

MPK-2000e

Digital micro-ohmmeter

User's guide

GU-1294

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Safety Precautions

- This equipment should be operated only by qualified and duly trained people, closely observing the corresponding safety regulations and instructions contained in the present User guide.
- It should be checked that the item to be measured is voltage free.
- Before starting with the measurements, be sure that the battery is well charged and that the line voltage is between specified limits.
- Do not connect or disconnect the test leads during the measurement.
- There are no adjustable parts or parts that can be replaced by the user within the equipment. Taking out the Control Panel in order to have an access to the internal parts may be dangerous as there are high voltages inside, capable of causing fatal accidents.
- Cleaning of this instrument should be carried out using a soft cleaning liquid, after verifying that it doesn't attack the plastic parts used in the case and in the Control Panel of this equipment.

This equipment should be used only by a trained and competent person, strictly applying suitable safety rules.

Used symbols



Caution, refer to User Guide.

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1. Description

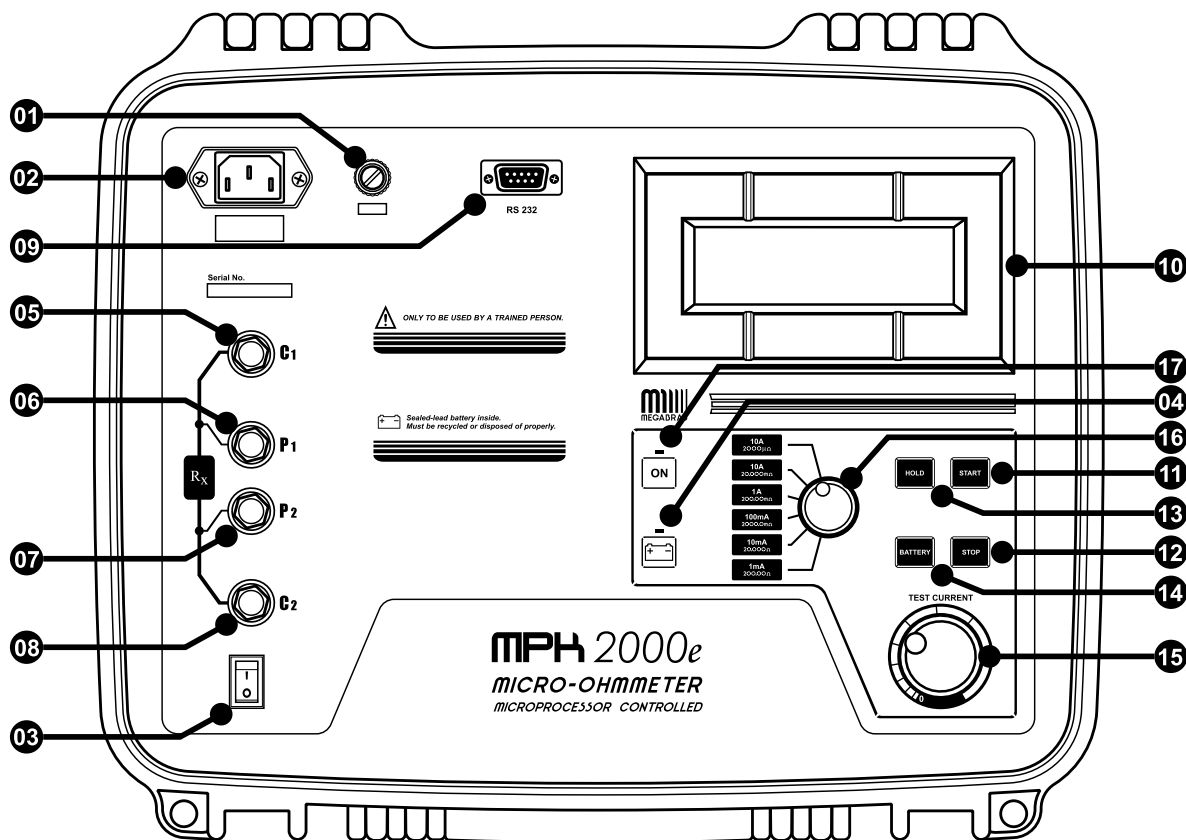
The **MPK-2000e** micro-ohmmeter is a portable, microprocessor controlled instrument, used to accurately measure very low contact resistances of breakers and switches, busbars, transformers and engines windings, etc, with test currents from 1 mA to 10 A.

- Kelvin architecture (four-terminal method).
- Digital reading, alphanumeric display.
- Up to 4½ digits readings.
- Powered by rechargeable battery or mains supply.
- 0.1 $\mu\Omega$ resolution.
- 200 Ω maximum reading.

1.1. Operating principle

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

2. Control panel



- 01 Fuse.
- 02 Power cord connector.
- 03 On/Off switch.
- 04 Battery charge indicator.
- 05 Current terminal (C+).
- 06 Potential terminal (P+).
- 07 Potential terminal (P-).
- 08 Current terminal (C-).
- 09 RS232 data output.
- 10 Alphanumeric display. Shows both the measured resistance value and messages to the operator.
- 11 Start key.
- 12 Stop key.
- 13 Hold key. It retains the last measurement in the display.
- 14 Battery key. To measure the battery charge condition.
- 15 Test current control.
- 16 Range and test current selector.
- 17 On led.

3. Power supply

Mains supply or internal battery powered

Battery: rechargeable, 12 V - 7 Ah.

Mains: 100 - 240 V~

3.1. Battery condition

The charge condition of the battery can be verified before or during the resistance measurement. In order to achieve that, the operator has to press the **battery** **14** key while the equipment is turned on. The bargraph shows remaining charge as a percentile value. If during measurement the charge of the battery achieves a critical level, the display will show the **BAT** message notifying that the charge level is low. After a few minutes the measurement will be automatically interrupted in order to preserve the battery from a deep discharge that is prejudicial for its expected useful life.

3.2. Battery charger

This equipment has an internal battery charger with a smart, microprocessor-controlled circuit, which adjusts the battery charge to the optimized parameters to ensure the maximum service life.

Charging procedure:

- Check that the **On/Off** **03** switch is in Off.
- Connect the equipment to the mains supply.
- The **battery charge indicator** **04** will keep on lightning with a red light up to completing the charge. At that point, it will change to a green light, being like this up to the equipment disconnection from the mains supply.

If, during the battery charge, the equipment is turned ON, the charge will be momentarily interrupted, returning to the charge process once the equipment is turned OFF.

The rechargeable battery does not show the “memory effect” and there are no restrictions to start charging it as many times as is needed. However the battery could be damaged if remains in deep discharge for a while.

To avoid this effect, charge the battery before left the equipment in storage and don't let pass more than 30 days without recharge, even if the instrument wasn't used (under storage, the battery loses part of its charge).

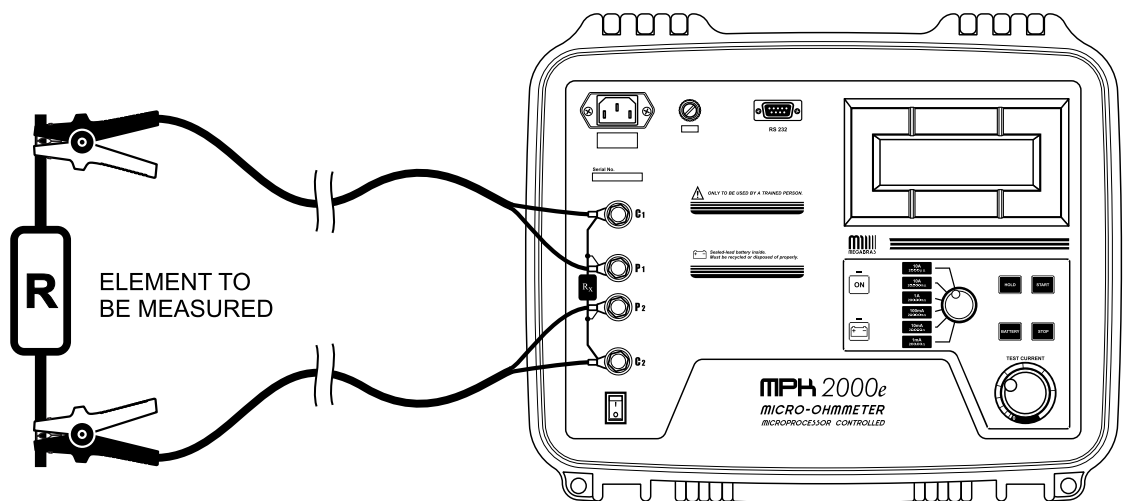


At the end of battery useful life, the battery must be recycled or disposed of properly, in order to protect the environment.

4. Measurement

It should be checked that the item to be measured is voltage free.

1. Before turning the equipment On, connect the test leads to the item to be measured and to the front panel terminals.



The alligator clamps in the drawings are only for illustration.

2. Using the **test current selector** ⑩, choose the range and the current to be used.
3. Choose the power supply to use. If you are going to use the battery, advance to the following point. If you are going to use the mains supply, plug the power cord into the **connector** ②.
4. Switch the equipment On using the **On/Off** ③.
5. The *PRESS START* message will appear showing that measurement can be started. Press the **Start** ⑪ key. Depending on the position of the **test current control** ⑮ the *LOW CURRENT* message will turn up.

6. Turning the **test current control** ⑮ clockwise increases the current. Adjust this control until obtaining the desired value or until the current indicator (bargraph) indicates 100%. The bargraph will show the test current value as a percentage of the nominal value selected by using the **test current selector** ⑯.
7. The lowest current for measuring is 10% of the nominal value. It is important to consider that the measurement errors increase while test current decreases. The equipment accuracy is specified for test currents higher than 80%.
8. The **display** ⑩ will show the resistance value measured and the corresponding unit (Ω [ohms], $m\Omega$ [milli-ohms] or $\mu\Omega$ [micro-ohms]).
9. The value can be retained in the display by pressing the **hold** ⑬ key. Pressing this key again, the value will be released.
10. Press the **Stop** ⑫ key in order to finish the measurement. Do not turn Off the equipment without pressing the **Stop** ⑫ key before.
11. Finally, when finishing measurements, turn the equipment Off using the **On/Off** ⑭ switch.

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

5. Messages

SOURCETRONIC MPK-2000e

When turning the equipment On using the **On/Off 03** switch, this introductory message appears for a while. During that time, the equipment carries out some functional checking.

WAIT...

This message appears each time the equipment needs to adjust any parameter in order to optimize the readings.

PRESS START

The equipment is ready to start a measurement, thus the operator has to press the **Start 11** key.

LOW CURRENT

It shows that the test current is not enough to carry out the reading. It appears at the beginning of each test and it keeps on being there up to the operator rotates the **test current control 15** clockwise, as necessary for the test current to be higher than 10 % of the nominal current in the scale. The inappropriate connection of the cables may cause a difficult circulation of test current. If this message keeps on being displayed, please check that the current cables are connected appropriately.

OVERRANGE

It indicates that the measured resistance is higher than the maximum value readable in the selected range.

H

Indicates that the value is the one retained in the memory when pressing the **hold 13** key.

BAT

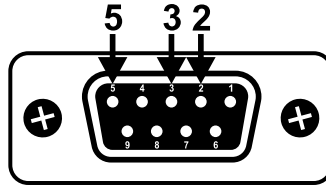
It shows that the battery is quite discharged. It is necessary the battery to be recharged.

6. Some notes about accuracy

In order to obtain the specified accuracy, the operator has to adjust the test current to a value higher than the 80% of the nominal value. If it were necessary, it is possible to use a lower current, but by doing this the accuracy will be affected.

MPK-2000e has an auto-compensation system that automatically eliminates the error produced by internal offset. Thus, it is not necessary to carry out measurements by reversing the polarity in order to compute the average value. Nevertheless, if the operator suspect that there is a difference of temperature between the contact points that would can generate thermoelectric voltages, it is necessary to carry out two measurements by reversing the current cables and so, the circulation sense of the current through the resistance under measurement. The resistance value to be measured will be the average between the values in one sense and in the contrary (direct and inverse current).

7. RS232 output



The equipment has an **RS232 09** data output in the control panel that can be used to register measurements in a serial printer or data collector. The outputs are the following ones:

- Pin 2: Rx ; Pin 3: Tx ; Pin 5: Gnd;
- Rate: 4800 bps
- 8 bits - no parity - 1 stop bit (8,n,1)

Note: In order to assure the compatibility with most printers available in the market, the resistance units are shown with the following symbols:

- uR = micro-ohm
- mR = milli-ohm
- R = ohm

8. Cleaning

The panel, terminals and connectors of the equipment must stay dry and clean. Cleaning should be made using a wet cloth in water and a soft detergent or isopropyl alcohol (be sure that the products to be used for cleaning does not affect plastic goods).

9. ⚠ Replacement fuse

To check the instrument **fuse 01**, remove it with a screw driver. If the fuse is ruptured replace it by another with the following specifications:

Fuse Schurter, model SPT 5x20 (Time-lag) 5A/250V. High breaking capacity.

10. Technical specifications

Test currents	: 1 mA - 10 mA - 100 mA - 1 A - 10 A. Each current may be continuously adjustable from 0 to 100%.
Resistance ranges	: 0 - 2000 $\mu\Omega$ @ 10 A 0 - 20 m Ω @ 10 A 0 - 200 m Ω @ 1 A 0 - 2000 m Ω @ 100 mA 0 - 20 Ω @ 10 mA 0 - 200 Ω @ 1 mA
Resolution	: 0.1 $\mu\Omega$ @ 10 A
Output voltage	: Up to 10 Vd.c. @ 1 A (open circuit).
Measurement principle	: Four-terminal, Kelvin-type.
Basic accuracy	: \pm (0.10% of reading + 0.005% of full range)
Advanced features	: Digital direct reading of very low resistances in the alphanumeric display, with up to 4½ digits. Very fast and accurate measurements.
Serial data output	: RS232 @ 4800 bps. Suitable for data collection in an external serial printer, computer or data-logger.
Environmental protection	: IP54 with closed lid.
Safety class	: Meets the requirements of IEC 61010-1:1990, IEC 61010-1:1992 amendment 2
Power supply	: Rechargeable battery 12 V - 7 Ah or 100-240 V~ mains supply.
Built-in battery charger	: 100-240 V~ mains supply.
Operating temperature range	: -5°C to 50°C
Storage temperature range	: -25°C to 65°C
Humidity range	: 95% RH (non condensing)

Weight	: Approx. 8,8 kg (including battery and accessories)
Dimensions	: 378 x 308 x 175 mm
Accessories	: 2 Combined current and potential leads (1.8 m). 1 Communication cable (RS232). 1 Power cord. 1 User guide. 1 Carrying bag.

Subject to technical change without notice.

11. Warranty

SOURCETRONIC warrants to the original purchaser that each instrument it manufactures will be free from defects in material and workmanship under normal use and service. The warranty period is valid for 12 months, except the built-in rechargeable battery that has 6 months, and begins on the date of shipment. The manufacturer's warranty does not apply to any product or accessories which, in the manufacturer's opinion, have been misused, altered, neglected, or damaged by accident or abnormal conditions of operation and handling.

To obtain warranty service, send the equipment, with a description of the difficult, shipping and insurance prepaid, to SOURCETRONIC. The manufacturer assumes no risk for damage in transit. SOURCETRONIC will, at its option, repair or replace the defective equipment free of charge or refund your purchase price. However, if SOURCETRONIC determines that the failure was caused by misuse, alteration, accident or abnormal condition or handling, you will be charged for the repair and the repaired equipment will be returned to you transportation prepaid.

This warranty is exclusive and is instead of all other warranties, express or implied, including but not limited to any implied warranty or merchantability or fitness for a particular purpose or use. SOURCETRONIC will not be responsible for any special, indirect, incidental, or consequential damages or loss of data, whether in contract, or otherwise.

For application or operation assistance or information on SOURCETRONIC products, contact:

SOURCETRONIC

Georg-Groening-Strasse 47, D-28209 Bremen, Germany

Fax: (+49) 421 – 277 99 98 - email: info@sourcetric.com

Liability limitation

The liability for malfunctioning of the equipment is limited to the application of the warranty pursuant to the aforementioned provisions. The manufacturer does not take any responsibility for any eventual damage due to the use or impossibility to the use of the equipment such as accidents in the field, loss of profit, etc.

Notes
