

RMO-D series

Micro Ohmmeters

- Lightweight – 9.0 - 12 kg / 20 - 26.5 lbs
- Powerful – up to 600 A DC
- Measuring range 0 – 999,9 mΩ
- Resolution 0,01 μΩ
- Typical accuracy ± (0,1 % rdg + 0,1 % FS)
- Remote Control Unit (optional)
- Both Sides Grounded Unit (optional)
- *SINGLE / CONTIN / BSG / DTRtest* modes
- *DEMAGNETIZATION* feature
- *High Precision module (built-in)*



Description

RMO-D series of Micro Ohmmeters (hereafter referred to as “RMO-D”) contain 3 models: **RMO200D**, **RMO500D** and **RMO600D**.

All RMO-D models are based on a state of the art technology, using the most advanced switch mode technique available today. The main difference between these models is the maximum test current that can be generated (200 A for RMO200D, 500 A for RMO500D and 600 A for RMO600D model).

RMO-D generates a true DC ripple-free current with automatically regulated test ramps. During a test the RMO-D ramps its output with increasing current before taking measurement and decreasing current after the measurement. This eliminates magnetic transients.

The RMO-D instrument can store internally up to 500 measurements. All measurements are time and date stamped. Using the DV-Win software a test can be performed from a PC and the results can be obtained directly on the PC. Communication between the RMO-D and a PC is through an USB (as standard) or an RS232

cable (as an option). Using the DV-Win the result can be arranged as an Excel spreadsheet which can be later presented in a graphic form and printed for a report.

The set is equipped with a thermal and an overcurrent protection. The RMO-D has a 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 a proprietary hardware and software.

The RMO-D instrument has four separate test modes:

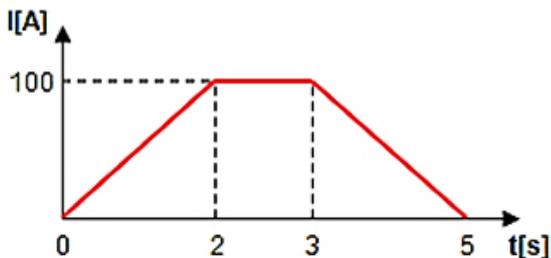
- SINGLE mode
- CONTIN mode
- BSG mode (*Both Sides Grounded*)
- DTRtest mode (*Dead Tank Resistance*)

The **DEMAGNETIZATION** feature enables for full automatic demagnetization of a current transformer core after the measurement.

Single Test

The RMO-D instrument generates a filtered (true ripple-free) DC current and delivers it in an automatically regulated current ramp form. By sloping the current up and down, magnetic transients are virtually eliminated.

Below is an example of a single test ramp for the 100 A current.



Continuous Test

RMO-D can generate DC current continuously in predefined test durations, as presented in the table below.

C o n t i n u o u s T e s t	
Test current (A)	Maximum test duration time (sec)
5, 10, 20, 50, 100	*300
200	150
300	90
400	50
500	30
600	20

*test duration at 100 A test current can be up to 30 minutes as per request

To prevent overheating, certain duty cycles apply depending on the test current being used.

BSG test

Grounding circuit breakers from both sides provides increased safety for testing personnel compared to methods with only one side grounded.

This test mode is specially designed for **Both Sides Grounded** testing. A special current clamp meter supplied from the instrument is used for measuring the current through the groundings. The test setup is very simple (same as for the SINGLE test) and all calculations are made automatically by the device's internal algorithm.

DTRtest

Presence of current transformers (CT) on the dead tank circuit breakers may introduce errors during contact resistance measurement due to CT magnetizing process. For this reason, it is necessary to saturate a CT prior to starting a measurement.

DTRtest menu is specially designed for resistance measurement of the dead tank circuit breakers. All calculations for detecting the saturated condition of CTs are done by internal algorithm. Accordingly, the process of measurement parameters setting and testing in this mode is very simple and does not differ much from live tank circuit breaker testing (in SINGLE / CONTIN test modes).

Demagnetization feature

The new feature allows a fully automatic demagnetization of a current transformer core after the measurement. Demagnetizing a magnetic core of a current transformer requires applying the AC with decreasing magnitude bringing it down to zero. The RMO-D provides this alternating current by automatically changing the polarity of a controlled DC current and decreasing its magnitude following a proprietary developed software solution.

High – Precision module (built-in)

The high-precision module is newly developed built-in addition to our RMO-D micro ohmmeters. It provides an increased precision and offers a highly accurate contact resistance measurement in the range from 1 $\mu\Omega$ to 30 $\mu\Omega$, with 0,01 $\mu\Omega$ resolution.

RMO-D devices with the built-in High Precision Module may be used for applications on very small resistance measurements of non-inductive test objects. This requirement is usually met at resistance inspections of generator circuit breakers, welding joints, GIS testing, etc.

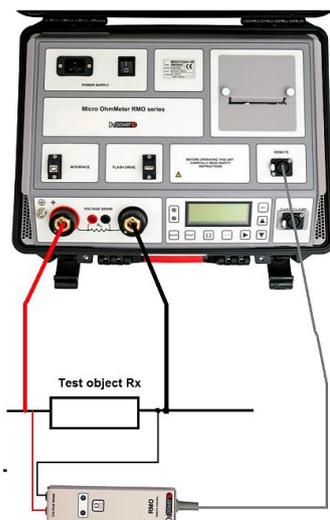
Application

Typical application is measuring a resistance of non-inductive test objects:

- High, middle and low voltage circuit breakers (live and dead tank)
- High, middle and low voltage disconnecting switches
- High-current bus bar joints
- Cable splices
- Welding joints
- Fuse

Remote Control Unit

The RMO-D Remote Control Unit is an optional control unit that is used to start and stop the tests from a remote location, away from the actual RMO-D.



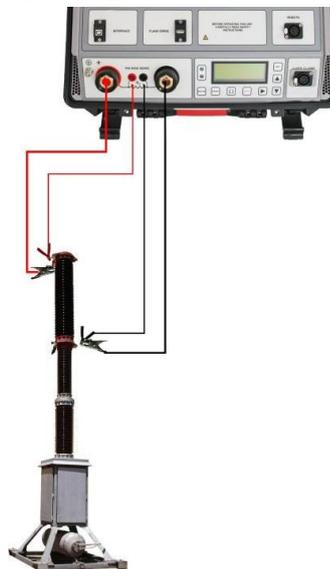
Provided that, for a series of tests, the same test current is fed through the test object, multiple measurements can be carried out with the RMO-D Remote Control Unit.

Connecting the Test Object to RMO-D

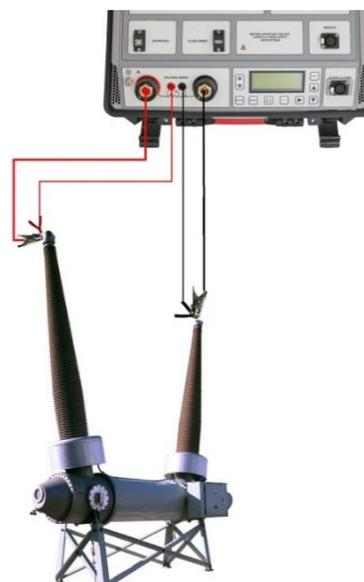
The connection diagram of the RMO-D devices corresponds to the Kelvin's (four point) measurement principle. The measuring cables from the "Voltage Sense" sockets are attached as close as possible to Rx, and in between the current feeding cables. That way, a resistance of both cables and clamps is almost completely excluded from the resistance measurement.



The connecting diagrams for the live tank and dead tank circuit breakers are presented in the following two figures:



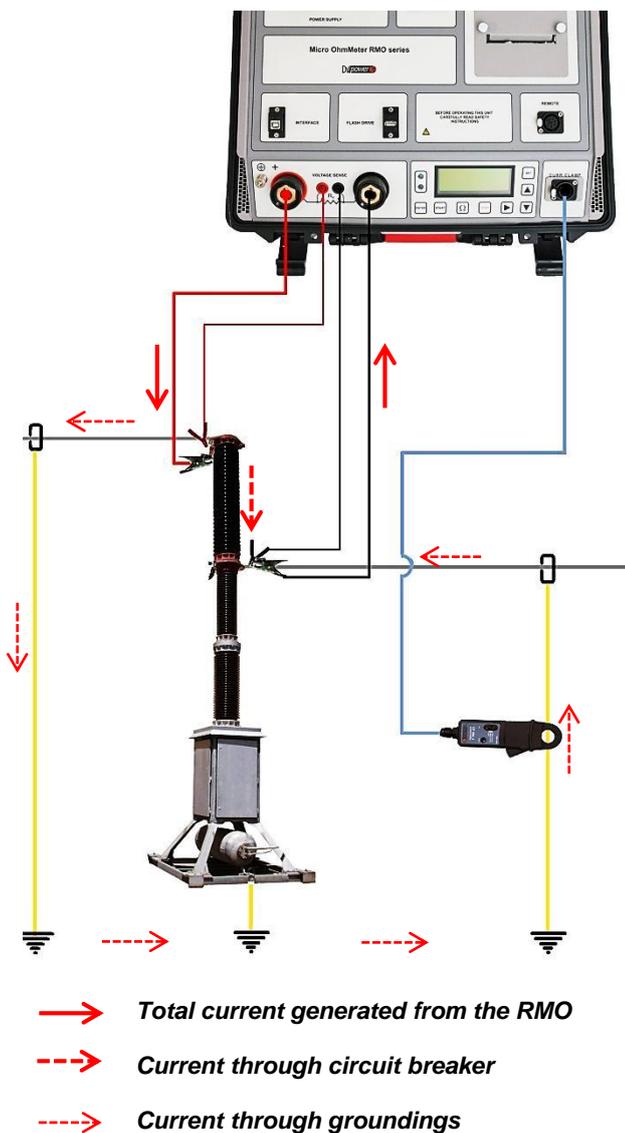
RMO-D cable connection on live tank circuit breaker



RMO-D cable connection on dead tank circuit breaker

Connecting RMO-D to a Both Sides Grounded Circuit Breaker

Using the RMO-D with both sides grounded option, it is possible to make a safer measurement of breakers with both terminals of the breaker grounded.



Using the RMO-D with a current clamp-meter is an additional safety feature. Measurement of a circuit breaker contact resistance is done with both sides of the breaker grounded.

The RMO-D device will measure the current through the ground circuit connection and add this value to the selected test current value in order to provide the selected test current through the test object.

Benefits and features

The main benefits and features of the RMO-D devices are listed below:

- The **DEMAGNETIZATION** feature for full automatic demagnetization of a current transformer core after the measurement on dead tank circuit breakers.
- Very high output power (output voltage multiplied by output current) enables two main advantages:
 1. Wide resistance measurement range even when very high currents are used.
e.g. RMO600D can test up to 5,3 mΩ with 600 A test current when 5 m / 50 mm² current cables are used.
 2. Use of thinner/longer test cables, depending on the customer requirement.
e.g. RMO200D can use 20 m current cables with cross-section of only 16 mm² for testing circuit breakers with 100 A test current.
- The output current is filtered and has a ripple of less than 1 %.
- The instrument has a very high typical accuracy ± (0,1 % rdg + 0,1 % FS).
- The best resolution of the RMO-D is 0,01 μΩ.

Several advanced features are available as standard (optional) accessories:

- Rmax feature - pass/fail criteria
- Built-in thermal printer (*optional*)
- USB or RS232 communication port
- Bluetooth communication (*optional*)
- DTRtest mode – special mode for Dead Tank circuit breakers testing
- A built-in High Precision module – provides an increased precision and offers a highly accurate contact resistance measurement in the range from 1 μΩ to 30 μΩ, with 0,01 μΩ resolution.

Technical data

Mains power supply

- Connection according to IEC/EN60320-1; C320
- Mains supply: 90 V – 264 V AC
- Frequency: 50 / 60 Hz
- Power consumption

Model	@ 230 V AC	@ 115 V AC
RMO200D	1785 VA	1770 VA
RMO500D	3865 VA	3615 VA
RMO600D	4560 VA	3925 VA

- Fuse: *type F*
RMO200D 12 A / 250 V
RMO500D & RMO600D 20 A / 250 V

Output data

- Test current ranges and load intervals:

Model	Test current	Test duration
RMO200D	200 A	150 s
RMO500D	500 A	30 s
RMO600D	600 A	20 s

- Full Load Voltages at maximum current

Model	@ 230 V AC	@ 115 V AC
RMO200D	6,7 V	5,8 V
RMO500D	5,8 V	4,7 V
RMO600D	5,7 V	3,6 V

Measurement

- Resistance range: 0,1 $\mu\Omega$ – 999,9 m Ω
- Resolution

0,01 $\mu\Omega$ – 99,99 $\mu\Omega$	0,01 $\mu\Omega$
100,0 $\mu\Omega$ - 999,9 $\mu\Omega$	0,1 $\mu\Omega$
1,000 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
- Typical accuracy \pm (0,1 % rdg + 0,1 % FS)

Display

- LCD screen 20 characters by 4 lines;
- LCD display with backlight, visible in bright sunlight.

Interface

- RMO-D is equipped with an USB port
- optional: RS232 (connection to an external computer)
- optional: Bluetooth communication interface

Test Result Storage

- RMO-D can store up to 500 measurements

Printer (optional)

- Thermal printer
- Paper width 80 mm / 3.2 in

Dimensions and weight

Model	Weight kg / lbs	Dimensions (W x H x D) mm / in
RMO200D	9 kg / 20 lbs	405 x 165 x 330 / 7.8 x 10 x 15 <small>*RMO200D in version without built-in thermal printer</small>
RMO500D	12 kg / 26,5 lbs	480 x 190 x 385 / 18.9 x 7.48 x 15.16
RMO600D	12 kg / 26,5 lbs	<small>*RMO500D/RMO600D and RMO200D in version with built-in thermal printer</small>

Environmental protection

- Ingress protection rating: IP67*with closed lid

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

Applicable Standards

- Installation/overvoltage: category II
- Pollution: degree 2
- Safety: LVD 1006/95/EC (CE Conform)
EN 61010-1
- EMC: Directive 1004/108/EC (CE Conform)
Standard EN 61326-1:1006
- CAN/CSA-C22.2 No.61010-1, 2nd edition,
including Amendment 1

Warranty

- 3 Years

Accessories



Current cables



Extension current cables



Voltage sense cables



Current clamp 30/300A power supplied from the instrument with extension 5 m



Test shunt



Cable bag

* Besides battery clamps, current cables are also available with C clamps or with alligator clamps (as option)

** Besides isolated alligator (A2) clamps, sense cables are also available with semi-isolated alligator (A1) clamps or with TTA clamps (as option)

Recommended cross-sections for RMO-D models:

CROSS SECTION/ LENGHT	25 mm ²	35 mm ²	50 mm ²	70 mm ²
5 m	RMO200D	-	RMO500D & RMO600D	-
10 m	RMO200D	-	RMO500D & RMO600D	-
15 m	-	RMO200D	-	RMO500D & RMO600D

Order info

Instrument with included accessories	Article No
Micro Ohmmeter RMO-D <ul style="list-style-type: none"> - DV-Win PC software including USB cable - A built-in high precision module - Mains power cable - Ground (PE) cable 	RMO200D-N-00 RMO500D-N-00 RMO600D-N-00

Recommended accessories	Article No
Current cables 2 x 5 m, *XX mm ² with battery clips	C2-05-XXYMBY**
Sense cables 2 x 5 m with alligator clips	S2-05-02BPA2
Transport case *RMO500/600D and RMO200D in version without built-in thermal printer	HARD-CASE-LC
Cable bag	CABLE-BAG-00

Optional accessories	Article No
Transport case *RMO200D without built-in thermal printer	HARD-CASE-SC
Transport case *RMO500/600D and RMO200D in version without built-in thermal printer	HARD-CASE-LC
Cable plastic case – medium size	CABLE-CAS-02
Test shunt 100 μΩ (600 A/60 mV)	SHUNT-600-MK
Current cables 2 x 10 m, *XX mm ² with battery clips	C2-10-XXYMBY**
Current cables 2 x 15 m, *XX mm ² with battery clips	C2-15-XXYMBY**
Current extension cable 2 x 10 m, *XX mm ²	E2-10-XXYMYF
Sense cables, extension 2 x 10 m	E2-10-02BPBP
Sense cables 2 x 10 m with alligator clips	S2-10-02BPA2
Sense cables 2 x 15 m with alligator clips	S2-15-02BPA2
Built-in thermal printer	PRINT-080-00
Remote control unit	RMORCU-09-00
Remote control test probes (one with trig button)	RMO-RCTP-TB0
Current clamp 30/300 A power supplied from the instrument with extension 5 m (Both Sides Grounded Unit)	CACL-0300-06

*XX - Cross-section of current cables varies, depending of the output power of the model.

**YMBY – For RMO200D without built-in thermal printer: YMBY=LMB1;

For other models (including RMO200D with built-in thermal printer): YMBY=VMB3

e.g.

For RMO200D without built-in thermal printer, the article number for current cables 10 m/25 mm² cross-section is C2-10-25LMB1

For RMO600D, the article number for current cables 5m/50 mm² is C2-05-50VMB3

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