Three-Phase Transformer Turns Ratio Tester TRT03

- Test voltages from 8 to 100 V AC
- Turns ratio range 0.8 – 50 000
- The best turns ratio accuracy of 0.05%
- Single-phase test voltage
- Automatic vector group detection
- Built-in tap changer control unit
- Detailed analysis of test results using DV-Win software
- Interchangeable test leads with Three-phase Winding Ohmmeters & Tap Changer Analyzers TWA

Description

TRT03 is a three-phase, fully automatic test set specially designed for turns ratio, phase shift, and excitation current measurements of power, distribution and instrument transformers. TRT03 determines the transformer turns ratio by applying voltages across high voltage windings, accurately measuring voltages across the unloaded transformer windings, and then displaying the ratio of these voltages.

TRT03 is based on a state of the art technology, using the most advanced technique available today. The test set can be used to test single-phase and three-phase transformers, both with and without taps in accordance with the requirements of the IEC 60076-1 standard.

For a three-phase measurement, the test set is connected to all the three phases of a transformer to be tested. If specific vector diagrams are selected for different types of transformers, the TRT03 will run a specific test for each transformer type (i.e., single phase, Delta to wye/star, Wye/Star to delta, Delta to delta, Wye/Star to wye/star, Delta to zig-zag, etc.) without a need to switch the test hookup cables. Following the test, it displays a turns ratio, phase shift, and excitation current.

TRT03 lets users enter a transformer’s nameplate voltages for the turns ratio deviation calculation. This feature eliminates any error otherwise caused by an operator’s manual calculation. The TRT03 also compares the test result with the nameplate ratio and prints out the % of error for each test.

Operating conditions messages or error messages identify incorrect test conditions, abnormal operating condition or transformer problems. TRT03 has a very high ability to cancel electrostatic and electromagnetic interference in HV electric fields. It is achieved by a very efficient filtration. The filtration is made utilizing the proprietary hardware and software design solutions.
Application
The list of instrument application includes:

- Turns ratio measurement
- Turns ratio deviation calculation
- Excitation current measurement
- Phase angle measurement
- Automatic vector group detection
- Verification of demagnetization process
- Magnetic balance test

Connecting TRT03 to Test Object

Three-Phase Transformer
TRT03 is programmed to automatically test turns ratio, phase shift, and excitation current of power and distribution transformer types defined by CEI/IEC standards. Using two sets of four cables, all bushings of the primary and the secondary sides are connected only once.

![Connecting TRT03 to a three-phase transformer](image)

Three-Phase Autotransformer
TRT03 is also programmed to automatically test turns ratio, phase shift, and excitation current of autotransformer types defined by CEI/IEC standards. Using two sets of four cables, all bushings of the primary and the secondary sides are connected only once.

![Connecting TRT03 to a three-phase autotransformer](image)

Single-Phase Transformer
Although a three-phase device, TRT03 is able to test single-phase transformers. Either a special cable set or a three-phase cable set can be used for this purpose.

![Connecting TRT03 to a single-phase transformer](image)

Single-Phase Autotransformer
Although a three-phase device, TRT03 is able to test single-phase autotransformers. Either a special cable set or a three-phase cable set can be used for this purpose.

![Connecting TRT03 to a single-phase autotransformer](image)
Current Transformer

TRT03 can also be used for verifying turns ratio and polarity of current transformers (CTs). CTs are specially constructed transformers – they are instrument transformers with only one, or occasionally two primary turns. Larger number of turns is on the “X” (secondary) side of CTs. For that reason, when verifying CTs, the “X” test cables must be connected to the primary of a CT. If there are no primary terminals, the “X” cables should be slid through the CT core and short-circuited.
Benefits and Features

Accuracy
The highest accuracy in the market, for all three parameters measured – turns ratio, excitation current, and phase angle – makes potential transformer irregularities and faults more visible.

Resolution
Excitation current measurement is important for determining problems in the transformer magnetic core. High measurement resolution enables better tracking of the current trend through all tap positions.

Interchangeable cables with TWA
TRT03 uses the same cable set as Three-phase Winding Ohmmeter & Tap Changer Analyzer TWA. This enables one-time cable setup for performing six tests: turns ratio, excitation current, phase angle, winding resistance, on-load tap changer DVtest, and demagnetization, thus making TRT03 and TWA one measurement system.

Automatic Vector Group Detection
TRT03 is able to automatically detect vector group of three-phase transformers and auto-transformers. This is possible both with and without PC software.

DV-Win Software
The DV-Win software is included in the purchase price, and all its updates are free of charge. The software allows full control of TRT03 functions from a PC, and downloading test results from the instrument’s internal memory. All results are presented both numerically and graphically, for an easy and convenient analysis. Test results can be directly exported to excel document. Customized test report can be generated, edited, saved in several file formats including pdf, and printed.

Magnetic Balance Test
This test helps in detecting possible problems in the transformer magnetic core. The test is completely automatic and requires no changes in cable setup comparing to turns ratio test. Results are presented both numerically and graphically.

Memory
There is enough memory in the TRT03 to store 200 test records. Each record consists of 50 test readings.

USB Flash Drive
Results can also be exported to a USB memory through integrated USB flash drive.

Tap Changer Control Unit
TRT03 has a built-in tap changer control unit, which allows remote on-load tap changer operation. A single operator can perform complete testing very quickly.

Built-in Printer
Built-in thermal printer, 112 mm (4.4 in) wide, is an optional accessory. A single measurement, measurement range, or entire memory can be printed on a thermal paper.
Technical Data

Mains Power Supply
- Connection: according to IEC/EN60320-1; UL498, CSA 22.2
- Mains supply: 90 – 264 V AC, 50/60 Hz or 110 – 350 V DC
- Input power: 200 VA
- Fuse: 2 A / 250 V, type F, not user replaceable

Output Data
- Instrument / Test voltages

<table>
<thead>
<tr>
<th>Model</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRT03A</td>
<td>8, 40, 100 V AC</td>
</tr>
<tr>
<td>TRT03B</td>
<td>10, 40, 100 V AC</td>
</tr>
<tr>
<td>TRT03C</td>
<td>8, 40, 80 V AC</td>
</tr>
</tbody>
</table>

Measurement
- Turns ratio measuring range: 0.8 – 50 000
- Turns ratio resolution: 5 digits
- Typical turns ratio accuracy:
  - @80 or 100 V AC
    - 0,8 – 999: ±0,05%  
    - 1 000 – 3 999: ±0,05% 
    - 4 000 – 14 999: ±0,1%  
    - 15 000 – 19 999: ±0,2%  
    - 20 000 – 50 000: ±0,25%  
  - @40 V AC
    - 0,8 – 999: ±0,05%  
    - 1 000 – 3 999: ±0,1%  
    - 4 000 – 15 000: ±0,2%
- Excitation current range: 0 – 2 A
- Excitation current resolution:
  - 0,0000 – 9,9999 mA  
    - 0,1 µA  
  - 10,000 – 99,999 mA  
    - 1 µA  
  - 100,00 – 999,99 mA  
    - 10 µA  
  - 1,0000 – 2,0000 A  
    - 100 µA
- Typical excitation current accuracy:
  - ±(0,25% rdg + 500 µA)

- Phase angle range: 0 – 360°
- Phase angle resolution: 0,01°
- Typical phase angle accuracy: ±0,05°

Display
- LCD screen 20 characters by 4 lines;
- LCD display with backlight, visible in bright sunlight

Interface
- USB (standard)
- RS232 (optional)

Data Storage
- TRT03 can store up to 10 000 test results

Environmental Conditions
- Operating temperature:
  - -10 °C – +55 °C / 14 °F – +131 °F
- Storage & transportation:
  - -40 °C – +70°C / -40 °F – +158 °F
- Humidity: 5% – 95% relative humidity, non condensing

Dimensions and Weight
- Dimensions (W x H x D):
  - 480 x 190 x 385 mm / 18.9 x 7.48 x 15.16 in
- Weight: 8 kg / 17.6 lbs

Warranty
- 3 years

Printer (optional)
- Built-in thermal printer
- Paper width 112 mm / 4.4 in
- Printer operating temperature:
  - 0 °C – +50 °C / 32 °F – +122 °F
- Printer density is guaranteed in this range:
  - 5 °C – +40 °C / 41 °F – +104 °F
  - 20 – 85% relative humidity, non condensing
Applicable Standards

- Installation/Overvoltage category: II
- Pollution degree: 2
- Safety: LVD 2014/35/EU (CE Conform)
  Standard EN 61010-1:2001
- EMC: Directive 2014/30/EU (CE Conform)
  Standard EN 61326-1:2006

All specifications herein are valid at ambient temperature of +25 °C and recommended accessories. Specifications are subject to change without notice.
### Order Info

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Article No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-phase Transformer Turns Ratio Tester TRT03A</td>
<td>TRT03AX-N-00</td>
</tr>
<tr>
<td>Three-phase Transformer Turns Ratio Tester TRT03B</td>
<td>TRT03BX-N-00</td>
</tr>
<tr>
<td>Three-phase Transformer Turns Ratio Tester TRT03C</td>
<td>TRT03CX-N-00</td>
</tr>
</tbody>
</table>

### Included accessories
- Windows-based DV-Win PC software including USB cable
- Tap changer control cable 5 m (16.4 ft)
- Mains power cable
- Ground (PE) cable

### Recommended accessories
<table>
<thead>
<tr>
<th>Article No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC-10-4LMCWC</td>
<td>H winding test lead set, 4 x 10 m (32.8 ft) with TTA clamps (compatible with TWA and TRT series)</td>
</tr>
<tr>
<td>XC-10-4LFCWC</td>
<td>X winding test lead set, 4 x 10 m (32.8 ft) with TTA clamps (compatible with TWA and TRT series)</td>
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<tr>
<td>CABLE-CAS-03</td>
<td>Cable plastic case – large size</td>
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<tr>
<td>HARD-CASE-LC</td>
<td>Transport case</td>
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</tbody>
</table>

### Optional accessories
<table>
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<tr>
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<tr>
<td>HC-15-4LMCWC</td>
<td>H winding test lead set, 4 x 15 m (49.2 ft) with TTA clamps (compatible with TWA and TRT series)</td>
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<tr>
<td>XC-15-4LFCWC</td>
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<tr>
<td>HC-20-4LMCWC</td>
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<tr>
<td>XE-15-4LFCMC</td>
<td>X winding cable extension set, 4 x 15 m (49.2 ft) with TTA clamps (compatible with TWA and TRT series)</td>
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<tr>
<td>Description</td>
<td>Code</td>
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<tr>
<td>-----------------------------------------------------------------------------</td>
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<tr>
<td>H winding test lead set, 4 x 5 m (16.4 ft) with TTA clamps (compatible with TRT series only)</td>
<td>HC-05-4TRTMW</td>
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<td>X winding test lead set, 4 x 5 m (16.4 ft) with TTA clamps (compatible with TRT series only)</td>
<td>XC-05-4TRTFW</td>
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<tr>
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<td>HE-05-4TRTMF</td>
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<td>XE-05-4TRTFM</td>
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<td>XE-15-4TRTFM</td>
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<tr>
<td>Cable plastic case – small size</td>
<td>CABLE-CAS-01</td>
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<tr>
<td>Cable plastic case – medium size</td>
<td>CABLE-CAS-02</td>
</tr>
<tr>
<td>Cable plastic case with wheels – medium size</td>
<td>CABLE-CAS-W2</td>
</tr>
<tr>
<td>Cable plastic case with wheels – large size</td>
<td>CABLE-CAS-W3</td>
</tr>
<tr>
<td>Plastic transport case</td>
<td>HARD-CASE-PC</td>
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<tr>
<td>Plastic transport case with wheels</td>
<td>HARD-CASE-PW</td>
</tr>
<tr>
<td>Built-in thermal printer 112 mm (4.4 in)</td>
<td>PRINT-112-00</td>
</tr>
<tr>
<td>Thermal paper roll 112 mm (4.4 in)</td>
<td>PRINT-112-RO</td>
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<tr>
<td>Bluetooth communication module</td>
<td>BLUET-MOD-01</td>
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<tr>
<td>Inverter 12 V DC to 230 V AC, 50 Hz</td>
<td>IN650-12-230</td>
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<tr>
<td>Verification Calibrator TRTC</td>
<td>TRTC-05-4800</td>
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<td>H winding test lead set, 4 x 1 m (3.28 ft) with banana plugs</td>
<td>HC-01-4LMCBP</td>
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<tr>
<td>X winding test lead set, 4 x 1 m (3.28 ft) with banana plugs</td>
<td>XC-01-4LFCBP</td>
</tr>
<tr>
<td>Cable bag</td>
<td>CABLE-BAG-00</td>
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<tr>
<td>TWA-TRT safety switchbox with ground cable</td>
<td>SWTCH-BOX-00</td>
</tr>
<tr>
<td>H connection between instrument and switchbox, 4 x 0.8 m (2.62 ft)</td>
<td>HE-08-4LMCMC</td>
</tr>
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<td>XE-08-4LFCFC</td>
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