RMO300GM

Generator Motor Winding Analyzer

- Test currents: 5 A – 300 A DC
- Lightweight: 14,6 kg / 32.1 lbs
- Measurement range: 0,1 µΩ - 999,9 mΩ
- 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 analyzer is designed to measure the winding resistance of electrical motors/generators. Based on the state-of-the-art technology, using the most advanced switch-mode technology available today, RMO300GM instrument is accurate (0,1%), powerful (up to 300 A) and portable (14,6 kg / 32.1 lbs). Instruments generate a true DC ripple-free current with an automatically regulated measurement and discharging circuit.

RMO300GM instrument can perform a simple, quick, and reliable DC resistance measurement of all types of large rotating machine windings. Problems such as a turn-to-turn short circuit in windings, which reduces a motor/generator 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 this instrument. 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/generators in series connection. 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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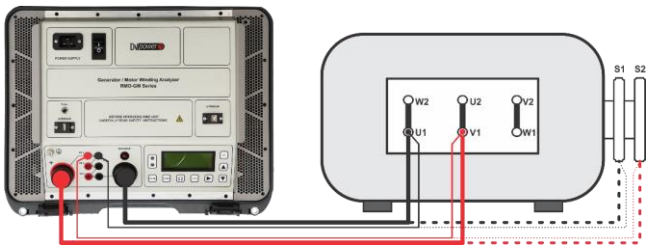
Connecting RMO300GM to a Test Object

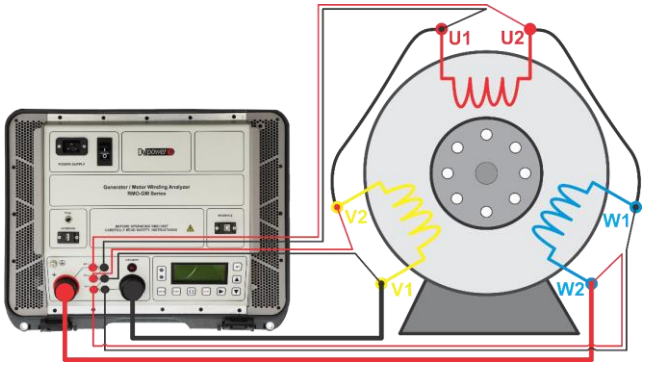
The connection of the test leads to a test object should always be established respecting Kelvin's four-point method. This way, the resistance of the leads, including current clamps contact resistance, will be completely excluded from the measurement circuit.

To perform the measurement using one voltage channel with RMO300GM, current and voltage sense cables should be connected to the primary connection points of the stator/rotor windings. The connection scheme is shown in the figure below. This measurement method is practical for machines when only primary connection points of windings are accessible.

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



It is also possible to perform winding resistance measurement at all three phases simultaneously. This is achieved by using three voltage sense channels and it is possible when all 6 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 and there is no need for test cables switching between windings

Benefits and Features

Winding Resistance Measurement

The instrument injects a direct current amplitude of up to 300 A. Combined with a high measurement precision (0,1% accuracy) a wide range of problems with a winding can be determined easily and undoubtedly by measuring the resistance.

Windings problems that can be detected using RMOGM instruments are:

- Broken winding (open winding),
- Turn-to-turn short,
- Phase-to-phase short,
- Bad solder joints between the windings,
- Integrity of the windings including all connections/joints in the circuit,
- Power circuit problems.

One of the common faults occurring in the motor/generator 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 short-circuited winding or even phases. Also, excessive heating might not only destroy the motor/generator windings but also damage the insulation between the laminations of the stator core.

Testing with RMO300GM instrument helps to detect possible problems and avoid significant damage of the test object.

There is enough memory within the RMO300GM instrument to store 5000 measurements. All measurements are time and date stamped.

The instruments are equipped with thermal and overcurrent protection. Also, RMO300GM instrument have very high ability to cancel electrostatic and electromagnetic interference that exists in HV electric fields.

Three Measurement Channels

RMO300GM 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 reducing 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.

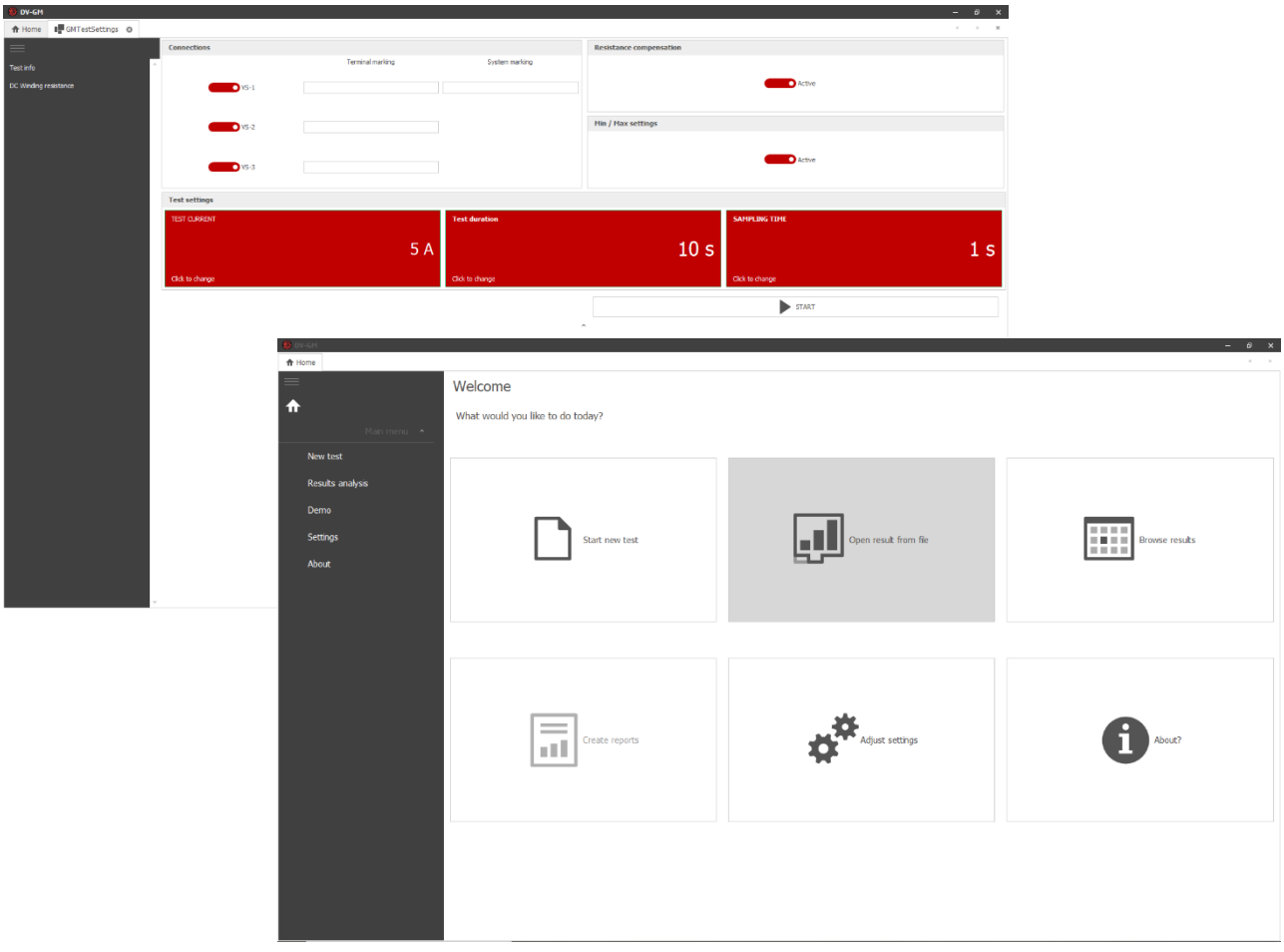
High resistance in the power circuit can be a result of:

- Corroded terminals and/or contacts
- Malfunction in the operation of circuit breakers or disconnecting switches,
- Loosen cables and/or 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, heating, 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-GM Software

The DV-GM 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. The software also includes the results database enabling the operators to save and manage test results in the predefined place available for the entire team.



Technical Data

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:
  3100 VA (RMO300GM) 230 V,
  2800 VA (RMO300GM) 115 V,
- Protection: Circuit Breaker with thermal overload protection 20A/240V.

  − Designed according to UL 1077 standard (Supplementary Protectors for Use in Electrical Equipment)
  − For primary protection of the electrical panel, a circuit breaker according to the UL 489 standard shall be used

Output data

- Test currents ranges and load intervals:
  up to 200 A unlimited test time
  300 A up to 10 min
- Full Load Voltages:

Main supply voltage	Output current	Maximum output voltage
230 V AC	300 A	8,2 V DC
	200 A	8,6 V DC
115 V AC	300 A	7,2 V DC
	200 A	7,5 V DC

Measurement

- Resistance range: 0,1 µΩ – 999,9 mΩ
- 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

Data Storage

- 5 000 internal memory locations

Computer Interface

- USB (standard)
- RS232 or Bluetooth (optional)

Display

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

Dimensions and Weight

- Dimensions (W x H x D):
  503 x 406 x 193 mm /19.8 x 15.9 x 7.60 in
- Weight: 14,6 kg / 32.1 lbs

Environment protection

- Ingress protection rating: IP67 with closed lid

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

Applicable Standards

- Installation/overvoltage: category II
- Pollution: degree 2
- Safety: LVD 2014/35/EU (CE conform)
  EN 61010-1
- EMC: Directive 2014/30/EU (CE Conform) Standard EN 61326-1:2006
- CAN/CSA-C22.2 No.61010-1, 2nd edition, Including Amendment 1

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.

Accessories

Current cables with aligator clamps

Current cables with battery clamps

Current connection cable with battery clamps

Voltage sense cables with alligator clamps

Temperature sensor

Cables extension

Ground cable

Test shunt

Cable plastic case

Instrument with included accessories	Article No
Generator/Motor Winding Analyzer RMO300GM	RMO300GM-N-3
DV-GM PC software including USB cable	
Mains power cable	
Ground (PE) cable	
Plastic transport case	

Standard accessories	Article No
Current Cables 2 x 5 m 50 mm2 with alligator clamps	C2-05-50VMA4
Sense cables 2 x 5 m with alligator clamps (3 sets)	S2-05-02BPA2
Current connection cable 1 x 1 m 50 mm2 with alligator clamps (2 sets)	CX-01-502XA4
Cable plastic case - medium size	CABLE-CAS-02

Optional accessories	Article No
Current Cables 2 x 5 m 50 mm2 with alligator clamps	C2-05-50VMA4
Current Cables 2 x 5 m 50 mm2 with battery clamps	C2-05-50VMB3
Current Cables 2 x 5 m 50 mm2 with C Clamps	C2-05-50VMC0
Current Cables 2 x 10 m 50 mm2 with alligator clamps	C2-10-50VMA4
Current Cables 2 x 10 m 50 mm2 with battery clamps	C2-10-50VMB3
Current Cables 2 x 10 m 50 mm2 with C Clamps	C2-10-50VMC0
Current Cables 2 x 15 m 50 mm2 with alligator clamps	C2-15-50VMA4
Current Cables 2 x 15 m 50 mm2 with battery clamps	C2-15-50VMB3
Current Cables 2 x 15 m 50 mm2 with C Clamps	C2-15-50VMC0
Extension cables 2 x 5 m 50 mm2	E2-05-50VMVF
Extension cables 2 x 10 m 50 mm2	E2-10-50VMVF
Current connection cable 1 x 1 m 50 mm2 with alligator clamps	CX-01-502XA4
Current connection cable 1 x 2 m 50 mm2 with alligator clamps	CX-02-502XA4
Current connection cable 1 x 1 m 50 mm2 with battery clamps	CX-01-502XB3
Current connection cable 1 x 2 m 50 mm2 with battery clamps	CX-02-502XB3
Current connection cable 1 x 1 m 50 mm2 with C Clamps	CX-01-502XC0
Current connection cable 1 x 2 m 50 mm2 with C Clamps	CX-02-502XC0
Sense cables 2 x 5 m with alligator clamps	S2-05-02BPA2
Sense cables 2 x 10 m with alligator clamps	S2-10-02BPA2
Sense cables 2 x 15 m with alligator clamps	S2-15-02BPA2
Sense cables 2 x 20 m with alligator clamps	S2-20-02BPA2
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
Plastic transport case with wheels – medium size	PLCAS-P01-W2
Cable plastic case - small size	CABLE-CAS-01
Cable plastic case - medium size	CABLE-CAS-02
Cable plastic case - large size	CABLE-CAS-03
Cable plastic case with wheels - medium size	CABLE-CAS-W2
Cable bag	CABLE-BAG-00
Bluetooth communication module	BLUET-MOD-01
Test Shunt 600 A / 60 mV	SHUNT-600-MK
Ground cable	CABLE-GND-00
USB Cable	CABLE-USB-00

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