MTO250
Transformer Ohmmeter

- **Capable of testing transformers up to 1000 MVA**
- **DC test current up to 50 A maximum**
- **Integrated demagnetization feature**
- **Computer control and internal data storage**
- **Validates proper operation of on-load tap-changers**
- **Protected against accidental current lead disconnection (through potential leads)**

DESCRIPTION

The MTO250 Transformer Ohmmeter is a line-operated, field- portable instrument designed specifically to measure the resistance of all types of magnetic windings safely and accurately. It tests transformers, shunt reactors, rotating machine windings and performs low resistance measurements on connections, contacts and control circuits.

The dual set of potential inputs enables the resistance measurement of either two primary, two secondary windings, or of a primary plus a secondary winding simultaneously. This dual reading, dual injection characteristic, is a highly efficient method of completing tests in a timely manner.

The MTO250 is useful for testing the winding plus contact resistance of LTC (Load Tap Changers) as well as assessing the "make-break" transition event. Operating the LTC to change taps while DC test current is applied helps validate proper make-break transition. This test diagnoses possible issues such as aggressive pitting, weak springs, and misalignment of contact mechanisms.

Load tap changers are the only moving part of a transformer, and as they are mechanical devices, are one of the most vulnerable parts of a transformer. Load tap-changers result in more failures and outages than any other component and so require frequent testing and attention to ensure reliable and safe operation.

Applying DC current to highly inductive objects is a potentially dangerous test. The MTO250 has multiple built in safety features for the protection of the end user, the asset under test and the MTO itself. The MTO safety features include auto discharge in the event of input power loss, automatic discharge in the event of inadvertent disconnection of a test lead, safety interlock which places test into discharge when interrupted, and an optional high voltage strobe which warns personnel of presence of a dangerous condition.

TYPICAL APPLICATIONS

The MTO250 Transformer Ohmmeter is used to:

- Perform field testing of CT, PT, power transformer windings and their associated tap changers, and motors/generators.
- Verify factory winding resistance test results.
- Perform factory heat run tests.
- Diagnose and pinpoint problems such as the presence of defects in transformers, such as loose connections, and poor tap changer operation.
- To validate proper "make-before-break" operation of load tap-changers (LTC).

LTC / CONTINUITY

In normal LTC operation, continuity between the internal LTC contacts is maintained throughout each complete transition (from one tap position to the next). To check for this continuity, the MTO250 continually monitors the transition currents, in high resolution, for each tap position, and any slight discontinuities are detected and reported.

AUTO CORE DEMAGNETIZATION

It is common for DC current used for winding resistance, and OLTC/ Continuity testing to magnetize the transformer core. If the core is left magnetized after the completion of test, it can cause numerous issues as noted below.

Core magnetization results in remnant flux that can affect the measurements of subsequent AC testing such as excitation current or sweep frequency response analysis and cause erroneous readings. Magnetized CT cores can cause accidental tripping of protective relays. In other cases, when power transformers with a magnetized core are put back in service excessive inrush currents can develop which can trip the protection system.

Megger

MTO250
Transformer Ohmmeter

FEATURES AND BENEFITS

- 50 amp test current reduces test time on high current secondary windings by up to 10 times when compared to traditional 10A units.
- Internal data storage with nine internal sets (groups) of results, allowing for easier organization while in the field.
- Two channel digital displays allows for testing two windings at a time, improving traditional test time by 50% or more.
- Computer-aided test form guides operator through connections and tests for all single- and three-phase transformers via PC control or data download.
- Checks the contact and timing health of on-load tap changers.
- Patented universal kelvin clamps, with 4 in. (100 mm) adjustable jaws are available, eliminating the need for multiple types of lead clips. Each kelvin clamp also includes banana plugs for use of external probes for testing on terminal blocks.
- Built-in safety discharge circuit safely discharges the specimen when test is completed, if lead accidentally disconnects, or if power is lost.
- Automated "heat run" testing and report via PowerDB software.

REMOTE TAP CHANGER (OPTIONAL)

The RTC-1 is a manually operated remote tap controller designed to provide a more efficient method of controlling (on)load tap changer (LTC) while performing routine tests on power transformers. It removes the need to be physically close to the LTC while testing or to have a second person controlling the LTC while operating the testing instrument. A 30 ft (9 m) three-conductor cable is provided to allow proximity to the test instrument while performing testing and advancing tap positions as required throughout the test.

SPECIFICATION

Input

85-264 VAC, 47-63 Hz, 1500 VA

Output

User Selectable Current Ranges	1 A / 10 A / 25 A / 50 A
Open Circuit Voltage	50 V DC

Resistance and Current Measurement/Display

Current Range (A)	Resistance Range (Ohms)	Resolution (Ohms)
50 A	10 μΩ to .04 Ω	0.0000001
50 A	0.04 Ω to 0.4 Ω	0.00001
25 A	10 μΩ to 0.08 Ω	0.0000001
25 A	0.08 Ω to 0.8 Ω	0.00001
10 A	10 μΩ to .2 Ω	0.000001
10 A	0.2 Ω to 2 Ω	0.0001
1 A	100 μΩ to 2 Ω	0.00001
1 A	2 Ω to 20 Ω	0.001

NOTE: Resistance range 20 Ω to 2,000 Ω has best accuracy of ±0.5%

Typical Accuracy:	±0.1% reading, ±0.1% range
Best Resolution:	0.1 μΩ
Guaranteed Accuracy:	±0.25% reading, ±0.25% range (once current has stabilized)
Current Resolution:	4 digits
Current Accuracy:	±0.25%, ±0.25% range

Computer Interface (for downloading results and computer control)

Via Ethernet port

Internal Data Storage

9 groups (1-9) 99 results per group

LTC Make-Break Transition Settings

2 mS, 20 mS, 50 mS, 80 mS

Safety/EMC/Vibration Conforms to the Requirements of:

EN61010-1 Safety
ISTA 1A Shipping
EN61326 EMC

Environmental

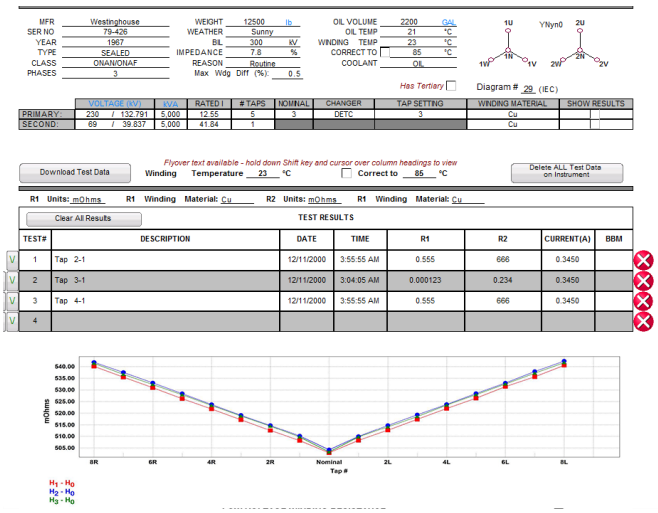
Operating:	14° F to 122° F (-10° C to 50° C)
Storage:	-13° F to 158° F (-25° C to +70° C)
Relative Humidity:	0-90% non-condensing

Dimensions

8.5 H x 21.5 W x 13 D in
(216 H x 546 W x 330 D mm)

Weight

Unit:	net 30 lb (13.6 kg)
Optional leads:	net 29 lb (13 kg) (for 60 ft [18 m])
In optional transit case:	net 96 lb (43.5 kg)



Power DB Lite - Typical sample of a computer control and download report. (included at no charge)

Universal Kelvin Clips make connections to transformers easy and secure, replacing the traditional two leads with one lead. Max opening: 4 in. (10 cm) Included: two banana plug inputs for lead connection to small specimens.

Transit Case
Cat # 2005-340
Dimensions: 27 x 27 x 16 in. (69 x 69 x 41 cm)
Weight: 37 lb (17 kg)

Universal Kelvin Lead Set

Cat. No.	Length	Weight
2000-789-30	30 ft (9 m)	15 lb (7 kg)
2000-789-60	60 ft (18 m)	29 lb (13 kg)
2000-789-100	100 ft (30 m)	50 lb (23 kg)

HV Strobe and Leads
Cat # 1004-639
Length: 60 ft (18 m)
Weight: 2.3 lb (1.1 kg)

Lead set, 60 ft (18 m) [500 kV].
Also available in 30 ft (9 m) and 100 ft (30 m) **Cat # 1004-641**

Remote Hand Switch
Cat # 30915-220

Test Shunt, 50 A, 2 mΩ
Cat # 1006-512-1

Test Shunt, 10 A, 10 mΩ
Cat # 1006-512-2

ORDERING INFORMATION

Item (Qty)	Cat. No.
Transformer Ohmmeter, 50A	MTO250
Included Accessories	
Backpack lead bag	2012-180
AC power cord (IEC60320-C19 to US standard)	17032-23
AC power cord (IEC60320-C19 to Schuko CEE 7/7)	17032-19
Ground Lead 15 ft (4.5m)	4702-7
User guide	MTO250_UG
Quick guide	2006-128
Optional Accessories	
Transit case	2005-340
HV strobe, complete with 60 ft (18 m) lead	1004-639
Remote tap controller model RTC-1	1007-502
Test shunt, 50 A, 2 mΩ	1006-512-1
Test shunt, 10 A, 10 mΩ	1006-512-2

Item (Qty)	Cat. No.
Optional Accessories (continued)	
Lead set, 30 ft (9 m), [**150 kV] complete with:	**1004-640**
Current lead set, 30 ft (9 m)	2000-787-30
V1 potential lead set, 30 ft (9 m)	2000-700-30
V2 potential lead set, 30 ft (9 m)	2000-701-30
Current shorting lead, 15 ft (4.5 m)	2000-788-15
Lead set, 60 ft (18 m), [**500 kV] complete with:	**1004-641**
Current lead set, 60 ft (18 m)	2000-787-60
V1 potential lead set, 60 ft (18 m)	2000-700-60
V2 potential lead set, 60 ft (18 m)	2000-701-60
Current shorting lead, 30 ft (9 m)	2000-788-30
Lead set, 100 ft (30 m), [**750 kV] complete with:	**1004-642**
Current lead set, 100 ft (30 m)	2000-787-100
V1 potential lead set, 100 ft (30 m)	2000-700-100
V2 potential lead set, 100 ft (30 m)	2000-701-100
Current shorting lead, 50 ft (15 m)	2000-788-50
Kelvin Lead Sets:	
1 set current+potential leads, 30 ft (9 m) [**150kV]	2000-789-30
1 set current+potential leads, 60 ft (18 m) [**500kV]	2000-789-60
1 set current+potential leads, 100 ft (30 m) [**750kV]	2000-789-100

/** Denotes the recommended length for voltage class of transformer. Some transformers vary and may require a longer or shorter length.

SALES OFFICE
4545 W. Davis Street
Dallas, TX 75211
T 1 800 723 2861 (USA only)
T +1 214 333 3201
F +1 214 331 7399
ussales@megger.com

MTO250--DS_US_V06a
www.megger.com
ISO 9001

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