

Megger®



MOM690 Micro-ohmmeter

User guide

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MOM690

Micro-ohmmeter

User guide

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1 Introduction

The MOM690 is designed to measure the resistances of breaker contacts, bus-bar joints, contact elements in bus-bars and other high-current links.

When contact resistance rises because of oxidation, loosened or improperly tightened threaded joints, temperatures rise abnormally at the points of contact. This abnormal heating reduces conductivity thereby accelerating the rise in temperature — and this often leads to serious trouble.

The MOM690 can be used to detect such problems early so that they can be remedied long before trouble starts. Checking contact resistance at regular intervals provides a clear indication of the state of your system.

During measurement, the instrument generates a high current. This current must not cause excessive heating inside the instrument. To prevent this, both a thermal fuse and a miniature circuit breaker that serves as a line fuse are provided. The instrument is equipped with an induction protector. For protection against external overvoltages, both the current output and the sensing input are decoupled to ground. A full-wave rectified current, i.e. a pulsating DC current, is used for measurement.

2 Safety

2.1 Symbols on the instrument



Caution, refer to accompanying documents.



Protective conductor terminal.



WEEE, Waste Electrical and Electronic Equipment. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

The unit can also be returned to Megger at any time at no charge for the disposal.

Information duty regarding substances on REACH article 33, SVHC-list

This product contains a coin cell battery which contains 1,2- dimethoxyethane (CAS 110-71-4) above 0.1% by weight.

2.2 Safety instructions



Important!

Read the manual and comply with the following instructions before using the micro-ohmmeter.

Always comply with local safety regulations.



Warning

Before measuring resistances in circuit breakers or disconnecting switches (isolators), always check to see that the object being tested is closed and grounded on one side.

If there is a current transformer in the current circuit, the protective relay equipment that is connected to it must be blocked to prevent actuation. After completing your measurements, you can follow the normal procedures that are used to demagnetize current transformer cores after DC has passed through their current transformer.

Never open a circuit breaker while a MOM690 is connected to it.

The outputs DC+ and AC must not be loaded at the same time.

Connection points for current cables can become hot during current generation.

Current continues to flow for a while after the MOM690 is turned off. How long it continues depends on the ratio of the components in the L/R circuit.



Important

Always connect protective earth (ground)

Always use safety connecting leads.

Always turn the equipment off before connecting.

High voltage/current on input/output terminals.

Never leave the instrument unattended while it is turned on and in the highcurrent mode.

Unplug the instrument from the mains supply when it is left unattended or not in use.

Do not attempt to service the instrument yourself. Opening or removing covers may expose you to dangerous voltage. If you attempt to service the instrument yourself the warranty is no longer valid.

Do not use any accessories that are not intended for use together with the instrument.

Disconnect the instrument from the mains before cleaning. Use a damp cloth for cleaning. Do not use liquid cleaners or aerosol cleaners.

Use only approved mains detachable cable set with the instrument. Main supply cables shall be rated for the maximum current for the equipment and the cable shall meet the requirements of IEC 60227 or IEC 60245. Mains supply cables certified or approved by a recognized testing authority are regarded as meeting this requirement.

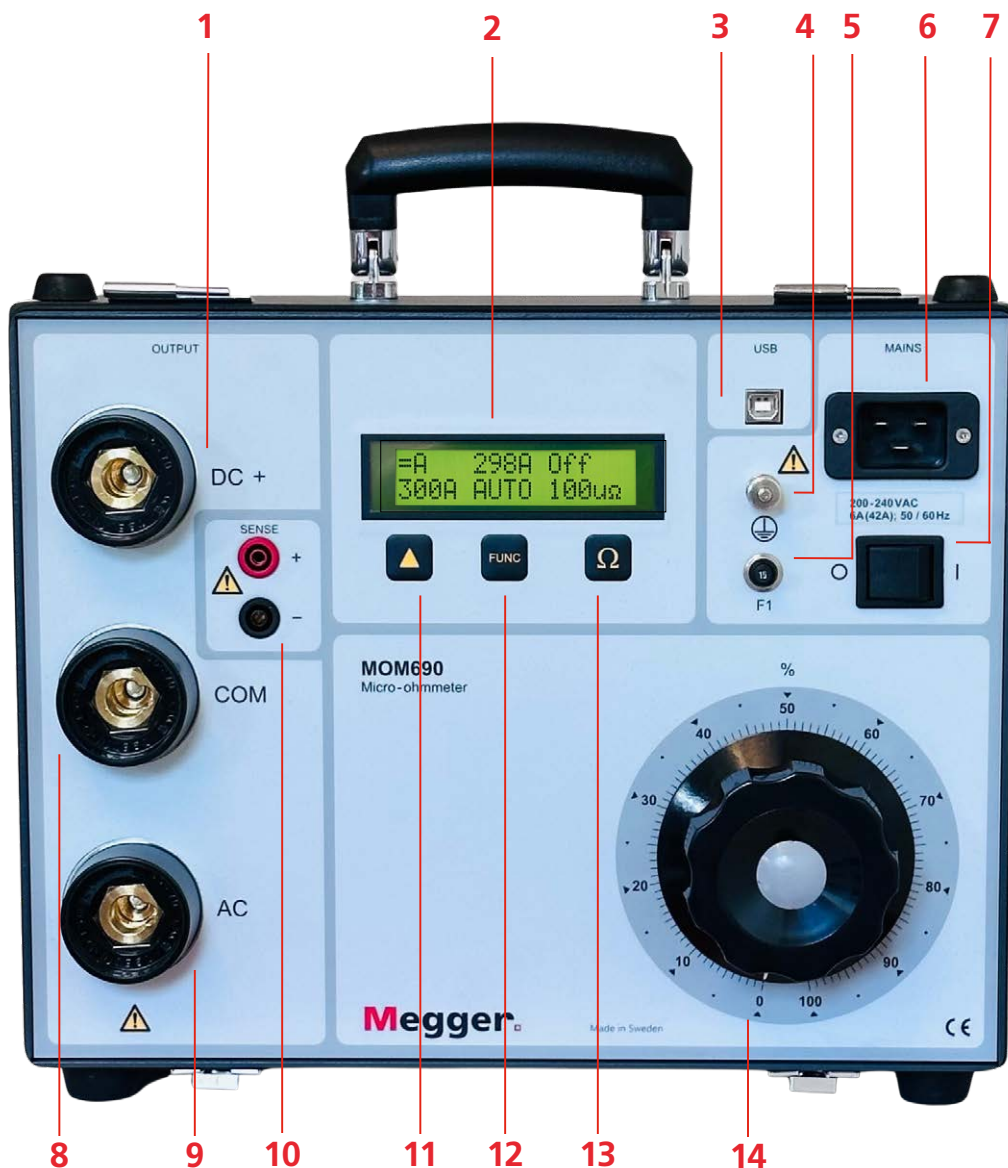
Refer all servicing to Megger authorized personnel.

If you need to return the instrument, please use either the original crate or one of equivalent strength.

3 Control panel

3.1 Panel description

1. DC current output
2. Display
3. USB service port
4. Grounding terminal
5. Miniature circuit breaker for mains
6. Connection for mains voltage
7. Switch for mains voltage
8. Common output terminal
9. AC current output
10. Voltage measurement input
11. Setting selector
12. Function selector
13. Interrupts current and toggles the display between resistance and voltage
14. Variable transformer



3.2 Display

Indicates whether the current is above (>) or below (<) a preselected value.

Value of the generated current.

Information about current generation or memory location.

>A	123A	DC On
100A	AUTO	100 $\mu\Omega$

Selected test current for "Auto"/"DC Off"
Scroll using the <▲>-key.

Selected function. Scroll using the <FUNC>-key.

Shows the measured resistance or voltage value. Toggle by pressing the <Ω>-key.

Menu options

You can make different settings with the keys beneath the display.

Select language

>A	118A	DC On
100A	AUTO	63 $\mu\Omega$

- 1] Press the <FUNC>-key to enter the "AUTO" or "MAN" mode.
- 2] While holding down the <▲>-key, press the <FUNC>-key.

Select language		
ENGLISH		OK

- 3] Use the <▲>-key to scroll to the desired language.
- 4] Finish by pressing the <↵>-key.

Save test results

Record Mem1-30		
On	REC	Save

The memory function is turned on or off using the <▲>-key. When you take measurements in the "MAN" or "AUTO" mode, the values measured are stored in the memory.

>A	123A	Rec>1
100A	AUTO	67 $\mu\Omega$

Memory locations are filled successively until all 30 are full, whereupon the next measured value replaces the oldest of those already in the memory.

100A	Mem-8
View	57 $\mu\Omega$

To view the values stored in memory, scroll to "PLAY" using the <FUNC>-key. Then step forward in the memory by pressing the <▲>-key (hold the key down to step faster). Press the <Ω>-key to view the voltage value, and press it a second time to view the resistance value.

Note Values stored in memory vanish when you turn of the MOM690.

Save values permanently

- 1] To save the values permanently, you scroll to the "REC" position using the <FUNC>-key.
- 2] Then press the <Ω>-key, whereupon the values will be saved.

Saving Mem1-30..

Reset all values in the memory

- 1] Step to "AUTO" or "MAN" using the <FUNC>-key.
- 2] While holding down the <▲>-key, press the <Ω>-key.
- 3] Press the <FUNC> key to reply "Yes".

Program version

To view the program version, first press the <FUNC>-key and then, while holding it down, press the <Ω>-key.

4 Operating instructions

4.1 Connection setup



Important

Read the manual and comply with the Safety instructions, see page 6, before using the micromhmmeter. Always comply with local safety regulations.



Warning

If there is a current transformer in the current circuit, the protective relay equipment that is connected to it must be blocked to prevent actuation.

If you are measuring resistance in a circuit breaker or disconnecting switch (isolator), make sure that it is closed before starting. High current must only flow throughout a short interval. Never leave the instrument unattended while it is turned on and in the high-current mode.

- 6] Connect the MOM690 to the mains and switch it on.

Note *Since power consumption is high, the instrument requires a 16 A fuse.*

- 7] Select "AUTO" or "MAN" with the <FUNC>-key.

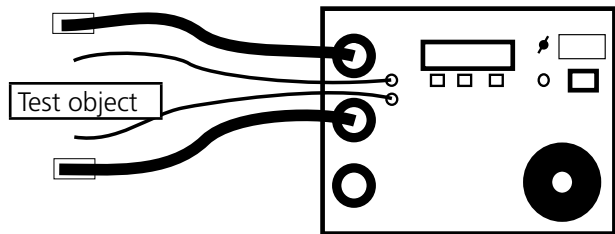


Fig. 1

- 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 MOM690 disconnected from the mains while making connections.
- 3] Ground the MOM690.
- 4] Connect one current cable between one side of the object being tested and the DC+ terminal on the MOM690. Connect the other current cable between the other side of the object being tested and the COM- terminal on the MOM690.
- 5] Connect the two sensing cables (using the same polarities as those used for the current cables) on two sides of the test object and as close to the test object as possible.

Important:

The sensing cables must be connected inside the current cables. Otherwise the test data may be incorrect. See Fig. 1.

4.2 Operating

Safety functions

Timed current cut-off

Current from the instrument is interrupted automatically after a certain interval whose length depends on the value of the current. Repeated short beeps are heard before the current is interrupted. When you hear them, you should reduce the current or press the $\langle \Omega \rangle$ -key. "O.L.!" will appear on the display.

O.L.!	420A	DC On
MAN	63 $\mu\Omega$	

High temperature

If the temperature in the instrument rises too high, repeated short beeps are heard, and the display shows:

! OVERHEATED
Please wait...

The temperature must drop before you can continue.

Measuring in AUTO mode

- 1] Select the desired current using the $\langle \blacktriangle \rangle$ -key.
- 2] Turn the knob on the variable transformer down to 0, whereupon it will enter the current-generation mode.
- 3] Turn the knob on the variable transformer to the right. When the current reaches the preselected value, "A" appears on the display and a long beep is heard. The current is interrupted. The display shows the word "Off" and the values are frozen.

Note *When the current is lower or higher than the preselected value, "< A" or "> A" respectively appears on the display. When the current exceeds (passes) the preselected measurement current a short beep is heard.*

- 4] Turn off and disconnect the MOM690 from the mains before doing any disconnection work or moving any cables or wiring.

Measuring in MAN mode

- 1] Turn the knob on the variable transformer down to "0", whereupon it will enter the current-generation mode.
- 2] Now turn the knob on the variable transformer to the right until the current rises to the desired value.
- 3] Press the $\langle \boxtimes \rangle$ -key, the instrument will cut off the current and hold the measured values.
- 4] Turn off and disconnect the MOM690 from the mains before doing any disconnection work or moving any cables or wiring.

Demagnetizing current transformer cores

It is important to demagnetize current transformer cores after DC has passed through the current transformer.

- 1] After measurement is finished, connect the DC current cable to the AC output.
- 2] Select the "AC" function using the $\langle \text{FUNC} \rangle$ -key.

<10%	0A	Off
129A	AC	

- 3] The highest frozen current value appears at the bottom of the left side of the display.
- 4] Increase the current until "< 10%", shown at top left on the display, changes to "> 10%". A long beep will be heard simultaneously, and the frozen current value will be erased from the memory.
- 5] Decrease the current down to zero.

Calibration

An external calibration shunt (600 A/60 mV) is available as an accessory. Art.No: BB-90024

4.3 Application examples

Measuring resistance in a breaker



Important

Read the manual and comply with the Safety instructions, see page 6, before using the micromhmmeter. Always comply with local safety regulations.

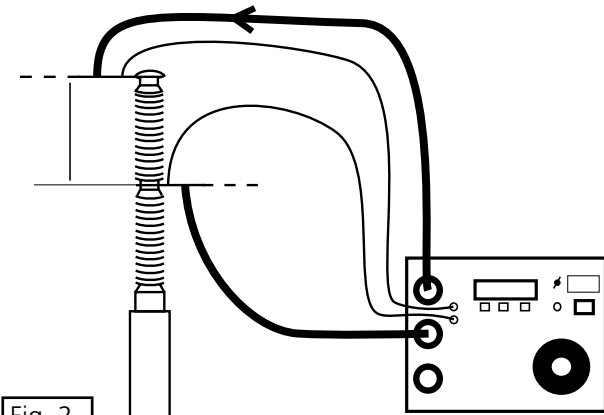


Fig. 2

- 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 MOM690 disconnected from the mains while making connections.
- 3] Ground the MOM690.
- 4] Connect the current cables and the sensing cables (with the same polarities) on both sides of the breaker. The sensing cables must be connected inside the current cables. Otherwise the test data may be incorrect. See fig. 2.
- 5] Connect the MOM690 to the mains.
- 6] Switch on the MOM690.
- 7] Select "AUTO" or "MAN" with the <FUNC>-key.
- 8] See also the sections headed "Measuring in MAN mode" and "Measuring in AUTO mode".
- 9] Turn off and disconnect the MOM690 from the mains before doing any disconnection work or moving any cables or wiring.

Measuring resistance at bus-bar joints



Important

Read the manual and comply with the Safety instructions, see page 6, before using the micromhmmeter. Always comply with local safety regulations.

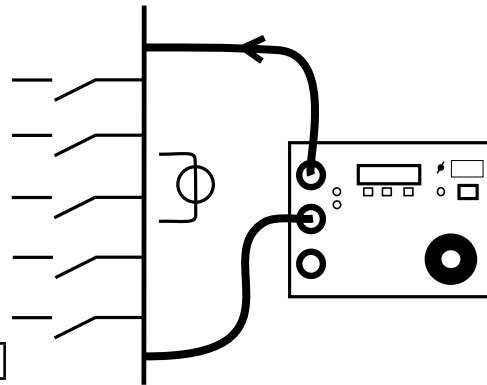


Fig. 3

- 1] Make certain the mains are de-energized on both sides of the bus-bar. Ground the bus-bar on one side.
- 2] Keep the MOM690 disconnected from the mains while making connections.
- 3] Ground the MOM690.
- 4] Connect the MOM690's current cables to the test object. Do not connect the sensing cables. Measurement will be done manually using an external portable voltmeter.
- 5] Connect the MOM690 to the mains.
- 6] Switch on the MOM690.
- 7] Select "MAN" with the <FUNC>-key.
- 8] Turn down the knob on the variable transformer to 0.
- 9] Increase the current to the desired value.
- 10] Using an external voltmeter, measure the voltage drop (voltage) across each contact element within every section of the bus-bar being tested. The multimeter must be set to DC and to measure voltage.
- 11] Calculate the actual resistance yourself.
Example: If the voltage drop is 0.0067 V at a current of 100 A, the resistance will be 0.0067/100 ohms, i.e. 67 microhms.
- 12] Turn off and disconnect the MOM690 from the mains before doing any disconnection work or moving any cables or wiring.

4.4 Software

A PC program is available as an accessory. The PC is connected via the serial port on the MOM690. Using a Windows program named MOMWin, you can conduct further analyses and prepare reports of the results. The MOM690 can be controlled from a PC during measurement, but the user can also retrieve previously stored measurement results for analysis. All measured values are saved in ASCII format and can be exported easily to your favorite spreadsheet program (not included with MOMWin). Results can be presented graphically or in table form in MOMWin.

PLEASE DELETE 4.4 SOFTWARE AND REPLACE IT WITH

4.4 Troubleshooting

4.4 Troubleshooting

Fault	Cause	Remedy
The display presents O.L.	The measuring range of the instrument has been exceeded.	If possible, select a different current range.
	Poor contact at measurement cables.	Check the connections.
Thermal miniature circuit breaker has tripped.	Overload.	Wait for the instrument to cool down.
Miniature circuit breaker that serves as a line fuse has tripped.	Overload or faulty instrument.	Reset the miniature circuit breaker. If it trips again, contact service personnel.

5 Specifications

SPECIFICATIONS

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

Environment

Application field The instrument is intended for use in high-voltage substations and industrial environments.

Temperature

Operating 0°C to +50°C (32°F to +122°F)
Storage & transport -40°C to +70°C (-40°F to +158°F)
Humidity 5% – 95% RH, non-condensing

CE-marking

LVD 2014/35/EU
EMC 2014/30/EU
RoHS 2011/65/EU

General

Mains voltage 115/230 V AC, 50/60 Hz
Power consumption (max) 115 V, 5980 VA (at 600 A output)
 230 V, 9660 VA
Protection Miniature circuit breaker, thermal fuse, software

Dimensions

Instrument 350 x 270 x 220 mm
 (13.8" x 10.6" x 8.7")
Transport case 610 x 290 x 360 mm
 (24.0" x 11.4" x 14.2")
Weight, 115 V model 24 kg (52.9 lbs)
 38.9 kg (85.7 lbs) with accessories and transport case
Weight, 230 V model 23.7 kg (52.2 lbs)
 38.6 kg (85.1 lbs) with accessories and transport case
Available languages English, French, German, Spanish, Swedish

Measurement section

Ammeter

Range 0 – 800 A
Resolution 1 A
Inaccuracy 100 – 800 A, ±1% of reading + 1 digit
 50 – 99 A, ±(2% of reading + 2 digits)
 0 – 49 A, not specified

Resistance

Range 0 – 200 mΩ, > 200 mΩ not specified
Resolution 1 μΩ
Inaccuracy 100 – 800 A, ±1% of reading + 1 digit
 50 – 99 A, ±(2% of reading + 2 digits)
 0 – 49 A, not specified

Max. load resistance / current, 115 V model

Cable set	Standard	Standard + Ext. 1	Standard + Ext. 2	2 x 15 m 95 mm ²
At 300 A	10 mΩ	6 mΩ	3 mΩ	10 mΩ
Max. current	575 A	420 A	360 A	540 A

Max. load resistance / current, 230 V model

Cable set	Standard	Standard + Ext. 1	Standard + Ext. 2	2 x 15 m 95 mm ²
At 300 A	18 mΩ	14 mΩ	11 mΩ	18 mΩ
At 600 A	3.0 mΩ			1.8 mΩ
Max. current	750 A	570 A	480 A	690 A

Output DC (CAT I), 115 V model

Current (A)	Voltage (V)	Max. load time	Input current (A)
0	7.3	–	0.8
50	6.9	30 min.	
100	6.4	10 min.	10
200	5.5	60 s	19
300	4.8	35 s	
400	3.9	20 s	38
500	3.0	10 s	
575 ¹⁾	2.5	2 s	
600	2.2	0.5 s	52
700	1.5	0.2 s	
800 ²⁾	0.9	–	

1) Maximum current with standard cables 2 x 5 m 50 mm²

2) At 800 A and above, instant shut off

Note: The above figures shows maximum load time from cold state 25°C. They are not valid for repeated tests

Output AC (CAT I), 115 V model

Current (A)	Voltage (V)	Max. load time	Rest time
0	8.7	Cont.	–
660	3.5	2 s	4 min.

Note: The DC and AC outputs must not be loaded at the same time.

Output DC (CAT I), 230 V model

Current (A)	Voltage (V)	Max. load time	Input current (A)
0	9.4	–	0.4
50	9.0	30 min.	
100	8.6	10 min.	6
200	8.0	90 s	
300	7.2	30 s	
400	6.4	20 s	
500	5.7	10 s	
600	5.0	5 s	33
700	4.3	3 s	
750 ¹⁾	3.8	2 s	
800 ²⁾	3.6	–	42

1) Maximum current with standard cables 2 x 5 m 50 mm²

2) At 800 A and above, instant shut off

Note: The above figures shows maximum load time from cold state 25°C. They are not valid for repeated tests

Output AC (CAT I), 230 V model

Current (A)	Voltage (V AC)	Max. load time	Rest time
0	11.2	Cont.	–
660	4.5	2 s	4 min.

Note: The DC and AC outputs must not be loaded at the same time.

Cable sets – load currents

	Cable set			
	Standard 2 x 5 m, (16.4 ft) 50 mm ²	Standard + Ext. 1	Standard + Ext. 2	2 x 15 m (49.2 ft) 95 mm ²
Maximal current at 100 μΩ	750 A ⁽¹⁾ 575 A ⁽²⁾	570 A ⁽¹⁾ 420 A ⁽²⁾	480 A ⁽¹⁾ 360 A ⁽²⁾	690 A ⁽¹⁾ 540 A ⁽²⁾
Max. load at 300 A	18 mΩ ⁽¹⁾ 10 mΩ ⁽²⁾	14 mΩ ⁽¹⁾ 6 mΩ ⁽²⁾	11 mΩ ⁽¹⁾ 3 mΩ ⁽²⁾	18 mΩ ⁽¹⁾ 10 mΩ ⁽²⁾
Max. load at 600 A	3.0 mΩ ⁽¹⁾	–	–	1.8 mΩ ⁽¹⁾
(1 MOM 690 for 230 V		(2 MOM 690 for 115 V		
Ext. 1 = 2 x 5 m (16.4 ft) 50 mm ²		Ext. 2 = 2 x 10 m (32.8 ft) 50 mm ²		



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