

Micro-Ohmmeter VG-CSx00-II

OPERATING MANUAL



Warranty:

Mostec AG 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 AG. Transportation damages are not covered by the warranty and should be referred to the respective delivery service.

Technical data

The micro-ohmmeters VG-CS200/300/400 and VG-CS600 are used for ohmic measurements of high power switches etc. All instruments are identical, except the maximal measuring current. The strengths of the instruments are the easy handling, rugged design and low weight. The 4.3" LCD graphic display, enables measurements in darkness, coldness and full sunlight.

Designed for continuous measurements, the instrument has no limitation for the numbers of current cycles. An internal thermal printer is standard to enable logging of test results. With the option "remote logging" all stored measuring values can be downloaded to a personal computer or laptop. Measurement data is saved directly to a USB stick. A cable remote control is optionally available. It has two sense line inputs to avoid the need to bring the instrument to the test object.

The VG-CS200, with a weight of 7.5kg only, is very handy and easy transportable. The rugged transport case contains all test cables and accessories.

Typical applications are ohmic tests of:

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

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1. Safety Instructions



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.



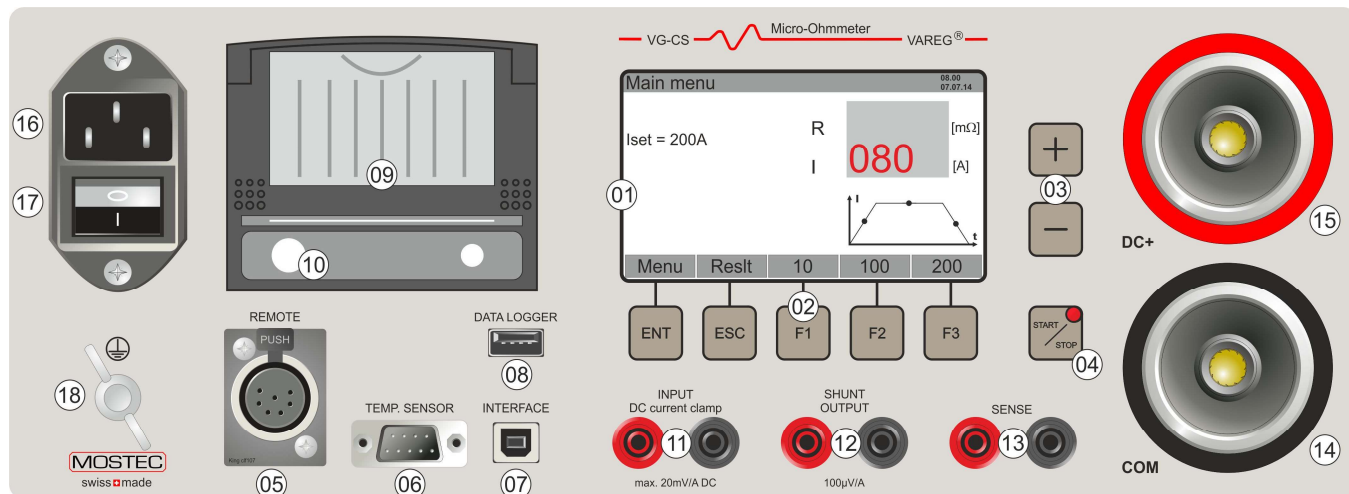
Testing inductive circuits can be hazardous. The VG-CSx00 is a high power instrument, designed for testing resistive loads. It must not be used to test inductive loads.

2. 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 7.

3. Control Panel



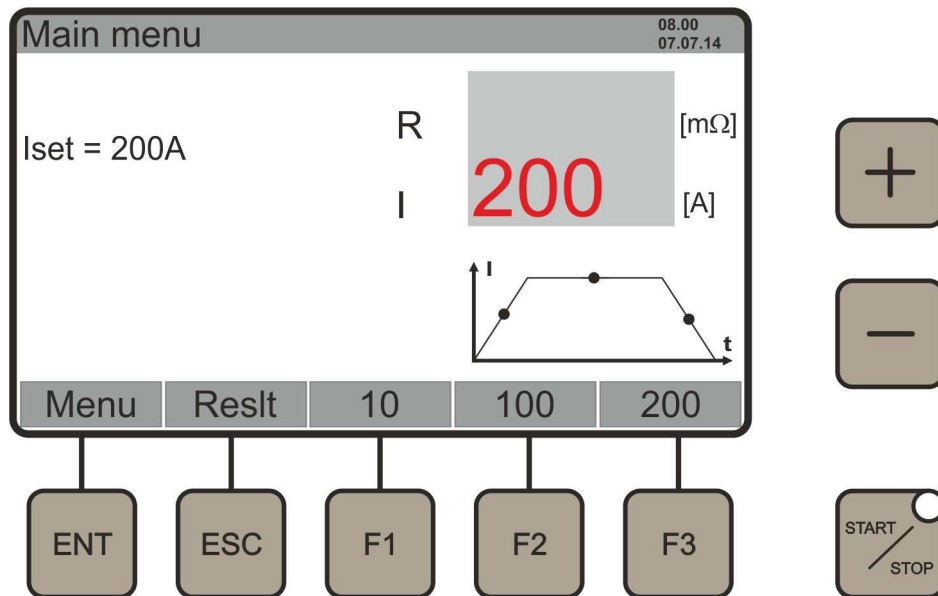
- 01. LCD 4.3" graphic display
- 02. Keys to control the menu functions
- 03. Increment/decrement keys for menus and values
- 04. Start/Stop keys with status LED
- 05. Remote control connector
- 06. Temp. sensor
- 07. Interface
- 08. Data logger / USB stick
- 09. Thermal printer
- 10. Thermal printer button line feed
- 11. Current clamp sense input
- 12. Raw signal shunt voltage terminals
- 13. Sense terminals
- 14. DC - current output
- 15. DC+ current output
- 16. Mains plug
- 17. Main switch
- 18. Ground terminal



Warning: Opening the instrument case voids the warranty.

4. Power ON

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

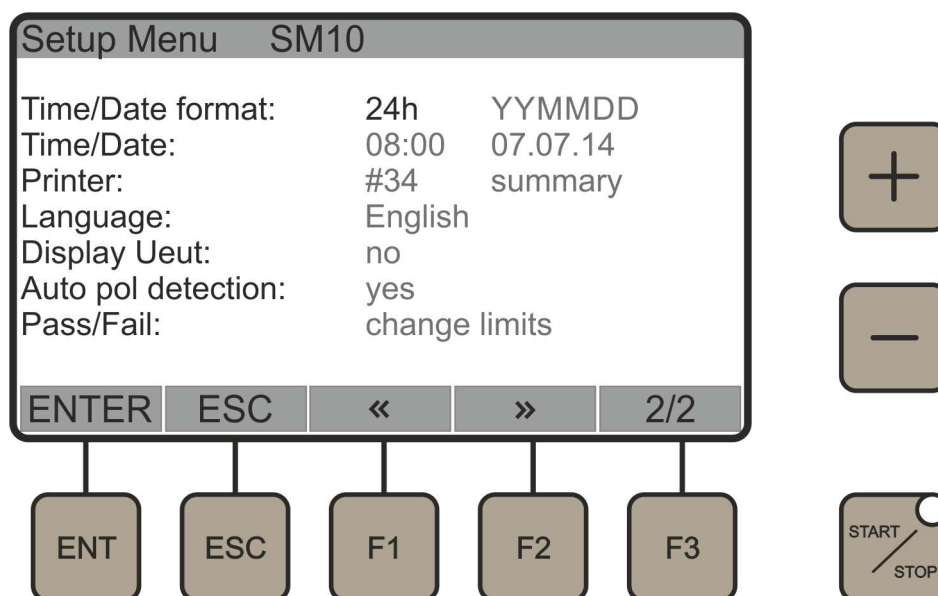
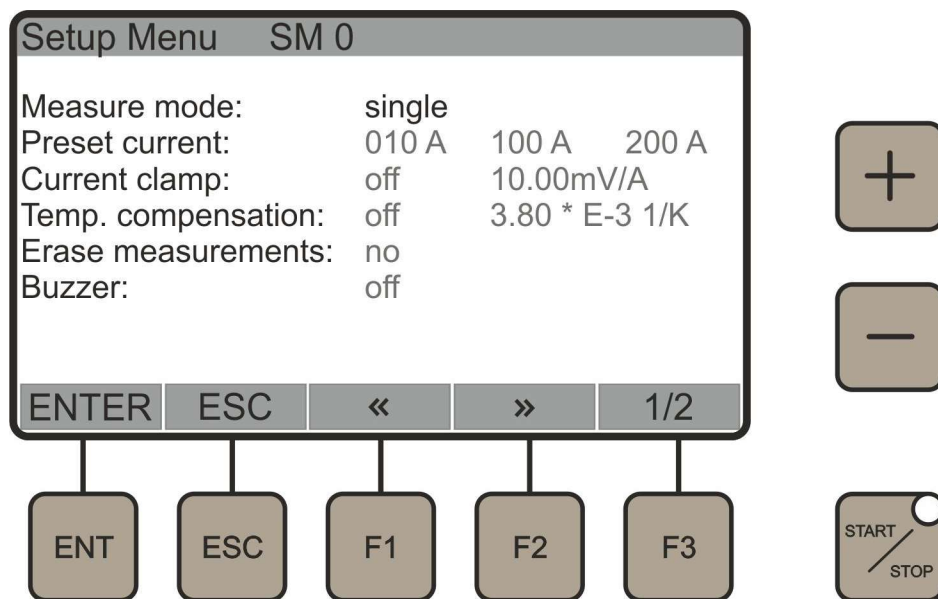


5. Main Menu

- 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. Further explanations see below.
- Reslt = Pressing **[Esc]**, the user enters the window with the measuring results.
- 10A = 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.
- 100A = 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.
- 200A = 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.

6. 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.



6.1. First Page

Menu item	Description	Range of values
SM 0	Measure mode: The measuring current flows continuously until it's interrupted by the user. Single = the measuring current only flows for a fixed given time.	single/continuous
SM 1	Current: Preset current 1. The adjusted value appears in the main menu above [F1] .	5A to 205A (605A)
SM 2	Current: Preset current 2. The adjusted value appears in the main menu above [F2] .	5A to 205A (605A)
SM 3	Current: Preset current 3. The adjusted value appears in the main menu above [F3] .	5A to 205A (605A)
SM 4	Current Clamp: 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.	on/off
SM 5	Current Clamp: Set the sensitivity of the external current clamp in mV/A.	0.10mV/A...20mV/A
SM 6	Temp. Compensation: When this item is ON, the instrument works with the temperature coefficient (α , see SM7). It measures the temperature of the test object with the external temperature sensor and compensates the temperature coefficient of the test object.	on/off
SM 7	Temp. Compensation: Set the value for the temperature coefficient (α) of the test object that will be measured.	-/+ 9.99 x 10⁻³ 1/K
SM 8	Erase measurements: Erases all saved measurements.	yes/no
SM 9	Buzzer: Activates key click and audio warning during measurement and error messages.	on/off

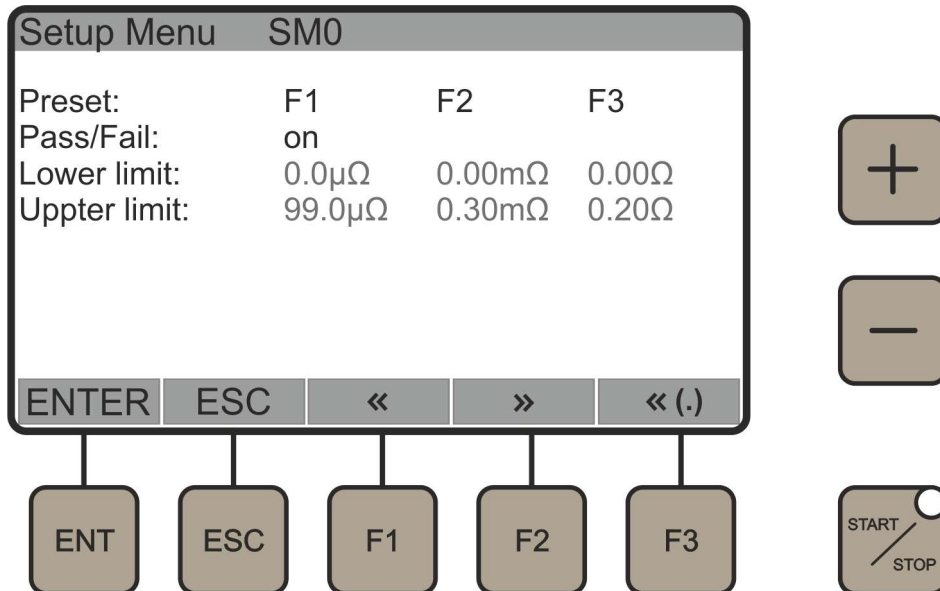
Press **[F3]** for next page.

6.2. Second Page

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

6.3. 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.

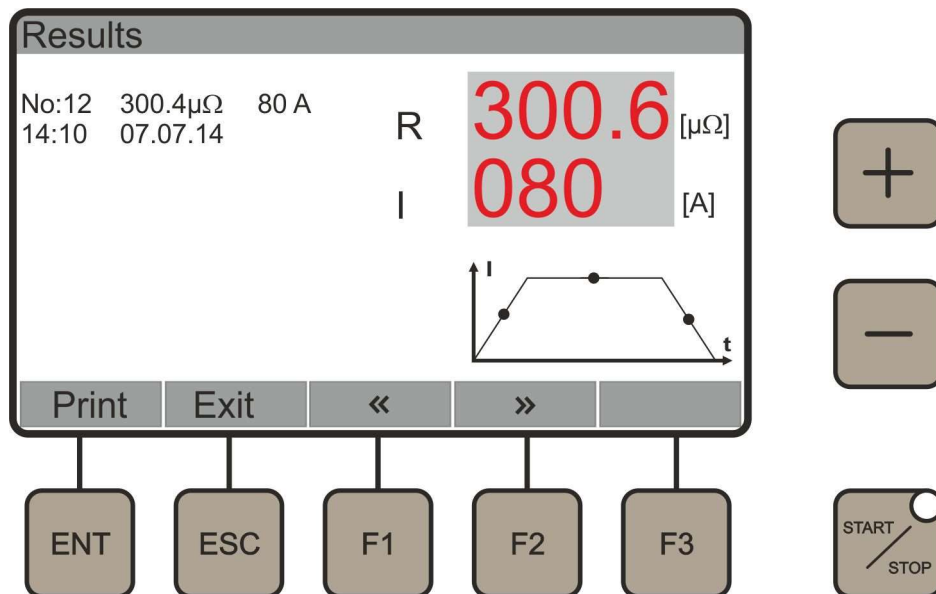


- [Ent]** Save settings and goes back to the system menu
- [Esc]** Goes back to the system menu without saving
- [F1]** Shows the next parameter
- [F2]** Shows the previous parameter
- [F3]** Changes range of selected preset

The 3 limits can be 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.

7. 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. During continuous mode, the result window is continuously updated after a completed measuring cycle. The Micro-Ohmmeter stores the last 100 data sets. Unlimited data sets for the external USB stick.



The window shows the time and date of the running test, storing 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

8. 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.

9. Printer

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

10. Error Messages

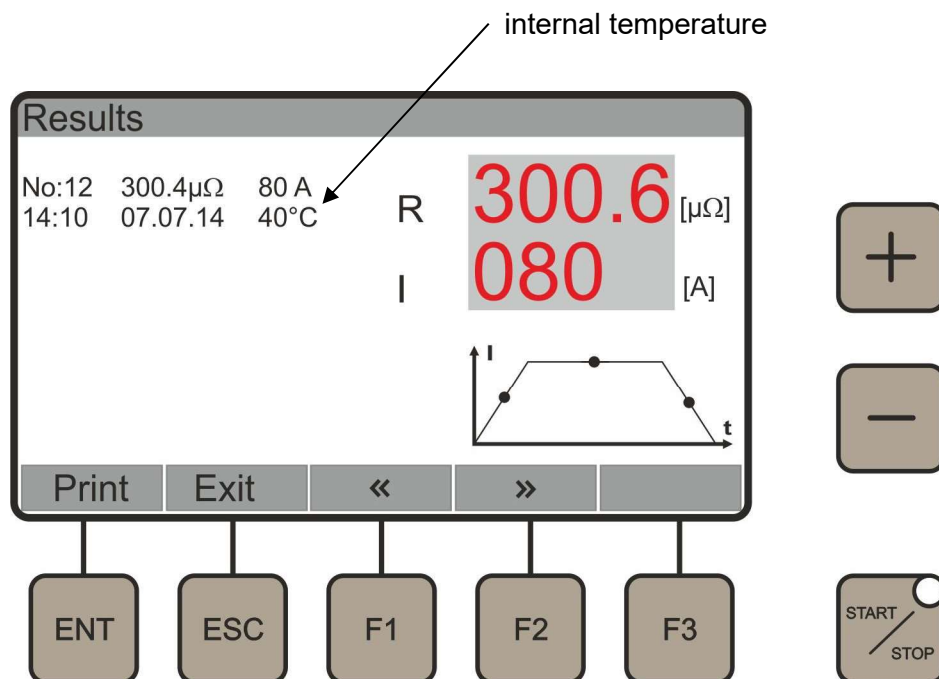
The Micro-Ohmmeter can detect and display different errors.

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.

11. 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.



12. Application Example - one side grounded



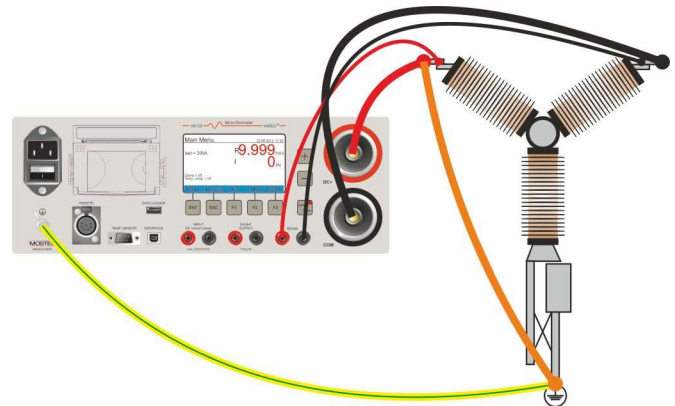
Comply to the **safety regulations** and **operation instructions** when using the Micro-Ohmmeter. See page 4

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 resistance in a breaker or disconnecting switch (isolator), make sure that it is closed before starting.



1. Make certain the mains are de-energized on both sides of the breaker. Ground the breaker on one side and make certain it is closed.
2. Keep the Micro-Ohmmeter disconnected from the mains 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 Micro-Ohmmeter. Connect the other current cable between the other side of the object being tested and the COM terminal on 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 Micro-Ohmmeter to the mains.
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.

Note:

If you are using the instrument the first time, make sure that the continuous mode (Setup Menu SM0, see page 7) is not selected. Also verify that the current clamp is switched off (Setup Menu SM4, see page 8).

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. 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]** or **[ESC]** keys.
11. Turn off and disconnect the Micro-Ohmmeter from the mains before doing any disconnection work or moving any cables or wiring.

13. Application Example - both sides grounded



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

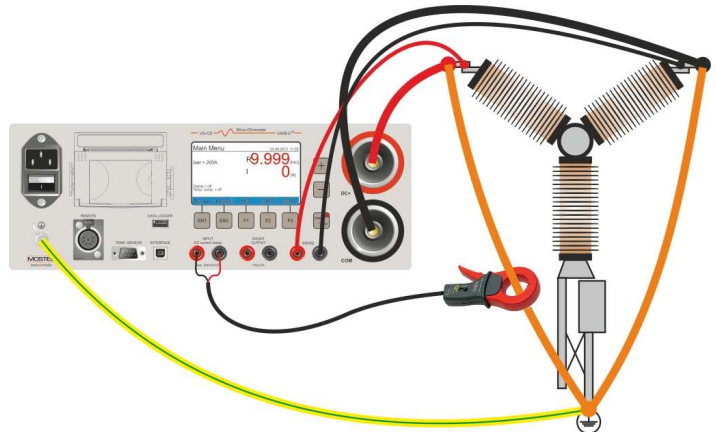
Important:

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 resistance in a breaker or disconnecting switch (isolator), make sure that it is closed before starting.



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 Micro-Ohmmeter disconnected from the mains while making connections.
3. Ground Micro-Ohmmeter
4. Connect one current cable to one side of the object being tested and the DC+ terminal on Micro-Ohmmeter. Connect the other current cable to the other side of the object being tested and the COM terminal on 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. Connect the Micro-Ohmmeter to the mains.
8. Switch on the Micro-Ohmmeter.
9. 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 continuous mode (Setup Menu SM0, see page 7) is not selected.

10. In the "Setup Menu", "SM4" (see page 8) switch on the current clamp and adjust the proper sensitivity of the current clamp you are using.
11. Press the **[START/STOP]** key.
12. You can stop the measurement by pressing **[START/STOP]** or **[ESC]** keys.
13. 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.
14. Turn off and disconnect the Micro-Ohmmeter from the mains before doing any disconnection work or moving any cables or wiring.

14. Verify the measuring current



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

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

Shunt voltage = 100uV/A

Measuring mV

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

10mV

For example: $\frac{10\text{mV}}{100\text{uV/A}} = 100\text{A}$



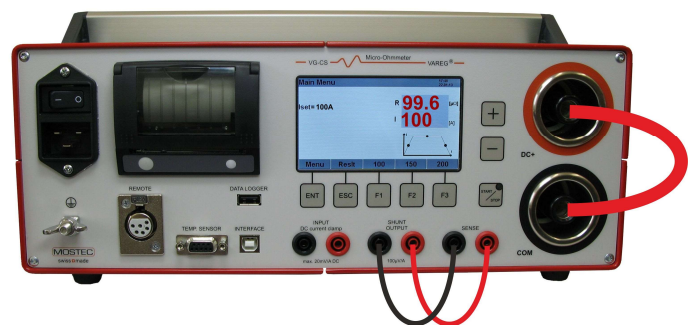
15. Verify the measuring function



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

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")



16. 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:	VG-CS200-II	VG-CS300-II	VG-CS400-II	VG-CS600-II
	5 - 205A	5 - 305A	5 - 405A	5 - 605A
Continuos current:	205A	300A	300A	300A
Maximum test voltage:	5V			
Current ramp:	The test current rises following a linear ramp, holds the preselected value and falls with a linear ramp.			
Measuring interval:	No limitation of the number of current cycles @ 200A for the VG-CS200 No limitation of the number of current cycles @ 300A for the VG-CS300 - 600			
Result data logging:	The last 100 data sets are stored internally. Unlimited data sets for the external USB stick			
Data logger:	Accepts FAT32 formatted USB sticks			
Sense input:	Independent polarity with banana jacks.			
Input voltage:	Max. 5V			
Input impedance:	>200kΩ			
Shunt output:	100μV/A +/-1%, banana jack red = plus, banana jack black = negative			
Shunt voltage:	20mV @ 200A for VG-CS200, 60mV @ 600A for VG-CS600			
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:	-40°C ... +60°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			
Breaker standards:	ANSI C37.09-1979 (5.14), IEC 1208, IEC 694 (6.4)			
Printer:	24-characters, standart thermal paper (58x32mm diameter)			
Unit manipulations:	Keyboard, external PC or Android phone/tablet			
Manipulations:	Menu operated, easy to use			
Power supply:	100...240V, 16A, 50-60Hz			
Power consumption:	1530W @ 5V for VG-CS200, 3030W @ 5V for VG-CS600			
CE-conformity:	Fulfilled			
Dimensions:	L x W x D: 300 x 360 x 130 mm			
Weight:	7.5 kg (VG-CS200), 12 kg (VG-CS600)			
Warranty:	2 Years			
Software (optional):	PC-software to transfer and log stored data sets, Order No: VG-CS WIN			
Accessories:	- Customer specific changes - Without thermal printer - Other ramp times - Current clamp (for example 20mV/A), to measure grounded systems - USB stick			

17. Notes

[illegible]

[illegible]

