312849, 24339075 ■ KOLKATA: 033-24765536, FAX : 24752394 ■ MUMBAI: 022-25398358, FAX : 253839360
- NOIDA : 0120-2451141, FAX : 2451142

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