The CTMP-2012 is a lightweight portable test instrument capable of performing a complete test protocol of instrument transformers and associated circuits. Ratio of current, potential, and power transformers are measured by the voltage comparison method and the ratio is calculated and displayed. Current transformers can be tested installed in switchgear, transformers, and circuit breakers. Voltage and current inputs are provided to allow the unit to measure an external voltage, current, and phase angle. The unit therefore eliminates the need for the phase angle and other meters required to perform a commissioning test of a protective relay scheme. The CTMP is a test set that includes a complete array of instrument transformer system test functions. The unit offers integrated instructions for ease of use.
CTMP

SPECIFICATIONS

TYPE—Portable Multifunctional Instrument transformer test set.

SIZE—11.25 x 13.25 x 15 (HWD)

WEIGHT—39 LBS.

INPUT POWER—120 VAC 60 HZ, 240V and 50HZ available if specified.

OUTPUT TEST VOLTAGE—0-200VAC @ 2A, 0-1000VAC @0.4A (1 A at 20% duty cycle)

CT RATIO RANGE—5/5 to 100,000/5, Accuracy 0.1%RDG +.01%Scale

PT RATIO RANGE—1/1 to 3000/1, Accuracy 0.1%RDG + .01%Scale

SATURATION CURRENT METERING—0 to 2AAC, Accuracy 0.4%RDG +.01% Scale

SATURATION VOLTAGE METERING—0 to 200/2000VAC, Accuracy 0.3%RDG +.01%Scale

VOLTAGE INPUT—0 to 150VAC, Accuracy 0.4%RDG 20V to 150V

CURRENT INPUT—0 to 10AAC, Accuracy 0.4%RDG 0.2A to 6A

PHASE ANGLE—0 TO 360, Accuracy +/- 1 degree.

DISPLAY—7”, 800 x 480 touch screen, 16 bit color.

PC INTERFACE—Flash drive allows transfer of data to PC.
Detailed CTMP function description

**Ratio Test Mode**

**Current Transformer Ratio Mode**

The instrument displays the primary and secondary voltages and the angle between them. Ratio to 5 is calculated and displayed. Complete ratio and polarity data with no lead changes or switch manipulation. Data may be saved to a flash drive, downloaded to a computer, and imported to spreadsheet or word processor programs to facilitate data sheet creation.

Two X1–X2 excitation output voltage ranges, 0-200V and 0-1000V, facilitate accurate measurement of CT ratios to 100,000 to 5. Output voltage metering autoranges to a 0-20V scale to maintain accuracy on low ratio transformers. H1-H2 input range is 0-0.32V to allow high resolution with the typical one turn primary used to perform a CT ratio test. Ratio accuracy is 0.1% over the entire measurement range.

**Potential Transformer Ratio Mode**

The instrument displays the primary and secondary voltages and the angle between them. Ratio to 1 is calculated and displayed. As with the current transformer test, no lead changes are required to obtain all test data.

The ratio test is performed by connecting the output of the test set to the high voltage, H1-H2 terminals, of the potential transformer. The low voltage X1-X2 terminals of the PT are connected to the ratio input of the CTMP. The output excitation voltage range in the PT mode is 0-200VAC, with meter autoranging to 0-20V when the output is below 20VAC. Two H1-H2 input ranges are provided, low range offers a 0-3.2 VAC scale and is optimum for PT ratios below 60/1, a high range with a 0.32V scale is used for PT ratios above 60/1. The potential transformer mode may also be used for power transformers of any size and will provide 0.1% accuracy over the entire range of measurements. The CTMP satisfies any transformer ratio test requirement.
Current Transformer Saturation Test

The instrument displays the excitation voltage and current. Data may be saved to a flash drive, downloaded to a computer, and imported to Excel, Word, or other spreadsheet and word processor programs.

Two X1–X2 excitation output voltage ranges, 0-200V and 0-1000 volts, facilitate saturation of most current transformers. Current output is rated at 300VA continuous with a meter range of 2 amperes. One ampere may be obtained on the 1000V scale if a 20% duty cycle is observed. Transition from the CT ratio test may be made with a simple menu selection, no lead changes are required. The distortion of the exciting current waveform is measured and used to indicate saturation. The current prints in red if saturation is detected. The unit also plots a graph of the exciting characteristic during the test.
External Metering Function

The instrument displays the amplitude and phase angle of an AC voltage and current connected to the E and I inputs. The watts, VARS, VA, and power factor are calculated and displayed.

Voltage on the display is the amplitude of the voltage connected to the E input, the range is 0 to 150VAC. I1 is the current flowing in the I input circuit, range 0 to 10AAC. Phase angle is measured as 0 to 360 degrees I lag E. Accuracy and resolution is one degree. This mode of the CTMP is designed for verification of correct instrument transformer connections after a protective relay scheme has been placed in service. This test is often called a load test or in service check and is necessary to insure that the current and potential transformers are connected correctly and that relay inputs are receiving the intended signals. In addition to the 0-10AAC hardwire input, a clamp on input is standard and the unit is supplied with a clamp probe. Unit is calibrated to the supplied probe and scaled to produce a range of 0-10AAC. The screen display for the clamp on function is the same as that for the hard input and allows measurement of phase angle and other parameters without risk of opening a CT circuit or where no metering jack is provided.

The unit will also measure two currents and the angle between them. This function is easily selected from the menu and is useful for verification of current contributions to differential relay circuits. The clamp on measures one current (0 to 10A) and the hardwire binding post circuit measures the other (0 to 10A).

The unit will perform a ratio test of an energized and loaded CT. The clamp on is used to measure a primary current in the range of 10 - 100 Amps. A “duckbill” and the I input binding posts are used to measure the secondary current. The unit will indicate the two currents, the angle between them, and the calculated ratio to 5. Optional clamp probes measure to 1000AMPS primary.
Detailed CTMP function description

Secondary Injection and Burden Tests

Secondary Injection Function

The Secondary Injection Mode displays the amplitude of the current output at the X1-X2 terminals and the current input at the I terminals or clamp on (as selected). The angle between the measured quantities is also indicated. The Burden Mode displays the output voltage, the output current, and the calculated impedance.

The I output indication is the current sourced by the X1-X2 terminals, I Input is the input current at the I binding posts. Angle is the angle between these currents. The test is performed by connecting the output of the test set to the CT secondary terminals of a complete protective system. The I input is then connected using a suitable paddle or test probe to a relay or other component. The output control is increased to supply a small current and the amplitude and direction of that current is verified in protective and metering devices. This allows a secondary circuit to be proven prior to energization of the protected equipment. Test current range is 0.1 to 2 amperes measured to an accuracy of 0.4%. Angle +/- 1 degree. Clamp on input enhances the utility of this function. The CTMP also performs a burden test and displays the impedance of the CT secondary circuit.
The CTMP is housed in a rugged case designed to provide many years of service under typical field conditions. An 18 month warranty is standard on all CTMP-2012 units.

A 5 ampere toggle operated circuit breaker provides control of power to the unit and is easily reset in the event of an overload.

An output ON/OFF switch allows positive disconnect of output voltage independent of computer control. This feature enhances operator safety.

Premium quality 5 way brass binding posts are used for all test connections. A rugged variable transformer insures a long life for this component. The variac is an off the shelf item as are the switches, binding posts, circuit breaker, and display. Maintenance, if ever required, may be accomplished without contacting the factory for expensive custom parts.

The use of the CTMP reduces the possibility of test errors and, through its efficient presentation of data and file save feature, expedites testing. These factors represent a great increase in productivity compared to previous test methods.

The CTMP employs an extremely precise AC measurement system that uses a 16 Bit A/D converter and a proprietary sampling algorithm that extracts amplitude and phase information from two AC signals. The ratio mode measures AC voltages to a typical accuracy of 0.05% and requires no separate hardware to measure phase angle. This technology allows a compact multi-functional unit to provide a level of performance previously achieved only in very expensive calibration laboratory equipment. The E and I input accuracy is rated at 0.4% due to variances in magnetics of input isolation transformers. The CTMP now has a 400MHZ ARM9 processor.