

# Portable Micro-Ohmmeter VG-BAT-x00

## OPERATING MANUAL



## Warranty

Mostec warrants this product to be free of manufacturing defects for a 2-year period after the original date of purchase. Within this period, defective products will be repaired free of charge provided that the defect occurred during normal operation. This warranty does not cover damage to the product resulting from ordinary usage such as front panel scratches, broken control elements and corrosion, etc. The customer is responsible for shipping and packing charges for products returned under warranty to Mostec. Mostec warrants this product beyond the 2-year warranty period for an additional 2 years in case of long term damages due to improper manufacturing. Such damages as poorly soldered joints or other assembly problems are also covered by the warranty. Transportation damages are not covered by the warranty and should be referred to the respective delivery service.

## Technical data

The portable micro-ohmmeters VG-BAT-x00 are used for resistance measurements of high power switches etc. The strengths of the instruments are the easy handling, battery powered, rugged design and low weight.

The VG-BAT-x00 enables a real direct current measurement for highest accuracy. The current rises linear for 1 second than holds the preset current for 3 seconds and falls back within another 1 second.

The advanced build-in LiFePO<sub>4</sub> battery offers maximum power with excellent safety and outstanding life.

The 4.3" LCD graphic display, enables measurements in darkness, coldness and full sunlight.

Measurement data is saved directly to a USB stick and to the internal Memory.

The USB PC-Interface is used to control the device or read out the results automatically by computer.

Read out the device history or start a measurement with an Android phone or tablet. Send the data directly to your office.

The VG-BAT-200, with a weight of 5.2kg only, is very handy and easy transportable.

Typical applications are ohmic tests of:

- Circuit breakers
- Disconnecting switches
- High current busbar joints
- Railway parts
- Cable splices
- Welding joints
- Ground connections

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## 1. Safety Regulations



Always comply with local safety regulations when using the Micro-Ohmmeter.



Always connect protective earth (ground).



Read and comply with the safety regulations in this manual before using Micro-Ohmmeter.



Never open a breaker as long as the Micro-Ohmmeter is connected.



High voltage/currents can occur at the input/output clamps.



The connection joints of the high current cables may become hot during a test.



Do not subject the instrument to strong impact, mechanical shock or excessive heat.



Do not expose the instrument to water, salt water or other liquids.



This instrument contains a LiFePO<sub>4</sub> high energy battery pack and a lithium coin cell.  
Do not pierce, damage, disassemble or modify the battery



Testing inductive circuits can be hazardous. The VG-BAT-x00 is a high power instrument, designed for testing resistive loads. It must not be used to test inductive loads.

## 2. Battery care



The battery should be charged at a minimum of 6 month intervals. This is to prevent deep discharge.

Never attempt to charge the battery below 0°C or above +40°C ambient.

The instrument is specified between -20°C and +50°C. However keep in mind that at very low temperatures, the battery is stressed and the capacity of measurements is reduced. Keeping the instrument at room temperatures before doing measurements outside at low temperatures helps to improve battery life.

The battery is charged by connecting the provided recharger at the DC socket on the back of the instrument.

If the recharger is connected the LED next to the ON/OFF key illuminates.

The battery charging time is 1.5 hours.

Store the instrument in a cool, dry location to improve battery life.

Storage temperatures below freezing should be avoided. Do not attempt to remove the batteries from this unit.

## 3. Battery disposal



The crossed out wheeled bin symbol placed on the batteries is a reminder not to dispose of them with general waste at the end of their life.

This product contains lithium ion batteries and a coin cell. They are located inside the instrument. The Lithium ion coin cell can be safely removed by Mostec AG.

## 4. Operating Instructions

1. Keep the Micro-Ohmmeter switched off while making connections.
2. Ground one side of the test object.
3. Ground the Micro-Ohmmeter.
4. Connect the current cables to the test object.
5. Connect the two sense cables as close as possible to the test object.
6. Switch on the Micro-Ohmmeter.
7. The Micro-Ohmmeter powers up and shows the startup text on the display.
8. Select the desired measuring current with the "ADJUST" keys **[+]** and **[-]** or use a preset current with the keys **[F1]**, **[F2]** or **[F3]**.
9. Start the measurement with **[Start/Stop]**.

To change the instrument settings, see page 8.

## 5. Control Panel

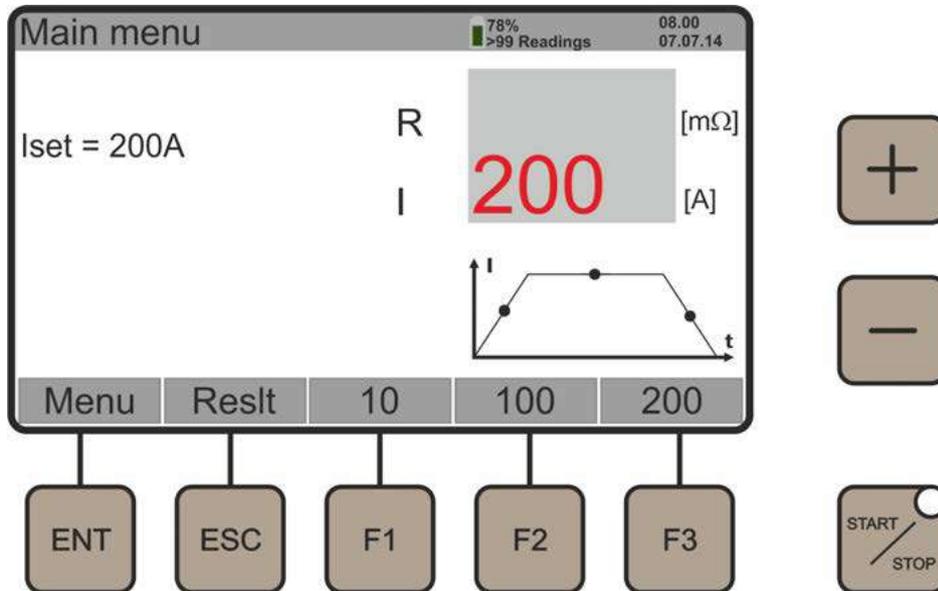


01. LCD 4.3" graphic display
02. Keys to control the menu functions
03. Increment/decrement keys for menus and values
04. Start/Stop keys with status LED
05. Remote control connector
06. Accessories connector
07. USB PC-Interface
08. Data logger / USB stick
09. Current clamp sense input
10. Raw signal shunt voltage terminals
11. Sense terminals
12. DC - current output
13. DC+ current output
14. Power switch with recharging LED
15. Ground terminal

 Warning: Opening the instrument case voids the warranty.

## 6. Power ON

After power up the display shows the welcome message for 3 seconds. After that, the display shows the main menu.



## 7. Main Menu

Iset = The previously set measuring current. The measuring current can be changed by using the **[+]** and **[-]** keys.

Menu = Pressing **[Ent]**, the user enters the system menu.

Reslt = Pressing **[Esc]**, the user enters the window with the measuring results.

10 = Preselect value 1 of the measuring current. By pressing **[F1]**, the measuring current Iset is changed to 10A. This value can be changed in the system menu.

100 = Preselect value 2 of the measuring current. By pressing **[F2]**, the measuring current Iset is changed to 100A. This value can be changed in the system menu.

200 = Preselect value 3 of the measuring current. By pressing **[F3]**, the measuring current Iset is changed to 200A. This value can be changed in the system menu.

**78%**  
**>99 Readings**

= State of charge

= Shows the numbers of remaining measurements for the actual load. On startup the instrument takes the maximal load for calculation and adjusts the value with further measurements.

## 8. System Menu

Pressing **[Ent]** in the main menu leads to the system menu. In this menu, the user can navigate between the items using the **[F1]** and **[F2]** key. Pressing **[F3]** switches between the first and second page of the system menu. **[Ent]** selects the actual indicated item. The data of the selected item can be modified using the keys **[+]** and **[-]**. To store the modified data and leave the selected menu item, press the **[Ent]** key. **[Esc]** leaves the system menu without any changes.

Setup Menu SM 0

Measure mode:	single		
Preset current:	010 A	100 A	200 A
Current clamp:	off	10.00mV/A	
Temp. compensation:	off	3.80 * E-3 1/K	
Erase measurements:	no		
Buzzer:	off		

ENTER
ESC
«
»
1/2

+

-

ENT

ESC

F1

F2

F3

START  
/ STOP

Setup Menu SM10

Time/Date format:	24h	YYMMDD	
Time/Date:	08:00	07.07.14	
Printer:	#34	summary	
Language:	English		
Display Ueut:	no		
Auto pol detection:	yes		
Pass/Fail:	change limits		

ENTER
ESC
«
»
2/2

+

-

ENT

ESC

F1

F2

F3

START  
/ STOP

## 9. System Menu, Description

### First Page

Menu item	Description	Range of values
<b>SM 0</b>	<b>Measure mode(not available for battery types):</b> The measuring current flows continuously until it's interrupted by the user. Single = the measuring current only flows for a fixed given time.	<b>single/continuous</b>
<b>SM 1</b>	<b>Current:</b> Preset current 1. The adjusted value appears in the main menu above <b>[F1]</b> .	<b>5A to 205A 5A to 305A 5A to 405A 5A to 605A</b>
<b>SM 2</b>	<b>Current:</b> Preset current 2. The adjusted value appears in the main menu above <b>[F2]</b> .	<b>5A to 205A 5A to 305A 5A to 405A 5A to 605A</b>
<b>SM 3</b>	<b>Current:</b> Preset current 3. The adjusted value appears in the main menu above <b>[F3]</b> .	<b>5A to 205A 5A to 305A 5A to 405A 5A to 605A</b>
<b>SM 4</b>	<b>Current Clamp:</b> The instrument calculates the current which can be bypassed through the grounding connections. This value is subtracted from the measuring current which flows through the device under test.	<b>on/off</b>
<b>SM 5</b>	<b>Current Clamp:</b> Set the sensitivity of the external current clamp in mV/A.	<b>0.10mV/A...20mV/A</b>
<b>SM 6</b>	<b>Temp. Compensation:</b> When this item is ON, the instrument works with the temperature coefficient ( $\alpha$ , see SM7). It measures the temperature of the test object with the external temperature sensor and compensates the temperature coefficient of the test object.	<b>on/off</b>
<b>SM 7</b>	<b>Temp. Compensation:</b> Set the value for the temperature coefficient ( $\alpha$ ) of the test object that will be measured.	<b>-/+ 9.99 x 10<sup>-3</sup> 1/K</b>
<b>SM 8</b>	<b>Erase measurements:</b> Erases all saved measurements.	<b>yes/no</b>
<b>SM 9</b>	<b>Buzzer:</b> Activates key click and audio warning during measurement and error messages.	<b>on/off</b>

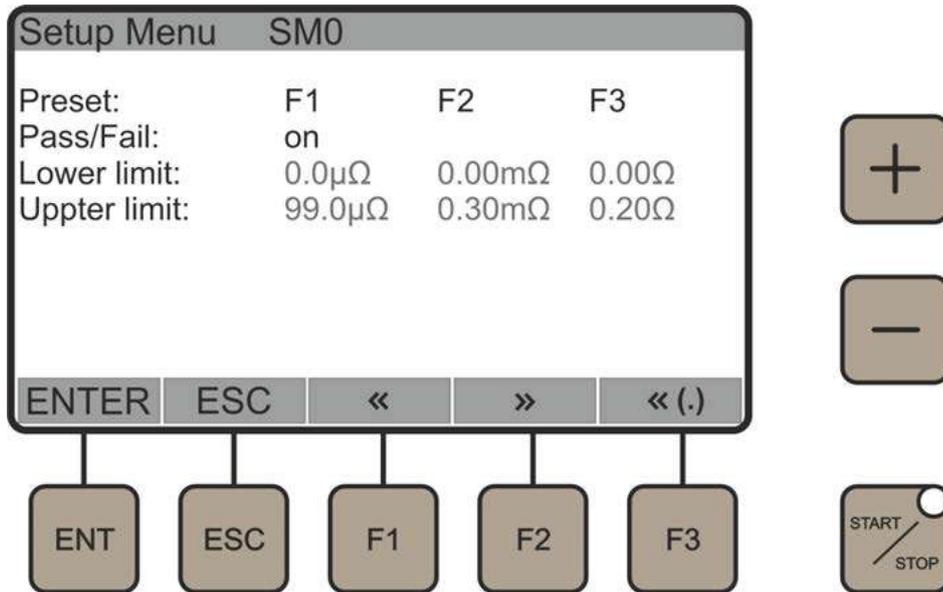
Press **[F3]** for next page.

## Second Page

Menu item	Description	Range of values
SM 10	<b>Time format:</b> Switches between 24/12h formats	12h/24h
SM 11	<b>Date format:</b> Switches between different date formats.	YYMMDD, DDMMYY, MMDDYY
SM 12	<b>Time:</b> Adjusts the hour of the internal clock.	0...12 / 0...23
SM 13	<b>Time:</b> Adjusts the minute of the internal clock.	0...59
SM 14 SM 15 SM 16	<b>Date:</b> Adjusts year, month, day of internal calendar.	TT 1...31 MM 1...12 JJ 0...99
SM 17	<b>Printer:</b> Incremental counter for the printout. The printouts are numbered. The first number is set by item SM17.	0...9999
SM 18	<b>Printer:</b> The user can switch the printout between simple and detailed mode.	summary/all values
SM 19	<b>Language:</b> Select the active language of the display.	English Deutsch Español Swenska Française
SM20	<b>Display Ueut:</b> Displays sense voltage	yes/no
SM21	<b>Auto pol detection:</b> Disables automatic correction of sense polarity.	yes/no
SM22	<b>Pass/Fail:</b> Enter submenu for changing limits by the <b>[Ent]</b> key. In the submenu the limits for the measurement analysis may be changed.	change limits

### Submenu Measurement Analysis

Enter this submenu by the **[Ent]** key in the system menu on item SM22. If the measurement analysis is switched on, then the resistance value will be compared with the selected limits. If the reading is within the selected limit the display shows "Reading: Pass" otherwise it shows "Reading:Fail" after a measurement.

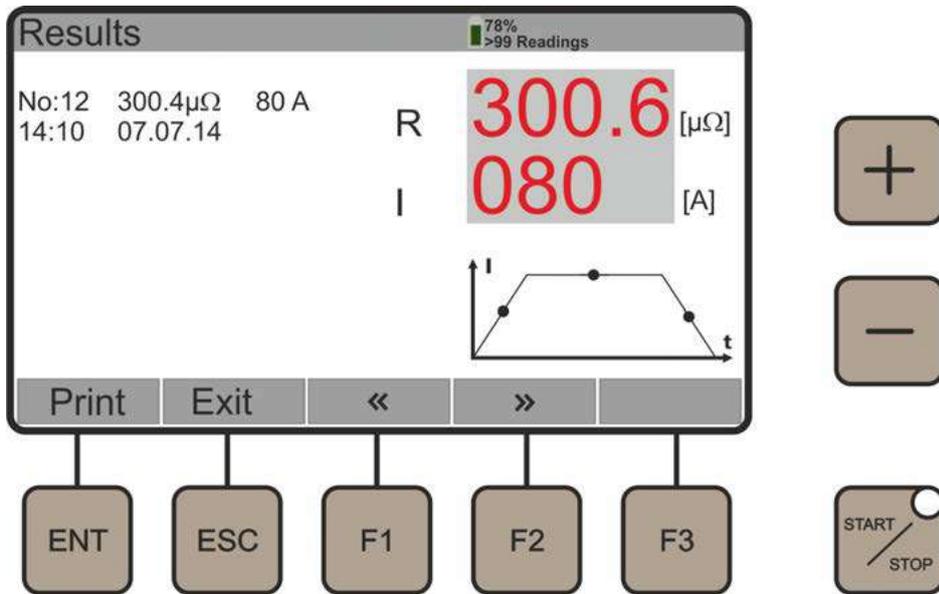


- [Ent]** Save settings and goes back to the system menu
- [Esc]** Goes back to the system menu without saving
- [F1]** Shows the previous parameter
- [F2]** Shows the next parameter
- [F3]** Changes range of selected preset

The 3 limits can selected at the main menu by the **[F1]**, **[F2]** and key **[F3]**. As an example the selected limit is shown on the main menu view like this: Analysis: 0.0<R<99.0μΩ.

### 10. Result Window

The result window can be activated by pressing the key **[Esc]** in the main menu. It will also be automatically activated if a measurement has been completed. The Micro-Ohmmeter stores the last 100 data sets. Unlimited data sets can be achieved by using an external USB stick.



The window shows the time and date of the running test, storage location, ohmic value and test current. When the external current clamp is activated, the clamp current is shown as well.

- [Ent]** Prints the data set
- [Esc]** Goes back to the main menu
- [F1]** Shows the next result
- [F2]** Shows the previous result

### 11. Start/Stop Measurement

The measurement is started by the **[Start/Stop]** key. This process is announced by the red blinking LED and, if activated, a pulsating audio alarm (Buzzer). The measurement can be aborted by the **[Start/Stop]** or the **[ESC]** key.

### 12. Printer

The thermal printer is maintenance free and the paper can be easily changed. The key under the paper output does the paper feed. The green LED lamp indicates "printer ready". A blinking green lamp indicates a paper problem.

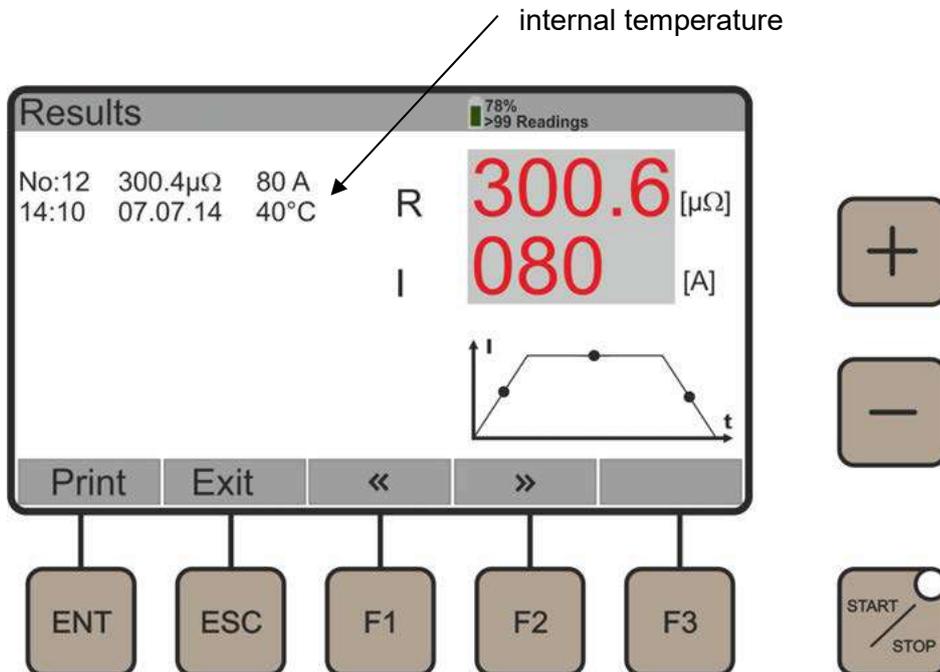
### 13. Error Messages

The Micro-Ohmmeter can detect and display different errors.

Fault	Cause	Remedy
Sense line broken	Sense line defective or broken	Verify the sense line connections
Overflow	Ohmic value too high for the selected current	Bad connection and/or too large resistance
Measuring current value not reached	1. Instrument overheated 2. Resistance > 999.9mΩ	Cool down the instrument Bad connection or too large resistance of the test object. Too long high current cables.

### 14. Instrument Temperature Monitoring

The Micro-Ohmmeter has a temperature surveillance controller. At >40°C internal temperature, the LCD display shows the inside temperature, right, on the first line. At >50°C it derates the test current. At >70°C the measuring current is set zero. For more cycles, wait until the internal temperature decreases.



## 15. Application Example - one side grounded



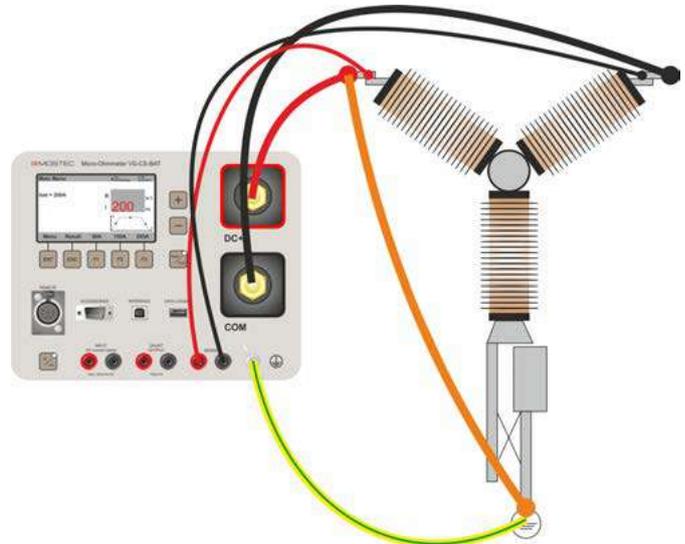
Comply to the **safety regulations** and **operation instructions** when using the Micro-Ohmmeter. See page 4 and 5. Never use the instrument without the protective earth connections!

### Important:

The sensing cables must be connected after the high current cables, as close to the test object as possible.  
If the high power cables are closer to the test object than the sense lines, the test data may be incorrect.

### Note:

If you are measuring the resistance of a breaker or disconnecting switch (isolator), make sure that it is closed and grounded before making connections and starting the test.



1. Make certain the mains are de-energized on both sides of the breaker. Ground the breaker on **one side** and make sure it is closed.
2. Keep the Micro-Ohmmeter switched off while making connections.
3. Ground the Micro-Ohmmeter.
4. Connect one current cable between one side of the object being tested and the DC+ terminal on the Micro-Ohmmeter. Connect the other current cable between the other side of the object being tested and the COM terminal on the Micro-Ohmmeter.
5. Connect the two sensing cables on two sides of the test object and as close to the test object as possible.
6. Switch the Micro-Ohmmeter on.
7. Set the test current using the keys **[+]** and **[-]** or use one of the preselected currents using the **[F1]** or **[F2]** or **[F3]** key.  
*Note:* If you are using the instrument the first time, make sure that the current clamp is switched off (Setup Menu SM4, see page 9).
8. Press the **[START/STOP]** key. The measurement is announced by a red blinking LED, and if activated, a pulsating audio alarm (Buzzer) is on. The result will be shown after a few seconds. The result is saved, you can make a printout and/or run a new test.
9. You can stop the measurement by pressing **[START/STOP]** or **[ESC]** keys.
10. Turn off the Micro-Ohmmeter before doing any disconnection work or moving any cables or wiring.

## 16. Application Example - both sides grounded



Comply to the **safety regulations** and **operation instructions** when using the Micro-Ohmmeter. See page 4 and 5. Never use the instrument without the protective earth connections!

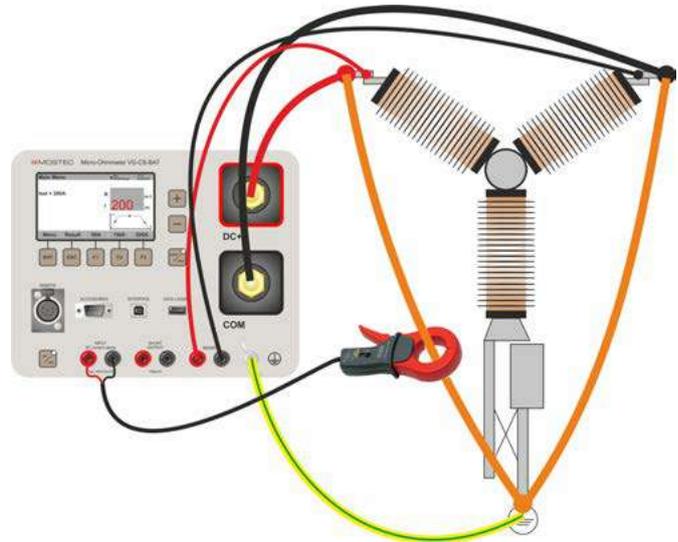
### Important:

The sensing cables must be connected after the high current cables, as close to the test object as possible.

If the high power cables are closer to the test object than the sense lines, the test data may be incorrect.

### Note:

If you are measuring the resistance of a breaker or disconnecting switch (isolator), make sure that it is closed and grounded before making connections and starting the test.



1. Make certain the mains are de-energized on both sides of the breaker. Ground the circuit breaker on **both sides** and make certain it is closed.
2. Keep the Micro-Ohmmeter switched off while making connections.
3. Ground the Micro-Ohmmeter
4. Connect one current cable to one side of the object being tested and the DC+ terminal on the Micro-Ohmmeter. Connect the other current cable to the other side of the object being tested and the COM terminal on the Micro-Ohmmeter.
5. Connect the two sensing cables on two sides of the test object and as close to the test object as possible.
6. Connect the external current clamp to one of the ground bars of the breaker and the clamp output to the DC current clamp input on the Micro-Ohmmeter.
7. Switch the Micro-Ohmmeter on.
8. Set the test current using the keys **[+]** and **[-]** or use one of the preselected currents using the **[F1]** or **[F2]** or **[F3]** key.
9. In the "Setup Menu", "SM4" (see page 9) switch on the current clamp and adjust the proper sensitivity of the current clamp you are using.
10. Press the **[START/STOP]** key.
11. You can stop the measurement by pressing **[START/STOP]** or **[ESC]** keys.
12. If the current through the ground bar was too high compared to the current through the breaker, adjust the test current and start the measurement again. Repeat this step, until the current through the breaker meets your requirements.
13. Turn off the Micro-Ohmmeter before doing any disconnection work or moving any cables or wiring.

### 17. Verify the measuring current



Comply to the **safety regulations** and **operation instructions** when using the Micro-Ohmmeter. See page 4 and 5.

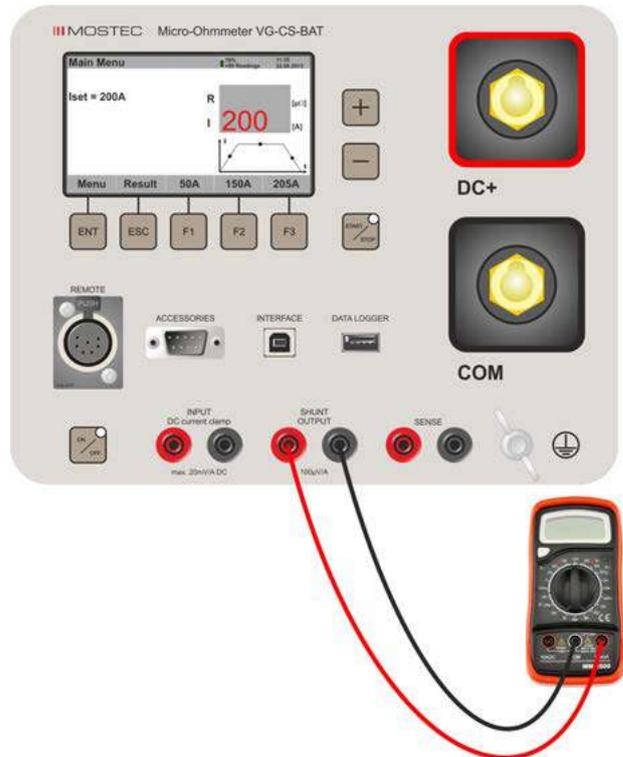
1. Connect mV-Meter to the shunt output
2. Calculate the measuring current:

Shunt voltage = 100uV/A

$$\text{Measuring Current} = \frac{\text{Measuring mV}}{\text{Shunt voltage } 100\mu\text{V/A}}$$

For example:

$$\frac{10\text{mV}}{100\mu\text{V/A}} = \underline{100\text{A}}$$

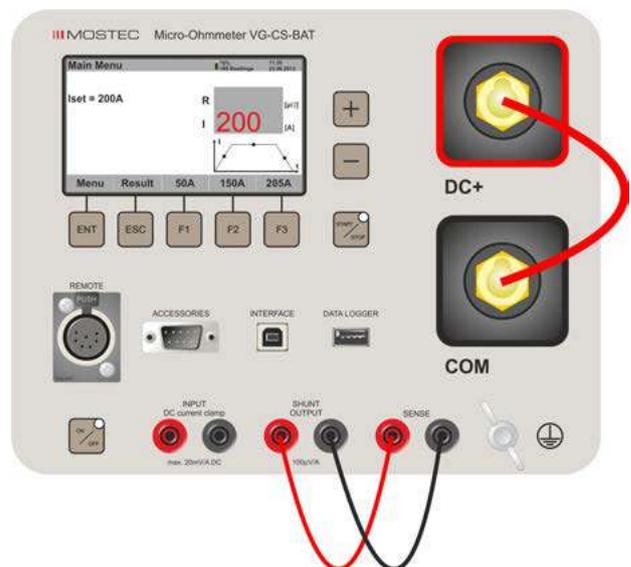


### 18. Verify the measuring function



Comply to the **safety regulations** and **operation instructions** when using the Micro-Ohmmeter. See page 4 and 5.

1. Connect the current cable together
2. Connect the sense cables from the Shunt-Output to the Sense-Input terminal
3. Start a 100A, single measurement
4. Result = 99.6uΩ for example



→ The value 99.6uΩ must be the same value as in the calibration certificate (see “shunt output value”)

## 19. Technical Data

Measuring ranges:	0...20.00μΩ, 0...200.0μΩ, 0...2.000mΩ, 0...20.00mΩ, 0...200.0mΩ 0...999.9mΩ
Display:	Sunlight readable LCD 4.3"graphic display with a resolution of 480x272 dots
Display resolution:	0.01μΩ ... 0.1mΩ
Accuracy:	0 ... 1000μΩ, @ 200A / 25°C = ±0.05% FS 1 ... 25mΩ, @ 200A / 25°C = ±0.2% FS 25 ... 999mΩ, @ 5 - 200A / 25°C = ±0.5% FS
Reproducibility:	<0.1%
Measuring current:	5 - 205A (VG-BAT-200), 3 adjustable preset currents
Maximum test voltage:	5.5V
Current ramp:	The test current rises following a linear ramp, holds the preselected value and falls with a linear ramp.
Battery: Charging:	LiFePO4, 75Wh CCCV, 1.5hours
Number of Measurements:	200A 27mΩ 58#   100A 27mΩ 229#   50A 27mΩ 916# 200A 5mΩ 308#   100A 5mΩ 1237#   50A 5mΩ >2000# 200A 1mΩ 1546#   100A 1mΩ >2000#   50A 1mΩ >2000#
Measuring interval:	No limitation of the number of current cycles
Result data logging:	The last 100 data sets are stored internally. Unlimited data sets for the external USB stick.
Automatic power switch-off:	Default 2 minutes
Data logger:	Accepts FAT32 formatted USB sticks
Sense input: Input voltage: Input impedance:	Independent polarity with banana jacks. Max. ±5V >200kΩ
Shunt output: Shunt voltage:	100μV/A +/-1%, banana jack red = plus, banana jack black = negative 20mV @ 200A for VG-BAT-200
Data interface:	USB, various measuring protocols may be set (VG-CS Win, data output, data control)
Pass/Fail:	Display signalization, 3 preset limits. Optional alarm contacts
Date/time:	The instrument has a battery buffered real time clock
Buzzer:	An acoustic click for keyboard operation or an ongoing test
Ambient temperature:	-20.0°C ... +50.0°C
Humidity:	Max. 95% non-condensing
LVD:	RL2014-35-EU, EN 61010-1:2011
EMC:	RL2014-30-EU, EN 61326:2008 + A1:2009, EN61000-6-1/2/3/4:2007
Printer:	Optional, 24-characters standard thermal paper (58x32mm diameter)
Unit manipulations:	Keyboard, external PC or Android phone/tablet
Manipulations:	Menu operated, easy to use
Power supply:	100...240V, 1.3A, 50-60Hz
CE-conformity:	Fulfilled
Dimensions:	L x W x D: 300 x 248 x 195 mm
Weight:	5.2 kg (VG-BAT-200)
Warranty:	2 Years
Software (optional):	PC-software to transfer and log stored data sets, Order No: VG-CS WIN
Special accessories:	-Customer specific changes -Current clamp (for example 20mV/A), to measure dual grounded systems -USB stick





