

# **USER MANUAL**

## **INSULATION RESISTANCE METER**

**MIC-10**

# MIC-10

Test leads connections



Start of measurement procedure

**SET/SEL** - enter the meter settings, select the digit to change

Shift/selection: right/left, up/down

Meter turn on and off (when pressed for 2 sec.), Backlight on and off

**ESC** - exit to the last screen, leave without saving changes

Approve

## SELECTOR SWITCH

Measurement function selection:

- **U<sub>±</sub>** - voltage measurement
- **50V** - insulation resistance measurement with test voltage of 50V
- **100V** - insulation resistance measurement with test voltage of 100V
- **250V** - insulation resistance measurement with test voltage of 250V
- **500V** - insulation resistance measurement with test voltage of 500V
- **1000V** - insulation resistance measurement with test voltage of 1000V
- **R<sub>CONT</sub>** - measurement of resistance of protective conductors and equipotential bonding with 200mA current
- **R<sub>X</sub>** - measurement of resistance with current <15mA
- **R<sub>ZERO</sub>** - test leads resistance compensation for R<sub>CONT</sub> i R<sub>X</sub>



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# **INSULATION RESISTANCE METER MIC-10**



**SONEL Test & Measurement  
Santa Clara, Ca. USA**

**SONEL S.A.  
Świdnica, Poland**

Version 1.06 06.03.2020

Thank you for purchasing the MIC-10 insulation tester. Please acquaint yourself with this manual to avoid measuring errors and prevent possible problems related to the operation of the meter.

**This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**CAUTION:**

Equipment changes or modifications not expressly approved by SONEL TEST & MEASUREMENT Inc., the party responsible for FCC compliance, could void the user's authority to operate the equipment, and could create a hazardous condition.

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# 1 Safety

The MIC-10 meter is designed to determine the safety of electrical wiring, to ensure adequate protection against electric shock. For correct operation and accurate results observe the following recommendations:

- Before operating the meter acquaint yourself thoroughly with this manual. Observe the safety cautions, warnings, and instructions.
- Any application that differs from those specified in this manual may result in a damage to the device and constitute a source of danger to the user.
- The MIC-10 meter must be operated only by appropriately qualified personnel with relevant certification authorizing them to work on electrical systems. Operating the meter by unauthorised personnel may result in damage to the device and constitute a source of danger to the user.
- During measurements of insulation resistance dangerous voltages up to 1 kV occur at the ends of test leads.
- Before any measurement of insulation resistance ensure the tested object is not energized, and disconnected from the mains power supply.
- Do not disconnect the test leads from the tested object before the measurement is completed, otherwise the capacitance of the object will not be discharged creating a risk of electric shock.
- Using this manual does not exclude the need to comply with occupational health and safety regulations and with other relevant fire regulations required during the performance of a particular type of work. Before starting work with the meter in special environments, e.g. potential of fire-risk or explosive environment, consult with the person responsible for health and safety.
- Do not operate:
  - ⇒ A meter which is damaged, completely or partially malfunctioning
  - ⇒ A meter with damaged test leads insulation
  - ⇒ A meter stored for an excessive period of time in adverse environmental conditions (e.g. excessive humidity). If the meter is transferred from a cool to a warm environment with a high level of relative humidity, wait 30 minutes until the meter is warmed up to the ambient temperature.
- A **BATT** message indicates insufficient voltage of power supply. The batteries must be charged or replaced.
- An **ErrX** message, where **X** is a number from 1 to 9, indicates incorrect operation of the meter. If after restarting the meter this error message still appears, it indicates that the meter is damaged.
- Before measurement choose a correct measurement function and make sure that test leads are connected securely to their respective measuring terminals.
- Do not operate a meter with an open or incorrectly closed battery compartment, or power it from other sources not specified in this manual.
- Meter inputs are electronically protected against overloads, such as caused by connecting the meter to a live circuit, up to 550V for measurements, and up to 600V for the voltmeter.
- Repairs may only be performed by Sonel or an authorized Sonel service center.

**Note:**

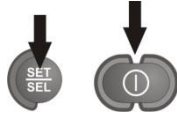
**When installing driver software in Windows may result in an "Installation failed" message. Windows 8 by default blocks drivers without a digital signature. Disable the driver signature enforcement in Windows.**

**Note:**

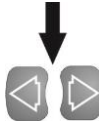
**Due to continuous development the actual appearance of the display, and some of the functions may slightly differ from the information presented in this operating manual.**

## 2 Meter Configuration

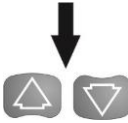
①



Turn on the meter by pressing the power and **SET/SEL** buttons simultaneously.



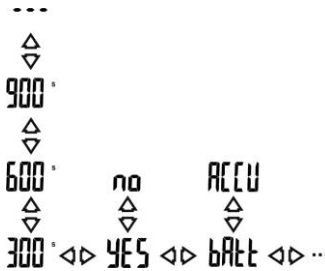
Use the and buttons to select a parameter.



Use the and buttons to change a parameter value. The value or symbol to be changed flashes.  
The **YES** symbol indicates an active parameter, the **no** - symbol indicates an inactive one.

②

Follow this diagram to understand how to select and change settings and parameters:



Parameter	Auto-OFF	Beep signalling pressed push-button	Selection of power supply source
Symbol(s)	OFF	BE EP	SUPP

③



Press **ENTER** to save the selection. The meter then goes into the measurement mode.

or

④



Press **ESC** to go the measurement mode without saving changes.

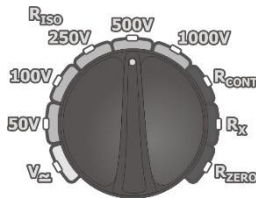
### 3 Measurements

#### 3.1 Measurement of insulation resistance

**WARNING:**  
Measured object must be de-energized. Do not make measurements on live circuits.

**Important Note:**  
Make sure that test leads do not touch each other and the probes (crocodile clips) during measurements, especially of high resistances. Such contact may cause the flow of surface currents resulting in additional errors in measurement results.

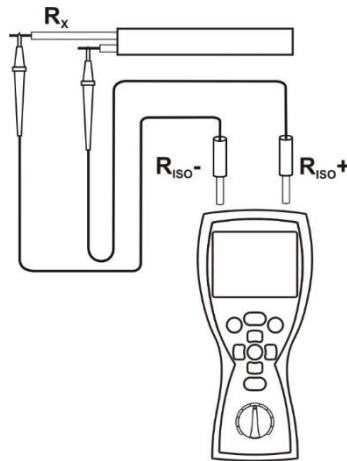
①



Set the rotary function switch at one of  $R_{ISO}$  positions. Each position is marked with the measuring voltage.

②

Connect the test leads according to this diagram.



③



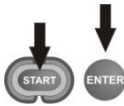
The meter is ready for measurement.



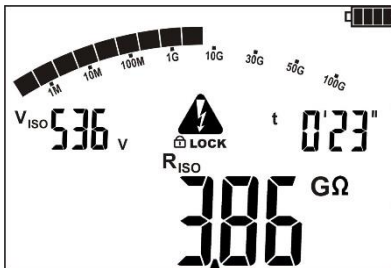
4



Press and hold **START** button.  
The measurement is performed continuously until the **START** button is released or the pre-set time is reached.



Instead of holding the **START** button down the function can be latched by first pressing the **ENTER** and then press **START** and release. The **LOCK** symbol will be displayed. To cancel the measurement press **ESC** or **START**.



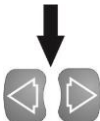
View of the screen during measurement.



5

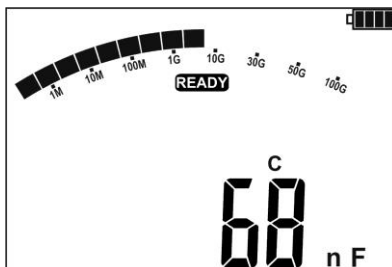


View the results after the measurement is completed.

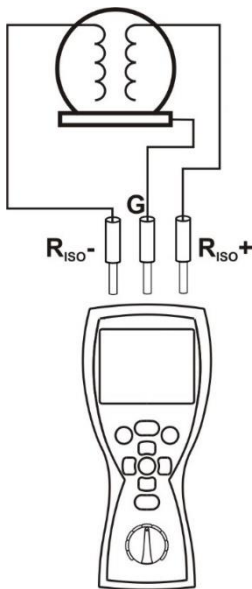
6



Use the  and  button to read the capacitance of the tested object.



To eliminate the influence of surface currents in the devices of up to 1kV a three-lead measurement is used. For example, to measure the inter-winding resistance of a small motor, connect the G terminal of the meter with the motor housing:



## Notes:





**Danger! During measurements of insulation resistance up to 1 kV occurs at the ends of test leads when connected to the MIC-10 meter.**



**Danger! Do not disconnect test leads before the measurement completes. Failure to obey this instruction will lead to the possibility of a high voltage electric shock as the object under test can be charged up to 1000V, and make it impossible to discharge the object under test. If obeyed the MIC-10 safely discharges the object under test.**

- The **LIMIT !!** message indicates the meter is working with current limiting (e.g. when charging an object).
- If current limiting lasts for 20 seconds the measurement is cancelled.
- After measurement completes, the charge on the tested object is discharged by shorting the test terminals through a 100k $\Omega$  resistance.
- The capacitance of the object under test is measured at the end of the measurement process during the object discharge..

## Additional information displayed by the meter

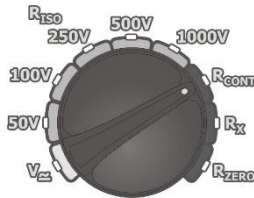
	Test voltage is present on terminals of the meter.
	Error! Consult the manual.
<b>READY</b>	The meter is ready for measurement.
<b>NOISE!</b>	Noise is detected in the system during the measurement. The measurement results may be affected by additional uncertainties.
<b>LIMIT !</b> + continuous audio tone	Current limit is activated.
<b>HILE</b>	Leakage current is too high; breakdown of insulation during the measurement.
<b>dS</b>	Object under test is being discharged.
<b>UDET</b> + red LED, + two-tone beep	The tested object is live. The measurement is cancelled.
<b>bAtE</b>	Rechargeable batteries are discharged

## 3.2 Low-voltage measurement of resistance

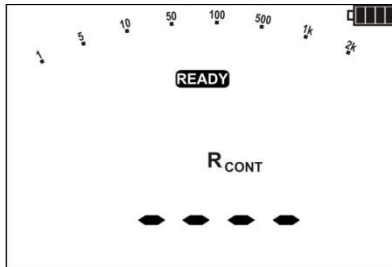
### 3.2.1 Measurement of resistance of protective conductors and equipotential bonding with 200 mA current

**NOTE**  
The MIC-10 meter measures  $R_{\text{CONT}}$  bidirectionally ( $\pm 200\text{mA}$ ).

①



Set the rotary function switch to the  $R_{\text{CONT}}$  position.

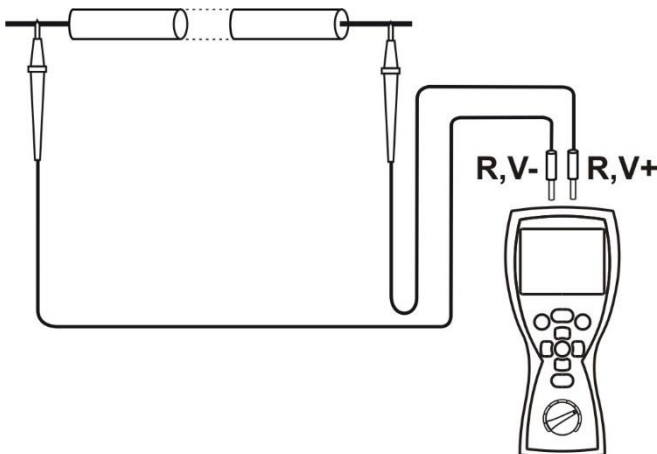


The meter is ready for measurement.

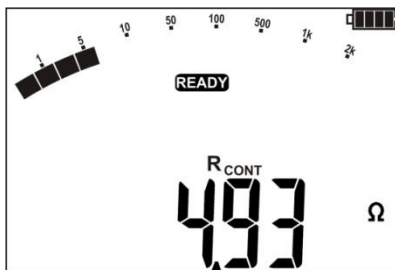
②

Connect the meter to the object tested as in the following diagram:

The measurement starts automatically when the meter detects a resistance within the measurement range.  
The measurement may be also triggered manually by pressing the **START** button.



3



View the result.

4



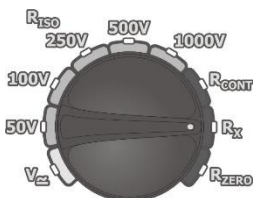
Press the **START** button to start another measurement without disconnecting the test leads from the object.

### Additional information displayed by the meter

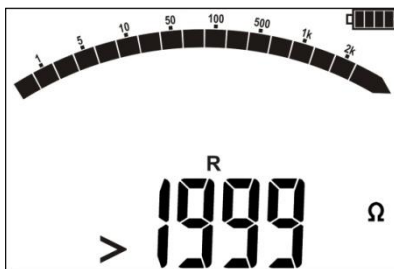
<b>NOISE!</b>	Noise is detected in the system during the measurement. The measurement results may be affected by additional uncertainties.
<b>Udet</b> + red LED, + two-tone beep	The tested object is live. The measurement is cancelled.
<b>AUTO-ZERO</b>	Compensation for the test leads resistance is included in the result.

### 3.2.2 Measurement of resistance

1

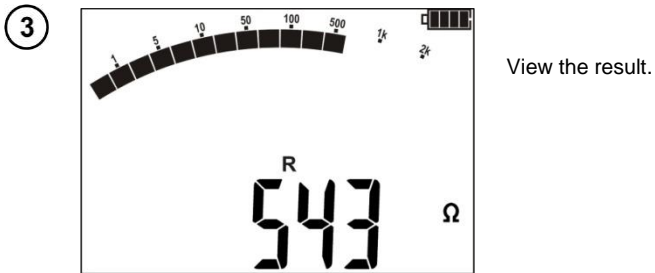
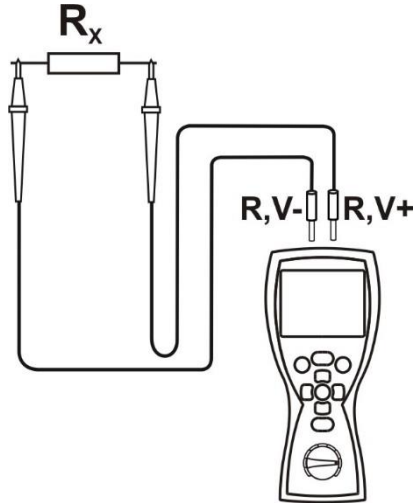


Set the rotary function switch to **the Rx** position.



The meter is ready for measurement.

- ② Connect the meter to the object to be tested as in the following diagram: The measurement is performed continuously.



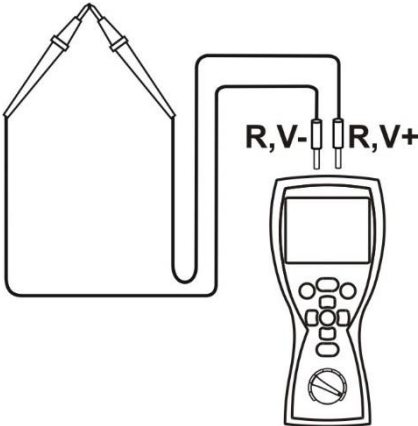
**Note:**


- For  $R < 30\Omega$  there is a continuous beep and the LED illuminates green.

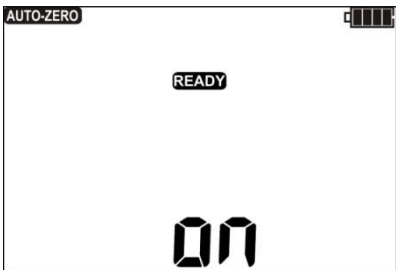
### 3.2.3 Compensation of test leads resistance

To eliminate the effect of the resistances of the test leads upon the measurements  $R_{CONT}$  and  $R_X$ , perform the auto-zeroing function as follows:

①  Set the rotary function switch at the  $R_{ZERO}$  position.

②  Short the test leads together.

③  Press **START**.

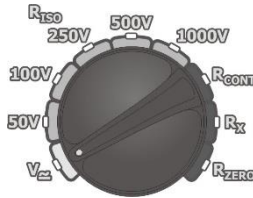
④  **AUTO-ZERO** and **0n** are displayed, confirming the completion of test leads resistance compensation.

The compensation for  $R_{CONT}$  and  $R_X$  and is retained in memory for all future measurements until auto-zeroing is performed again.

⑤ To remove the compensation for test leads resistances, and return to default calibration, perform the auto-zeroing function with the test leads open. The messages **AUTO-ZERO** and **0n** disappear, and **OFF** is displayed.

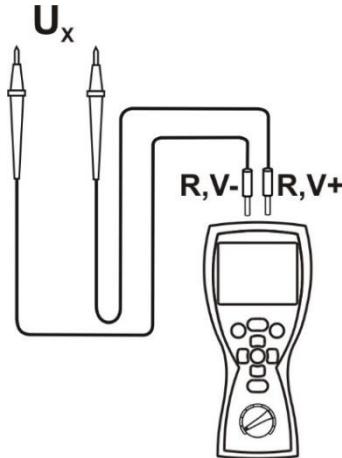
### 3.3 Voltage measurement

①



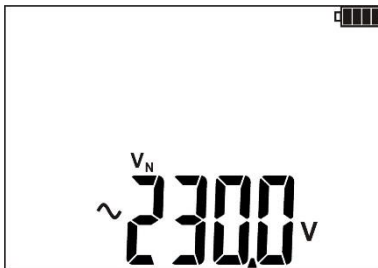
Set the rotary function switch at the  $V_{\sim}$  position.

②



Connect the meter to a voltage source.

③



Measurement of voltage is performed continuously.

### Additional information displayed by the meter

<p>&gt; <b>600</b><sup>V</sup> + red LED, + two-tone beep</p>	<p>Voltage exceeds the maximum range of the meter. <b>Immediately</b> disconnect the test leads.</p>
---	--

### 3.4 Remembering the last measurement result

The last measurement is remembered by the meter until a new measurement is started, or measurement settings are changed, or the measuring function is changed by the rotary switch. If the meter has returned to the voltage measurement mode (by pressing **ESC** button), to recall the last result press **ENTER**. The latest measurement result can also be viewed after turning the meter off and then turning on, providing the position of the function selector has not been changed.



## 4 Power supply of the meter

### 4.1 Monitoring of the power supply voltage

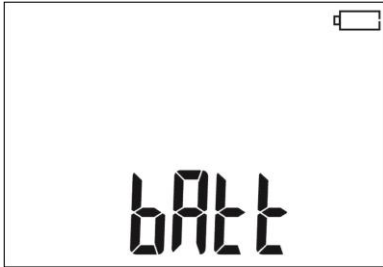
The level of charge of the batteries is continuously indicated by the battery symbol in the upper right corner of the display:



Batteries charged



Batteries almost discharged.



Batteries are fully discharged.  
The meter switches off automatically.

### 4.2 Replacing battery/rechargeable batteries

MIC-10 Meters are powered by four AA alkaline LR6 batteries or NiMH rechargeable batteries.



**NOTE! Before removing the battery cover disconnect the test leads.**

To replace the batteries:

1. Disconnect the leads from the measuring circuit and turn off the meter
2. Unscrew the 4 screws at the bottom of the housing and remove the cover
3. Replace all batteries with new ones.
4. Replace and fasten the cover.

**Note:**

**Rechargeable batteries must be recharged in an external charger.**

**NOTE!**

**Do not use the meter when the battery compartment is removed or open. Do not power the meter from any source other than those described in this manual.**

### **4.3 General principles regarding using NiMH rechargeable batteries**

- If the meter is not used for a prolonged period, it is recommended to remove the batteries and store them separately.
- Store the rechargeable batteries in a dry, cool, and well-ventilated place and protect them from direct sunlight. The temperature of the environment should not exceed 30°C / 86°F. If the rechargeable batteries are stored for a long period at high temperature their lifetime will be reduced.
- NiMH batteries withstand normally 500-1000 charging cycles. NiMH batteries reach their maximum capacity after 2-3 charge/discharge cycles. The most important factor which affects the lifetime of rechargeable batteries is the level of discharge. The deeper the discharge, the shorter the lifetime.
- NiMH batteries may be charged at any point with no serious consequences. However, it is recommended to discharge them periodically.
- During storage, NiMH batteries self-discharge at the rate of approximately 30% per month. High temperatures accelerate this process. To prevent excessive discharge of rechargeable batteries it is recommended to charge them periodically even if they are not used.
- Modern fast chargers detect both too low and too high a temperature of batteries and react accordingly. Too low a temperature prevents charging, which might damage the battery irreparably. High temperature of the battery stops any further charging. Charging at a high temperature reduces battery lifetime and causes a further increase of the battery temperature, which will not allow charging to full capacity.
- With quick charging batteries are charged to approximately 80% of their capacity. Better results may be obtained if charging is continued. Charging will continue, but with a low current. After a couple of hours the batteries are charged to their full capacity.
- Do not charge or use batteries in extreme temperatures. Extreme temperatures reduce the lifetime of batteries. Avoid using devices powered from Ni-MH batteries in very hot environments. The nominal working temperature must be observed.

## 5 Cleaning and maintenance

**NOTE!**

**Only use the maintenance methods described in this manual.**

The outside of the MRU-30 meter may be cleaned with a soft, damp cloth using all-purpose detergents. Do not use any solvents or cleaning agents or abrasives which might scratch the case.

Clean the probes with water and dry them. Before storing probes for long periods it is recommended to coat it with any machine lubricant to prevent corrosion.

Cable reels and test leads should be cleaned with water and detergents and dried.

The electronic system of the meter does not require maintenance.

## 6 Storage

When storing the MRU-30:

- Disconnect all the test leads from the meter
- Clean the meter and all its accessories thoroughly
- Wind the long test leads onto the reels
- To prevent a total discharge of the batteries charge them periodically.

## 7 Dismantling and disposal

- Scrap and disused electric and electronic equipment should be disposed of selectively, i.e. not placed with waste of another kind.
- Scrap and disused electric and electronic equipment should be sent to a collection point in accordance with local regulations for the disposal of electric and electronic equipment.
- Before the equipment is sent to a collection point do not dismantle or disassemble any elements.
- Observe local regulations concerning the disposal of equipment, and depleted batteries.

## 8 Technical specifications

### 8.1 Basic data

⇒ Abbreviation "m.v." used in the specification of measurement uncertainty means a standard measured value.

#### AC / DC voltage measurement

Display range	Resolution	Measurement uncertainty
0.0 to 299.9 V	0.1 V	±(2% m.v. + 6 digits)
300 to 600 V	1 V	±(2% m.v. + 2 digits)

- Frequency range: 45 to 65 Hz

#### Measurement of insulation resistance

- Voltage accuracy ( $R_{obc} [\Omega] \geq 1000 \cdot V_N [V]$ ): -0+10% of the selected value

Measurement range, according to IEC 61557-2 for  $V_N = 50$  V: 50 k $\Omega$  to 250.0 M $\Omega$

Display range for $V_N = 50$ V	Resolution	Measurement uncertainty
0.0 to 999.9 k $\Omega$	0.1 k $\Omega$	± (3 % m.v. + 8 digits)
1.000 to 9.999 M $\Omega$	0.001 M $\Omega$	
10.00 to 99.99 M $\Omega$	0.01 M $\Omega$	
100.0 to 250.0 M $\Omega$	0.1 M $\Omega$	

Test range according to IEC 61557-2 for  $V_N = 100$ V: 100k $\Omega$  to 500.0M $\Omega$

Display range for $V_N = 100$ V	Resolution	Measurement uncertainty
0.0 to 999.9 k $\Omega$	0.1 k $\Omega$	± (3 % m.v. + 8 digits)
1.000 to 9.999 M $\Omega$	0.001 M $\Omega$	
10.00 to 99.99 M $\Omega$	0.01 M $\Omega$	
100.0 to 500.0 M $\Omega$	0.1 M $\Omega$	

Test range according to IEC 61557-2 for  $V_N = 250$  V: 250k $\Omega$  to 2.000 G $\Omega$

Display range for $V_N = 250$ V	Resolution	Measurement uncertainty
0.0 to 999.9 k $\Omega$	0.1 k $\Omega$	± (3 % m.v. + 8 digits)
1.000 to 9.999 M $\Omega$	0.001 M $\Omega$	
10.00 to 99.99 M $\Omega$	0.01 M $\Omega$	
100.0 to 999.0 M $\Omega$	0.1 M $\Omega$	
1.000 to 2.000 G $\Omega$	0.001 G $\Omega$	

Test range according to IEC 61557-2 for  $V_N = 500 \text{ V}$ : 500 k $\Omega$  to 5.00 G $\Omega$

Display range for $V_N = 500 \text{ V}$	Resolution	Basic uncertainty
0.0 to 999.9 k $\Omega$	0.1 k $\Omega$	± (3 % m.v. + 8 digits)
1.000 to 9.999 M $\Omega$	0.001 M $\Omega$	
10.00 to 99.99 M $\Omega$	0.01 M $\Omega$	
100.0 to 999.0 M $\Omega$	0.1 M $\Omega$	± (4 % m.v. + 6 digits)
1.000 to 5.000 G $\Omega$	0.001 G $\Omega$	

Test range according to IEC 61557-2 for  $V_N = 1000 \text{ V}$ : 1000 k $\Omega$  to 10.0 G $\Omega$

Display range for $V_N = 1000 \text{ V}$	Resolution	Basic uncertainty
0.0 to 999.9 k $\Omega$	0.1 k $\Omega$	± (3 % m.v. + 8 digits)
1.000 to 9.999 M $\Omega$	0.001 M $\Omega$	
10.00 to 99.99 M $\Omega$	0.01 M $\Omega$	
100.0 to 999.9 M $\Omega$	0.1 M $\Omega$	± (4 % m.v. + 6 digits)
1.000 to 9.999 G $\Omega$	0.001 G $\Omega$	
10.00 to 99.99 G $\Omega$	0.01 G $\Omega$	
100.0 G $\Omega$	0.1 G $\Omega$	

⇒ **Note:** For insulation resistance below  $R_{ISOmin}$  there is no accuracy specified because the meter operates in current limit mode in accordance with the following formula:

$$R_{ISOmin} = \frac{V_{ISO nom}}{I_{ISO nom}}$$

where:

- $R_{ISOmin}$  - minimum insulation resistance measured without limiting the current
- $V_{ISO nom}$  - nominal test voltage
- $I_{ISO nom}$  - nominal current (1 mA)

### Measurement of capacitance

Display range	Resolution	Measurement uncertainty
1 to 999 nF	1 nF	± (5% m.v. + 10 digits)
1.00 to 9.99 $\mu\text{F}$	0.01 $\mu\text{F}$	

- Measurement of capacitance is made only during  $R_{ISO}$  measurement.
- For measurement voltages below 100 V and when measured resistance is below 10 M $\Omega$ , the measurement error is not specified.

### Low-voltage continuity and resistance measurement

#### **Measurement of continuity of protective conductors and equipotential bondings with 200 mA current**

Measuring range according to IEC 61557-4: 0.10 to 1999 $\Omega$

Display range	Resolution	Measurement uncertainty
0.00 to 19.99 $\Omega$	0.01 $\Omega$	±(2% m.v. + 3 digits)
20.0 to 199.9 $\Omega$	0.1 $\Omega$	
200 to 1999 $\Omega$	1 $\Omega$	±(4% m.v. + 3 digits)

- Voltage at open terminals: <8 V
- Output current at  $R < 2 \Omega$ :  $I_{SC} > 200 \text{ mA}$
- Compensation of test leads resistance

## Low-current resistance measurement

Range	Resolution	Measurement uncertainty
0.0 to 199.9 $\Omega$	0.1 $\Omega$	$\pm(3\% \text{ m.v.} + 3 \text{ digits})$
200 to 1999 $\Omega$	1 $\Omega$	

- Voltage at open terminals: <8 V
- Current at shorted terminals 5 mA <  $I_{sc}$  < 15 mA
- Acoustic signal and LED illuminates green for measured resistance < 30  $\Omega \pm 10\%$
- Compensation of test leads resistance

## Other technical specification

- a) type of insulation.....double, IEC 61010-1 and IEC 61557 compliant
- b) measurement category.....IV 600 V (III 1000 V) according to IEC 61010-1
- c) protection class of enclosure acc. to IEC 60529.....IP67
- d) power supply for the meter ..... 4 AA alkaline batteries or rechargeable batteries
- e) dimensions ..... 220 x 100 x 60 mm / 8.7 x 3.9 x 2.4 in
- f) meter weight..... approx 0.6 kg / 1.3 lb
- g) storage temperature ..... -20 to +70°C / -4 to +158°F
- h) operating temperature ..... -10 to +50°C / 14 to +122°F
- i) humidity..... 20 to 90%
- j) reference temperature ..... +23  $\pm$  2°C / +73  $\pm$  3°F
- k) reference humidity ..... 40 to 60%
- l) altitude (above sea level)..... <2000 m / <6562 ft
- m) display ..... LCD segment
- n) quality standard..... development, design and manufacturing are ISO 9001 compliant
- o) the device meets the requirements of the IEC 61557 standard
- p) the product meets the EMC requirements (immunity for industrial environment) according to the following standards..... IEC 61326-1 and IEC 61326-2-2

## 8.2 Additional data

Data on additional uncertainties are useful mainly when the meter is used in non-standard conditions and for metrological laboratories for the purpose of calibration.

### 8.2.1 Additional uncertainties according to IEC 61557-2 ( $R_{ISO}$ )

Significant parameter	Designation	Additional uncertainty
Position	E <sub>1</sub>	0%
Supply voltage	E <sub>2</sub>	0% ( <b>BATT</b> is not displayed)
Temperature 0 to 35°C / 32 to 95°F	E <sub>3</sub>	2%

### 8.2.2 Additional uncertainties according to IEC 61557-4 ( $R_{CONT}$ 200mA)

Significant parameter	Designation	Additional uncertainty
Position	E <sub>1</sub>	0%
Supply voltage	E <sub>2</sub>	0% ( <b>BATT</b> is not displayed)
Temperature 0 to 35°C / 32 to 95°F	E <sub>3</sub>	2%

## 9 Accessories

The current list of accessories can be found on the manufacturer's website.

### 9.1 Standard accessories

Standard set of MIC-10 equipment supplied by the manufacturer includes:

- MIC-10 – **WMUSMIC10**,
- 1.2 m cable CAT III 1000V – 2 pcs (red - **WAPRZ1X2REBB**, black - **WAPRZ1X2BLBB**),
- crocodile clip CAT III 1000V – 1 pc (black - **WAKROBL20K01**),
- blade probe CAT III 1000V – 2 pcs (black - **WASONBLOGB1**, red - **WASONREOGB1**),
- M-6 carrying case for the meter and accessories – **WAFUTM6**,
- calibration certificate,
- user manual,
- Set of 4xAA alkaline batteries 1.5 V,
- strap for carrying the meter – **WAPOZSZE4**,
- plastic hook (to hang the meter) – **WAPOZUCH1**.

### 9.2 Optional accessories

Additionally, the following items that are not included in the scope of standard equipment can be purchased from the manufacturer or the distributors:

**WAPRZ1X2BUBB**



- 1.2m cable CAT III 1000V blue

**WAKRORE20K02**



- crocodile clip CAT III 1000V red
- calibration certificate issued by an accredited laboratory

**WAKROBU20K02**



- crocodile clip CAT III 1000V blue

**WASONBUOGB1**



- test prod with banana socket - blue

## 10 Manufacturer

The manufacturer of the device and provider of warranty and post-warranty service:

**SONEL Test & Measurement, Inc.**

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**NOTE**

**Service repairs must be performed solely by the manufacturer.**













## NOTES

## NOTES

## WARNING AND ADDITIONAL MESSAGES DISPLAYED BY THE METER

### CAUTION!

Connecting the input terminals to voltages above 600V may cause damage to the meter and the risk of electrical injury to the user.

	Test voltage is present on terminals of the meter.
	You must consult the manual.
	The meter is ready for measurement.
	Indicates noise in the system during the measurement. The measurement result may be affected by additional uncertainty.
	Activation of current limit. The symbol displayed is accompanied by a continuous audio signal.
	Leakage current too high (breakdown of insulation during the measurement).
 two-tone acoustic signal	The tested object is live. The measurement is blocked.
	Discharging of the object tested after the measurement.
	Resistance compensation is active.
	The charge level of the batteries: Batteries/ rechargeable batteries charged. Batteries / rechargeable batteries almost discharged. Batteries / rechargeable batteries fully discharged.



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