RMO-M Series

Motor & Generator Winding Ohmmeters

- Test currents: 5 mA – 100 A DC
- Lightweight: 8,0 kg / 17.6 lbs
- Measurement range: 0,1 μΩ - 1 kΩ
- Accuracy: ± (0,1% rdg + 0,1% F.S.)
- Resolution: up to 0,1 μΩ
- Three resistance measurement channels
- Automatic discharge circuit

Description

The motor & generator winding ohmmeters are designed to measure the resistance of electrical motors' and generators' windings. Based on the state of the art technology, using the most advanced switch-mode technology available today, RMO-M series instruments are accurate (0,1%), powerful (up to 100 A) and lightweight (8,0 kg / 17.6 lbs). Instruments generate a true DC ripple-free current with automatically regulated measurement and discharging circuit.

RMO-M series instruments can perform a simple, quick, and reliable DC resistance measurement of all types of rotating machine windings. Problems such as a turn-to-turn short circuit in a winding, which reduces a motor/generator's ability to produce a balanced magnetic field, and a phase-to-phase short circuit, which in most cases results in a motor/generator trip, can be easily detected with these instruments. Additionally, any anomalies of the power circuit occurring downstream of the test lead connections will be identified by a resistance imbalance.

Application

The list of the instrument's applications includes:

- Three-channel winding resistance measurement, which enables simultaneous winding resistance measurement of all windings of motors and generators. The instrument is not intended for resistance measurement of high-inductive test objects such as transformers;
- Detection of turn-to-turn and phase-to-phase short circuits in the motor/generator windings, including problems with connections and contacts on the rotating machine;
- Testing of the power circuit placed in between the rotating machine under a test and the test lead connections;
- Resistance measurement of solder joints between the windings, welding joints, cable splices, and any non-inductive test objects.

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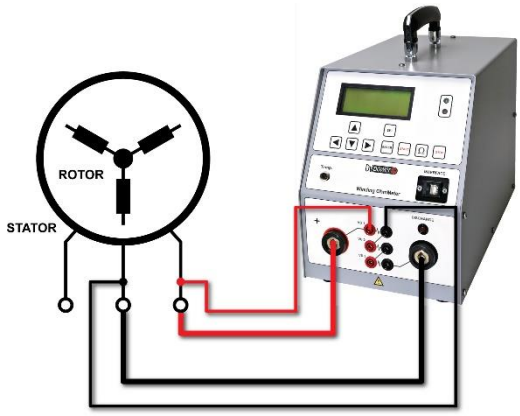
Connecting RMO-M to a Test Object

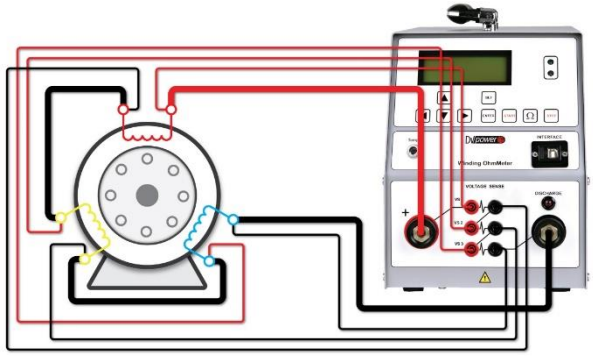
The connection of the test leads to a test object should always be established respecting Kelvin's four-point method. This way, the resistance of the leads, including current clamps contact resistance, will be completely excluded from the measurement circuit.

To perform the measurement using one voltage channel with RMO-M, current and voltage sense cables should be connected to the primary connection points of the stator windings. The connection scheme is shown in the figure below. This measurement method is practical for machines when only primary connection points of stator windings are accessible.

The measurement should be repeated for all three phases, which requires connecting and disconnecting current and voltage cables.



It is possible to measure motors' and generators' winding resistance in all phases at the same time. This is achieved by using three voltage sense channels and it is possible when all connection points of stator windings are accessible.



This way, all windings are externally connected in series and individual windings resistances are being measured. This measurement method is much faster than the previously explained one since the winding saturation process is performed only once.

Benefits and Features

Winding Resistance Measurement

The instrument injects a direct current amplitude of up to 50 A (RMO50M) or 100 A (RMO100M) depending on a model. Combined with a high measurement precision (0,1% accuracy) wide range of problems with a winding can be determined easily and undoubtedly by measuring the resistance.

Windings problems that can be detected using RMO-M instruments are:

- Broken winding (open winding);
- Turn-to-turn short;
- Phase-to-phase short;
- Bad solder joints between the windings;
- Power circuit problems.

One of the common faults occurring in the motor's/generator's windings is a turn-to-turn fault or the insulation breakdown between two turns of the winding. Short-circuited turns are usually completely isolated from the ground so this problem will not result in a trip of a motor/generator. However, shorted turns decrease the winding's ability to produce a balanced magnetic field, which leads to increased vibration, reduction in output power and eventually bearing failures. Furthermore, additional heating generated by the shorted turns can also spread and result in a short-circuited winding or even phases. Also, excessive heating might not only destroy the motor's/generator's windings but also damage the insulation between the laminations of the stator core.

Testing with RMO-M instruments helps to detect possible problems and avoid significant damage of the test object.

There is enough memory within RMO-M instruments to store 1 000 measurements. All measurements are time and date stamped.

The instruments are equipped with thermal and overcurrent protection. Also, RMO-M series instruments have very high ability to cancel electrostatic and electromagnetic interference that exists in HV electric fields. This is achieved by a proprietary filtration solution applied to both, the hardware construction and the application software implementation.

Three Measurement Channels

RMO-M winding ohmmeters have three separate resistance measurement channels, that enable simultaneous resistance measurement of three windings. The three-channel measurement option significantly speeds up the measurement process and reduces the total testing time.

Power Circuit Testing

Besides the windings, a resistance test can also provide valuable information about the power circuit condition. The power circuit refers to circuit breakers, fuses, disconnecting switches, conductors, etc. placed in the control box or local panel and connected to the motor/generator.

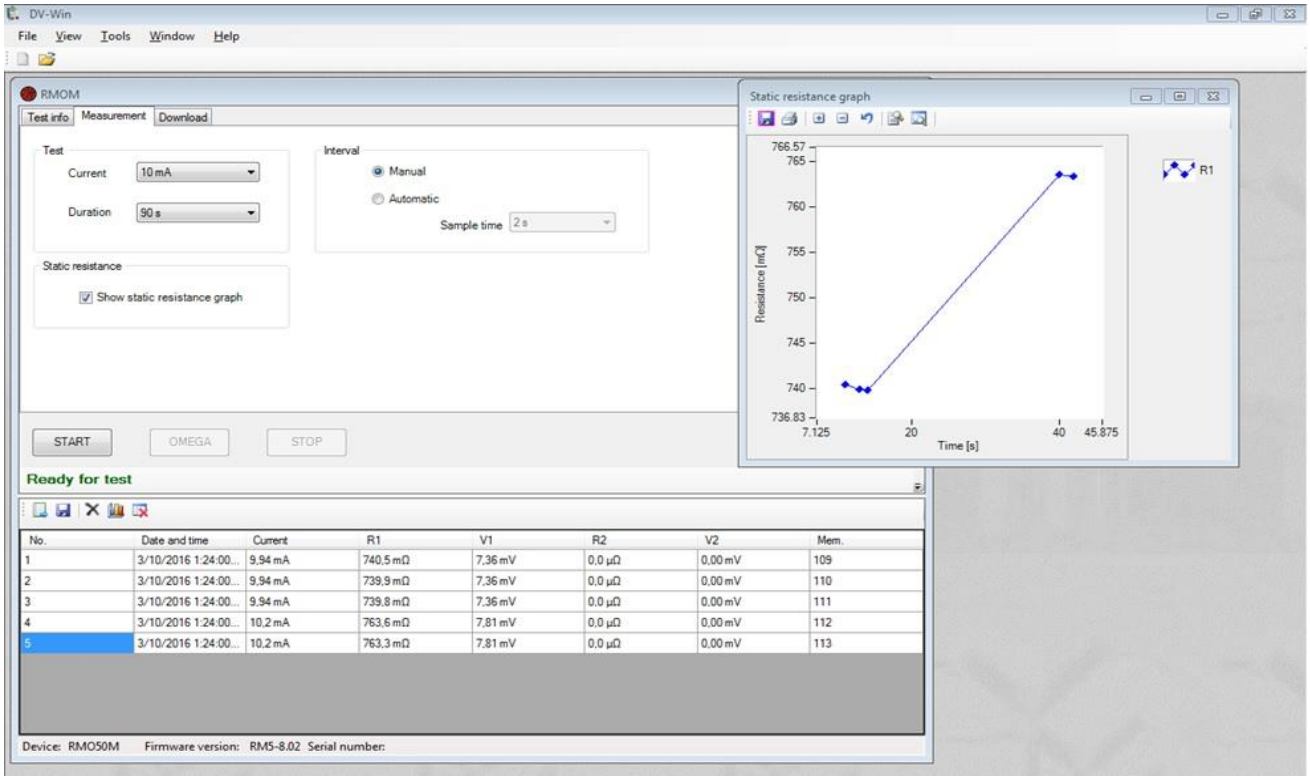
High resistance in the power circuit can be a result of:

- Corroded terminals;
- Corroded contacts;
- Malfunction in the operation of circuit breakers or disconnecting switches;
- Loosen cables;
- Loosen bus bars;
- Open circuit.

Any problem with the power circuit, manifesting as increased resistance of the phase(s) under test, may cause problems with harmonics or voltage and current imbalances. Such problems lead to reduced output power, temperature increase, and eventual insulation damage. Therefore, the proper functionality of the power circuit is required for a long-term operational life of the motor/generator.

DV-Win Software

The DV-Win application software enables control and monitoring of the test process steps, as well as saving and analyzing the results on a PC. It provides a test report, arranged in a selectable form as an Excel spreadsheet, PDF, Word, or ASCII format. The standard interface is USB while RS232 is optional.



Technical Data

Winding Resistance Measurement

- Test currents:
  RMO50M: 5 mA – 50 A DC
  RMO100M: 5 mA – 100 A DC
- Measurement range: 0,1 µΩ - 1 kΩ
- Typical accuracy: ± (0,1% rdg + 0,1% F.S.)

Range / Resolution

- 0,1 µΩ – 999,9 µΩ 0,1 µΩ
- 1,000 mΩ – 9,999 mΩ 1 µΩ
- 10,00 mΩ – 99,99 mΩ 10 µΩ
- 100,0 mΩ – 999,9 mΩ 0,1 mΩ
- 1,000 Ω – 9,999 Ω 1 mΩ
- 10,00 Ω - 99,99 Ω 10 mΩ
- 100,0 Ω – 999,9 Ω 0,1 Ω

Data Storage

- 1 000 internal memory locations

Printer (optional)

- Thermal printer
- Paper width 58 mm / 2.28 in

Computer Interface

- USB
- Optional: RS232

Temperature measurement

- One temperature measurement channel
  Thermometer Pt100 (Class B)
  -50 ºC +180 ºC / -58 ºF +356 ºF
  50 mm x 6 mm

Dimensions and Weight

- Dimensions (W x H x D):
  198 mm x 250 mm x 350 mm
  7.8 in x 9.8 in x 13.8 in
- Weight: 8,0 kg / 17.6 lbs

Environmental Conditions

- Operating temperature:
  -20 ºC to +55 ºC / -4 °F to +131 ºF
- Storage & transportation temperature:
  -40 ºC to +70 ºC / -40 °F to +158 ºF
- Humidity 0% - 95% relative humidity, non-condensing

Mains Power Supply

- Connection according to IEC/EN60320-1; UL498, CSA 22.2
- Mains supply: 90 V – 264 V AC
- Frequency: 50 / 60 Hz
- Input power:
  RMO50M: 600 VA
  RMO100M: 1 200 VA

Applicable Standards

- Safety:
  LVD 2014/35/EU (CE conform)
  Pollution degree 2
  Installation category II (IEC EN 61010-1)
- EMC:
  Directive 2014/30/EU (CE conform)
  Standard EN 61326-1:2013

Warranty

- 3 years + 1 additional year upon registration on DV Power official website

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

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Current cables with battery clamps

Current cables with TTA clamps

Current connection cable with battery clamps

Current conection cable with TTA clamps

Voltage sense cables with TTA clamps

Voltage sense cables with alligator clamps

Ground cable

Test shunt

Temperature sensor

Cable bag

Transport bag

Cable plastic case

Order Info

Instruments with included accessories	Article No
Motor and generator winding ohmmeter RMO50M with ground cable, USB cable, DV-Win PC software, mains cable and transport bag	RMO050M-N-02
Motor and generator winding ohmmeter RMO100M with ground cable, USB cable, DV-Win PC software, mains cable and transport bag	RMO100M-N-02

Standard accessories for RMO100M	Article No
Current cables 2 x 5 m 16 mm^2 (16.4 ft, 5 AWG) with battery clamps (B1)	C2-05-16LMB1
Sense cables 2 x 5 m (16.4 ft) with TTA clamps (3 sets)	S2-05-02BPWC
Current connection cable 1 x 1 m 16 mm^2 (3.3 ft, 5 AWG) with battery clamps (B1) (2 sets)	CX-01-162XB1
Cable bag	CABLE-BAG-00

Standard accessories for RMO50M	Article No
Current cables 2 x 5 m 10 mm^2 (16.4 ft, 7 AWG) with TTA clamps	C2-05-10LMWC
Sense cables 2 x 5 m (16.4 ft) with TTA clamps (3 sets)	S2-05-02BPWC
Current connection cable 1 x 1 m 10 mm^2 (3.3 ft, 7 AWG) with TTA clamps (2 sets)	CX-01-102XWC
Cable bag	CABLE-BAG-00

Optional accessories	Article No
Current cables 2 x 5 m 16 mm^2 (16.4 ft, 5 AWG) with battery clamps (B1)	C2-05-16LMB1
Current cables 2 x 10 m 16 mm^2 (32.8 ft, 5 AWG) with battery clamps (B1)	C2-10-16LMB1
Current cables 2 x 15 m 16 mm^2 (49.2 ft, 5 AWG) with battery clamps (B1)	C2-15-16LMB1
Current cables 2 x 5 m 10 mm^2 (16.4 ft, 7 AWG) with TTA clamps*	C2-05-10LMWC
Current cables 2 x 10 m 10 mm^2 (32.8 ft, 7 AWG) with TTA clamps*	C2-10-10LMWC
Current cables 2 x 15 m 10 mm^2 (49.2 ft, 7 AWG) with TTA clamps*	C2-15-10LMWC
Sense cables 2 x 5 m (16.4 ft) with TTA clamps	S2-05-02BPWC
Sense cables 2 x 10 m (32.8 ft) with TTA clamps	S2-10-02BPWC
Sense cables 2 x 15 m (49.2 ft) with TTA clamps	S2-15-02BPWC
Sense cables 2 x 5 m (16.4 ft) with alligator clamps (A1)	S2-05-02BPA1
Sense cables 2 x 10 m (32.8 ft) with alligator clamps (A1)	S2-10-02BPA1
Sense cables 2 x 15 m (49.2 ft) with alligator clamps (A1)	S2-15-02BPA1
Current connection cable 1 x 1 m 16 mm^2 (3.3 ft, 5 AWG) with battery clamps (B1)	CX-01-162XB1
Current connection cable 1 x 2 m 16 mm^2 (6.6 ft, 5 AWG) with battery clamps (B1)	CX-02-162XB1
Current connection cable 1 x 5 m 16 mm^2 (16.4 ft, 5 AWG) with battery clamps (B1)	CX-05-162XB1
Current connection cable 1 x 1 m 10 mm^2 (3.3 ft, 7 AWG) with TTA clamps*	CX-01-102XWC
Current connection cable 1 x 2 m 10 mm^2 (6.6 ft, 7 AWG) with TTA clamps*	CX-02-102XWC
Current connection cable 1 x 5 m 10 mm^2 (16.4 ft, 7 AWG) with TTA clamps*	CX-05-102XWC
Temperature sensor 1 x 50 mm + 5 m cable	TEMP1-050-05
Temperature sensor 1 x 50 mm + 10 m cable	TEMP1-050-10
Temperature sensor 1 x 50 mm + 15 m cable	TEMP1-050-15
Temperature sensor 1 x 50 mm + 20 m cable	TEMP1-050-20
Test shunt 150 A / 150 mV	SHUNT-150-MK
Bluetooth communication module	BLUET-MOD-01
Thermal printer 58 mm (2.28 in) (built-in)	PRINT-058-01
Thermal printer roll 58 mm (2.28 in)	PRINT-058-RO
Cable bag	CABLE-BAG-00
Transport bag for instruments in Metal housing	TRBAG-M00-01
Cable plastic case – small size	CABLE-CAS-01
Cable plastic case – medium size	CABLE-CAS-02
Cable plastic case with wheels – medium size	CABLE-CAS-W2
Cable plastic case – large size	CABLE-CAS-03
Cable plastic case with wheels – large size	CABLE-CAS-W3

***Can be used with RMO50M only**

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