

Transformer Ratiometers



TRM-150



TRM-200

FEATURES

- Measure : Ratio, phase angle deviation, percent deviation, excitation current
- Numeric readout
- High ratio upto 2021 : 1; on TRM-200 upto 2022.21:1; on TRM-150
- Two isolated test voltages, 120V/12V
- True four terminal measurement
- Phase sensitive synchronous null detector with gain control
- Three phase lead switching built-in (TRM-200)
- Checks for correct polarity
- Resettable, fast acting MCB and fuse for input protection
- High accuracy
- Built in excitation current Meter (TRM 150/200)

PHASE ANGLE DEVIATION : ELTEL are the pioneers in manufacturing ratiometers which facilitates balancing of phase angle deviation. The phase angle difference between primary and secondary voltage gives clues to whether the power transformer under test has shorted turns or whether the windings has an unequal number of turns connected in parallel. All these factors change the phase angle between primary & secondary voltage. The phase angle deviation is also important in evaluating CTs for shorted turns.

TEST VOLTAGES : There are two isolated test voltages, 120V/12V, which enable testing of both power transformers (120V) and current transformers (12V). Large CTs can be tested using 120V.

TRUE 4 TERMINAL MEASUREMENT : The leads that are supplied allow for a true four terminal measurement which eliminates errors caused by lead length and errors due to circulating currents.

PHASE SENSITIVE NULL DETECTOR : The electronic, synchronous and phase sensitive null detector with a 100:1 gain control permits fast and precise balance with the capability of discerning 1 turn in 2000.

LEAD SWITCHING : ELTEL's TRM-200 has a built-in three phase switching Rotary Switch to assist the operator and eliminate the time consuming task of climbing to the top of power transformers to change the leads. Measurement continues to be performed in single phase method and the front panel Rotary switch allows the selection of any phase combination.

POLARITY CHECK : The polarity indicator comes 'ON' when the connections between the instrument and the transformer under test are not properly made or the phase angle difference between the primary and the secondary of the transformer is greater than 10 degrees. There is a polarity reversal switch marked " REV" with a LED indication provided. When the LED glows the switch position has to be changed before balancing.

DESCRIPTION

This compact and portable ELTEL instrument measures the no-load transformer ratio, i.e., ratio of high voltage winding to low voltage winding of a transformer in a bridge circuit and at low flux density in a core. Besides ratio, the ELTEL ratiometer is used to measure percent deviation of ratio, phase angle deviation and excitation current. It can also be used as a transformer comparator. The instrument provides a selectable excitation voltage, either 120V A.C. or 12V A.C. which is isolated from the main supply. When balanced, the ratio of the transformer is read directly in numerical form from the dials on the front panel. The balancing procedure is simplified by an internal synchronous and phase sensitive detector, which can be made sensitive to either the ratio or the phase angle adjustments.

The heart of the instrument is a special, precise multi-wound toroidal transformer, which is used as a standard transformer in the comparator circuit. Transformer ratios from 0.8:1 upto 2021 : 1 ; can be measured. Electronic circuitry in the detector makes ratio and phase deviation measurements precise.

FULLY PROTECTED : It frequently happens that the ratiometer is connected to a transformer incorrectly stepping up the test voltage instead of stepping down. The input terminals have high speed electronic protection which shorts out the input and causes the fast acting resettable MCB to trip and turn off the instrument.

REPLACEABLE PCB : All electronics is focussed on to a single plug-in-type PCB which is easily field replaceable.

POWERLINE FILTERS : This is provided at the power input to reduce effect of RF interference.

EXCITATION CURRENT : ELTEL's Model TRM-200/TRM-150 has a built-in milliammeter to measure excitation current. This will help in detecting a shorted turn on a parallel winding of power transformer if readings from previous measurements are available.

TRM-150 provides additional resolution and accuracy for those that wind coils of many turns. This allows them to measure turns/turns ratio down to one turn. Manufacturers of higher voltage PTs would tend to benefit the most from this instrument.

RESOLUTION : TRM-150 provides a minimum resolution of 0.0013% (1 turn in 80,000) on dials.

SPECIFICATIONS

Circuits	: Transformer-arm bridge
Power	: 230V, $\pm 10\%$ 50Hz 20VA or 115 $\pm 10\%$, 60Hz
Test voltage	: 120V and 12V AC at 1A isolated
Ratio Range	: 0.8:1 to 2022.21:1 for TRM-150 0.8:1 to 2021:1 for TRM-200
Ratio Resolution	: 0.0013% for TRM-150
Accuracy	: Better than $\pm 0.1\%$ of ratio at 120V test voltage
Deviation dials	: Ratio deviation $\pm 0.55\%$ of ratio with a resolution of 0.02 ; $\pm 0.5\%$ of ratio ± 5.5 CR for TRM-150
Phase angle deviation	: 2 ranges of ± 0.55 CR and ± 5.5 CR
Dimensions	: 450mm x 230mm x 200mm (LxBxH)
Weight	: 15 kgs approx

All specifications and accuracies for the Model TRM-100 ratio meter are identical to those of the Model TRM-200/TRM-150, with the exception that in the TRM-100, there is no meter for excitation current measurement. The model TRM-100 is a simple single phase connected device using standard binding posts. In TRM-200/TRM-150 am phenol MIL standard connectors are provided TRM-200 has a built in three phase lead switching. TRM-200 with Rotary switching is also available for three phase lead switching.

ELTEL ratiometers are supplied with AC line cord, instruction manual and spare fuses.

APPLICATIONS

For Testing Turns Ratio of :

- Power Transformers
- Distribution Transformers
- Potential Transformers

ACCESSORIES

- Set of 10 meter cable (optional 15 meters cable)
- Spare PCB
- Range Extension 5:1
- CVT Range Extension 40:1



FEATURES

AUTOMATIC TRANSFORMER RATIOMETER MODEL ATRM-200

- ❖ Automatic measurement of ratio & phase angle deviation
- ❖ Digital presentation of ratio & phase angle deviation
- ❖ Suitable for operation in energized switchyard conditions
- ❖ Ratio range of 0.2 – 199.99 to 1 in three ranges
- ❖ Four terminal measurements to reduce errors due to winding and lead resistance
- ❖ Internal three-phase lead switching circuitry (manual)
- ❖ Automatic polarity indication
- ❖ Manual selection of ratio-phase angle deviation functions
- ❖ Isolated excitation & Isolated measurement
- ❖ Excitation voltage of 36 volts @ line frequency
- ❖ High accuracy and resolution
- ❖ Light weight and portable

DESCRIPTION

The Eltel ATRM-200 Automatic Transformer Ratiometer measures the transformation ratio of transformers in a ratiometric circuit. As the measurement is conducted at low flux density, this measurement is equivalent to the turns ratio of the transformer. Besides measuring turns ratio, ATRM-200 also measures phase angle deviation between the tested windings. As a perfect transformer should show no phase difference between the input and output, the measured phase angle deviation is an indicator of possible shorted turns or poor core quality.

The instrument excites the High Voltage winding (HV) of the test transformer and measures the output of the Low Voltage winding (LV) in a ratiometric circuit and displays the result on a 4½ digit LCD indicator.

The ATRM-200 uses 36 volts at line frequency to excite the HV winding. The measurement is not instantaneous but is conducted over a period

that is equal to a whole number of line frequency periods, thereby helps to eliminate line frequency interference. The ATRM-200 is useful for all transformer except for small CTs that may saturate when 36 volts are applied.

PRINCIPAL OF OPERATION

The ATRM-200 excites the High Voltage winding of the test transformer with a signal of 36V, line frequency. The output of the Low Voltage winding is measured in a ratiometric circuit with respect to its magnitude and phase. The result of the measurement is displayed on a 4½ digit LCD indicator.

In addition to the ratio, the polarity of the winding is indicated by LED indicator. The polarity indicator comes 'ON' when the connections between the instrument and the transformer under test are not properly made or the phase angle difference between the primary and the secondary of the transformer is greater than 10°. The selection of Ratio or Phase Angle Deviation indication is accomplished manually. A LED indication is also provided for 'under range' and 'over range'.

The Ratio and Phase Angle Deviation measurements are conducted over a number of power frequency cycles in an effort to reduce or eliminate power frequency interference. The reading is updated every 64 cycles of the power frequency, thereby updating the display every 1.28 seconds at 50 Hz or 1.04 seconds at 60 Hz. The excitation source is isolated, as are the two measuring inputs. This features allows one to measure auto transformers or transformers that may have a common (ground) connection between the primary and secondary winding.

The ATRM-200 has a built-in three phase rotary switch to assist the operator and eliminate the time consuming task of climbing to the top of power transformers to change the leads. Measurement continues to be performed in single phase method and the front panel switch allows the selection of any phase combination.

SPECIFICATIONS

- ❖ Ratio Range : 0.2 - 1.9999, 19.999, 199.99 to 1, manually selected
- ❖ Ratio Accuracy : ± 0.1% ± 2 counts
- ❖ Phase Angle Deviation : + 20 degrees
- ❖ Phase Resolution : 0.01 degrees
- ❖ Excitation : 36 volts @ line frequency
- ❖ Power : 230 volts 50Hz OR 115 volts 60 Hz, 60VA max.
- ❖ Weight : Approximately 8 Kgs
- ❖ Size : Apprx. 200mm x 200mm x 350mm

RECOMMENDED ACCESSORIES

- ❖ A set of 10 meter cable or 15 meter TRM-150/200
- ❖ A set of 15 meter extension cable
- ❖ Range Extension (10 : 1 ATRM-200 & 5:1 - TRM-200/150)
- ❖ CVT Range Extension 40:1

OTHER PRODUCTS

- Manual & Automatic Transformer Ratio Meters. ■ Manual & Automatic Transformer Winding Resistance & On Load Tap Changer Test Sets.
- Automatic CT/VT Test Sets & Systems. ■ 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 ■ Relaying Current Transformer Analyser.



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