TWA Series

Three-Phase Winding Ohmmeters & Tap Changer & Winding Analyzers

- Resistance measurement of all tap positions in all six windings performed in a single test
- True three-phase on-load tap changer dynamic resistance measurement
- Extremely quick measurement, single-step cable setup
- Automatic discharge process
- Rapid automatic demagnetization
- Built-in tap changer control unit
- Temperature measurement channel



Description

The TWA series instruments are designed for six-winding resistance measurement and simultaneous three phase on-load tap changer analysis of both the primary and the secondary transformer windings (provided by the TWA40 model). This is performed with a one single-step cable setup, with test currents of up to 40A. Each transformer configuration has a special measurement algorithm which is optimized for the fast stabilization of test results. The TWA instruments generate a true DC ripple-free current. Both the injection of the current and the discharge of energy from the magnetic circuit are automatically regulated.

Application

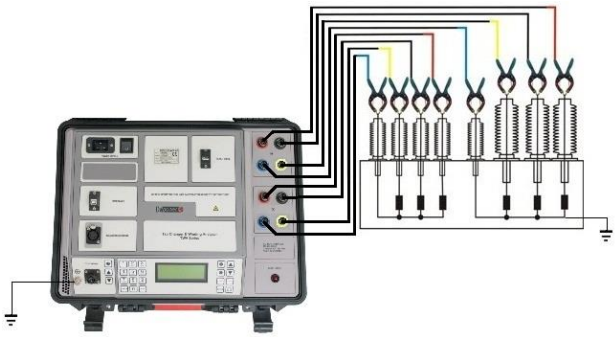
The list of the instrument application includes:

- A six-winding measurement of transformer winding resistances with a one-time cable connection
- Quick YN mode, which enables measuring the resistances of three transformer windings in the YN configuration simultaneously (TWA40D)
- Dynamic resistance measurement (DVtest) of on-load tap changers, which can be performed simultaneously on all three phases, or on a single phase (TWA40D)
- An evaluation of synchronization between on-load tap changer phases (TWA40D)
- A measurement of on-load tap changer motor current by using a dedicated channel (TWA40D)
- A three-phase or single-phase automatic transformer demagnetization

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Connecting the TWA to a Transformer

Using two sets of four cables, all bushings of the primary and the secondary sides are connected only once. The connection to the transformer is made using two-contact clamps that provide the four-wire Kelvin test method.
The figure presents the simultaneous testing of both windings (high side and low side) on a three-phase transformer. The setup time is minimized and the test is performed very quickly. The speed is increased by saturating the magnetic core through the HV and LV windings at the same time, so the total test time is very short. The TWA test leads are interchangeable with the test leads for the TRT Three-Phase Transformer Turns Ratio Testers.



Benefits and Features
Six-Winding Resistance Measurement

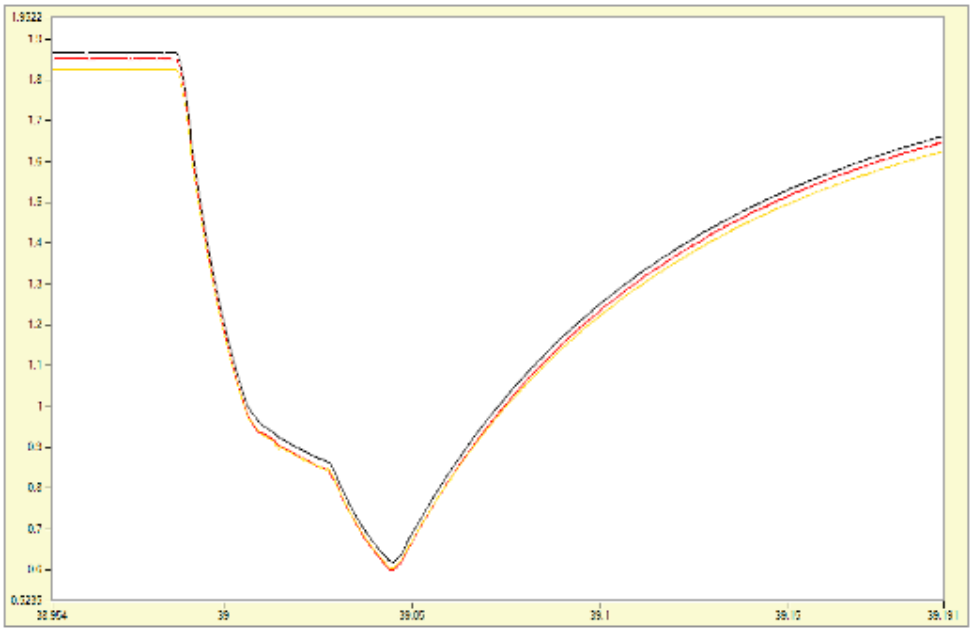
The TWA injects the current with a voltage value as high as 55 V. This ensures that the magnetic core is saturated quickly and duration of the test is as short as possible. All transformer windings, both primary and secondary, can be measured with a single cable setup. The TWA has internal memory capacity to store up to 500 measurements. All measurements are time and date-stamped. The instrument is equipped with thermal and overcurrent protection. The TWA has very high ability to cancel electrostatic and electromagnetic interference that exists in HV electric fields. It is achieved by a proprietary solution applied to both the hardware construction and the application software implementation.

A special mode is provided for the resistance measurement in multiple de-energized tap changer (DETC) positions.

On Load Tap Changers – Simultaneous Dynamic Resistance Measurement (DRM) of All Three Phases

The TWA40D can be used to measure the winding resistance of the individual taps of a power transformer without discharging between the tests.
The unit also checks whether the on-load tap changer (OLTC) switches without an interruption. The moment a tap position is changed from one tap to another, the device detects a sudden, very short drop of the test current. These drops called "Ripple" should be consistent, where any drop out-of-line should be investigated. Tap changer malfunctions can be detected by analyzing the measurements of transition ripple, transition time, and visualizing DRM graphs, can be observed too. The currents in all three phases are recorded simultaneously. Test currents can reach up to 40 A in total during the test.

Dynamic resistance graphs are recorded for all three phases simultaneously, so the synchronization is verified using the cursors provided in the DV-Win software. All three phase traces are plotted on the same graph. In addition, the tap changer motor current is recorded, and displayed on the same graph. The built-in tap changer control unit enables remote control of the tap changer operation from the instrument's keyboard.



DV-Win Software

The Windows-based DV-Win software enables control and observation of the test process, as well as saving and analyzing the results on a PC. It pro-vides a test report, arranged in a selectable form as an Excel spreadsheet, PDF, Word, or ASCII format. The software provides an OLTC (tap changer) condition assessment through analysis of the graphs representing dynamic resistance values during the tap changer transitions. Additionally, the DV-Win measures and calculates the OLTC transition time, the ripple and the winding resistance for each tap changing operation. The standard interface is USB. RS232 is optional.

Additional testing mode, Quick YN, is enabled by the DV-Win software for the TWA40D model. In this mode, it is possible to measure the resistances of three transformer windings in the YN configuration simultaneously. It is also possible to test the resistances of all tap changer positions of all three phases in a single pass through the tap changer positions.

Tap Changer Motor Current Monitoring Channel

The AC and/or DC current monitoring channel enables monitoring and recording the OLTC mechanical drive motor current during the tap changer operation on the TWA40D model. The motor current waveform (or another useful signal) is printed on the same DV-Win-generated DRM graph, and can help in detecting OLTC mechanical problems. Motor recording allows for DRM recording using the motor operation trigger, which is useful for reactance tap changers. An AC/DC current clamp is available as an optional accessory.

Automatic Transformer Demagnetization

After a DC current test, such as a winding resistance measurement, the magnetic core of a power or instrument transformer may be magnetized. Also, when disconnecting a transformer from a service, some amount of magnetic flux trapped in the core could be present.

The remnant magnetism can cause various problems such as erroneous measurements on a transformer, or an inrush current at start-up of a power transformer, or an incorrect operation of the protective relays due to the magnetized CT cores. To eliminate this source of potential problems, demagnetization should be performed. When the discharging process has been completed, the TWA can perform fully automatic demagnetization.

Demagnetizing the magnetic core of a transformer requires alternating current applied with decreasing magnitude down to zero. The TWA provides this alternating current by

internally changing the polarity of a controlled DC current. During the demagnetization process the TWA supplies current at decreasing magnitude for each step, following the proprietary developed program. The TWA40D enables performing both single-phase and three-phase demagnetization.

Technical Data

Winding Resistance Measurement

- Test currents: 5 mA – 25 A DC (TWA25A)
  5 mA – 40 A DC (TWA40D)
- Output voltage: up to 55 V DC
- Measurement range: 0,1 µΩ - 10 kΩ
- Typical accuracy: ± (0,1 % rdg + 0,1 % F.S.)

Resolution

- 0,1 µΩ – 999,9 µΩ: 0,1 µΩ
- 1,000 mΩ – 9,999 mΩ: 1 µΩ
- 10,00 mΩ – 99,99 mΩ: 10 µΩ
- 100,0 mΩ – 999,9 mΩ: 0,1 mΩ
- 1,000 Ω – 9,999 Ω: 1 mΩ
- 10,00 Ω - 99,99 Ω: 10 mΩ
- 100,0 Ω – 999,9 Ω: 0,1 Ω
- 1 000 Ω – 9 999 Ω: 1 Ω

Data Storage

- 500 internal memory positions
- USB flash drive feature enables storage of a huge number of measurements

OLTC Dynamic Resistance Measurement

- Sampling rate: 0,1 ms for TWA40D, 4 ms for TWA25A
- Automatic open circuit detection and warning
- Transition current ripple measurement
- Transition time measurement using DV-Win software
- Timing measurement of different transition changes using DV-Win graph analysis tool

AC Current Measurement Channel (TWA40D)

- Resolution: 0,1 ms
- Amplitude resolution: 16 bit

Current Clamp Meter Specifications

- Nominal current: 300 A_{RMS} or 450 A DC_{PK}
- Measuring ranges: 30/300 A
- Frequency range: DC to 20 kHz (-3 dB)
- Resolution: ± 50 / ± 100 mA
- Accuracy: ± 1% of the reading

Computer Interface

- USB
- Optional: RS232

Warranty

- Three years

Environmental Conditions

- Operating temperature:
  -10 ºC - + 55 ºC / 14 ºF - +131 ºF
- Storage & transportation:
  -40 ºC - + 70ºC / -40 ºF - +158 ºF
- Humidity 5 % - 95 % relative humidity, non-condensing

Dimensions and Weight

- Dimensions (W x H x D):
  480 mm x 197 mm x 395 mm
  18.9 in x 7.8 in x 15.6 in
- Weight:12,8 kg / 28.3 lbs

Mains Power Supply

- Connection according to IEC/EN60320-1; UL498, CSA 22.2
- Mains supply: 90 V - 264 V AC
- Frequency: 50/60 Hz
- Mains supply voltage fluctuations up to ±10 % of the nominal voltage
- Input power: 2 250 VA
- Fuse 15 A / 250 V, type F, not user replaceable

Temperature Measurement

- One temperature measurement channel
  Thermometer Pt100
  -50 ºC +180 ºC / -58 ºF +356 ºF
  50 mm x 6 mm

Applicable Standards

- Installation/overvoltage: category II
- Pollution: degree 2
- Low voltage directive:
  Directive 2014/35/EU (CE Conform)
  Applicable standards, for a class I instrument, pollution degree 2, installation category II : IEC EN 61010-1
- Electromagnetic compatibility:
  Directive 2014/30/EU (CE Conform)
  Applicable standard EN 61326-1
- CAN/CSA-C22.2 No. 61010-1, 2nd edition, including Amendment 1

All specifications herein are valid at ambient temperature of + 25 °C and recommended accessories.
Specifications are subject to change without notice
Specifications are valid if the instrument is used with the recommended set of accessories



H winding test cable set



X winding test cable set



Cable plastic case



Current clamp 30/300 A (TWA40D)



Test shunt



Transport case

TWA Series – Models

	TWA25A	***TWA40D***
		
Six-winding resistance measurement	Yes	Yes
DC test current	5 mA – 25 A	5 mA – 25 A; up to 25 A for winding resistance measurement and up to 40 A for the 3-phase synchronization test
Measurement accuracy	± (0,1 % rdg + 0,1 % FS)	± (0,1 % rdg + 0,1 % FS)
Simultaneous 3-phase winding resistance measurement	No	Yes (Quick YN test)
DVtest sampling resolution	4 ms	0.1 ms
Simultaneous 3-phase DVtest	No	Yes
Tap changer motor current measurement	No	Yes
3-phase demagnetization	Yes	Yes
Interchangeable test leads with TRT turns ratio testers	Yes	Yes
Resistance measurement range	0,1 µΩ - 10 kΩ	0,1 µΩ - 10 kΩ
USB flash drive feature	Yes	Yes
Built-in tap changer control unit	Yes	Yes

Order Info

Instrument with included accessories	Article No
Built-in Tap Changer Control Unit	
DV-Win PC software including USB cable	
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-10-4FMCWC
X winding test lead set, 4 x 10 m (32.8 ft) with TTA clamps	XC-10-4FFCWC
Current clamp 30/300 A power supplied from the instrument with 5 m (16.4 ft) extension (TWA40D)	CACL-0300-06
Cable plastic case	CABLE-CAS-03
Transport case	HARD-CASE-LC

Optional	Article No
H winding test lead set, 4 x 15 m (49.2 ft) with TTA clamps	HC-15-4FMCWC
X winding test lead set, 4 x 15 m (49.2 ft) with TTA clamps	XC-15-4FFCWC
H winding test lead set, 4 x 20 m (65.6 ft) with TTA clamps	HC-20-4FMCWC
X winding test lead set, 4 x 20 m (65.6 ft) with TTA clamps	XC-20-4FFCWC
Test shunt 1 mΩ (150 A / 150 mV)	SHUNT-150-MK
Temperature sensor 1 x 50 mm (1.97 in) + 5/10/15 m (16.4/32.8/49.2 ft)	TEMP1-050-XX
Bluetooth communication module	BLUETOOTH-00

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