

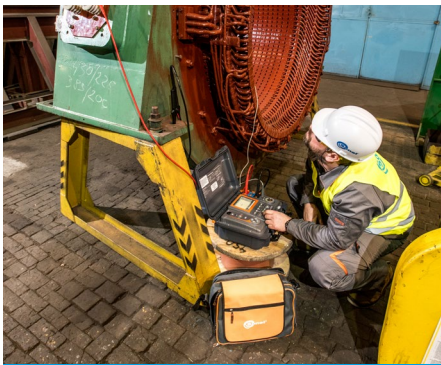


The most advanced insulation resistance meter on the market

Designed for professionals providing power electrical services, including maintenance of electrical insulation materials

Features of the meter

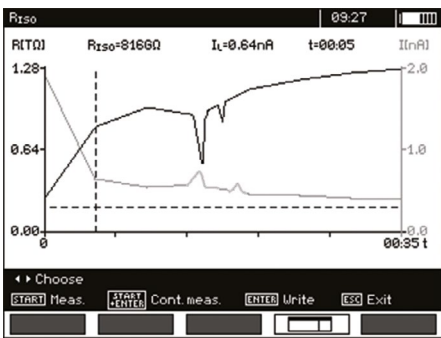
- Graphical visualization of the measurement process combined with numerical values provides a reliable picture of insulation condition throughout the measurement cycle.
- Sliding tags allow you to check the minimum and maximum resistance values and leakage current recorded on the measurement chart.
- The maximum voltage of 10 000 V and the measurement range of 40 TΩ ensures the measurements on the most effective materials used to insulate high voltage objects.
- Efficient inverter with a power of ~60 W, will intensify the potential damage point to facilitate the location of the fault using reflectometric methods.
- Designed for the toughest working conditions with airtight suitcase housing.
- Compliance with the recommendations of IEEE Std 43™ provides an option of diagnosing rotating machines.
- Dedicated AutoISO-5000 adapter will shorten time of connection works when measuring resistance in multi-core cables, e.g. of street lighting.
- High resistance to electromagnetic interference guarantees uninterrupted work in power stations and in close proximity to high voltage transmission lines - 765 kV.
- Built-in discharge resistor will fully reduce electric charge, accumulated during the measurement of very long cables, securing the meter.
- When there is no historical data, the meter will assess the insulation condition by determining the polarization index (PI) and the absorption coefficient (DAR), it will also measure the time constant (TC), leakage current I_L , discharge coefficient of the dielectric (DD) and the capacitance (C), which confirms that it is a complex diagnostic tool.



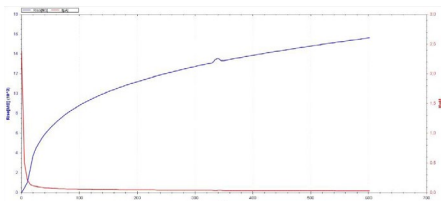
Professional diagnostic tool



Several measurements in one connection



Graphic interpretation of results



Dedicated PC software



For the toughest working conditions

Application

MIC-10k1 meter is designed to measure the insulation resistance of electro-power objects, i.e. single- and multi-core cables, transformers, motors and generators, capacitors, switches and other devices installed in power stations. MIC-10s1 meter is a reinforced version of MIC-10k1, dedicated for measurements in areas with very high electromagnetic disturbances, e.g. electrical substations with 765 kV voltage.

Features of the device

Highly efficient HV inverter, with test voltage of 10 kV and current of 6 mA, suitable for measuring the insulation resistance up to 40 TΩ. Achieving such a result makes these meters unrivaled devices. Three-wire resistance measurement, performed using a "GUARD" wire, eliminates surface leakage currents caused by contaminated insulation, thereby increasing the reliability of obtained results.

The meter measures temperature of tested object, which is necessary to determine the temperature correction factor for R_{ISO} . In addition, it indicates the absorption coefficient (DAR - Dielectric Absorption Ratio), Polarization Index (PI) and the value of Dielectric Discharge (DD). The device allows user to assess the condition of the insulation, by applying the test voltage incrementally in steps (SV). This solution ensures that a dielectric in good condition will provide the same results, regardless of the applied voltage. Deviations in obtained resistance values of approx. 25%, observed on the chart in the individual steps, may indicate the potential insulation defects.

MIC-10s1 and MIC-10k1 have the unique ability to perform measurements on multi-core cables, within one connection step, using the AutoSO-5000 adapter. This solution reduces the duration of measurements on repetitive of objects, such as cables of street lighting systems. Inverter with a power of almost 60 W is able to intensify the point of cable damage, which facilitates finding the location of the fault using a reflectometric method e.g. with TDR-420 device.

Built-in digital filters, with averaging time of 10, 30, 60 sec. (and additionally 100, 200 sec. in MIC-10s1) and "smart" solution guarantee stable measurement results in areas of strong electromagnetic interference.

Data analysis

The device, with its backlight graphical screen may display a waveform of insulation resistance, voltage and current as a function of time. The operator, basing on the trend shown by the waveform, may quickly assess the insulation condition right after starting the measurement. This provides full control over the tested object and clear image of the tested insulation. In addition, with movable tags, the operator may trace the course of the measurement and check resistance values obtained for any time of the current measurement and of measurements made in the past.

After installing mobile application, as a part of the set the user receives SonelReader software for collecting historical data and comparing it with current results, transferred from the extensive memory of the meter. This solution helps user to prepare a measurements report, track the insulation degradation and plan the maintenance / repair works.

Note

When choosing a professional meter, make sure that:

- it can be used in harsh measurement conditions, in high humidity and dusty environment (IP67),
- it has advanced digital filters for measuring objects with strong electromagnetic interferences, i.e. up to 1550 V of induced voltage and 8 mA of interference current,
- it provides the highest safety standards in accordance with EN 61010-1 and the measurement category of CAT IV 600 V,
- it has a feature of cable lock that prevents unintentional removal of cables from terminals of the meter, eliminating the risk of leaving the object undischarged,
- provided with a wireless communication and the ability to collect large amounts of data,
- equipped with a Li-Ion battery, for continuous 8-hour operation.

Comparison of MIC-10k1 and MIC-10s1

	MIC-10k1	MIC-10s1
resistance to external interference voltages	up to 750 V	up to 1550 V
advanced, digital interference filtration	10 / 30 / 60 seconds	10 / 30 / 60 / 100 / 200 seconds and SMART
test leads lock	no	yes

Measurement of insulation resistance

- Measuring range according to IEC 61557-2 for MIC-10k1 or MIC-10s1

$U_N = 10\ 000\ \text{V}$: 10.0 M Ω ...40.0 T Ω

- Measurement with DC and increasing voltage (SV) for $U_{\text{ISO}} = 5\ \text{kV}$

Range	Resolution	Accuracy
0...999 k Ω	1 k Ω	
1.00...9.99 M Ω	0.01 M Ω	
10.0...99.9 M Ω	0.1 M Ω	$\pm(3\% \text{ m.v.} + 10 \text{ digits})$
100...999 M Ω	1 M Ω	
1.00...9.99 G Ω	0.01 G Ω	
10..0...99.9 G Ω	0.1 G Ω	
100...999 G Ω	1 G Ω	$\pm(3.5\% \text{ m.v.} + 10 \text{ digits})$
1.00...9.99 T Ω	0.01 T Ω	$\pm(7.5\% \text{ m.v.} + 10 \text{ digits})$
10.0...20.0 T Ω	0.1 T Ω	$\pm(12.5\% \text{ m.v.} + 10 \text{ digits})$
10.0...40.0 T Ω		

Ranges of measured resistance depending on the test voltage

Voltage U_{ISO}	Measuring range	Measuring range for AutoISO-5000
50 V	200 G Ω	20.0 G Ω
100 V	400 G Ω	40.0 G Ω
250 V	1.00 T Ω	100 G Ω
500 V	2.00 T Ω	200 G Ω
1000 V	4.00 T Ω	400 G Ω
2500 V	10.00 T Ω	400 G Ω
5000 V	20.0 T Ω	400 G Ω
10 000 V	40.0 T Ω *	-

Measurement of capacitance

Range	Resolution	Accuracy
0...999 nF	1 nF	$\pm(5\% \text{ m.v.} + 5 \text{ digits})$
1.00...49.99 μF	0.01 μF	

- Displaying measured capacity after R_{ISO} measurement
- For measurement voltages below 100 V, the measurement error is not specified

Temperature measurement

Range	Resolution	Accuracy
-40.0...99.9 °C	1 °C	$\pm(3\% \text{ m.v.} + 8 \text{ digits})$



Please see available applications with "Virtual Instruments Applications". They allow you to check the functions of the meter and its interface before the purchase. Application user may introduce changes in device settings and perform all possible measurements, just like in reality.

<https://www.sonel.pl/en/virtual-instrument-applications>

Technical specification

type of insulation	double, EN 61010-1 and IEC 61557 compliant
measurement category	IV 600 V (III 1000 V) according to EN 61010-1
ingress protection	IP67 (IP40 with open housing) according to EN 60529
power supply of the meter	battery: Li-Ion 14.8 V network: 90 V ÷ 260 V, 50 Hz/60 Hz
dimensions	390 x 308 x 172 mm
meter weight	approx. 5.6 kg
storage temperature	-25°C...+70°C
working temperature	-20°C...+50°C
humidity	20%...90%
working height	≤3000 m
reference temperature	+23°C ± 2°C
reference humidity	40%...60%
display	graphic LCD
number of R _{iso} measurements with battery power supply	at least 1000 according to EN 61557-2
data transmission	USB and Bluetooth
quality standard	in accordance with ISO 9001, ISO 14001, N-18001
the device meets the requirements of	EN 61010-1 and IEC 61557 standards
the product meets EMC requirements (immunity for industrial environment)	according to standards EN 61326-1 and EN 61326-2-2

Standard accessories



Test lead 3 m, blue, 11 kV (banana plugs)

WAPRZ003BUBB10K



Test lead 3 m, black, 11 kV (banana plugs, shielded)

WAPRZ003BLBBE10K



Test lead 3 m, red, 11 kV (banana plugs)

WAPRZ003REBB10K



Crocodile clip, blue, 11 kV, 32 A

WAKROBU32K09



Crocodile clip, black, 11 kV, 32 A

WAKROBL32K09



Crocodile clip, red, 11 kV, 32 A

WAKRORE32K09



USB cable

WAPRZUSB



Battery charging cable (IEC C13 connector)

WAPRZ1X8BLIEC



L4 carrying case

WAFUTL4



PC software: Sonel Reader

WAPROREADER