

# AUTOMATIC DIELECTRIC CONSTANT TAN DELTA & RESISTIVITY TEST SET



ADTR 2K PLUS



Oil Test Cell



Automatic Oil Test Cell Heater AOC-H-06

The ADTR-2K Plus is an automated instrument for measuring the electrical characteristics of transformer oil, insulating liquids & other insulating material samples. The ADTR-2K Plus measures Capacitance, Dielectric Constant ( $\epsilon$ ), Dielectric loss, Tan Delta (Dissipation Factor), Resistance & Resistivity of the test sample.

The Tan Delta value gives an indication of the condition of the oil sample. There are several reasons due to which the Tan Delta value may be affected – such as moisture and temperature.

ADTR-2K Plus is especially designed to work with the IEC & ASTM type oil cell with a 2mm spacing and will apply a stress in the range of 100-1200 volts per mm as recognised by ASTM and other specifications.

## FEATURES

- Fully automatic testing sequence controlled by a microprocessor.
- Optional manual test feature to carry out AC & DC testing separately.
- Automatic and continuous calibration of resistance measuring circuit against highly stable regulated voltage sources.
- Automatic and continuous calibration of the C & DF measurement against internal reference capacitor.
- Internal AC voltage source synchronized with line frequency and sinusoidal wave shape.
- Internal DC voltage sources for DC voltage.
- Windows software for interfacing to a PC.
- RS232 Computer interface for downloading data or control from a PC.
- USB Serial printer interface for direct test data printout.
- Menu driven software for user friendly operation.
- Stores up to 80 automatic test results.
- Measures Resistivity by applying DC test voltage.
- Open GND and Interlock protection for safety of Instrument as well as the operator.

## BENEFITS

- Eliminates manual balancing & reduces operator error.
- Reduces the time required for each test sample.
- Provides a high degree of repeatability.
- Provides a printout, storage or export of test data.

## DESCRIPTION

The Eltel Model ADTR-2K Plus is a versatile Test Set used for measuring the Dielectric Constant, Tan Delta (DF), Resistivity of transformer oils & other electrical insulating liquids or solid insulating materials in sheet form. The ADTR-2K Plus cannot be used as a standalone equipment and should be used with three-terminal oil test cell. A heater is required if the oil is to be tested at temperatures specified in international or national standards. A suitable solid dielectric test cell is required for testing solid insulation materials in sheet form.

When excited with an AC source, the ADTR-2K Plus measures the Voltage, Capacitance, Dielectric Loss and Frequency. Dissipation Factor (Tan Delta) is calculated from the above measurements. To determine the Dielectric Constant, the measurements are carried on an empty and a full test cell. The parameters of the test cell can also be entered manually, using the keypad.

The operating procedure is menu driven & simple. The AC & DC test voltages are set using the front panel keypad. Tests can be programmed for the AC test between 200 to 2400 volts and 100 to 1,000 volts for the DC test.

After initial set-up, the oil test cell is filled with the oil test sample & the test procedure is initiated. The test set performs all the selected measurements automatically & the results are displayed on the front panel. The test results can be transferred to a PC using the RS232 interface, printed using

the USB Serial port, or stored in a non-volatile memory. The tests can also be repeated.

The Temp setting for the Oil Cell Heater should be entered in the Model ADTR-2K Plus front panel. There is separate option provided to test solid cell in automatic mode which provides reading after a stabilization period of 1 min.

The ADTR-2K Plus automatically turns ON the Heater. We can enter upto a max of 4 Temperatures values (any 4 temp values - in ascending order from 21 deg C to 110 deg C) in the ADTR-2K Plus. Once the testing is initiated, heating is commenced until the first set temp is reached; then the heating is automatically cut-off, and measurements are carried out. Then the Heater is automatically turned ON for the next set value and measurements are carried out. This process is repeated until the last temp is reached and measurements are carried out. The final result (Epsilon, Tan Delta and Resistivity) are all displayed for all the Set temperatures.

There is also an option to carry out measurement as temperature falls. Here again oil heater and measurements are carried out as above. Additionally once cooling takes place and oil temp reduces to the next lower pre-set value, again measurements are carried out and so on till the lowest selected set temp is reached. The final results are displayed for all the pre-set values selected.

There is a check measurement option available in ADTR-2K Plus Test Set. With this feature, the measurements for the test sample is repeated upto 20 times. At the end, all the 20 results are displayed. This is a separate menu in the ADTR-2K Plus which carries out the measurements only at the temp of the Oil Cell.

The ADTR-2K Plus is housed in 3 U chassis. The temperature is displayed on the LCD display of the ADTR-2K Plus Test Set.

This Instrument is intended for laboratory use and normal Industrial Environment.

This Instrument is not intended for use in potentially EXPLOSIVE atmosphere.

## SPECIFICATIONS

### DIELECTRIC CONSTANT & TAN DELTA

<b>Test Voltage</b>	: 200 - 2,400 V AC in 1 volt steps at line frequency.
<b>*Accuracy</b>	: $\pm 1\%$ of output.
<b>Capacitance</b>	: 0 to 1600 pF.
<b>*Accuracy</b>	: $\pm 0.1\%$ of reading $\pm 0.1$ pF.
<b>Best Resolution</b>	: 0.1 pF.
<b>Dielectric Constant</b>	: 1 to 20 when using a typical oil test cell ( $C = \sim 70$ pF).
<b>*Accuracy</b>	: $\pm 0.1\%$ .
<b>Resolution</b>	: 0.001.
<b>Dissipation Factor (DF)</b>	: 0 - 1.000 .
<b>*Accuracy</b>	: $\pm 1\%$ of reading $\pm 0.0001$ .
<b>Best Resolution</b>	: 0.00001 ( $10^{-5}$ ).
<b>Dielectric Loss</b>	: 0 - 10.00 watts.
<b>*Accuracy</b>	: $\pm 1\%$ of reading $\pm (10^{-5})$ .
<b>Best Resolution</b>	: 0.001 milli watts ( $10^{-6}$ watts).

**Cell Constant** : Any cell acceptable; oil test cell with 50 - 70 pF are ideal for Optimum performance.

### RESISTANCE - RESISTIVITY

Test voltage : 100 - 1000V DC in 1 volt steps.  
 \*Accuracy : ±1% of setting.

### RESISTANCE RANGE & RESOLUTION

Range :  $10^6 \Omega$  to  $10^{13} \Omega$ .  
 – (1 mega $\Omega$  - 10 Tera $\Omega$ ).  
 Resolution : 3 digits.  
 Resistance Range : 1 Mega $\Omega$  to 10 Tera $\Omega$ .  
 \*Accuracy : 2% from 1 Mega $\Omega$  to 10 Giga $\Omega$  ( $10^6$  -  $10^{10}\Omega$ ).  
 5% from 10 Giga $\Omega$  - 1 Tera $\Omega$  ( $10^{10}$  -  $10^{12} \Omega$ ).  
 10% above 1 Tera $\Omega$  (1 T $\Omega$  - 10 T $\Omega$ ) ( $10^{12}$  -  $10^{13} \Omega$ ).

### RESISTIVITY RANGE & RESOLUTION

Range : 1,000 M $\Omega$  cm - 10,000 T $\Omega$  cm ( $10^9$  -  $10^{16} \Omega$  cm).  
 \*Accuracy : 2% (1G $\Omega$  cm - 10 T $\Omega$  cm) ( $10^9 \Omega$  cm -  $10^{13} \Omega$  cm).  
 5% (10 T $\Omega$  cm - 1,000 T $\Omega$  cm) ( $10^{13} \Omega$  cm -  $10^{15} \Omega$  cm).  
 10% (1,000 T $\Omega$  cm - 10,000 T $\Omega$  cm) ( $10^{15} \Omega$  cm -  $10^{16} \Omega$  cm).

\* Accuracy applies over a temp range of 22° C to 28° C and humidity of <50% RH.

## MEASUREMENTS

### Manual Measurements

Separate and continuous measurements of C, DF and Resistivity can be made at a selected voltage.

### Automated Measurements

The test set will conduct one set of C, DF and Resistivity Measurements automatically and display the results.

### Display

240 by 128 dot matrix. LCD panel with back lighting.

### Keyboard

20-key Keypad providing numeric and soft-function entries.

## OUTPUTS

### RS-232 Serial Port

Opto-isolated serial port for controlling the instrument from a PC and for outputting data to a PC.

### USB Port

Opto-isolated serial port for USB/ centronics compatible printer.

### Data Storage

Capacity – upto 80 test results can be stored.

## CONNECTIONS

### Test voltage (HV)

- Amphenol MVH connector.

### Measuring Terminal (LV)

- BNC connector.

### Ground (GND)

- Ground Stud.

### Control

- 5 pin Audio connector.

### Power connection

- IEC three terminal socket.

### POWER

- 90 – 260 volts, 50/60Hz, 50VA.

## TECHNICAL SPECIFICATIONS

Ingress Protection : I Pxx.

### Measurement

Category : 2.

Class : 1.

### Physical

Size (LxBxH) : 482.5 mm x 425 mm x 132.5 mm.

Weight : Approx. 11 kgs.

Temperature Range : -10° to 50°C (storage temperature).

Humidity : Ambient to 90%, RH.

## REQUIRED ACCESSORIES

### OIL TEST CELL

This 3 Terminal Oil Test Cell is designed for routine and Laboratory tan delta test on transformer oils and other electrical insulation liquids. The electrode of the cell is designed with a spherical bottom which offers more uniform stress on the oil as compared to electrode with tapered end.



### SPECIFICATIONS

Construction : 3 terminal configuration.  
 Material : Stainless Steel 316 with Teflon spacers.  
 Cell Capacitance : 50 - 70 pF.  
 Cell Electrode Spacing : 2mm.  
 Volume : 60ml.  
 Dimension : 90mm x 195mm.  
 Maximum test voltage : 2.4 kV AC & 1 kV DC.  
 Weight : Approx. 2.5 Kgs.

## AUTOMATIC OIL TEST CELL HEATER - AOCH-06

The heater is a very compact unit and is used to heat the oil in the cell to the required temperature. This uses a high frequency induction heater which raises the temperature to 90°C in 15 min approximately. A temperature sensing probe is supplied and this senses the temperature and stops heating of the oil once the set temperature is reached. LED is provided to indicate 'heating on'.

To ensure safety, the built-in micro switch interlock automatically trips the high voltage when the plexi cover of the heater is raised.

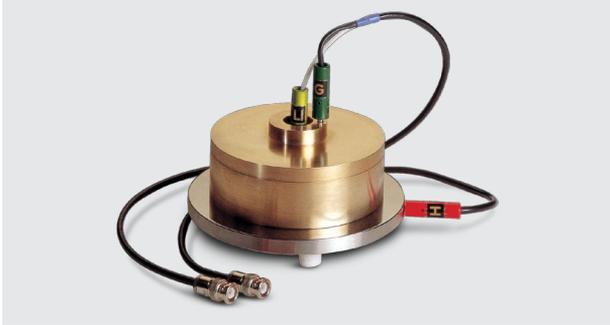


### SPECIFICATIONS

Power Supply : 230 VAC ± 10%, 50 Hz OR 110 VAC ± 10%, 60 Hz, 200 VA.  
 Temperature Range : 20 - 110°C.  
 Accuracy of Temperature Control : ± 2°C.  
 Dimension : 230mm x 258mm x 314mm.  
 Weight : Approx. 5.5Kgs w/o Cell.

## OPTIONAL ACCESSORIES

### SOLID DIELECTRIC TEST CELL



The Eltel solid test cell is designed to test electrical insulating material in sheet form using the ADTR-2K test set. The circular electrodes are constructed from rigid stainless steel & will accept samples with a minimum of 120mm in diameter.

The Sample Should be Square with a minimum of 120mm x 120mm (WxB) and a maximum height of 2.5mm or a disc with 120mm minimum dia and height of 2.5mm. The samples can be tested only at room temperature.

### SPECIFICATIONS

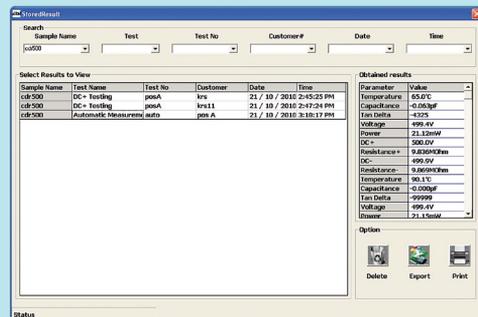
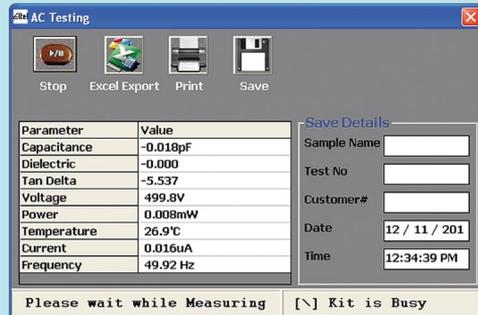
Cell type & construction	: Three terminal, guarded; Stainless Steel.
Cell gap spacing	: 0.1mm to 2.5mm.
Electrode diameter	: 100mm.
Cell Capacitance	: 70pF at 1mm gap.
Maximum test voltage	: 2.4 kV AC & 1kV DC.
Weight	: Approx. 5Kgs.

### C-DF & RESISTIVITY CALIBRATOR



This calibration box is used to routinely check and inspect the Test Set. The Calibrator offers one Capacitance, three Tan Delta & four Resistivity values. The maximum operating voltage is 500V AC or DC.

### SAMPLE WINDOWS SOFTWARE SCREENS



### OTHER PRODUCTS

- Manual & Automatic Transformer Ratio Meters.
- Digital Micro Ohm Meters with built in 100Amp source.
- Manual & Automatic Transformer Winding Resistance & On Load Tap Changer Test sets.
- Automatic CT/VT Test Sets & Systems.
- Automatic 12 kV & 5 kV Capacitance & Tan Delta Test Sets.
- Transformer Loss Measurement System.
- Relaying Current Transformer Analyser.



**ELTEL INDUSTRIES**

311 Embassy Centre, Crescent Road, Bengaluru 560 001, India

TEL: +91-80-22255467, 22205686, 22284253, 22284298  
FAX: +91-80-22252733 email: marketing@eltelindustries.com

[www.eltelindustries.com](http://www.eltelindustries.com)

Manufacturing Facility : Plot No. 39, KIADB Industrial Area, Veerapura, Doddaballapur, Bengaluru - 561 203, INDIA.  
TEL : 91-80-27630366, 27630367, 27630368, +91-9686693047, +91-9686693048 FAX : 91-80-27630351

- CHENNAI: 044-24339075 ■ GURGAON: 0124-2460619, 093115 42530 ■ MUMBAI: 022 - 21713579, 09325885244
- KOLKATA: 033-24765536, 09830067236, 09331094257 ■ VADODARA: 09327757574