

True Three-Phase Transformer Turns Ratio Tester **TRT40A**

- Specially designed option for testing capacitive voltage transformers
- Test voltages 8 V, 40 V, 125 V AC
- Up to 5 kV AC with additional CVT40
- Turns ratio range 0,8 – 15 000
- The best turns ratio accuracy of 0,05%
- Single-phase test voltage
- True three-phase test voltage
- Automatic vector group detection
- Detailed analysis of test results using DV-Win software
- Interchangeable test leads with Three-phase Winding Ohmmeters & Tap Changer Analyzers TWA



Description

TRT40A is a true three-phase, fully automatic test set specially designed for turns ratio, phase shift, and excitation current measurements of power, distribution and instrument transformers. TRT40A 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.

TRT40A 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 TRT40A 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. In addition, it can perform the test with true three-phase test voltage, allowing testing any transformer type. Following the test, it displays a turns ratio, phase shift, and excitation current obtained with single-phase and/or true three-phase tests.

TRT40A 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 TRT40A 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. TRT40A 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

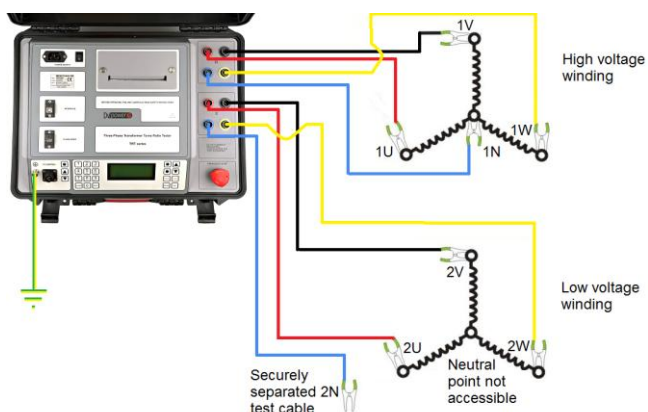
The list of instrument application includes:

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

Connecting TRT40A to Test Object

Three-Phase Transformer

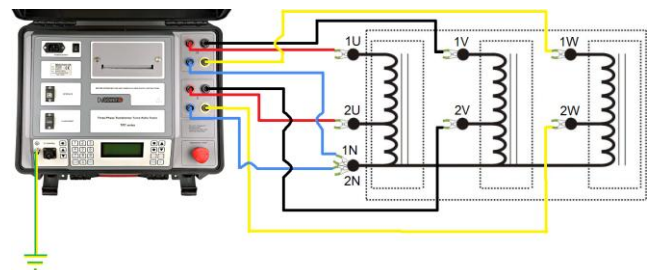
TRT40A is programmed to automatically test turns ratio, phase shift, and excitation current of power and distribution transformer types defined by CEI/IEC standards. Using two sets of four cables, all bushings of the primary and the secondary sides are connected only once.



Connecting TRT40A to a three-phase transformer

Three-Phase Autotransformer

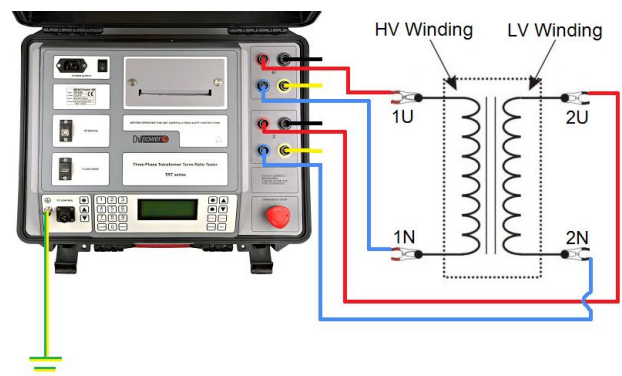
TRT40A is also programmed to automatically test turns ratio, phase shift, and excitation current of autotransformer types defined by CEI/IEC standards. Using two sets of four cables, all bushings of the primary and the secondary sides are connected only once.



Connecting TRT40A to a three-phase autotransformer

Single-Phase Transformer

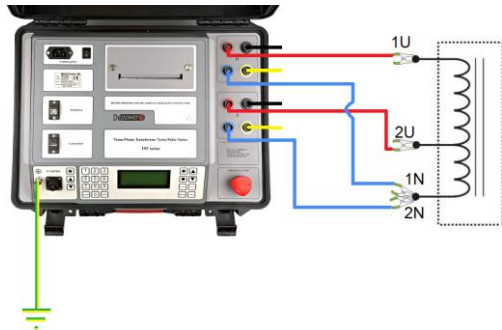
Although a three-phase device, TRT40A is able to test single-phase transformers. Either a special cable set or a three-phase cable set can be used for this purpose.



Connecting TRT40A to a single-phase transformer

Single-Phase Autotransformer

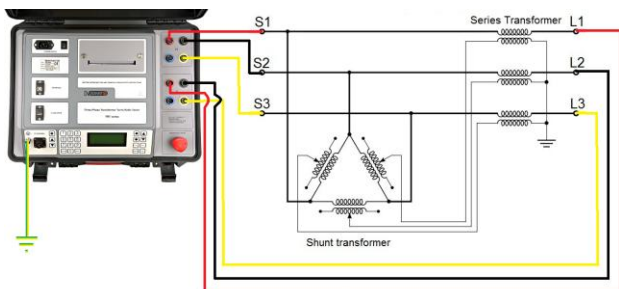
Although a three-phase device, TRT40A is able to test single-phase autotransformers. Either a special cable set or a three-phase cable set can be used for this purpose.



Connecting TRT40A to a single-phase autotransformer

Phase-Shifting Transformer

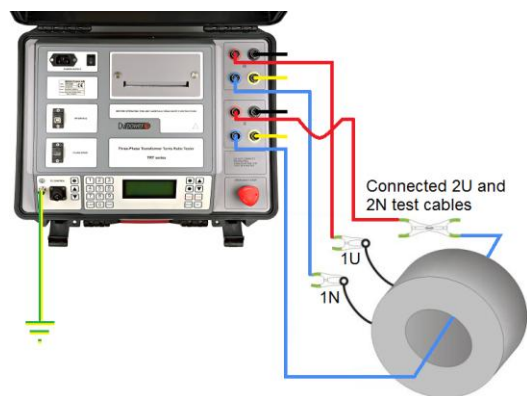
The presence of true three-phase test voltage allows TRT40A to test any type of transformer, even those with irregular vector groups, including phase-shifting transformers.



Connecting TRT40A to a phase-shifting transformer

Current Transformer

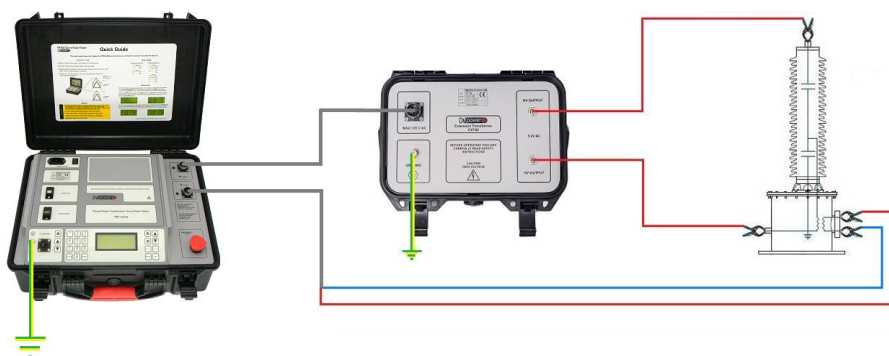
TRT40A can also be used for verifying turns ratio and polarity of current transformers (CTs). CTs are specially constructed transformers – they are instrument transformers with only one, or occasionally two primary turns. Larger number of turns is on the “X” (secondary) side of CTs. For that reason, 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.



Connecting TRT40A to an unmounted current transformer

Capacitive Voltage Transformer

When measuring turns ratio of capacitive voltage transformers (CVTs), test voltage of several kilovolts is required, much higher than available in common turns ratio testers. Together with Extension Transformer CVT40, TRT40A can output up to 5 kV AC, which is suitable for measuring turns ratio of CVTs. Polarity can be checked at the same time.



Connecting TRT40A to a capacitive voltage transformer via CVT40

Benefits and Features

Test Voltage up to 5 kV AC

TRT40A has specially designed option for testing turns ratio of capacitive voltage transformers (CVTs). Because of their design, these transformers require several kilovolts over capacitive part in order to excite inductive part and obtain correct turns ratio. Together with Extension Transformer CVT40, TRT40A can output up to 5 kV AC.

True Three-Phase Test Voltage

TRT40A is a true three-phase turns ratio tester. Unlike other so-called “three-phase” testers that allow only connecting to three transformer phases at once, TRT40A also has the ability to output true three-phase test voltage, without any additional devices or modules. This allows testing any transformer type, including special designs such as phase shifting, arc furnace, rectifier transformers, etc. Besides measuring a turns ratio, it can also measure a voltage ratio of three-phase transformers, simulating real transformer working condition. By applying true three-phase test voltage, and by measuring induced three-phase voltage, TRT40A is able to determine actual phase shifts between HV and LV side voltages, and not just 0 or 180 degrees shift that is obtained by testing transformers with single-phase test voltage in turns.

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

TRT40A 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 TRT40A and TWA one measurement system.

Automatic Vector Group Detection

TRT40A 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 TRT40A functions from a PC, creating and storing test plans, 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.

Memory

There is enough memory in the TRT40A 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

TRT40A 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.

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: 250 VA
- Fuse: 2 A / 250 V, type F, not user replaceable

Measurement

- Turns ratio measuring range 0,8 – 15 000
- Turns ratio resolution 5 digits
- Typical turns ratio accuracy:

| @125 V AC | @40 V AC |
|-----------------------|-----------------------|
| 0,8 – 999: ±0,05% | 0,8 – 999: ±0,05% |
| 1 000 – 3 999: ±0,05% | 1 000 – 3 999: ±0,1% |
| 4 000 – 15 000: ±0,1% | 4 000 – 15 000: ±0,2% |
- @8 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% + 500 μA)
- Phase angle range 0 – 360°
- Phase angle resolution 0,01°
- Typical phase angle accuracy ±0,05°

Output Data

- Test voltages

| |
|-------------------------|
| 8 V, 40 V, 125 V AC |
| 3 x (8, 40, 125)√3 V AC |

Display

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

Interface

- USB (standard)
- RS232 (optional)

Data Storage

- TRT40A 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 |
| 18.90 x 7.48 x 15.16 in |
- Weight: 9 kg / 19.8 lbs

Warranty

- 3 years

Applicable Standards

- Installation/Overtoltage category: II
- Pollution degree: 2
- Safety: LVD 2006/95/EC (CE Conform)

| |
|--------------------------|
| Standard EN 61010-1:2001 |
|--------------------------|
- EMC: Directive 2004/108/EC (CE Conform)

| |
|--------------------------|
| Standard EN 61326-1:2006 |
|--------------------------|

CVT40 Technical Data

Input Data

- Power supply:
Only from associated TRT4x device, via provided connection cable
- Maximum input voltage: 125 V AC
- Frequency: 50/60 Hz

Output Data

- Maximum output voltage 5 kV AC

Measurement

- Turns ratio range 40:1
- Turns ratio accuracy $\pm 0,5\%$ of ratio
- Maximum excitation capacity: 0,02 μF

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):
223 x 260 x 284 mm
8.78 x 10.24 x 11.18 in
- Weight: 10 kg / 22 lbs

Applicable Standards

- Installation/Overtoltage category: II
- Pollution degree: 2
- Safety: LVD 2006/95/EC (CE Conform)
Standard EN 61010-1:2001
- EMC: Directive 2004/108/EC (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.



H winding test cable set

X winding test cable set



Cable plastic case – large size



Cable plastic case with wheels – large size



Extension Transformer CVT40



High voltage cable set



H test cable for connecting to TRT4x



TRTC Verification Calibrator

Order Info

| Instrument with included accessories | Article No |
|--|--------------|
| True Three-phase Transformer Turns Ratio Tester TRT40A | TRT40AX-N-00 |
| DV-Win PC software including USB cable | |
| Built-in tap changer control unit | |
| Tap changer control cable 5 m (16.4 ft) | |
| Mains power cable | |
| Ground (PE) cable | |

| Recommended | Article No |
|---|--------------|
| H winding test lead set, 4 x 10 m (32.8 ft) with TTA clamps | HC-10-4LMCWC |
| X winding test lead set, 4 x 10 m (32.8 ft) with TTA clamps | XC-10-4LFCWC |
| Cable plastic case – large size | CABLE-CAS-03 |

| Optional | Article No |
|--|--------------|
| H winding test lead set, 4 x 5 m (16.4 ft) with TTA clamps | HC-05-4LMCWC |
| X winding test lead set, 4 x 5 m (16.4 ft) with TTA clamps | XC-05-4LFCWC |
| H winding test lead set, 4 x 15 m (49.2 ft) with TTA clamps | HC-15-4LMCWC |
| X winding test lead set, 4 x 15 m (49.2 ft) with TTA clamps | XC-15-4LFCWC |
| H winding test lead set, 4 x 20 m (65.6 ft) with TTA clamps | HC-20-4LMCWC |
| X winding test lead set, 4 x 20 m (65.6 ft) with TTA clamps | XC-20-4LFCWC |
| H winding cable extension set, 4 x 5 m (16.4 ft) | HE-05-4LMCFC |
| X winding cable extension set, 4 x 5 m (16.4 ft) | XE-05-4LFCMC |
| H winding cable extension set, 4 x 10 m (32.8 ft) | HE-10-4LMCFC |
| X winding cable extension set, 4 x 10 m (32.8 ft) | XE-10-4LFCMC |
| H winding cable extension set, 4 x 15 m (49.2 ft) | HE-15-4LMCFC |
| X winding cable extension set, 4 x 15 m (49.2 ft) | XE-15-4LFCMC |
| Cable plastic case – small size | CABLE-CAS-01 |
| Cable plastic case – medium size | CABLE-CAS-02 |
| Cable plastic case with wheels – medium size | CABLE-CAS-W2 |
| Cable plastic case with wheels – large size | CABLE-CAS-W3 |
| Transport case | HARD-CASE-LC |
| Plastic transport case | HARD-CASE-PC |
| Plastic transport case with wheels | HARD-CASE-PW |
| Built-in thermal printer 112 mm (4.4 in) | PRINT-112-00 |
| Thermal paper roll 112 mm (4.4 in) | PRINT-112-RO |
| Bluetooth communication module | BLUET-MOD-00 |
| Inverter 12 V DC to 230 V AC, 50 Hz | IN650-12-230 |
| Verification Calibrator TRTC | TRTC-05-4800 |
| H winding test lead set, 4 x 1 m (3.28 ft) with banana plugs | HC-01-4LMCBP |
| X winding test lead set, 4 x 1 m (3.28 ft) with banana plugs | XC-01-4LFCBP |
| Extension Transformer CVT40 | CVT40XX-N-00 |
| High voltage cable set 2 x 10 m (32.8 ft) | CET-10-03EWC |
| H test cable for connecting to TRT4x 1 x 5 m (16.4 ft) | HET-05-1MCFC |
| Cable bag | CABLE-BAG-00 |