



# Tap Changer Analyzer & Winding Ohmmeter RMO60TD



- Test current 5 mA – 60 A DC
- Rapid automatic demagnetization
- AC Current monitoring channel
- Lightweight – 13 kg
- Measuring range 0,1  $\mu\Omega$  - 2 k $\Omega$
- Two voltage sense channels
- Extremely quick measurement
- Automatic discharge circuit
- Built-in Tap Changer Control Unit

## High DC current tap changer analyzer & resistance meter for transformers

### Description

The Tap Changer Analyzer & Winding Ohmmeter RMO60TD is designed for tap changer analysis and for resistance measurement of inductive test objects. RMO60TD generates true DC ripple free current. Both injection of current and discharge of energy from the inductance are automatically regulated.

RMO60TD injects current with a voltage as high as 60 V. This ensures that the duration of test is as short as possible, and that the desired test current is reached faster. Two independent channels enable testing of two series windings, or primary and secondary windings. There is enough memory within RMO60TD instrument to store 500 measurements (EEPROM memory). All measurements are time and date stamped.

The set is equipped with thermal and overcurrent protection. The RMO60TD has very high ability to cancel electrostatic and electromagnetic interference in HV electric fields. It is achieved by very efficient filtration. The filtration is made utilizing proprietary hardware and software.

### On Load Tap Changers

The RMO60TD can be used to measure winding resistance of individual taps of a power transformer's tap changer. It can also check 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 current. A properly working tap changer results differ from a malfunctioning one. This is obvious if an interruption during the change occurs, by the magnitude of the current ripple, the value of measured resistances, and also by different transition times. The instrument displays resistance value and ripple in percents. The Tap Changer Control Unit allows the operator to control the Tap Changer operation box from the RMO60TD instrument. For additional diagnostic functions, our software DV-Win should be used.

## Demagnetization Feature

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

The remanent magnetism can cause various problems such as erroneous diagnostic electrical measurements on a transformer, or an Inrush current at start-up of power transformer, or incorrect operation of protective relays due to magnetized CT cores.

To eliminate this source of potential problems, demagnetization should be performed. When a discharging process has terminated, the RMO60TD can perform fully automatic demagnetization.

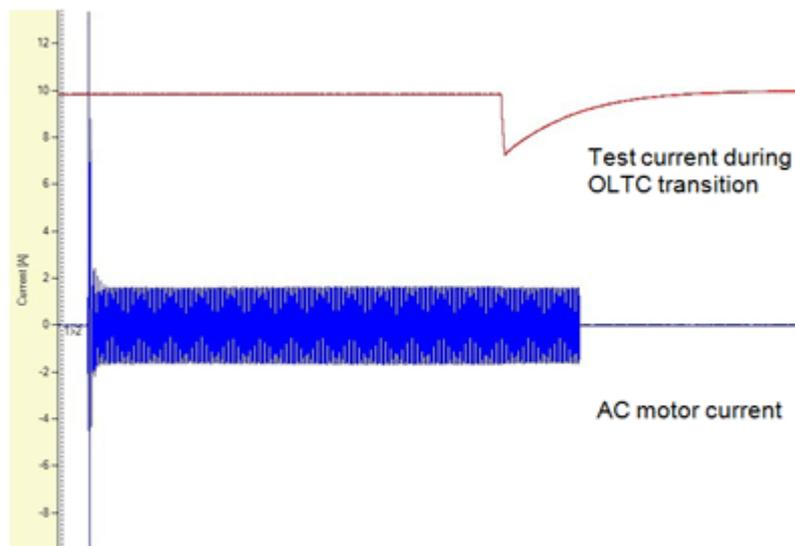
Demagnetizing magnetic core of a transformer requires alternating current applied with decreasing magnitude down to zero. The RMO60TD provides this alternating current by internally changing the polarity of a controlled DC current. During the demagnetization process the RMO60TD supplies current at decreasing magnitude for each step, following a proprietary developed program.

## DV-Win

Using DV-Win software, instrument can be operated and controlled from a PC, and results are obtained directly at a PC. The DV-Win software allows results to be arranged in an Excel spreadsheet, which can be shown later as a diagram and printed as a report, or exported in ASCII format. This software provides more detailed condition assessment of an OLTC (tap changer) by recording the graph which represents dynamic resistance during the tap change and motor current. The DV-Win measures OLTC transition time, an important characteristic for condition assessment. The standard interface is USB and optional RS232.

## AC Current monitoring channel

AC current monitoring channel is intended for monitoring and recording the OLTC mechanical-drive motor-current during tap changer operation. The motor current waveform is also printed on the DV Win generated graph, and can help in detecting OLTC mechanical problems. An AC current clamp is provided.



## Typical application

Typical application of RMO60TD is measuring the resistance of:

- ✓ Power transformers
- ✓ On-Load Tap Changers
- ✓ Generators and electrical motors
- ✓ High-current busbar joints
- ✓ Cable splices

## Accessories

### Included

- ✓ DV-Win PC software
- ✓ Built-in Tap Changer Control Unit
- ✓ Tap Changer Control cable set 5m
- ✓ Mains power cable
- ✓ Ground (PE) cable

### Recommended

- ✓ Current cables 2 x 10 m 10 mm<sup>2</sup> with clamps
- ✓ Sense cables 2 x 2 x 10 m 2,5 mm<sup>2</sup> with clamps
- ✓ Current connection cable 1 x 5 m 10 mm<sup>2</sup> with clamps
- ✓ Current clamp 20/200 A
- ✓ Cable bag

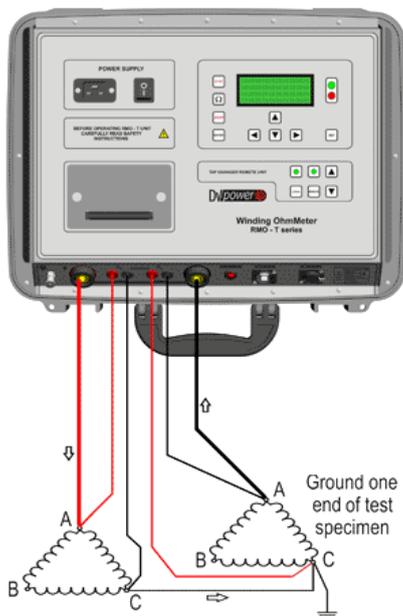
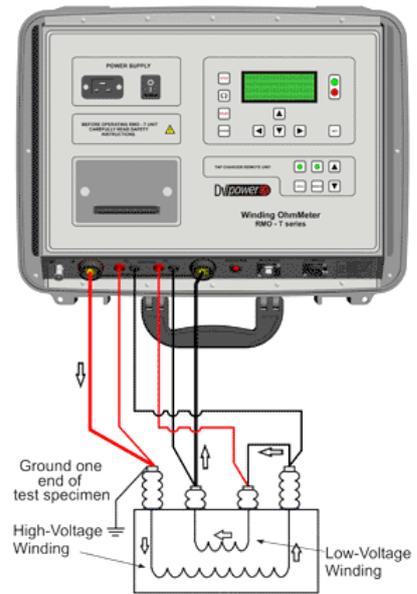
### Optional

- ✓ Built-in thermal printer 80 mm
- ✓ Test shunt 150 A / 150 mV
- ✓ Current cables 2 x 15 m 10 mm<sup>2</sup> with clamps
- ✓ Sense cables 2 x 15 m 2,5 mm<sup>2</sup> with clamps
- ✓ Cable plastic case

<p>Voltage sense cables</p>	<p>Current cables</p>	<p>Current connection cable</p>
<p>Current clamp</p>	<p>Shunt</p>	<p>Cable bag</p>

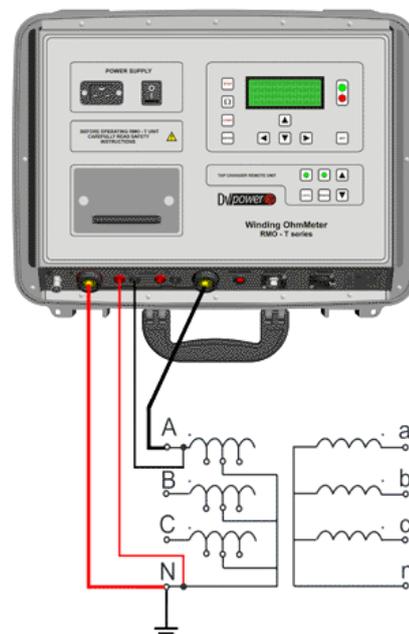
## Connecting a Test Object to RMO60TD

The RMO60TD should be turned off, connection between RMO60TD and the test object is such that the measuring cables from the "Voltage Sense" sockets are attached as close as possible to the measured resistance, while they are connected between the current feeding cables. That way, resistance of cables and clamps is almost completely excluded from the resistance measured. The figure to the right shows simultaneous testing of both windings (high and low) on a single-phase transformer. In such a way, it is possible to speed up the measurement when two channels are used to test both windings of the transformer.



Testing of a Delta-delta winding resistance is usually a very time consuming procedure. This is because the two windings represent two closed loop inductors. When energy is brought into the inductors, this energy (in the form of D.C. current) continually circulates within each winding. To test this configuration quickly, both high and low sides should be connected in series with the current source of a Transformer Ohmmeter. By having these two windings in opposing polarity, the internal circulating currents settle very quickly to obtain a balance, and discharge with the same speed. Even if only one side of the transformer needs to be tested, connecting both high and low windings in series will speed up the test considerably.

Using RMO60TD's Tap Changer menu, the power transformer winding resistance of individual tap positions can be measured. Also, you can check whether the on-load tap changer switches without an interruption. The RMO60TD current output injects a constant current into a power transformer. This current and voltage value is measured, and the winding resistance is calculated.



## Technical data

### 1 – Mains Power Supply

- Voltage	110 – 230 V AC
- Frequency	50 – 60 Hz
- Input power	2250 VA
- Fuse	15 A / 250 V, type F

### 2 – Output data

- Test current	5 mA DC – 60 A DC
- Test voltage	60 V DC
- Measuring range / Resolution	
0,1 $\mu\Omega$ - 999,9 $\mu\Omega$	0,1 $\mu\Omega$
1,000 m $\Omega$ - 9,999 m $\Omega$	1 $\mu\Omega$
10,00 m $\Omega$ - 99,99 m $\Omega$	10 $\mu\Omega$
100,0 m $\Omega$ - 999,9 m $\Omega$	0,1 m $\Omega$
1,000 $\Omega$ - 99,99 $\Omega$	10 m $\Omega$
100,0 $\Omega$ - 999,9 $\Omega$	0,1 $\Omega$
1000 $\Omega$ - 2000 $\Omega$	1 $\Omega$
- Typical accuracy	$\pm$ (0,2 % rdg + 0,2 % FS)

### 3 – AC Current monitoring channel

- Current monitoring resolution:	0,1 ms
- Amplitude resolution:	16 bit

### 4 - Current clamp meter specifications:

Nominal current:	20 A r.m.s
Measuring range:	5 mA - 30 A max
Accuracy:	20 A (< 1 kHz): $\pm$ (1 % of rdg + 2 mA) 20 A (1 to 20 kHz): $\pm$ (3 % of rdg + 2 mA)

### 5 – Environmental conditions

- Indoor use
- Altitude below 2000 m
- Temperature -10 °C - +55 °C / 14 °F - +131 °F
- Maximum relative humidity 95 % for temperatures up to 31 °C, decreasing linearly to 40 % relative humidity at 55 °C
- Mains supply voltage fluctuations up to  $\pm$ 10 % of the nominal voltage
- Installation/overvoltage category II
- Pollution degree 2

### 6 – Dimensions and Weight

- Dimensions	502 mm x 190 mm x 395 mm 19,75 in x 7,48 in x 15,53 in (W x H x D)
- Weight	13 kg / 28,6 lb

<b>7 - Warranty</b>	three years
---------------------	-------------

## 8 - Safety Standards

- European standards                    EN 61010-1  
    LVD 2006/95/EC
- International standards                IEC 61010-1  
    UL 61010-1  
    CAN/CSA-C22.2 No. 61010-1, 2nd edition, including  
    Amendment 1

## 9 - Electromagnetic Compatibility (EMC)

- CE conformity                            EMC directive 2004/108/EC
- Emission                                    EN 61326-1
- Interference Immunity                EN 61326-1

\*All specifications herein are valid at ambient temperature of + 25 °C and standard accessories.

\*Specifications are subject to change without notice.

**IBEKO POWER AB**

