# Megger.

# TTR®330
# 3-Phase Transformer Turns Ratio Test Set with "PowerDB OnBoard"

- **Fully automatic operation**

- **Integrated PowerDB software package allows for automated control without the use of a laptop**

- **Built-in capability for storing, printing and downloading test results**

- **Works in the presence of high interference/high voltage**

- **Highest ratio measurement (45,000:1); highest accuracy (0.1%)**

- **Displays % error vs. name plate with pass/fail limits**

## DESCRIPTION

The TTR330 is designed to measure the turns ratio of power, instrument, and distribution transformers in a substation or manufacturing environment. It features a high contrast LCD screen which can be seen in bright or ambient light and comes equipped with specially designed leads which provide the necessary flexibility needed in cold weather. A rugged and robust design makes this TTR well suited for use in a variety of harsh environments. The TTR is also suited for testing power transformers in manufacturing environments where testing can be performed quickly (including storage of results) while minimizing the possibility of errors.

## PowerDB™ Acceptance & Maintenance Test Data Management Software

The "PowerDB OnBoard" logo means PowerDB software is running on a computer embedded within the instrument. This gives the interface for new Megger instruments a common "look and feel." The instrument has a full QWERTY keyboard for entering nameplate, location information, test configuration and annotation.

The user interface is intuitive and the printed results match the format of these screens. (What you see is what you get.) The software maintains a history of results for each piece of equipment tests so past results can be displayed in trend charts. Data is stored in an open format XML data file. These files can be opened on a PC with PowerDB Lite to view or print the test results.

Multiple data files can automatically be fed to a full version of PowerDB in order to generate documentation with a table of contents, test data sheets, comment and deficiency summaries. PowerDB can also be used to customize the test sheets and configuration screens used by the instruments.

The TTR330 is controlled and automated by the PowerDB management system, a powerful software package providing data management for acceptance and maintenance testing jobs. Customer/contract information is quickly sorted and searched. Opening a specific record shows detailed information such as type of service, order date, sales contact, and invoice information. Job information can be transferred between field-use databases and a master database. Job/Device Productivity Reports aid in bidding future jobs as well as personnel evaluation.

Electrical utilities who have invested in sophisticated Computerized Maintenance Management Systems (CMMS) can easily link with the PowerDB software because it works with a number of systems.

The package also provides a number of other optional add-ons that are described in the PowerDB data sheet available on the Megger website **www.megger.com.**

# Megger.

## TTR Built-in Memory

The TTR also comes equipped with sufficient onboard memory to store up to 200 test results in the field for later retrieval. Test results can be printed on an optional serial printer whenever a hard copy is desired, or the data can be downloaded to a PC. Identification of individual test readings is also easily done. The system software allows entry of the transformer alphanumeric serial number, transformer type and tap information for each test performed.

## APPLICATIONS

The TTR applies voltage to the high voltage winding of a transformer and accurately measures the resulting voltage from the low voltage winding. In addition to turns ratio, the unit measures excitation current, phase angle deviation between the high and low voltage windings and percent ratio error.

## Transformer Turns Ratio

Transformer turns ratio is the ratio of the number of turns in the high-voltage winding to that in the low-voltage winding. Complexity in the measured ratio versus nameplate ratio occurs with most three phase power transformers because multipliers such as $\sqrt{3}$ are required to match the measured ratio to the nameplate ratio. The three-phase TTR automatically applies the multiplier in a form which allows the operator a direct comparison to the nameplate (or expected) ratio. The TTR's built-in calculator displays the % error versus nameplate for each tap and each winding, without the need of a computer or software.

## Exciting Current

The TTR provides accurate measurement of exciting current (to 0.1 mA) which can help provide information about the condition of a transformer's core. Unwanted circulating currents or unintentional grounds can increase the exciting current and indicate a problem.

## Phase Angle Deviation and its Application

The phase angle deviation, displayed in either degrees (minutes) or radians, is the phase relationship between the voltage signal applied to the high voltage winding and the voltage signal extracted from the low voltage winding. The phase deviation together with ratio error can be used as a low cost method of verifying accuracy class of all types of PTs and CTs at "zero burden."

The phase deviation between the high and low side of a transformer is generally very small. If there is deterioration or damage in the transformer core, however, the phase deviation can change significantly. The three-phase TTR can measure this phase relationship with the resolution of 0.1 minutes (equal to 1/600 of a degree), which is necessary to detect problems.

## FEATURES AND BENEFITS

- "PowerDB OnBoard" software allows for automated control and the option of saving data (information processing, data trending, report generation) in an XML file with all historical data.

- Measures the widest turns ratio range in the industry (45,000:1) and provides the highest accuracy (0.1%).

- Enables the operator to enter the ratio of the transformer and all of it's taps. This allows the operator to know immediately when a tap is outside the acceptable limits so problem taps can be easily flagged.

- Comes equipped with a "remote-control" switch for single person testing. This allows the operator to test transformers with "LTCs" very quickly.

- Internal TTR memory records up to 200 three-phase test results.

- Measures the phase deviation (in minutes) of the transformer primary versus secondary. This quickly indicates problems in the transformer such as partial shorted turns and core faults. This measurement is also useful in verifying phase errors in all types of PTs and CTs.

- This instrument is ideal for use by power transformer manufacturers. Its unique testing procedures and storage capability allows an operator to set up and test difficult three-phase transformers (with multiple tap changers and bushing CTs) in a fraction of the time than it used to take with other TTRs. This test also includes a pass/fail limit of individual ratios.

- A "Quick Test" mode provides a fast determination of the turns ratio for single and three-phase transformers, thus saving time.

- Rugged, lightweight design ideally suited for a harsh field and substation environment.

- Three user selectable standards: ANSI, IEC, and Australian. Also meets IEC 1010 as well as other safety standards such as CSA and UL.

- Six user selectable languages: French, German, Italian, Portuguese, Spanish and English.

- Environmentally sealed rubberized full QWERTY keyboard and navigational pushbutton interface.

## SPECIFICATIONS

### Input Power

**Cat. No. TTR330:**
120 V ac ±10%, single phase, 50 ±2 Hz or 60 ±2 Hz, 100 VA
**Cat. No. TTR330-47:**
230 V ac ±10%, single phase, 50 ±2 Hz or 60 ±2 Hz, 100 VA

**Battery Operation (Optional)**
Inverter 12 V dc to 120 V/230 V ac for operation from vehicle battery.

**Excitation Voltage**
8, 40, or 80 V rms, automatically or manually selected

**Excitation Current Range and Accuracy**
0 to 500 mA, 3 digit resolution, ±(2% of reading + 1 digit)

**Phase Deviation Range and Accuracy**
±90 degrees, 1 decimal point for the minutes display, 2 decimal points for the degree display, or for the centi-radian display
**Accuracy:** ±3 minutes

**Turns Ratio Range and Accuracy**
8 V ac:   ±0.1% (0.8 to 2000)
          ±0.25% (2001 to 4000)
          ±0.35% (4001 to 8000)
40 V ac:  ±0.1% (0.8 to 2000)
          ±0.15% (2001 to 4000)
          ±0.3% (4001 to 10,000)
          ±0.35% (10,001 to 25,000)
80 V ac:  ±0.1% (0.8 to 2000)
          ±0.15% (2001 to 4000)
          ±0.25% (4001 to 10,000)
          ±0.30% (10,001 to 45,000)
**Resolution:**   5 digit for all ratios

**PC/Printer Interface**
RS232 port, 9-pin 9600 baud

**Display**
8.4 in., full-color VGA with full QWERTY keyboard and navigational pushbuttons.

**Test Result Storage**
Internal, nonvolatile memory for storing up to 200 sets of three-phase measured and calculated ratio, exciting current, phase, ratio error, plus serial number and transformer type.

**Communication/Control Software — ComLink**
Included ComLink software for data storage, report printout and download of data to a PC, and control of the TTR via PC.

**Transformer Winding Phase Relationship**
ANSI C57.12.70-1978
CEI/IEC 76-1:1993 and Publication 616:1978
AS-2374, Part 4-1982 (Australian Standard)

**Safety/EMC/Vibration**
Meets the requirements of IEC-1010-1, CE and ASTM D999.75

**Temperature Range**
**Operating:** 23° F to 122° F (-5° C to 50° C)
**Storage:** -58° F to 140° F (-50° C to 60° C)

**Relative Humidity**
0 to 90% noncondensing

**Measuring Time**
8 to 20 seconds depending on mode of operation and type of transformer.

**Measurement Method**
ANSI/IEEE C57.12.90

**Dimensions**
10.5 H x 17.5 W x 6.9 D in.
(266.7 H x 444.5 W x 175.3 D mm)

**Weight**
Approx. 16.5 lbs (7.5 kg), instrument only, not including leads

## ORDERING INFORMATION

| Item (Qty) | Cat. No. | Item (Qty) | Cat. No. |
|---|---|---|---|
| 120 V ac ±10%, 50 or 60 Hz, Three-Phase TTR | TTR330 | **Optional Accessories** | |
| 230 V ac ±10%, 50 or 60 Hz, Three-Phase TTR | TTR330-47 | Test leads, 1-ø clip ends, H winding, 10 ft (3.1 m) | 30915-506 |
| **Included Accessories** | | Test leads, 1-ø clip ends,X winding, 10 ft (3.1 m) | 30915-507 |
| Canvas carrying bag for test leads | 30915-211 | Test leads, 3-ø clip ends, H winding, 20 ft (6.2 m) | 30915-524 |
| Power supply cord, 8 ft (2.5 m) | 17032-4 | TTR Printer Package | |
| Ground lead, 15 ft (4.6 m) | 4702-7 | 120 V, 60 Hz | 35312-1 |
| 3-ø shielded test leads, H winding, 10 ft (3.1 m) | 30915-505 | 230 V, 50 Hz | 35312-2 |
| 3-ø shielded test leads, X winding, 10 ft (3.1 m) | 30915-504 | Includes Battery/line-powered serial thermal printer, printer interface cable, and shelf for mounting printer | |
| Shielded extensions, H winding, 33 ft (10 m) | 30915-503 | Calibration Standard (for TTR verification) | 550555 |
| Shielded extensions,X winding, 33 ft (10 m) | 30915-502 | Inverter with 3 ft (0.91 m) cigarette adapter cord | |
| Hand-held switch assy for remote operation | 30915-220 | 12 V dc to 120 V ac, 60 Hz | 35271-1 |
| RS232 cable for connecting to a PC | | 12 V dc to 120 V ac, 50 Hz | 35271-3 |
| Bushing clips (6) | MC7144 | 12 V dc to 230 V ac, 60 Hz | 35271-2 |
| Transformer Vector Voltage Diagram Set (For ANSI, IEC, and AS Standards) | 35314 | 12 V dc to 230 V ac, 50 Hz | 35271-4 |
| Instruction manual | AVTMTTR330 | Transit case (for instrument leads and accessories) | 35313 |