

User's Guide

MRM-100A

100 A digital micro-ohmmeter



GU-1533RA
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MRM100A

DANGER / WARNINGS

DANGER

Complete Grounding of this unit is necessary for the safe operation of this equipment. Disconnect inputs before ungrounding this equipment

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Safety Warnings

- Before using this instrument, the User Guide and Safety warnings must be read and understood.
 - Safety procedures and rules for working near high voltage energized systems must be observed during the use of this equipment. **The generated voltages and currents may be dangerous.**
 - Before you begin the measurement, verify the mains supply voltage compatibility.
 - The micro-ohmmeter must be connected to earth point, through the green terminal or the power cord (both use the same point).
 - During a circuit breaker measurement, its contacts must be closed and connected to an earth point. The end connected to an earth point must be connected to the “C-” terminal.
 - Ensure that the measurement points that will be connected to the terminals are free of any voltage in relation to earth point and between each other. Take into account that in a substation you will find in disconnected points high potential levels in relation to the earth point. Those potentials are caused by present electromagnetic fields and can be minimized following the indications in the paragraph before.
 - Make sure that the current connections are well connected as well as the C-clamp to avoid undesirable heating.
 - Be careful when handling the current terminals in the instrument. You may get high temperatures in the current connections.
 - Never connect or disconnect the cables during a measurement. If you must modify any connection, it must be made after you have pressed the Stop button.
 - The equipment must be kept dry and clean.
 - Never use the equipment if you suspect malfunctions. The equipment must to be put out of service (contact the Phenix Service Department).
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This equipment should be used only by a trained and competent person, strictly applying suitable safety rules.

Used symbols





	Caution, refer to User Guide.
	Warning, hot surface. Be careful when handling.
	Equipment complies with current EU Directives.
	The rubbish bin with a line through it means that in the European Union, the product must undergo selective disposal for the recycling of electric and electronic material, in compliance with Directive WEEE 2002/96/EC.

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1. Description

The MRM-100A high-current micro-ohmmeter is a portable, digital instrument. It has optimized filters and protections for measurements in electrical substations. It can be used to accurately measure very low contact resistances of high voltage circuit-breakers and switches, busbars, etc., with test currents up to 100A. It employs the 4 terminals-method (U/I measuring principle) to avoid errors caused by test leads and their contact resistances.

Measurement accuracy is guaranteed by a state-of-the-art signal amplification system, offset-free and of high long-term stability. Resistance readings are shown in the alphanumeric display with up to 4½ digits-resolution. It allows measurement of resistances up to 300 mΩ, and the best resolution is 0.1 μΩ.

It has an internal memory for up to 50 registers with 80 readings each. The data output (USB) may be connected to a computer to download the stored values.

The high-current generation system is based on modern technology that allows to significantly decrease both its weight (approx. 11kg) and size. The cabinet is made of plastic material highly resistant to impacts and to environmental challenges. Internal thermal sensors in all sensitive components avoid any damage caused to the instrument due to overheating.

This is strong but lightweight equipment and may be easily carried by one person. It is water-resistant and can be used under severe weather conditions (IP54 with closed lid) offering an excellent performance working both in the laboratory and out in the field.

2. Operating Instructions

2.1. Operating principle

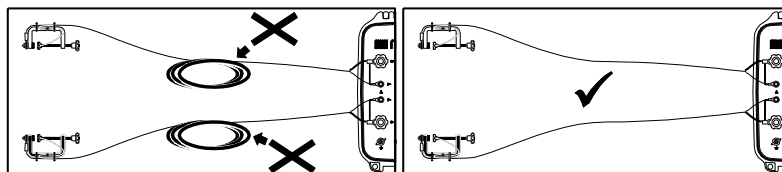
This device uses the Kelvin Bridge architecture, with four terminals, avoiding testing leads resistance to cause error during measurement. Test current may be chosen by the operator and the reading is obtained by comparison through internal high-stability standards. The result appears in the alphanumeric display which is easy to read.

2.2. ~ Use of Test Probes

WARNING

Only use the test leads supplied with the equipment for measurement and calibration procedure.

- Make sure that the current connections are well connected as well as the C-clamps, to avoid undesirable heating.
- Be aware when manipulating the current terminals of the instrument that there may be high temperatures in the current connections.
- Make sure that the cables are straight during the measurement to avoid overheating.



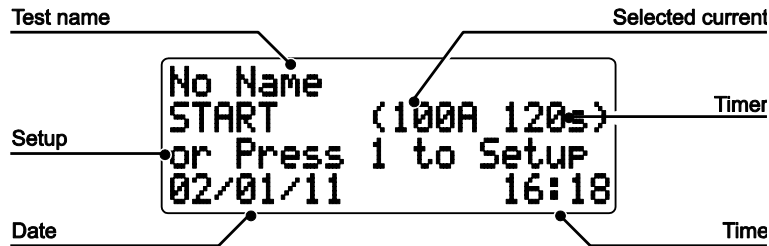
2.3. Control Panel



- | | |
|----------------------------------|-----------------------------|
| 1. On/Off switch. | 10. Keyboard. |
| 2. Power cord connector. | 11. Test current control. |
| 3. Fuse. | 12. Thermal printer. |
| 4. Current output terminal (C+). | 13. USB communication port. |
| 5. Potential terminal (P+). | |
| 6. Alphanumeric display. | |
| 7. Potential terminal (P-). | |
| 8. Current output terminal (C-). | |
| 9. Ground. | |

3. Display

Alphanumeric LCD display where the measurement result, the corresponding measuring unit, the elapsed time since the measurement started and messages to the operator are displayed.



Built-in chronometer

It features the elapsed time (in minutes and seconds) since test current is applied.

Real time clock

It has a real time clock with date, hours and minutes indication, to make identification of tests recorded in paper or in memory easier.

Test number

Tests are automatically numbered by the equipment to make their identification easier. The test number is printed at the beginning of each test and it is stored in memory.

Model and serial number


At the beginning of each test, the equipment model, as well its serial number, are registered, making it possible to relate the obtained results with their respective equipment Calibration Certificate.

3.1. Display Messages

MRM100A	When turning the equipment on using the On/Off switch, this introduction message appears briefly.
Auto Check 1/3	The equipment is carrying out some functional verifications.
No Name START (100A 120s) or Press 1 to Setup 02/01/11 16:18	Main screen where a test can be started or set a new one.
Edit Record Name: -	Screen to edit the record name.
CURRENT (100A) 1 - 25A 2 - 50A 3 - 75A 4 - 100A 5 - MANUAL	Screen to select the test current.
TIME OF TEST _99 sec Min = 5s Max = 120s	Screen to setup test duration.

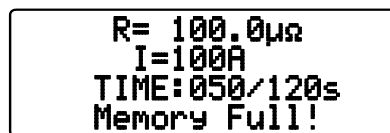
<pre> LOW CURRENT I= 5A (Low) TIME:003/120s 02/01/11 16:18 </pre>	<p>Indicates that the test current is not enough to carry out the reading.</p>
<pre> R=OVERRANGE I=100A TIME:004/120s 02/01/11 16:18 </pre>	<p>Indicates that the measured resistance is higher than the maximum value readable in the selected range.</p>
<pre> R= 100.0μΩ I=100A Overheating 02/01/11 16:18 </pre>	<p>Indicates that some part of the equipment has achieved the critical temperature. Thus, the system will cut the high current generation.</p>
<pre> R= 250.0mΩ I= 16A (max) TIME:004/120s 02/01/11 16:18 </pre>	<p>The message (max) indicates that the test current value shown in the display is the maximum value possible according with the measured resistance value.</p>

4. Internal Memory


This equipment can store up to 50 records with 80 readings each. Each register works like a folder where all readings saved will be stored until the operator creates another folder (record). During a measurement, when you want to save a measured value, press the  button.



The model and serial number, register name, test number, date and time, elapsed time, current and resistance value will be stored. In the display, the percentage of free memory will be displayed. When the memory is full, download all the registers and erase the equipment memory (use MegaLogg2 software).



5. Built-in Printer

This equipment has a built-in thermal printer. During a measurement, press the  button to print the measured value exhibited in the display.

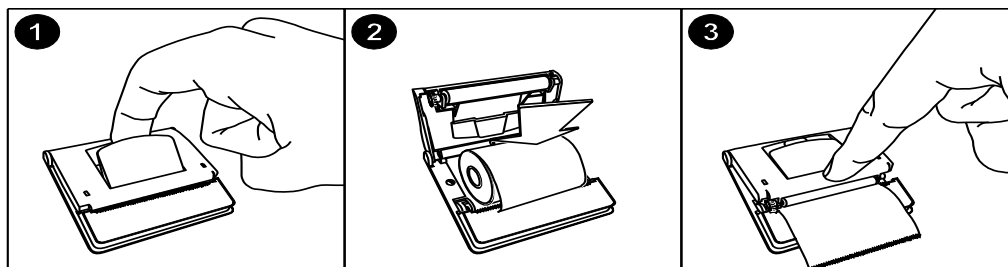
CAUTION: Don't pull the paper. The printer can be easily damaged.

This printer uses 56 mm-wide thermal paper, which comes in a 37 mm-diameter reel.

α Pull the lever located on the lid.

β Insert the paper reel as shown in the figure.

χ Keep the tip of the paper out of the printer and close the lid.



6. Protections

Temperature Protection

The time of **MRM-100A** continuous use is limited by thermal considerations. Some internal sensors measure the temperature of the sensitive parts and trigger the protection that will cut the current circulation, if any of them exceeds the limit temperature, thus avoiding any damage. The OVERHEATING message will appear in the display. Under these conditions, measurements will be inhibited up to the temperature decreases sufficiently.

7. Test Setup

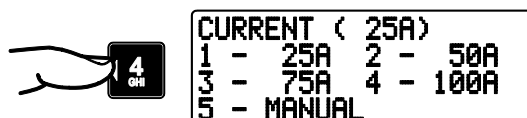
On the main screen, press the **1** key to configure the test.



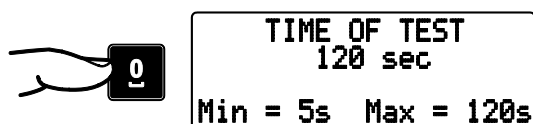
On the next screen use the keyboard to enter a name for the record (group of tests) and press the **Enter** key to save. To switch between uppercase and lowercase letters quickly, press twice the **1** key. To cancel the operation, press **ESC** button.



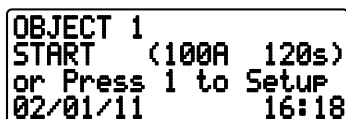
All the measured values saved will be associated with this name until the operator changes the record name. Select the test current with the keys **1** **2** **3** **4** or press **5** to manual adjust. Press the **Enter** button to save.



Set the test duration using the keypad and press the **Enter** button to save:



The display will return to the main screen. Now the equipment is configured to perform a test.

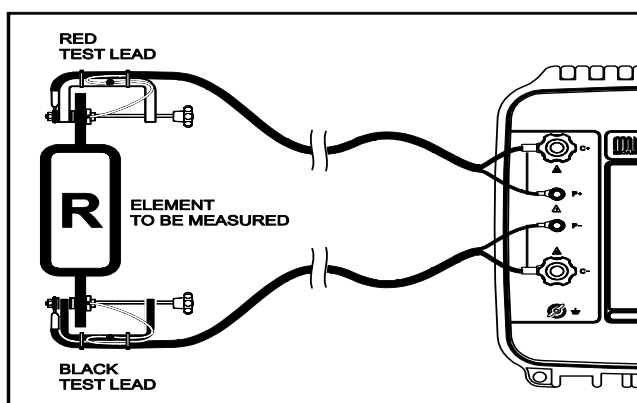


8. Measurement

~ WARNING

- Before using this instrument, the User's Guide and Safety warnings must be read and understood.
- Safety procedures and rules for working near high voltage energized systems must be observed during the use of this equipment. The generated voltages and currents may be dangerous.

1. The equipment should be connected to the mains supply.
2. Before turning the equipment on, connect the test probes to the item to be measured and to the front panel terminals.



The test leads in the drawings are only for illustration.

3. Turn-On the equipment using the **On/Off** switch.




4. An introduction message appears for a while.

MRM100A

5. The equipment will make some functional verifications. During this process the display shows the message:

Auto Check 1/3

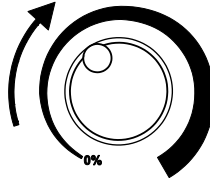
6. Set the test options and press  key.

```
OBJECT 1
START (100A 120s)
or Press 1 to Setup
02/01/11 16:18
```

7. Will be displayed the record name and test number.

```
OBJECT 1
Test number: 1
```







8. If the manual current adjust was selected, use the Test Current Control to select the desired current.



```
R= 100.0µΩ
I=100A
TIME:035/120s
02/01/11 16:18
```

9. The display will show the value of measured resistance (R), the value of the applied current (I), the elapsed time / maximum time (in seconds) and the date and time.

```
R= 100.0µΩ
I=100A
TIME:035/120s
02/01/11 16:18
```

10. The lowest current for measuring is 10% of the range nominal value. It is important to consider that the measurement errors increase while test current decreases. The error is specified for test currents higher than 80%.
11. The value can be stored in the internal memory by pressing the  button.
12. Press the  button to print the results.
13. Press the  button to finish the measurement.
14. Press the  button to start a new test or the  button to return to the main screen.
15. Do not turn off the equipment with the **On/Off** switch without having pressed the  button.
16. Finally, when finishing measurements, turn the equipment off using the **On/Off** switch.



CAUTION: Do not connect or disconnect the test leads during the measurement.

9. MegaLogg2 Software

This software makes communication between the equipment and a computer with Windows operative system easier. It makes possible to synchronize the date and time of the equipment internal clock with the computer clock, to transfer the stored date, to clear the memory, to generate test reports, etc.

10. Replacement Fuse ~

To check the instrument **fuse**, remove it with a screwdriver. If the fuse is ruptured replace it by another with the following specifications:

***Fuse Schurter, model SPT 5 x 20 (Time-lag) 8A/250V.
High breaking capacity.***

11. Technical Support

Technical support / repair for your equipment can be obtained by contacting Phenix Technologies, Inc.

Phenix Technologies Service Department

75 Speicher Drive
Accident, Maryland 21520

E-mail: info@phenixtech.com

PH: 1 (301) 746-8118

FAX: 1 (301) 895-5570

12. Technical Specifications

Test currents	: Up to 100 A (True DC). The current may be continuously adjustable from 10% to 100% in 1 A steps.
Resistance ranges	: From 0.1 $\mu\Omega$ up to 300 m Ω .
Measurement principle	: Four-terminal, Kelvin-type.
Protections	: Overcurrent, short-circuit, and overheating.
Programmable test time	: Allows to setup the test time from 5 seconds up to 120 seconds.
Basic accuracy	: $\pm 1\%$ of reading ± 1 digit.
Advanced features	: Digital direct reading of very low resistances in the alphanumeric display, with up to 4½ digits. Very fast and accurate measurements.
Built-in printer	: Allows print the measured values.
Internal memory	: Capacity to store 50 registers with 80 readings each.
Interface	: USB
Environmental protection	: IP54 with closed lid.
Safety class	: Meets the requirements of IEC 61010-1.
Power supply	: Mains: 90-240 V~ 60 Hz.
Operating temperature range	: -5°C to 50°C
Storage temperature range	: -10°C to 60°C.
Humidity range	: 95% RH (non condensing)
Equipment weight	: Approx. 11 kg.
Dimensions	: 502 x 394 x 190 mm
Accessories	: 2 Combined current and potential leads. 1 Ground cable. 1 Power cord. 1 USB cable. 1 Case for the accessories. 1 User guide.

Subject to technical change without notice.

