

## RMO-A series

### Micro Ohmmeters

- Lightweight – from 7 to 8 kg / 15.4 to 17.5 lbs
- Powerful – up to 600 A DC
- Measuring range 0 – 999,9 mΩ (up to 6 Ω)
- Resolution 0,1 μΩ
- Typical accuracy ± (0,1 % rdg + 0,1 % FS)
- *SINGLE / CONTIN / DTRtest* modes
- Mechanical protection IP50



#### Description

RMO-A series of Micro Ohmmeters (hereafter referred to as “RMO-A”) contain 6 models: **RMO100A, RMO200A, RMO300A, RMO400A, RMO500A and RMO600A.**

All RMO-A 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 (100 A for RMO100A, 200 A for RMO200A, up to 600 A for RMO600A model).

RMO-A generates a true DC ripple-free current with automatically regulated test ramps. During a test the RMO-A ramps with increasing current before measuring and decreasing current after the measurement. This significantly decreases magnetic transients.

The RMO-A 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 user's PC, and the results can be obtained directly on the PC.

Communication between the RMO-A and a PC is through an USB (as standard) or an RS232 cable (as an option). Bluetooth communication interface is also available as an option.

Using the DV-Win the result can be arranged as an Excel spread-sheet which can be later shown as a diagram and printed for a report.

The set is equipped with a thermal and an overcurrent protection. The RMO-A 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.

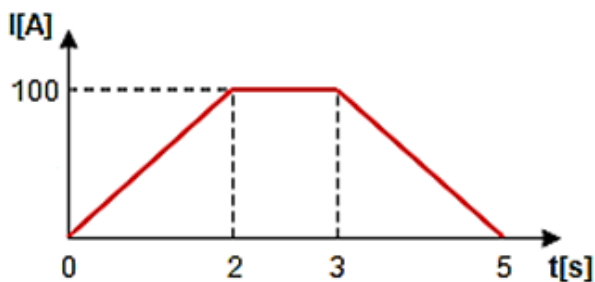
The RMO-A instrument has three separate test modes:

- SINGLE mode
- CONTIN mode
- DTRtest mode

## Single Test

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

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



## Continuous Test

RMO-A 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.

## 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 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).

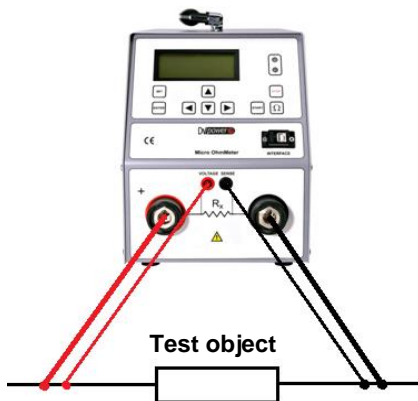
## Application

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

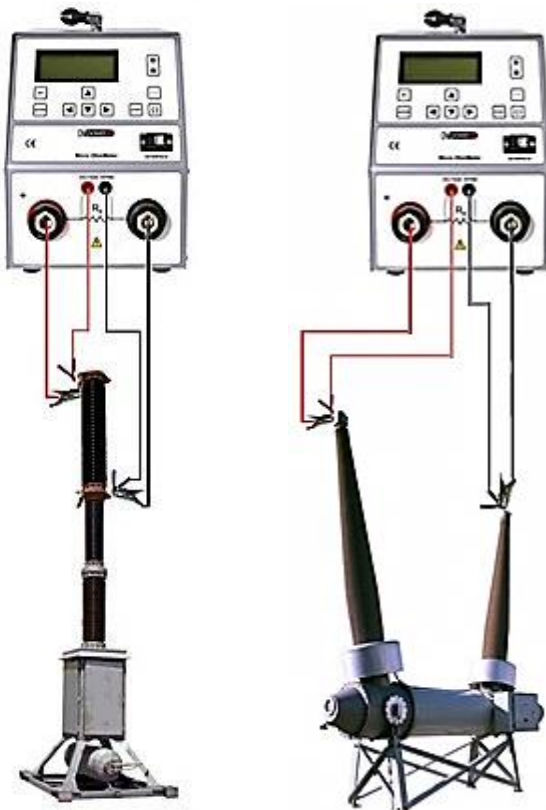
- High, middle and low voltage circuit breakers (live and dead tank)
- High, middle and low voltage disconnecting switches
- High-current bus bar joints
- Cable splices
- Welding joints
- Fuses

## Connecting the Test Object to RMO-A

The connection diagram of our RMO-A 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 figure below:



Micro Ohmmeter cable connection on live tank (left) and dead tank (right) circuit breaker

## Benefits and features

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

- Very high output power (output voltage multiplied with output current) enables two main advantages:

1. Wide resistance measurement range even when very high currents are used.

*e.g. RMO600A can test up to 5,3 mΩ with 600 A test current when 5 m / 50 mm<sup>2</sup> current cables are used.*

2. Use of thinner/longer test cables, depending of the customer requirement.

*e.g. RMO100A can use 20 m current cables with cross-section of only 16 mm<sup>2</sup> 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  $\pm (0,1 \% \text{ rdg} + 0,1 \% \text{ FS})$ .
- The best resolution of RMO-A is 0,1  $\mu\Omega$ .

Several advanced features are available as standard/optional accessories:

- Rmax feature (*pass/fail criteria, enabled with the device and the DV-Win software*)
- Built-in thermal printer (*optional accessory*)
- USB / RS232 communication port
- Bluetooth communication (optional)
- DTRtest mode (*a special mode for Dead Tank circuit breakers testing*)

## DV-Win software

DV-Win software provides acquisition and analysis of the test results, as well as control of all the RMO functions from a PC. The DV-Win also provides several advanced features as a supplement to multiple functions of RMO devices. Testing in Continuous mode is upgraded with a sample time feature which allows user to record test results in specific time intervals set in seconds.

After performed measurements results can be saved in a various formats and test report can be generated and saved or printed. Result can also be downloaded from the device to the PC by use of several different search filters.

For the RMO form of DV-Win software there is Help menu available, with detailed instructions and explanations of all functions and features.

## DV-Win Main Features

- Full control of the device in test
- Test reports \*available in several formats
- Several filters for results download to PC
- Test plans
- Sampling time feature for CONTIN mode

The screenshot displays the DV-Win software interface. The main window is titled 'RMO DV-Win' and contains several panels:

- Test Info:** Includes 'Test settings' (Operation mode: Single, Continuous, ESG, DTRtest) and 'Test parameters' (Test current: 50 A, Test duration: 10 s, Sample time: 1 s).
- Measuring object:** Includes 'Define measuring element' (Breaks per phase: 1, Breaking unit: A-Current Path).
- Test controls:** Includes 'START' and 'STOP' buttons.

Below the main window, a 'STATUS: Ready for test' panel is visible. To the right, an 'RMO Test Report' window is open, displaying a table of test results and an 'Open' dialog box for saving the report.

Memory	Date	Time	Mode	Current (A)	Voltage (V)	Power (W)	Temperature (°C)	...
43	3/13/2013	14:17	CONTIN	49.9	50	0.7459	37.2931	-
44	3/13/2013	14:17	CONTIN	50	50	0.7459	37.2979	-
45	3/13/2013	14:18	CONTIN	50	50	0.7459	37.2938	-
106	3/13/2013	14:18	CONTIN	49.9	50	0.7459	37.2916	-
107	3/13/2013	14:18	CONTIN	50	50	0.7459	37.295	-

## 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
<b>RMO100A</b>	1210 VA	1150 VA
<b>RMO200A</b>	1890 VA	1880 VA
<b>RMO300A</b>	2360 VA	2170 VA
<b>RMO400A</b>	3520 VA	2650 VA
<b>RMO500A</b>	3930 VA	3850 VA
<b>RMO600A</b>	4560 VA	4040 VA

- Fuse: *type F*
- |                   |              |
|-------------------|--------------|
| RMO100A & RMO200A | 12 A / 250 V |
| RMO300A & RMO400A | 15 A / 250 V |
| RMO500A & RMO600A | 20 A / 250 V |

### Output data

- Test current ranges and load intervals:

Model	Test current	Test duration
<b>RMO100A</b>	100 A	*300 s
<b>RMO200A</b>	200 A	150 s
<b>RMO300A</b>	300 A	60 s
<b>RMO400A</b>	400 A	60 s @300 A
<b>RMO500A</b>	500 A	30 s
<b>RMO600A</b>	600 A	20 s

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

- Open circuit voltage: 10 V DC  $\pm$  2%
- Full Load Voltages at maximum current

Model	@ 230 V AC	@ 115 V AC
<b>RMO100A</b>	7,25 V	6,90 V
<b>RMO200A</b>	7,10 V	6,10 V
<b>RMO300A</b>	5,90 V	4,70 V
<b>RMO400A</b>	6,60 V	4,30 V
<b>RMO500A</b>	5,90 V	5,00 V
<b>RMO600A</b>	5,70 V	3,70 V

### Measurement

- Resistance range: 0,1  $\mu\Omega$  – 999,9 m $\Omega$ \*  
\*expandable from 0  $\Omega$  up to 6  $\Omega$

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 $\Omega$ – 6,000 $\Omega$	1 m $\Omega$

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

### Test Result Storage

- RMO-A can store up to 500 measurements

### Printer (optional)

- Thermal printer
- Paper width 80 mm / 3.2 in

### NOTE

The print density is guaranteed within the range 5°C to 40°C, 20 to 85% relative humidity, no condensation. The printer can operate from 0°C to 50°C.

### Dimensions and weight

Model	Dimensions	Weight
<b>RMO100A</b>		7 kg / 15.4 lbs
<b>RMO200A</b>	(W x H x D) mm	7 kg / 15.4 lbs
<b>RMO300A</b>	198 x 255 x 380	7,5 kg / 16.5 lbs
<b>RMO400A</b>	(W x H x D) in	7,5 kg / 16.5 lbs
<b>RMO500A</b>	7.8 x 10 x 15	8 kg / 17.5 lbs
<b>RMO600A</b>		8 kg / 17.5 lbs

### Environmental protection

- Ingress protection rating: IP50

### 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: Directive 2014/35/EU (CE conform)  
Applicable standards, for a class I instrument, pollution degree 2, Installation category II: IEC EN 61010-1
- EMC: Directive 2014/30/EU (CE conform)  
Applicable standard: EN 61326-1
- CAN/CSA-C22.2 No. 61010-1, 2nd edition, including Amendment 1

### Warranty

- 3 Years

All specifications herein are valid at ambient temperature of + 25 °C and recommended accessories.  
Specifications are subject to change without notice.

### Accessories



Current cables



Extension current cables



Voltage sense cables



Test shunt



Transport case



Cable bag

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

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

### Recommended cross-sections of the current cables for RMO-A models:

CROSS SECTION/ LENGHT	16 mm <sup>2</sup>	25 mm <sup>2</sup>	35 mm <sup>2</sup>	50 mm <sup>2</sup>	70 mm <sup>2</sup>
5 m	RMO100A	RMO200A	RMO300A & RMO400A	RMO500A & RMO600A	-
10 m	RMO100A	RMO200A	RMO300A & RMO400A	RMO500A & RMO600A	-
15 m	-	RMO100A	RMO200A	RMO300A & RMO400A	RMO500A & RMO600A

## Order info

Instrument with included accessories	Article No
<b>Micro Ohmmeters RMO-A</b> <ul style="list-style-type: none"> <li>- DV-Win PC software including USB cable</li> <li>- Mains power cable</li> <li>- Ground (PE) cable</li> </ul>	RMO100A-N-00 RMO200A-N-00 RMO300A-N-00 RMO400A-N-00 RMO500A-N-00 RMO600A-N-00

Recommended accessories	Article No
Current cables 2 x 5 m, *XX mm <sup>2</sup> with battery clips	C2-05-XXYMBY
Sense cables 2 x 5 m with alligator clips	S2-05-02BPA2
Transport case	HARD-CASE-ME

Optional accessories	Article No
Cable bag	CABLE-BAG-00
Device bag	DEVIC-BAG-00
Test shunt 100 $\mu\Omega$ (600 A/60 mV)	SHUNT-600-MK
Current cables 2 x 10 m, *XX mm <sup>2</sup> with battery clips	C2-10-XXYMBY
Current cables 2 x 15 m, *XX mm <sup>2</sup> with battery clips	C2-15-XXYMBY
Current extension cable 2 x 10 m, *XX mm <sup>2</sup>	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
Bluetooth communication module	BLUET-MOD-00
Built-in thermal printer	PRINT-080-00

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

\*\*YMBY – For RMO100A and RMO200A: YMBY=LMB1; For other models: YMBY=VMB3