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.

![Graph of a single test ramp for 100 A current](image)

**Continuous Test**

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

<table>
<thead>
<tr>
<th>Test current (A)</th>
<th>Maximum test duration time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5, 10, 20, 50, 100</td>
<td>*300</td>
</tr>
<tr>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>300</td>
<td>90</td>
</tr>
<tr>
<td>400</td>
<td>50</td>
</tr>
<tr>
<td>500</td>
<td>30</td>
</tr>
<tr>
<td>600</td>
<td>20</td>
</tr>
</tbody>
</table>

*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 μΩ to 30 μΩ, with 0,01 μΩ 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:
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.

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.

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.
DV-Win software

DV-Win software provides acquisition and analysis of the test results, as well as control of all the RMO-D functions from a PC. The DV-Win also provides several advanced features as a supplement to multiple functions of RMO-D 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.

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

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

<table>
<thead>
<tr>
<th>Model</th>
<th>@ 230 V AC</th>
<th>@ 115 V AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMO200D</td>
<td>1785 VA</td>
<td>1770 VA</td>
</tr>
<tr>
<td>RMO500D</td>
<td>3865 VA</td>
<td>3615 VA</td>
</tr>
<tr>
<td>RMO600D</td>
<td>4560 VA</td>
<td>3925 VA</td>
</tr>
</tbody>
</table>

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

Output data
- Test current ranges and load intervals:

<table>
<thead>
<tr>
<th>Model</th>
<th>Test current</th>
<th>Test duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMO200D</td>
<td>200 A</td>
<td>150 s</td>
</tr>
<tr>
<td>RMO500D</td>
<td>500 A</td>
<td>30 s</td>
</tr>
<tr>
<td>RMO600D</td>
<td>600 A</td>
<td>20 s</td>
</tr>
</tbody>
</table>

- Full Load Voltages at maximum current

<table>
<thead>
<tr>
<th>Model</th>
<th>@ 230 V AC</th>
<th>@ 115 V AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMO200D</td>
<td>6.7 V</td>
<td>5.8 V</td>
</tr>
<tr>
<td>RMO500D</td>
<td>5.8 V</td>
<td>4.7 V</td>
</tr>
<tr>
<td>RMO600D</td>
<td>5.7 V</td>
<td>3.6 V</td>
</tr>
</tbody>
</table>

Measurement
- Resistance range: 0,1 µΩ – 999,9 mΩ
- Resolution
  - 0,01 µΩ – 99,99 µΩ
  - 100,0 µΩ - 999,9 µΩ
  - 1,000 mΩ - 9,999 mΩ
  - 10,00 mΩ - 99,99 mΩ
  - 100,0 mΩ - 999,9 mΩ
- Typical accuracy ± (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

<table>
<thead>
<tr>
<th>Model</th>
<th>Weight (kg / lbs)</th>
<th>Dimensions (W x H x D) (mm / in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMO200D</td>
<td>9 kg / 20 lbs</td>
<td>405 x 165 x 330 / 16.0 x 6.5 x 13.0</td>
</tr>
<tr>
<td>RMO500D</td>
<td>12 kg / 26.5 lbs</td>
<td>480 x 190 x 385 / 18.9 x 7.48 x 15.16</td>
</tr>
<tr>
<td>RMO600D</td>
<td>12 kg / 26.5 lbs</td>
<td>*RMO500D/RMO600D in version with built-in thermal printer</td>
</tr>
</tbody>
</table>

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
- 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

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:

<table>
<thead>
<tr>
<th>CROSS SECTION/LENGTH</th>
<th>25 mm²</th>
<th>35 mm²</th>
<th>50 mm²</th>
<th>70 mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 m</td>
<td>RMO200D</td>
<td>-</td>
<td>RMO500D &amp; RMO600D</td>
<td>-</td>
</tr>
<tr>
<td>10 m</td>
<td>RMO200D</td>
<td>-</td>
<td>RMO500D &amp; RMO600D</td>
<td>-</td>
</tr>
<tr>
<td>15 m</td>
<td>-</td>
<td>RMO200D</td>
<td>-</td>
<td>RMO500D &amp; RMO600D</td>
</tr>
</tbody>
</table>
## Order info

### Instrument with included accessories

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Article No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro Ohmmeter RMO-D</td>
<td></td>
</tr>
<tr>
<td>- DV-Win PC software including USB cable</td>
<td>RMO200D-N-00</td>
</tr>
<tr>
<td>- A built-in high precision module</td>
<td>RMO500D-N-00</td>
</tr>
<tr>
<td>- Mains power cable</td>
<td>RMO600D-N-00</td>
</tr>
<tr>
<td>- Ground (PE) cable</td>
<td></td>
</tr>
</tbody>
</table>

### Recommended accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Article No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current cables 2 x 5 m, *XX mm² with battery clips</td>
<td>C2-05-XYMBY**</td>
</tr>
<tr>
<td>Sense cables 2 x 5 m with alligator clips</td>
<td></td>
</tr>
<tr>
<td>Transport case *RMO500/600D and RMO200D in version without built-in thermal printer</td>
<td>HARD-CASE-LC</td>
</tr>
<tr>
<td>Cable</td>
<td></td>
</tr>
</tbody>
</table>

### Optional accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Article No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport case *RMO200D without built-in thermal printer</td>
<td>HARD-CASE-SC</td>
</tr>
<tr>
<td>Transport case *RMO500/600D and RMO200D in version without built-in thermal printer</td>
<td>HARD-CASE-LC</td>
</tr>
<tr>
<td>Cable plastic case – medium size</td>
<td>CABLE-CAS-02</td>
</tr>
<tr>
<td>Test shunt 100 µΩ (600 A/60 mV)</td>
<td>SHUNT-600-MK</td>
</tr>
<tr>
<td>Current cables 2 x 10 m, *XX mm² with battery clips</td>
<td>C2-10-XYMBY**</td>
</tr>
<tr>
<td>Current cables 2 x 15 m, *XX mm² with battery clips</td>
<td>C2-15-XYMBY**</td>
</tr>
<tr>
<td>Current extension cable 2 x 10 m, *XX mm²</td>
<td>E2-10-XYMZYF</td>
</tr>
<tr>
<td>Sense cables, extension 2 x 10 m</td>
<td>E2-10-02BPBP</td>
</tr>
<tr>
<td>Sense cables 2 x 10 m with alligator clips</td>
<td>S2-10-02BPBA2</td>
</tr>
<tr>
<td>Sense cables 2 x 15 m with alligator clips</td>
<td>S2-15-02BPBA2</td>
</tr>
<tr>
<td>Built-in thermal printer</td>
<td>PRINT-080-00</td>
</tr>
<tr>
<td>Remote control unit</td>
<td>RMORCU-09-00</td>
</tr>
<tr>
<td>Remote control test probes (one with trig button)</td>
<td>RMO-RCTP-TB0</td>
</tr>
<tr>
<td>Current clamp 30/300 A power supplied from the instrument with extension 5 m (Both Sides Grounded Unit)</td>
<td>CACL-0300-06</td>
</tr>
</tbody>
</table>

*XX - Cross-section of current cables varies, depending of the ouput 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

*YMBY with model RMO200D without built-in thermal printer:

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

---

IBEKO Power AB
Stockholmsvägen 18
181 50 Lidingö, Sweden

Contact
Phone: +46 70 0925 000
E-mail: sales@dv-power.com