

Operating Instructions

Portable Micro-Ohmmeter

VG-BAT-x00-III



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Operating notes

Warranty

Mostec AG grants a warranty of 2 years on the measuring device mentioned. The period for calculating the warranty period begins with the invoice date. During the warranty period, defects which are not due to improper use will be repaired free of charge. Excluded are damages caused by use, for example such as scratched front panels and displays, corroded potentiometers, entry of water or similar defects.

There is an extended warranty of additional 2 years on long term damages, should they be due to faulty manufacturing. This includes bad and cold solder joints, as well as assembly errors, which only become noticeable after a longer period of operation.

The warranty repair must in any case be carried out at Mostec. Postage and packaging expenses shall be paid by the customer. In the event of a warranty claim, the repaired unit will be returned at Mostec's expense. Transport damages are excluded from any warranty service and must be reported to the delivering carrier.

Technical description

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

The VG-BAT-x00 enables a real direct current measurement for highest precision. The current rises linear in a ramp over 1 second then holds the preset current for 3 seconds and then decreases linear in a ramp pattern over a 1 second.

An advanced build-in LiFePO4 battery offers maximum power with excellent safety and outstanding lifespan.

Equipped with a 5" IPS TFT touch display, the instrument can do measurements in darkness, coldness and full sunlight with an intuitive multilingual interface.

Measurement data is saved directly to a USB stick and to the internal memory. Through the USB PC-Interface the instrument can be controlled or the measurement results can be read out automatically by computer. Use our Bluetooth dongle to read out the device history or start a measurement with an Android phone or tablet. After you can send the data directly to your office.

The VG-BAT-200, with a weight of 5.8kg only is very handy and easily transportable. With the case door closed the instrument achieves an IP67 rating.

Typical applications are ohmic tests of:

- Circuit breakers
- Disconnecting switches
- High current busbar joints
- Railway parts
- Wind turbines
- Electric vehicle applications
- Cable splices
- Welding joints
- Ground connections

Technical support

For questions or concerns, we can be reached via email or phone during CET business hours.

Current operating instructions can be found on our website www.mostec.swiss.

Contact details

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CH-4410 Liestal BL
Phone: +41 61 921 40 90
E-mail: info@mostec.ch

Safety instructions



Observe the customary national regulations and safety requirements for electrical, light and heavy current installations.



Read and observe the safety regulations of this operating manual before using the device.



Always connect protective earth (ground).
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 when the instrument cover is open.



This instrument contains a LiFePO₄ high energy battery pack and a lithium coin cell.
Do not pierce, damage, disassemble or modify the battery



The limit values for the variables specified in the data sheet must not be exceeded under any circumstances.



Wiring, commissioning and operation of the equipment must be carried out by suitably qualified personnel in accordance with local regulations.



If it can be assumed that the device can no longer be operated without danger, it must be taken out of service and secured against further operation by means of labeling.



Failure to follow the safety instructions may result in damage to the device and injury to the operator.

Battery care

The battery should be charged at least once every 6 months. This will prevent deep discharge and damage to the battery.

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 front panel. If the charger is connected, the green LED next to the ON/OFF key is on. The battery charging time is 1.5 hours. When fully charged, the LED color changes to blue. If the device detects a defect in the battery, the color changes to red. In this case, the charger must be checked and a new attempt made.

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.

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 a LiFePO₄ battery and a lithium coin cell. They are located inside the instrument. The lithium coin cell can be safely removed by Mostec AG.

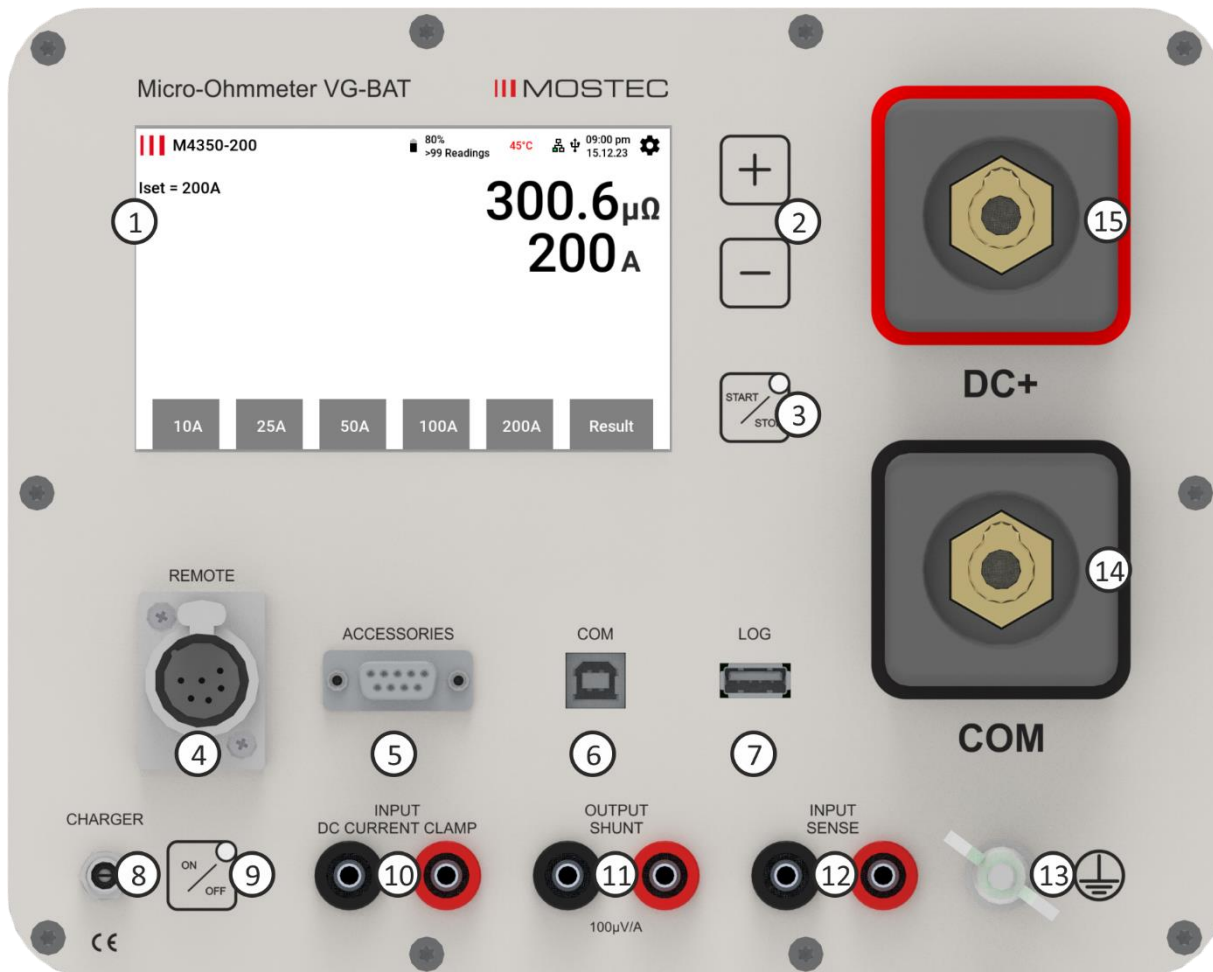
Operating regulations

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. Select the desired measuring current with the "ADJUST" keys **[+]** and **[-]** or use a preset current.
8. Start the measurement by pressing **[Start/Stop]**.

To change the instrument settings, refer to the User menu on page 8 below.

Instrument overview

Instrument elements



1. 5" IPS TFT touch display
2. Increment/decrement keys for current and values
3. Start/Stop keys with status LED
4. Remote control connector
5. Accessories connector
6. USB PC-Interface
7. Data logger / USB stick
8. Charging socket
9. Power switch with recharging LED
10. Current clamp sense input
11. Raw signal shunt voltage terminals
12. Sense terminals
13. Ground terminal
14. DC - current output
15. DC+ current output

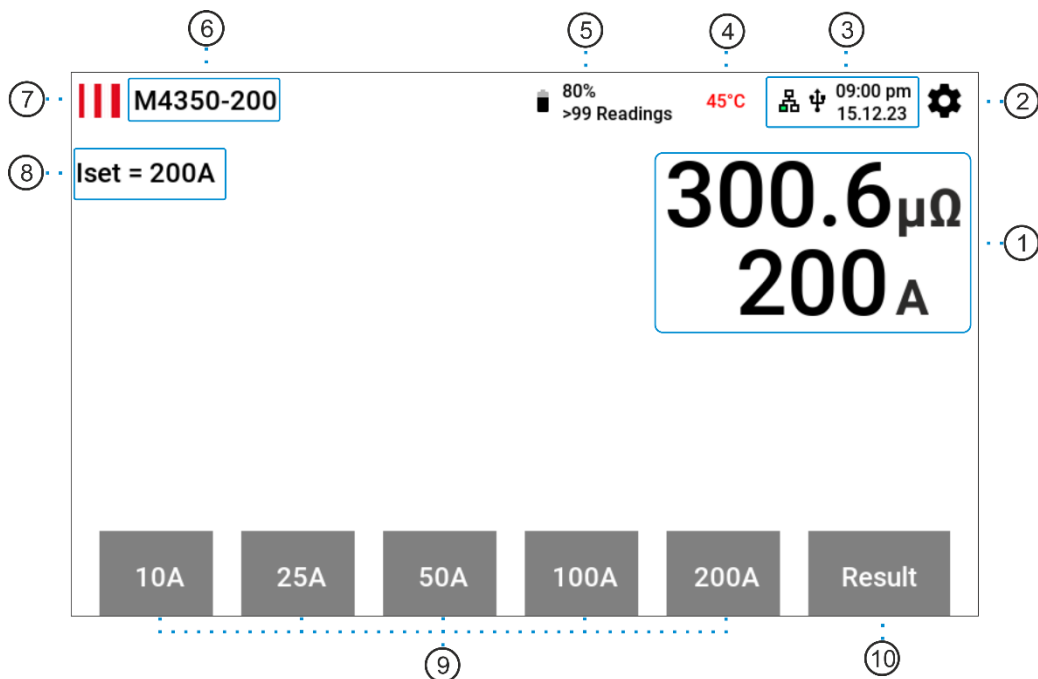






Warning: Opening the instrument case voids the warranty.

Power ON

The device starts immediately and is ready for use. The display shows the following main menu.

Main menu



1. Actual measured values:
Shows the measured resistance and measurement current of the last measurement
2. Settings :
Enter the User menu
3. Status bar:
Current time, date, USB and interface activity
4. Internal temperature:
Shows up when the device gets hot
5. Battery state of charge:
State of charge in % and 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.
6. Device label
7. Logo and "Device info" entry 
8. The set measuring current. The measuring current can be adjusted using the [+] and [-] keys or preselect buttons (item 9 below).
9. Preselect measuring currents 1-5 
10. Result 

All symbols marked with  can be selected

Meaning of the symbols

USB



USB storage medium connected



USB storage medium is currently being accessed

Communication



Communication connected



Communication active

User menu

The user menu has the following submenus. In these submenus, device-specific settings can be made.



The bar on the right side is a scroll bar



The default values are shown **[Bold]**

Settings

Enter the **Settings** menu by pressing the icon  in the Main menu.

Menu item	Submenu items	Section
Measure Settings	Measure mode Preset Preset 1-5 Enable Current Pass/Fail Enable Range Lower limit Upper limit Current clamp (CT) Current clamp sensitivity Temperature Mode Compensation Coefficient Temperature manual Offset Pt-100 Auto pol detection Display Ueut Advanced settings	See on page 9 below
Device Settings	Buzzer Time format Date format Time Date Printer Printout Number Language Erase measurements Code Backlight Custom label	See on page 11 below

Menu item	Submenu items	Section
USB settings	Device settings Advanced data logging Save all results Finalize log file	See on page 11 below
Communication Settings	Software unlocked USB interface Protocol Address Baudrate Configurations Remote interface Protocol Address Baudrate Configurations	See on page 12 below
Device info	Firmware version Serial number Device type Hardware Shunt Firmware update	See on page 12 below

Measurement settings

In this submenu, measurement-specific settings can be made.

Menu item	Function/Comment	Possible values
Measure mode	Single: The measuring current only flows for a fixed given time. Continuous: The measuring current flows continuously until it's interrupted by the user. (Not available for battery types):	single continuous [single]
Preset	Settings for preset values	See on page 10
Current clamp (CT)	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. The sensitivity must match with external current clamp.	on off [off]
Current clamp sensitivity		0.10...20.00 mV/A [1.00]
Temperature	Temperature settings	See on page 10
Auto pol detection	Disables automatic correction of sense polarity.	on off [on]
Display Ueut	Displays sense voltage on display and printout	on off [off]
Advanced settings	Advanced settings	Ask us for more information

Preset settings

Select the preset current value from 1 – 5. For each preset button the following settings can be made.

Menu item	Function/Comment	Possible values
Preset	Enable or disable the preset current on the main screen	on off [on]
Current	The adjusted value appears in the main menu	Minimal to maximal current corresponds to the device type Example 5-205A
Pass/Fail	Measurement analysis	See below

Measurement Analysis

The measurement analysis is done for each preset current separately. If the measurement analysis is switched on, the resistance value will be compared with the selected limit values. If the reading is within the selected limits the display shows **“Reading: Pass”** otherwise it shows **“Reading: Fail”** after a measurement.

The selected limit is shown in the main menu view as follows: **“Analysis: 0.0 < R < 99.0μΩ”**.

For each limit following settings can be made.

Menu item	Function/Comment	Possible values
Pass/Fail	Enable or disable the limit surveillance on the main screen	on off [on]
Range	Changes the resistance range for the lower and the upper limit	9.99μΩ 99.9μΩ
Lower limit	Adjusts the lower limit within range	999μΩ
Upper limit	Adjusts the upper limit within range	9.99mΩ 99.9mΩ 999mΩ 9.99Ω

Temperature settings

When the temperature compensation is set to **“on”**, the instrument works with the temperature coefficient (α). It measures the temperature of the test object with the external temperature sensor and compensates the temperature coefficient of the test object. It also possible to select a manual temperature for the compensation calculation. Following settings can be made.

Menu item	Function/Comment	Possible values
Compensation	Enable or disable the temperature compensation.	on off [off]
Coefficient	temperature coefficient (α)	-9.99...9.99 * E-3 1/K [3.80]
Mode	Selects the sensor type of the temperature measurement	Pt-100 Manual [Pt-100]
Temperature manual	Temperature in "Manual" mode	Adjustable from: 0.0°C to 100.0°C [25.0°C]
Pt-100 zero offset	Zero offset of the temperature sensor	Adjustable from: -2.5°C to +2.5°C [0.0°C]

Device settings

Device specific settings are made in this submenu.

Menu item	Function/Comment	Possible values
Language	Setting the menu language	English Deutsch Français Español Svenska Cesky [English]
Access code	Activate/deactivate the access code. When the access code is active, only some menu items can be accessed. Notice: Contact us if you have forgotten the access code.	Numeric access code Size: 4 digits [off]
Brightness	Screen brightness	Adjustable from: 5% to 100% [50%]
Device label	Changing the device label of the measurement screen	16 alphanumeric characters with special characters possible [M4x50-xxx]

USB settings

Whenever a USB thumb drive is present the device starts to record the measurements. Following additional USB settings can be made in this submenu.

Menu item	Function/Comment	Possible values
Device settings	Option to back up or restore the device settings	back up restore not available
Advanced data logging	Also writes the partial voltages during the measurement from Shunt, Sense Clamp. For battery powered devices also output and battery voltage.	on off [on]
Save all results	Saves all results from the internal memory to the USB drive	yes no not available
Finalize log file	Create log file names with actual date. See below File name / file formation page 17	yes no not available

Communication settings

In this submenu you can setup the protocol for “Remote” and “USB” interface. There are several protocols available. For full remote access with various protocols (Modbus-RTU, Data Output, Data Control) a software license code is needed. These protocols are designed to integrate the instrument into a custom specific calibration or test process. The software license also unlocks the Windows software (VG-Win) which makes it easy to manage and save all test results to a windows computer.

For further information about Modbus RTU integration see "M4150_M4350_Modbus_UserGuide_Vx.xx.pdf".

Ask us for further information about “DataOutput” or “DataControl” protocol if needed.

Following settings can be made in the communication submenu.

Menu item	Function/Comment	Possible values
Softcode	Unlock the software license	
USB interface	Settings for the USB interface	
Remote interface	Settings for the Remote interface	

For each interface these settings can be made.

Menu item	Function/Comment	Possible values
Protocol		Modbus RTU legacy legacy (DataCom) legacy (DataOutput) [legacy]
Address	Save address of the device	Adjustable from: 1 to 247 [1]
Baudrate	Set the requested baud rate	4800 9600 19200 38400 57600 115200 [38400]
Configuration	8 data bits N: no parity bit E: even parity bit O: odd parity bit 1 or 2 stop bits	8-N-1 8-N-2 8-E-1 8-E-2 8-O-1 8-O-2 [8-N-1]

Devices Info

Menu item	Function/Comment	Possible values
Firmware version	Shows the current firmware	
Serial number	Shows the serial number of the device	
Device type	Shows the device type	M4350 / M4150
Hardware	Hardware Info	
Shunt	Internal shunt value	Example: 300.3 µOhm
Firmware update	Performs a firmware update The device can be updated to the latest version in the field with a firmware update. Please ask us.	

Operation of the instrument

Result Window

The result window can be activated by pressing the result key 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. All internal measurements can be saved to the external USB stick according to the USB submenu described on page 11. Use the navigation keys to jump from one measurement to the next. The result window shows the time and date of the current test, storage location, ohmic value and test current. When the external current clamp is activated, the clamp current is shown as well. Printout is only available if an external printer is connected to the accessories port.

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 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.

Instrument Temperature Monitoring

The Micro-Ohmmeter has a temperature surveillance controller. At >40°C internal temperature, the display shows the inside temperature, righthand side, on the first line. At >50°C it starts to derate the test current. At >70°C the measuring current is set zero.

For more measuring cycles, wait until the internal temperature decreases.

Application Example - one side grounded



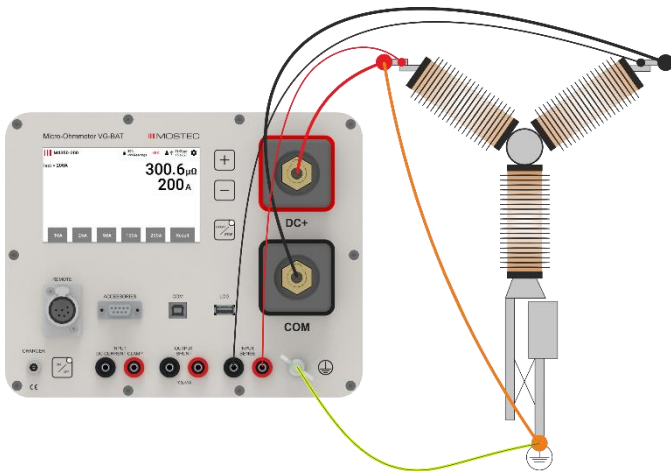
Comply to the **safety regulations** page 4 and **operation instructions** page 5 when using the Micro-Ohmmeter. **Never use the instrument without the protective earth connections!**



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.



If you are measuring the resistance of a breaker or a disconnecting switch (isolator), make sure 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. Turn the Micro-Ohmmeter on.
7. Set the test current using the keys **[+]** and **[-]** or use one of the preselected currents on the touch screen.
8. **Note:** If you are using the instrument the first time, make sure the current clamp is switched off (see Measurement settings on page 9).
9. 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. Then the result is saved, you can make a printout and / or run a new test.
10. You can stop the measurement by pressing **[START/STOP]** keys.
11. Turn off the Micro-Ohmmeter before doing any disconnection work or moving any cables or wiring.

Application Example - both sides grounded



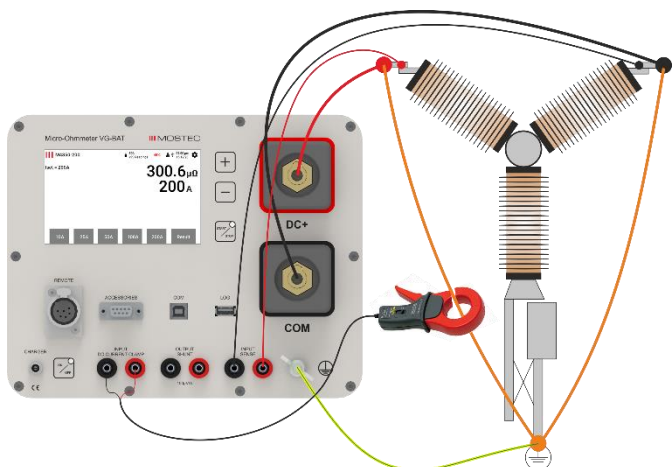
Comply to the safety regulations and operation instructions when using the Micro-Ohmmeter. See page 4 and 5. **Never use the instrument without the protective earth connections!**



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.



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 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. 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 on the touch screen.
9. In Measurement settings on 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. 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. Then the result is saved, you can make a printout and / or run a new test.
11. You can stop the measurement by pressing **[START/STOP]** 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.

Verify the measuring current



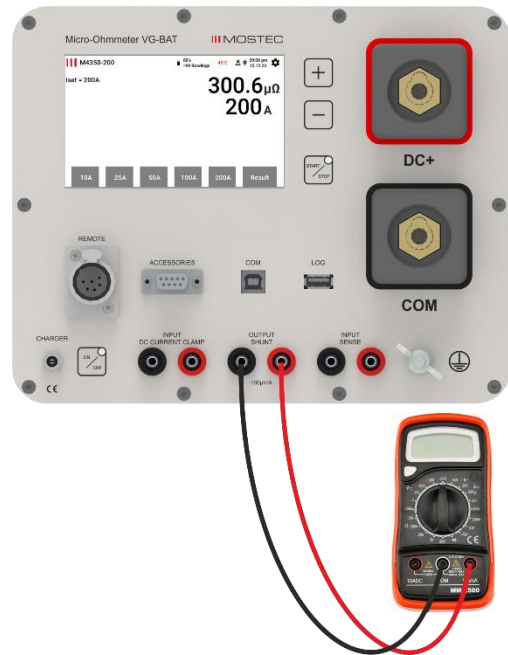
Comply to the safety regulations and operation instructions when using the Micro-Ohmmeter. See page 4 and 5. **Never use the instrument without the protective earth connections!**

1. Connect mV-Meter to the shunt output (mV DC)
2. Start measuring and read the mV value
3. Calculate the measuring current:

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

Example:

$$\frac{10.0 \text{ mV}}{100 \mu\text{V/A}} = 100 \text{ A}$$

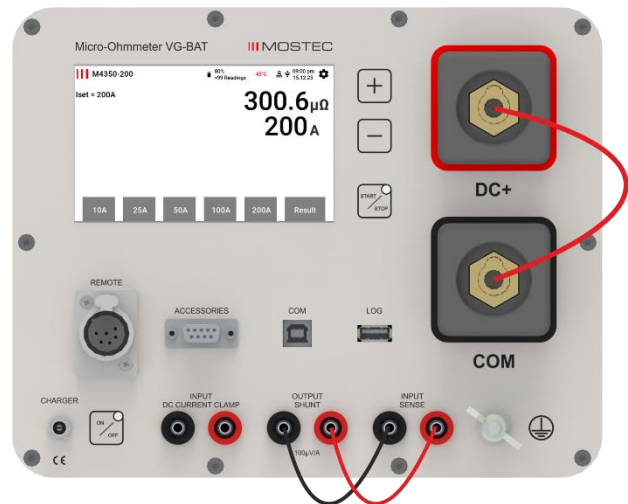


Verify the measuring function



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!**

1. Bridge the high current cables DC+ to COM
2. Connect the sense cables from the Shunt-Output to the Sense-Input terminal
3. Start a 100A, single measurement
4. Result = 99.6μΩ for example
5. The value 99.6μΩ must have same value as the shunt value in the calibration certificate of the instrument (see “shunt output value”)



USB Logger

Features of the USB Logger

- The device only accepts USB sticks formatted FAT32 and empty.
- Time and date must be set before inserting the USB stick. These settings are retained in the de-energized state via a backup battery. (Life span of the battery approx. 10 years)
- As soon as a valid storage medium is detected by the device, the USB symbol appears on the measurement screen and the logging process is started automatically.
- Do not remove the USB flash drive when the USB icon is red.
- For safe removal of the USB stick, stop the recording function in the user menu under the USB settings. Change “**Finalize log file**” to “**yes**” and confirm.
- The device creates a new log file after 60'000 log entries and archives the old one.
- Back up the data and empty the USB - stick from time to time (e. g. every year).

File name / file format

The data is saved in CSV format under the following name key:

"JJMMDDXX.csv" → archived data "log.csv" actual measurements

YY= last 2 numbers from current year (e. g. 2018 = "18")

MM= current month

TT= current day

XX= numbering (0-99)

The CSV format can be interpreted with the most common spreadsheet programs. The separator used is a ';' character and the encoding is Unicode (0x00-0xFF).

Example

Device:	VG-BAT-200-III									
Serial:	1									
FW/HW Version:	1.01.03/M01R1-24Q2									
Shunt:	298.9 µOhm									
Date	Time	Current[A]	Resistance[µOhm]	Current Clamp[A]	Temperature EUT[°C]	Temperature intern[°C]	Error code	Temperature Source EUT	Continuous	Clamp enable
19.07.2024	20:29:00	100	100.4	-	-	-	-	-	-	-
19.07.2024	20:27:00	100	300.3	-	-	-	-	-	-	-

Saving and loading device settings

This option can be found in the USB settings. Here, the current settings of the device can be saved or restored from a USB stick. When saving or restoring, all customer-adjustable settings are being taken. These two functions are not available if the settings are provided with a lock code.

Appendix

Technical data

Type:	VG-BAT-150	VG-BAT-200	VG-BAT-300															
Measuring ranges:	0...20.00μΩ, 0...200.0μΩ, 0...2.000mΩ, 0...20.00mΩ, 0...200.0mΩ, 0...999.9mΩ																	
Display:	Sunlight readable 5" IPS touch screen with a resolution of 800x480 dots																	
Display resolution:	0.01μΩ ... 0.1mΩ																	
General 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																	
Calculate measurement accuracy at a specific measuring point:	a) Calculate sense voltage: sense voltage[V] = EUT[Ω] * measurement current[A] Example 1: 500μΩ * 200A = 100mV Example 2: 50 μΩ * 100A = 5mV Example 3: 10 μΩ * 100A = 1mV b) Determine the absolute amplifier error for the desired measurement <table border="1" data-bbox="579 757 1501 967"> <thead> <tr> <th>Sense Voltage a)</th> <th>Max. Error Sense Voltage</th> <th>Absolute Error in [V]</th> </tr> </thead> <tbody> <tr> <td>200.1mV – 5.000V</td> <td>+/- 0.1%</td> <td>+/- 5mV</td> </tr> <tr> <td>20.01 – 200.0mV</td> <td>+/- 0.05%</td> <td>+/- 100μV</td> </tr> <tr> <td>2.001 – 20.00mV</td> <td>+/- 0.1%</td> <td>+/- 20μV or +/- 0.1μΩ whichever is greater</td> </tr> <tr> <td>0.00 – 2.000mV</td> <td>+/- 0.2%</td> <td>+/- 4μV or +/- 0.1 μΩ which-ever is greater</td> </tr> </tbody> </table> c) Divide the absolute error in [V] from the table b) by the measurement current Example 1: 100μV / 200A = +/- 0.5μΩ absolute sense amplifier error Example 2: 20μV / 100A = +/- 0.2μΩ absolute sense amplifier error Example 3: 4μV / 100A = +/- 0.04μΩ absolute sense amplifier error d) Additional security margin due to the current amplifier Example 1: +/- 0.5μΩ * 2 = +/- 1μΩ Example 2: +/- 0.2μΩ * 2 = +/- 0.4μΩ Example 3: +/- 0.04μΩ * 2 = +/- 0.08μΩ → +/- 0.1μΩ			Sense Voltage a)	Max. Error Sense Voltage	Absolute Error in [V]	200.1mV – 5.000V	+/- 0.1%	+/- 5mV	20.01 – 200.0mV	+/- 0.05%	+/- 100μV	2.001 – 20.00mV	+/- 0.1%	+/- 20μV or +/- 0.1μΩ whichever is greater	0.00 – 2.000mV	+/- 0.2%	+/- 4μV or +/- 0.1 μΩ which-ever is greater
Sense Voltage a)	Max. Error Sense Voltage	Absolute Error in [V]																
200.1mV – 5.000V	+/- 0.1%	+/- 5mV																
20.01 – 200.0mV	+/- 0.05%	+/- 100μV																
2.001 – 20.00mV	+/- 0.1%	+/- 20μV or +/- 0.1μΩ whichever is greater																
0.00 – 2.000mV	+/- 0.2%	+/- 4μV or +/- 0.1 μΩ which-ever is greater																
Reproducibility:	<0.1%																	
Measuring current:	5 - 155A, 5 adjustable preset currents	5 - 205A, 5 adjustable preset currents	5 - 305A, 5 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:	LiFePO4, 41Wh	LiFePO4, 82Wh	LiFePO4, 82Wh															
Charging:	CCCV, approx. 1.5hours	CCCV, approx. 2 hours	CCCV, approx. 2 hours															
Number of Measurements:		200A	100A	50A														
Typical for VG-BAT-200/300	27mΩ	60#	250#	1000#														
→ for VG-BAT-150 divide by 2	5mΩ	335#	1350#	>2000#														
	1mΩ	1690#	>2000#	>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 on the external USB stick.																	
Data logger:	Accepts FAT32 formatted USB sticks																	
Weight:	5.6 kg	5.8 kg	5.9 kg															

Operating instruction manual M4350

Chapter: Appendix

Type:	VG-BAT-150	VG-BAT-200	VG-BAT-300
Automatic power switch-off:	Default 2 minutes		
Sense input:	Independent polarity with banana jacks on front panel		
Input voltage:	Max. $\pm 5V$		
Input impedance:	$>200k\Omega$		
Current Clamp input:	Independent polarity with banana jacks on front panel		
Input voltage:	Max. $\pm 1V$		
Input sensitivity:	Adjustable 0.1 – 20mV/A		
Input impedance:	$>1M\Omega$		
Shunt output:	100 $\mu V/A$ +/-1%, banana jacks on front panel		
Data interface:	USB comport or RS232 Remote, various measuring protocols may be set (Modbus RTU, VG-CS Win, data output, data control) for full access software license is needed: Order No: VG-CS-WIN		
Pass/Fail:	Display signalization, 5 preset limits. Optional alarm contacts		
Date/time:	The instrument has a battery buffered real time clock		
Buzzer:	An acoustic beep for an ongoing test		
Other features:	<ul style="list-style-type: none"> -device labeling, 16 characters on display -settings can be copied from device to device via USB stick -firmware update via USB stick -the device settings can be protected with a 4-digit access code -write all results on USB stick -each current preset can be switched on and off 		
Ambient temperature:	-20.0°C ... +50.0°C		
IP Code:	IP67 (closed case cover) IP30 (open case cover)		
Humidity:	Max. 95% non-condensing		
LVD:	RL2014-35-EU, EN 61010-1:2020		
EMC:	RL2014-30-EU, EN 61326:2018, EN61000-6-1/2/3/4:2019		
Printer:	Optional, 24-characters standard thermal paper (58x32mm diameter)		
Unit manipulations:	Touch screen, keyboard, external PC or Android phone/tablet		
Manipulations:	Menu operated, multilingual (en, de, fr, es, sv, cs), easy to use, fast and responsive		
Power supply (battery charger):	100...240V, 1.3A, 50-60Hz		
CE-conformity:	Fulfilled		
Dimensions:	L x W x D: 318 x 249 x 203 mm		
Warranty:	2 Years		
Software license (optional):	PC-software (VG-Win) to transfer and log stored data sets, Order No: VG-CS WIN. Also needed for full remote access with various protocols (Modbus-RTU, Data Output, Data Control) ideal for integration in automatic custom specific processes.		
Special accessories:	<ul style="list-style-type: none"> -Customer specific changes -Current clamp (for example 20mV/A) to measure dual grounded systems 		