

Tap Changer & Winding Analyzer TWA40D

- Three-phase on-load tap changer dynamic resistance measurement
- Total test current 5 mA – 40 A DC
- Winding Ohmmeter range 0,1 $\mu\Omega$ – 2 k Ω
- Extremely quick measurement, single-step cable setup
- Automatic discharge process
- Rapid automatic demagnetization
- Tap changer motor current recording
- Built-in tap changer control unit



Description

The Tap Changer & Winding Analyzer TWA40D is designed for a simultaneous three-phase tap changer analysis and six-winding resistance measurement of both the primary and the secondary transformer windings. This is performed with only one single-step cable setup, with test currents of up to 40 A. Once all 6-8 bushings are connected and the transformer configuration selected, the instrument adjusts the test procedure automatically. The TWA40D generates a true DC ripple-free current. Both the injection of the current and the discharge of energy from the magnetic circuit are automatically regulated.

Winding Resistance of All Six Windings

The TWA40D injects the current with a voltage value as high as 60 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 TWA40D has internal memory capacity to store up to 250 measurements. All measurements are time- and date-stamped.

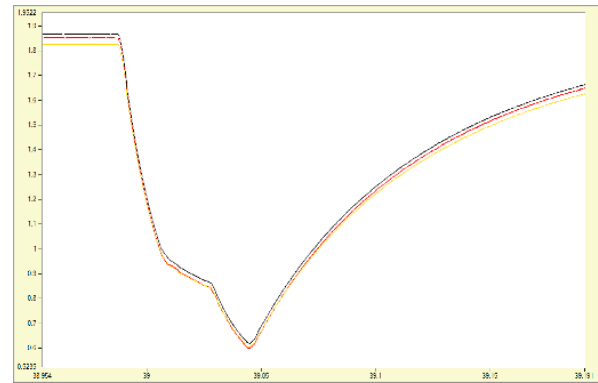
The instrument is equipped with thermal and overcurrent protection. The TWA40D has very high ability to cancel electrostatic and electromagnetic interference that exists in HV electric fields. It is achieved by a proprietary filtration solution applied to both the hardware construction and the application software implementation.

On Load Tap Changers – Simultaneous Measurement 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 currents in all three phases are recorded simultaneously. Test currents can reach up to 40 A in total during the test.

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. Defective "make before break" tap changer performance results in a 100% Ripple value, which is easy to observe. This is an indication of an interruption during the change, in which case the transition time also increases. This type of defect is one of the most troublesome ones. Other tap changer malfunctions detected analyzing measurements of Ripple, Transition time, and visualizing DRM graphs, can be observed too.

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 DV-Win software enables control and observation of the test process, as well as saving and analyzing the results on a PC. It provides 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 OLTC transition time, the ripple and the resistance for each tap changing operation. The standard interface is USB. RS232 is optional.

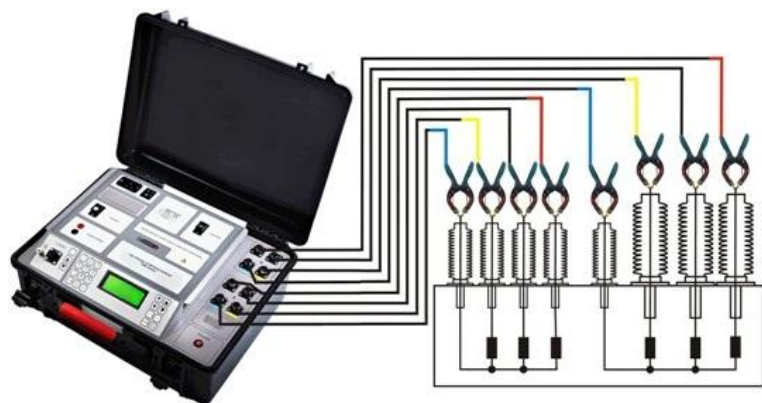
Tap Changer Motor Current Monitoring Channel

The AC current monitoring channel enables monitoring and recording the OLTC mechanical-drive motor current during the tap changer operation. The motor-current waveform is also printed on the same DV-Win-generated graph, and can help in detecting OLTC mechanical problems. An AC current clamp is available as an optional accessory.

Connecting the TWA40D 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 all three legs of the magnetic core at the same time, so the total test time is extremely short.



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 TWA40D can perform fully automatic demagnetization.

Demagnetizing the magnetic core of a transformer requires alternating current applied with decreasing magnitude down to zero. The TWA40D provides this alternating current by internally changing the polarity of a controlled DC current. During the demagnetization process the TWA40D supplies current at decreasing magnitude for each step, following the proprietary developed program.

The TWA40D enables performing both single-phase and three-phase demagnetization.

Accessories

Included

- DV-Win PC software
- Ground cable
- USB cable
- Built-in Tap Changer Control Unit
- Tap Changer Control cable set 5 m
- USB flash drive feature

Recommended

- H winding test cable set, 4 x 10 m with TTA clamps
- X winding test cable set, 4 x 10 m with TTA clamps
- Current clamp 30 / 300 A
- Cable plastic case

Optional

- Test shunt 150 A / 150 mV
- H winding test cable set, 4 x 15 m with TTA clamps
- X winding test cable set, 4 x 15 m with TTA clamps



H winding test cable set



X winding test cable set



Cable plastic case



Current clamp 30 / 300 A



Test shunt

Technical Data

Winding Resistance Measurement

- Test currents: 5 mA – 40 A DC
- Output voltage: up to 60 V DC
- Measurement range: 0,1 $\mu\Omega$ - 2 k Ω
- Typical accuracy: \pm (0,1 % rdg + 0,1 % F.S.)

Data Storage

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

AC Current Measurement Channel

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

Current Clamp Meter Specifications

- Current range: 30 / 300 A (RMS)
- Output sensitivity: 10 / 1 mV/A
- Resolution: \pm 50 / \pm 100 mA
- Accuracy: \pm 1% of the reading

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

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 \pm 10 % of the nominal voltage
- Input power: 2250 VA
- Fuse 15 A / 250 V, type F, not user replaceable

Resolution

- 0,1 $\mu\Omega$ – 999,9 $\mu\Omega$: 0,1 $\mu\Omega$
- 1000 m Ω – 9,999 m Ω : 1 $\mu\Omega$
- 10,00 m Ω – 99,99 m Ω : 10 $\mu\Omega$
- 100,0 m Ω – 999,9 m Ω : 0,1 m Ω
- 1,000 Ω – 99,99 Ω : 10 m Ω
- 100,0 Ω – 999,9 Ω : 0,1 Ω
- 1000 Ω – 2 k Ω : 1 Ω

OLTC Dynamic Resistance Measurement

- Sampling rate: 0,1 ms
- 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 tools

Computer Interface

- USB
- Optional: RS232

Warranty

- Three years

Dimensions and Weight

- Dimensions: 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

Applicable Standards

- Installation/overvoltage: category II
- Pollution: degree 2
- Safety: LVD 2006/95/EC (CE Conform)
EN 61010-1
- EMC: Directive 2004/108/EC (CE Conform)
Standard EN 61326-1:2006
- 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.