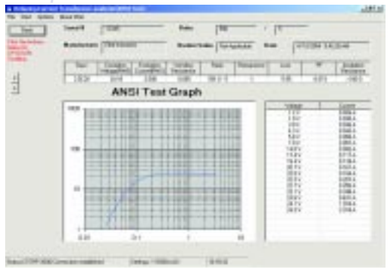
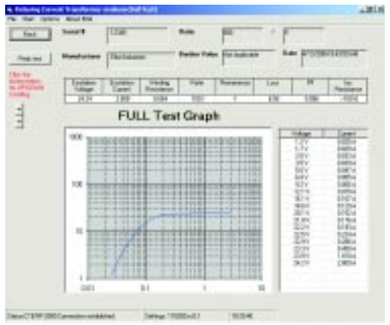
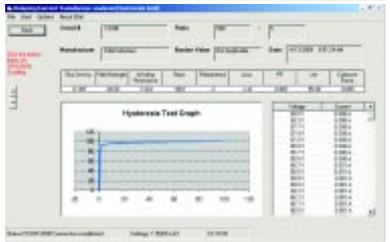
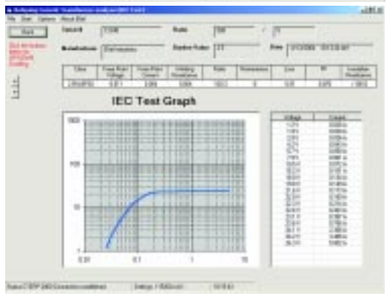
Sample Windows Software Screens









SPECIFICATIONS

Ratio	:	Range	: 1....1,000 to 1 (5...5,000 to 5)
		Accuracy	: ±0.3%(5...upto 240); ±1% (240...1,000)
		Resolution	: 4 digits.
Resistance Winding	:	Range	: 0...1000 ohms
		Accuracy	: ±1%
		Best Resolution	: 1m Ohm
Insulation	:	Range	: 1 M Ohm to 100 G Ohm
		Accuracy	: ±3 . . . 10%
		Test Voltage	: 500 volts.
		Resolution	: 3 digits.
Current Display Range	:		
Peak		Range	: 1 mA to 15 A
		Accuracy	: ±1% (10mA . . . 15A)
		Resolution	: 3 digits.
RMS	:	Range	: 1 mA to 15 A
		Accuracy	: ±1%
		Resolution	: 3 digits.
Voltage Display:			
		Range	: 0 to 10,000 volts
		Accuracy	: ±1% ±0.5V
		Resolution	: 3 digits.
Hysteresis Loss	:	Range	: 0VA . . . 10KVA
		Best Resolution	: 1mVA
Power Factor	:	Range	: 0...100%
		Resolution	: ±1%
Frequency	:	50 or 60Hz.	
Remanence	:	Range	: 0...±100%
		Resolution	: ±1%
		Accuracy	: ±3%
Demagnetization	:	Accuracy	: ±3%
Output Voltage	:	0 - 12 volts	
Output Current	:	0 - 20 amperes maximum (Peak)	
Operator interface	:	240 x 128 dot matrix Back-lit LCD graphic display & 20 Membrane keyboard	
PC Interface	:	RS-232 serial port,	
Printer Interface	:	Centronix Parallel Port.	
Power	:	Battery powered using a sealed lead acid battery 7.5 AH/12V (typically suitable for 6 hours operation under average use).	
Battery Charger	:	Input : 90-260 Volts, 45-65Hz, 20VA.	
Charger Output	:	19 V, 1A.	
Dimensions	:	Approx. 355x280x170mm	
Weight	:	Approx. 13 Kgs.	
Temperature	:	0 – 50°C	
Humidity	:	Ambient to 90% RH	

OTHER PRODUCTS

■ Manual & Automatic Transformer Ratio Meters. ■ Manual & Automatic Transformer Winding Resistance & On Load Tap Changer Test Sets. ■ Automatic CT/VT Test Sets & System. ■ Automatic & Semi-Automatic HV Capacitance & Tan Delta Test Sets. ■ Manual & Automatic Tan Delta & Resistivity Test sets for Transformer Oil. ■ Manual & Automatic Portable LV Capacitance& Tan Delta Test Sets. ■ Digital Micro Ohm Meters with built in 100A. source

ELTEL INDUSTRIES

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CHENNAI: 044 - 24312849 / 24339075 ■ KOLKATA: 033 - 24765536 / 24752394 ■ MUMBAI: 022 - 25383960 / 25398358
■ NEW DELHI: 011 - 29810252 / 29815746

Certified ISO 9001 by BVQI

(SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE)

SCROLL PRINTS 5.06.2004

Reptame Equipment Inc.
www.reptame.com
(905) 936-6979

Relaying Current Transformer Analyser

CTERP - 2000

The Eltel CTERP-2000 is a state-of-the-art, fully automatic microprocessor based instrument for testing relaying current transformers to International & National Standards. The instrument is a lightweight and portable test set that measures the excitation current, turns ratio, winding polarity and winding resistance of single-ratio or multi-ratio relaying current transformers. Although it is primarily designed for testing the over current performance of relaying CTs, it can be used to acces the characteristics of metering CTs, power transformers, motors or samples of electrical steel.

The CTERP-2000 is suitable for making complete commissioning tests on relaying CTs according to ANSI Specification C57.13.1 as well as IEC Specification IEC 44-1 that would be normally conducted prior to connecting such CTs to protective relays and commissioning the protective relaying system.

F E A T U R E S

- Measures Ratio, Excitation Characteristics, Polarity, Winding Resistance, Remanance, and Insulation Resistance of secondary winding.
- Used to test un-mounted CTs or CTs that are mounted but isolated inside the power system equipment.
- Conducts a whole series of tests automatically, thus speeding up the time to commission CTs and relaying systems.
- Battery powered test set - light weight & fully portable .
- Provides a graphical presentation of the CT excitation characteristics.
- Determines the IEC 10/50 knee point.
- Detects shorted turns or insulation problems with the test CT, thus avoiding commissioning of faulty equipment.
- Measures the Hysteresis loss of CT core and the Power Factor of the hysteresis loss and plots hysteresis curves of CT cores
- Automatically demagnetizes the test CT.
- RS-232 Computer Interface
- Centronics parallel port for Printer Interface
- Graph printing provided through PC

PRINCIPLE OF OPERATION

The CTERP-2000 operates and relies on fundamental physical principles. Measurements of the fundamental magnetic quantities of field strength and flux density are conducted and these allow the instrument to calculate and provide the desired results. The CTERP-2000 applies magnetic flux density, in volt-seconds, and measures the resulting magnetic field strength, in amperes. This process allows one to draw a full hysteresis loop for the test specimen. Multiple hysteresis loops allows the CTERP-2000 to calculate the excitation characteristics for the test specimen.

The hystersis loops that are conducted on the test specimen use a special procedure that allows the CTERP-2000 to separate the excitation loss into the "hysteresis loss" and the "eddy current loss". The ability to measure the "eddy current loss" makes the CTERP-2000 very sensitive to shorted turns and similar problems.

As the instrument applies "volt seconds" rather than "volts" during the test, it can test CTs, transformers, or other magnetic structures over the range of <10 volts to >10 kilovolts. As no actual "high voltage' is applied, the test is very safe to conduct. As the actual excitation characteristics are calculated from dc values, the measurements are very repeatable, and not influenced by the test frequency (set for 25, 50 or 60 Hz) or the distortion of the power line.

In addition to measuring the magnetic characteristics of the test CT, the CTERP-2000 also measures the insulation resistance of the secondary winding.

The application of voltage and the measurement of current is one simple - but an incomplete method of testing the performance of a CT for relaying applications. This method has been used for a long time because other suitable test equipment were not available .

As every CT has a "magnetic core" it is this magnetic core that needs to be tested.

The CTERP-2000 tests all the characteristics related to the core of the test CT & these tests reflect on the performance of the CT for relaying applications. The application of voltage to the winding test only some of the core characteristics. Thus the tests are not complete. For example, ANSI C-57.13 requires the "CORE LOSS" to be measured which the CTERP-2000 measures .

The specifications require one to obtain the excitation characteristics for the CT winding. The standards only suggests that one way of doing this is to apply a known sinusoidal voltage at the required frequency, and then measure the excitation current and excitation loss . The standards do not forbid the use of other test methods that provide the required information - namely excitation characteristics.

The graph that the Test Set plots has voltage (correct sinusoidal waveform at either 50 OR 60 Hz) on the vertical scale and time on the horizontal scale . This kind of voltage can be converted to "volt-seconds". The conversion of the voltage to volt-seconds is done by "integrating the area under one-half of a sine wave" and dividing it by two. Thus the area under the sine wave curve is "volt-seconds". This means that to make measurements on a CT one needs to apply "volt-seconds" and not "volts" in order to test it.

The Measuring Sequence

The measuring sequence is designed to obtain all the pertinent information from the CT in the shortest possible time. The test procedure is as follows:

- Insulation Test – measures insulation resistance of secondary winding at 500 volts DC.
- Remanence Measurement – The CT is saturated in the (+) & (-) polarity and remanence is calculated. The winding resistance is measured during this process.
- Excitation characteristics - Repetitive hysteresis curves are taken at gradually decreasing excitation values. When completed, the CT core is typically left with remanence in the order of 2%.The hysteresis test results are used to compute the voltage vs. current characteristics at the specified frequency for the test CT. The measurement of ratio is conducted at the same time.
- It should be pointed out that the measurements of remanence can be made ONLY ONCE. The measurement of remanence by any known means automatically destroys the existing value of remanence.

TESTS AND TEST RESULTS

When testing CTs, the CTERP-2000 measures and displays the following information:

Ratio
Polarity
Winding resistance
Excitation Characteristics
Excitation loss
Excitation power factor
Remanence
Insulation resistance
3 x 3 cycle log curve of the excitation characteristics
Access to all the excitation curve test points.
The CT is left in a demagnetized state after completion of the tests.

When testing CTs to ANSI C57.13.1 Standard, the CTERP-2000 also provides:
Excitation voltage for the 2.5 ampere excitation point.
ANSI Relaying Accuracy Class.

When testing CTs to IEC 44-1 Standard, the CTERP-2000 also provides:
IEC 10/50 knee-point voltage and current values,
IEC Relaying Accuracy Class (5%).

When conducting >OTHER TESTS< on CTs, one may determine the hysteresis characteristics of the CT core material, at preset excitation values. The shape of the excitation characteristics, the power factor of the excitation current and the relative value of the hysteresis loss to the eddy current loss are valuable assets when troubleshooting problems with CTs. When conducting hysteresis tests the CTERP-2000 provides a graphical representation of the upper half of the hysteresis curve and numerical values similar to the ANSI & IEC tests.
The CT is left in a demagnetized state after completion of the tests.

EXPLANATION & DESCRIPTION OF MEASURED QUANTITIES

Excitation Loss

Excitation loss (volt-amperes) reflects the characteristics of the core material used in the CT. The excitation loss is responsible for the ratio and phase error of the CT under normal operating conditions.

Hysteresis Loss

Hysteresis loss is one part of the excitation loss. It is due to the characteristics of the core material used in the CT. The hysteresis loss includes active (W) and reactive (VAR) components.

Eddy Current Loss

Eddy current loss is the second part of the excitation loss. It is due to eddy currents within the laminations of the core and the windings. Shorted turns on the CT show up as eddy current losses during the measurements.

Knee point

The "knee-point" used by the CTERP-2000 is that as defined by IEC. It is typically referred to as the 10/50 knee-point, meaning it is a point on the V-I excitation curve whose slope is 10/50, or where an increase in excitation voltage by 10% causes an increase in excitation current of 50%.

Winding Resistance

The winding of the secondary resistance is measured as it is required for both the ANSI and IEC relaying accuracy calculations. Some part of specifications require the use of the winding resistance at 75^{o} C. For correcting the winding resistance to 75^{o}C, the CTERP-2000 assumes a 25^{o} C ambient.

Remanence

Measuring remanence, or "residual magnetism" in the CT core, is a unique feature of the CTERP-2000. Remanence influences the performance of the CT under transient fault conditions on the power system. Such transient fault conditions can be found at or near generating stations as well as on high voltage transmission networks. The larger the capacity of the generating station and the higher the voltage of the transmission network – the higher the incidence of faults with transients and the higher the importance of remanence on the performance of CTs and associated protective relays.

Demagnetization

Any application of DC to the CT winding, like while measuring continuity or winding resistance, will magnetize the CT core. It is undesirable to leave CT cores magnetized as such magnetization (remanence or residual magnetism) may cause the CT to malfunction. Malfunction of CTs may in turn cause the protection relays attached to the CT to malfunction. Such malfunctioning typically occurs under transient fault conditions on the power system.

The CTERP-2000 test procedure has been specially organized in such a way so that it will leave the test CT in a demagnetized (degaussed) condition when the testing is completed. This avoids the need for separate demagnetization (degaussing).

Turns Ratio

The CTERP-2000 measures the ratio of the test CT, as such ratio measurement is also required when commissioning relaying systems. CT ratios affect the settings of distance and other relays on the power system.

Insulation Resistance

The CTERP-2000 verifies the insulation resistance of the secondary winding using a 500 volt test voltage. This test voltage is very safe to use as the winding should be rated and capable of withstanding a much higher voltage test.