Tap Changer Analyzer & Winding Ohmmeter
RMO40TD

- On-load tap changer dynamic resistance measurement
- Two resistance measurement channels
- Automatic resistance measurement for the Heat Run test
- Rapid automatic demagnetization
- Tap changer motor current monitoring channel
- Automatic discharge circuit
- Built-in tap changer control unit

Description

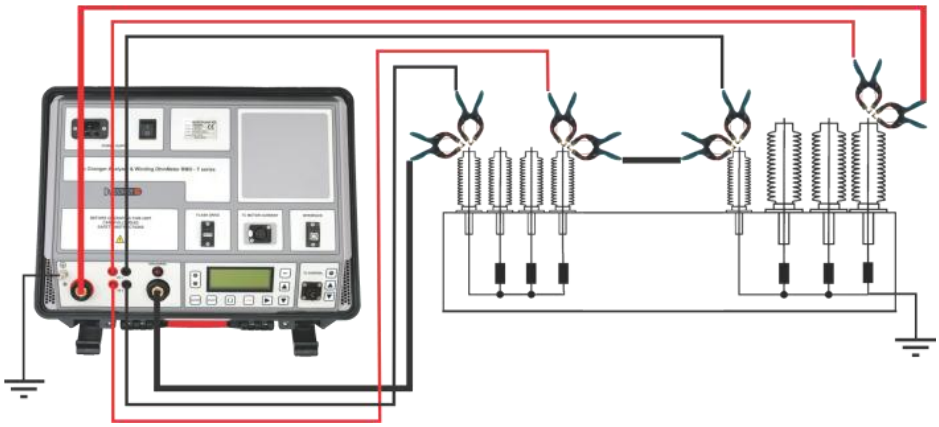
The Tap Changer Analyzer & Winding Ohmmeter RMO40TD instrument is designed for winding resistance measurement of inductive objects, and for a tap changer analysis. The RMO40TD instrument is based on the state of the art technology, using the most advanced switch mode technology available today. The RMO40TD instrument is accurate (0,1%), powerful (up to 40 A) and lightweight (13,0 kg / 28.7 lbs). It generates a true DC ripple free current with automatically regulated measurement and discharging circuit.

RMO40TD instrument can perform a simple, quick and reliable transformer on-load tap changer condition assessment. This instrument enables measurements of a winding resistance in every tap position, current ripple values (percentage of a current drop during a tap change) and transition times during the tap changes. Problems with a connection, contacts, and selector/diverter switch operation (tap change with interruption) can be detected with these measurements.

Application

The list of the instrument application includes:

- Two-channel winding resistance measurement, which enables simultaneous winding resistance measurement of up to two windings on a single phase
- Dynamic resistance measurement (DVtest) of on-load tap changers, performed on a single phase
- A measurement of on-load tap changer motor current by using a dedicated channel
- Heat Run test, which enables obtaining the Hot Spot temperature along with resistance graph during the cooling process
- A single-phase automatic transformer demagnetization



Connecting RMO40TD to Transformer

The RMO40TD has two separate resistance measurement channels, which enable simultaneous measurement of the primary and secondary winding on the same phase. This significantly speeds up the measurement and reduces the total transformer testing time. At the same time, by saturating the magnetic core through the HV and LV windings the stabilization time and subsequently the total testing time is reduced even more.

Benefits and Features

Simultaneous Two-Channel Winding Resistance Measurement

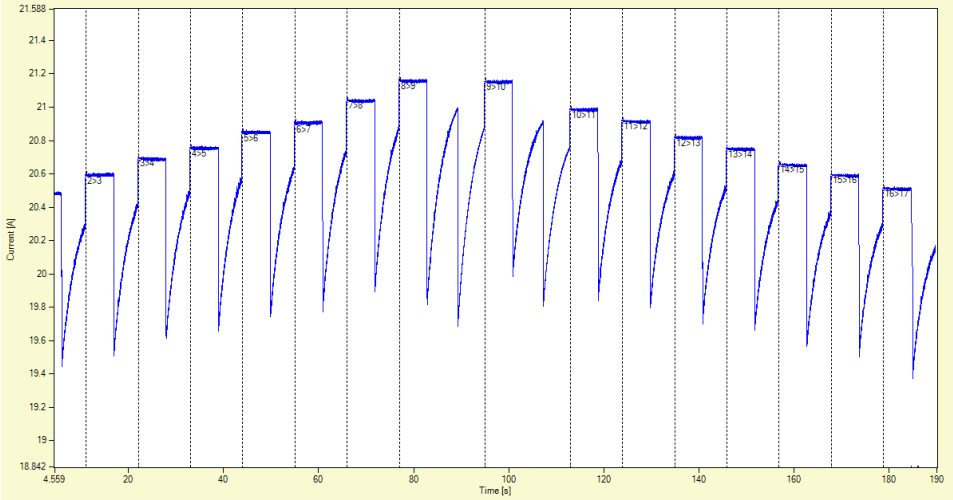
The RMO40TD injects the current with a voltage value as high as 55 V. This ensures that the magnetic core is saturated quickly and duration of the test is as short as possible. The two independent channels enable simultaneous testing of two windings in series – primary and secondary windings. There is enough memory within the RMO40TD instrument to store 1 000 measurements. All measurements are time and date stamped.

The instrument is equipped with thermal and overcurrent protection. The RMO40TD 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 – Dynamic Resistance Measurement (DV test)

The RMO40TD 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. Test currents of up to 40 A can be selected for the DRM test. 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.



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. 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 by 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 a measurement 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 RMO40TD can perform fully automatic demagnetization.

Demagnetizing the magnetic core of a transformer requires alternating current applied with decreasing magnitude down to zero. The RMO40TD provides this alternating current by internally changing the polarity of a controlled DC current.

DV-Win Software

The DV-Win application 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 the OLTC transition time, the ripple and the winding resistance for each tap changing operation. The standard interface is USB. RS232 is optional.

Heat Run Test Application

The DV-Win application software has an additional Heat Run temperature/resistance extrapolation feature. After the transformer heating is switched off, the RMO40TD is immediately connected to up to two transformer windings and the timer is started. The winding resistance is measured at regular time intervals. This information is used to automatically extrapolate the values of temperature and resistance at the moment when the transformer was switched off.

Technical Data

Winding Resistance Measurement

- Test currents: 5 mA – 40 A DC
- Output voltage: up to 55 V DC
- Measurement range: 0,1 µΩ – 10 kΩ
- Typical accuracy:

±(0,1% rdg + 0,1% F.S.) for 0,1 µΩ-1,999 kΩ range

±(0,2% rdg + 0,1% F.S.) for 2 kΩ – 10 kΩ range

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 kΩ – 9,999 kΩ: 1 Ω

Data Storage

- 1 000 internal memory positions
- USB flash drive feature enables storage of a huge number of measurements

Printer (optional)

- Thermal printer
- Graphic and numeric printout
- Paper width 80 mm

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 tool

AC Current Measurement Channel

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

Current Clamp Meter Specifications

- Measuring range: 30 / 300 A
- Nominal current: 300 A_{RMS} or 450 A DC_{PK}
- Frequency range: DC to 20 kHz (-3 dB)

Computer Interface

- USB
- Optional: RS232

Warranty

- Three years

Environmental Conditions

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

Dimensions and Weights

- Thermal printer and Tap changer control unit not included:
  - Dimensions (W x H x D)
    405 mm x 170 mm x 335 mm
    16 in x 6.7 in x 13.2 in
  - Weight
    13,0 kg / 28.7 lbs
- Thermal printer and / or Tap changer control unit included:
  - Dimensions (W x H x D)
    480 mm x 197 mm x 395 mm
    18.9 in x 7.75 in x 15.6 in
  - Weight
    13,5 kg / 29.8 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

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.

Current and Sense cables with TTA clamps

Voltage Sense cables with TTA clamps

Current connection cable with TTA clamps

Cable bag

Cable plastic case

Cable plastic case with wheels

Current clamp 30/300 A with extension 5 m (16.4 ft)

Test shunt

Order Info

Included accessories	Article No
DV-Win PC software including USB cable	RMO40TD-N-00
Built-in Tap Changer Control Unit (Optional)	
Tap Changer Control cable 5 m (16.4 ft) (Optional)	
Mains Power cable	
Ground (PE) cable	

Recommended	Article No
Current cables 2 x 10 m 10 mm^2 (32.8 ft, 7 AWG) and Sense cables 2 x 10 m (32.8 ft) with TTA clamps	CS-10-10LMXC
Sense cables 2 x 10 m (32.8 ft) with TTA clamps	S2-10-02BPWC
Current connection cable 1 x 5 m 10 mm^2 (16.4 ft, 7 AWG) with TTA clamps	CX-05-102XWC
Cable bag	CABLE-BAG-00
Current clamp 30/300 A supplied from the instrument with extension 5 m (16.4 ft)	CACL-0300-06

Optional	Article No
Test shunt 150 A / 150 mV	SHUNT-150-MK
Thermal printer 80 mm (3.15 in) (built-in)	PRINT-080-00
Thermal paper roll 80 mm (3.15 in)	PRINT-080-RO
Transport case	HARD-CASE-LC
Transport case	HARD-CASE-SC
Plastic transport case	HARD-CASE-PC
Plastic transport case with wheels	HARD-CASE-PW
Current cables 2 x 15 m 10 mm^2 (32.8 ft, 7 AWG) and Sense cables 2 x 15 m (49.2.8 ft) with TTA clamps	CS-15-10LMXC
Current cables 2 x 20 m 16 mm^2 (65.6 ft, 5 AWG) and Sense cables 2 x 20 m (65.6 ft) with TTA clamps	CS-20-16LMXC
Sense cables 2 x 10 m (32.8 ft) with TTA clamps	S2-10-02BPWC
Sense cables 2 x 15 m (49.2 ft) with TTA clamps	S2-15-02BPWC
Sense cables 2 x 20 m (65.6 ft) with TTA clamps	S2-20-02BPWC
Current cables 2 x 15 m 10 mm^2 (49.2 ft, 7 AWG) with TTA clamps	C2-15-10LMWC
Current cables 2 x 20 m 16 mm^2 (65.6 ft, 5 AWG) with TTA clamps	C2-20-16LMWC
Current connection cable 1 x 12 m 16 mm^2 (39.4 ft, 5 AWG)	CX-12-162XWC
Cable plastic case – medium size	CABLE-CAS-02
Cable plastic case with wheels - medium size	CABLE-CAS-W2
Cable plastic case – large size	CABLE-CAS-03
Cable plastic case with wheels - large size	CABLE-CAS-W3
Bluetooth communication module	BLUETOOTH-00

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