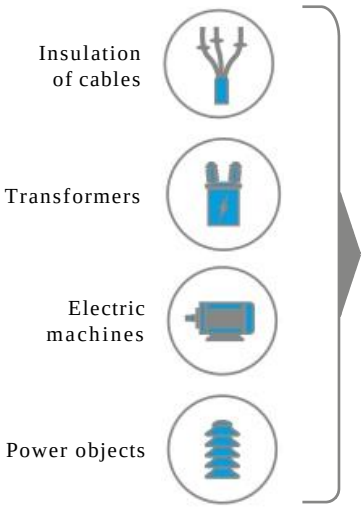
Insulation Resistance Meters

MIC-10s1 / MIC-05s1 / MIC-10k1 / 5050

index: WMGBMIC10s1 / WMGBMIC05s1 / WMGBMIC10k1 / WMGBMIC5050



CAT III 1000 V

CAT IV 600 V

IP67

BLUETOOTH

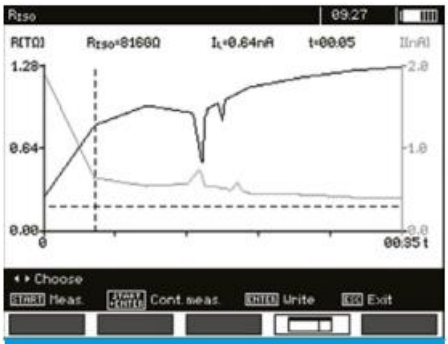
Damage location and insulation measurements

Features

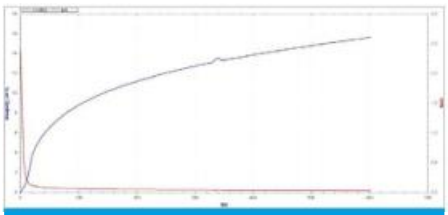
- Insulation resistance measurement
  - up to **40 TΩ** (MIC-10k1, MIC-10s1)
  - up to **20 TΩ** (MIC-5050, MIC-05s1)
- Measurement voltage - any in the range of
  - MIC-10k1, MIC-10s1: **50…10000 V**, 50…1000 V with steps of 10 V, 1…10 kV with steps of 25 V
  - MIC-5050, MIC-05s1: **50…5000 V**, 50…1000 V with steps of 10 V, 1…5 kV with steps of 25 V
- Continuous indication of measured insulation resistance or leakage current
- Automatic discharge of measured object capacitance voltage after the end of insulation resistance measurement
- Acoustic signalling of 5-second intervals to facilitate capturing time characteristics
- Adjustable measuring time - up to **99'59''**
- T_1, T_2 and T_3 test times for measuring one or two absorption coefficients from the range of 1…600 s
- Polarization index (PI), absorption coefficients Ab1, Ab2 and dielectric absorption ratio (DAR) measurement
- Test Lead Locking Facility is available
- Double Insulated Test Leads
- Indication of actual test voltage during measurement
- **1.2 mA**, **3 mA** or **6 mA** test current
- Insulation resistance measurement using two- or three-wire method
- Measurements with test leads up to 20 m
- Protection against measuring live objects
- Automatic measurement of multiple core cables with the optional **AutoISO-5000 adapter** (for MIC-10k1 and MIC-10s1 max. measuring voltage 5 kV)
- Measurement of capacitance during the measurement of R_{ISO}
- Measurement of temperature (with optional probe ST-1)
- Step voltage insulation resistance measurement (SV)
- Dielectric Discharge calculation (DD)
- Damage location (burnout)
- Digital filters for measurements with strong interferences

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 an reinforced version of MIC-10k1, dedicated for measurements in areas with very high electromagnetic disturbances, e.g. electrical substations with 765 kV voltage or higher.

Capabilities

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 unrivalled 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 AutoISO-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 Sonel Reader 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.

Comparison

	MIC-10k1	MIC-5050	MIC-10s1	MIC-05s1
maximum measuring voltage	10 000 V	5000 V	10 000 V	5000 V
maximum measuring range	40 TΩ	20 TΩ	40 TΩ	20 TΩ
resistance to external interference voltages	do 750 V	do 750 V	do 1550 V	do 1550 V
advanced, digital interference filtration	10 / 30 / 60 seconds	10 / 30 / 60 seconds	10 / 30 / 60 / 100 / 200 seconds and SMART	10 / 30 / 60 / 100 / 200 seconds and SMART
test leads lock	—	—	√	√

Insulation resistance measurement

• Measurement range acc. to IEC 61557-2

R_{ISOmin} =U_{ISOnom}/I_{ISOmax}=5 MΩ…40 TΩ (I_{ISOmax} =1.2 mA, 3 mA or (6 ± 15%) mA)

Range	Resolution	Accuracy
0…999 kΩ	1 kΩ	±(3% m.v. + 10 digits)
1.00…9.99 MΩ	0.01 MΩ	
10.0…99.9 MΩ	0.1 MΩ	
100…999 MΩ	1 MΩ	
1.00…9.99 GΩ	0.01 GΩ	
10.0…99.9 GΩ	0.1 GΩ	
100…999 GΩ	1 GΩ	±(3.5% m.v. + 10 digits)
1.00…9.99 TΩ	0.01 TΩ	±(7.5% m.v. + 10 digits)
10.0…20.0 TΩ*	0.1 TΩ	±(12.5% m.v. + 10 digits)
10.0…40.0 TΩ**		

* - only for MIC-5050, MIC-05s1

** - only for MIC-10k1, MIC-10s1

Values of measured resistance depending on measurement voltage

U_{ISO} voltage	Range	Range for AutoISO-5000
50 V	200 GΩ	20.0 GΩ
100 V	400 GΩ	40.0 GΩ
250 V	1.00 TΩ	100 GΩ
500 V	2.00 TΩ	200 GΩ
1000 V	4.00 TΩ	400 GΩ
2500 V	10.00 TΩ	400 GΩ
5000 V	20.0 TΩ	400 GΩ
10 000 V	40.0 TΩ*	-

* - only for MIC-10k1, MIC-10s1

Capacitance measurement

Range	Resolution	Accuracy
0…999 nF	1 nF	±(5% m.v. + 5 digits)
1.00…49.99 µF	0.01 µF	

• Capacitance measurement result is displayed after the R_{ISO} measurement

• For measuring voltages under 100 V capacitance measurement accuracy not specified

Temperature measurement

Range	Resolution	Accuracy
-40.0…99.9°C	1°C	±(3% m.v. + 8 digits)

Technical specification

type of insulation acc. to EN 61010-1 and IEC 61557	double
measurement category acc. to EN 61010-1	IV 600 V (III 1000 V)
ingress protection acc. to EN 60529	IP67 (IP40 for open case)
power supply	Li-Ion 14.8 V rechargeable battery 90 V ÷ 260 V, 50 Hz/60 Hz from electric grid
dimensions	390 x 308 x 172 mm
weight	approx. 5.6 kg
storage temperature	-25˚C…+70˚C
operating temperature	-20˚C…+50˚C
humidity	20%…90%
operating altitude	≤3000 m
reference temperature	+23˚C ± 2˚C
reference humidity	40%…60%
display	graphical LCD 5.6"
number of R_{ISO} measurements with battery power supply	min. 1000 acc. to EN 61557-2
data transmission	USB and Bluetooth
quality standard	ISO 9001, ISO 14001, PN-N-18001 compliant
device meets the requirements of standards	EN 61010-1 and IEC 61557
the product meets EMC requirements (immunity for industrial environment)	with accordance to standards EN 61326-1 and EN 61326-2-2

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

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

m.v. - measured value

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

Mains cable with IEC C13 plug

WAPRZ1X8BLIEC

L4 carrying case

WAFUTL4

Calibration certificate issued by an accredited laboratory (MIC-10k1, MIC-10s1)

Calibration certificate (MIC-5050, MIC-05s1)

Optional accessories

Test lead 11 kV (banana plugs) blue 1.8 / 5 / 10 / 20 m

WAPRZ1X8BUBB10K
WAPRZ005BUBB10K
WAPRZ010BUBB10K
WAPRZ020BUBB10K

Test lead 11 kV (banana plugs, shielded) black 1.8 / 5 / 10 / 20 m

WAPRZ1X8BLBBE10K
WAPRZ005BLBBE10K
WAPRZ010BLBBE10K
WAPRZ020BLBBE10K

Test lead 11 kV (banana plugs) red 1.8 / 5 / 10 / 20 m

WAPRZ1X8REBB10K
WAPRZ005REBB10K
WAPRZ010REBB10K
WAPRZ020REBB10K

AutoISO-5000 adapter

WAADAAISO50

PRS-1 resistance test probe

WASONPRS1GB

Mini Bluetooth keyboard

WAADAMK

CS-5kV calibration box

WAADACS5KV

Resistance calibrator SRP-10G0-10T0

WMXXSRP10G010T0

ST-1 temperature probe

WASONT1

PC software: Sonel Reader

WAPROREADER

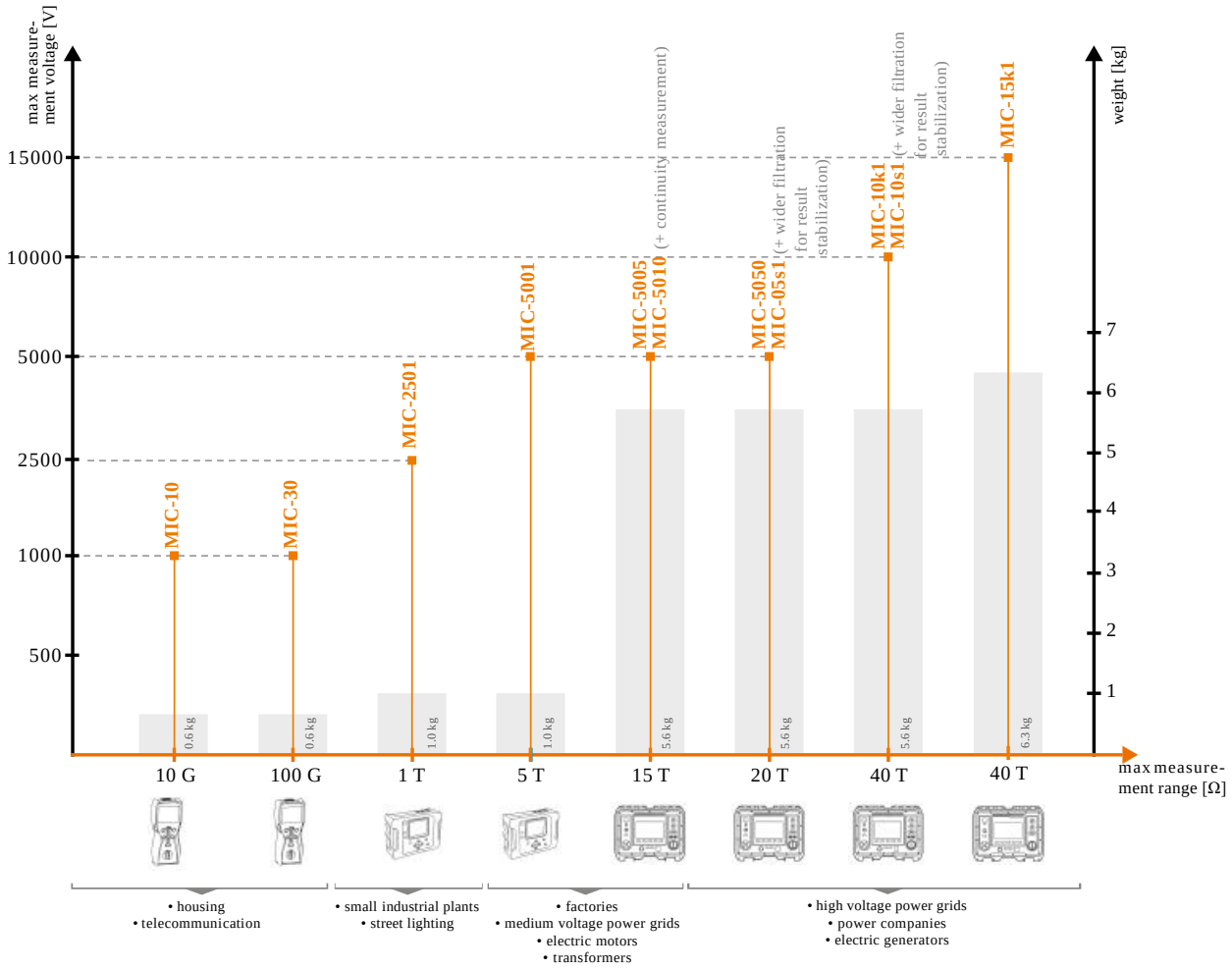
Calibration certificate issued by an accredited laboratory (MIC-5050, MIC-05s1)

Times of charging and discharging the tested object at measuring voltage of 1.05 U_{ISO}

Meter	Measuring voltage			Capacitance	Charging the object		Discharging the object
	5 kV	10 kV	15 kV	[µF]	Current [mA]	Maximal time [s]	down to voltage of 50 V [s]
MIC-5005 / MIC-5010	√			1	1.2	4.3	0.4
					3	1.7	
MIC-5050 / MIC-05s1	√			1	1.2	4.3	0.4
					3	1.7	
					6	0.8	
MIC-10k1 / MIC-10s1	√			1	1.2	4.3	0.9
					3	1.7	
					6	0.8	
		√		1	1.2	8.7	1.0
					3	3.5	
					6	1.7	
MIC-15k1	√			1	1.2	4.3	1.1
					3	1.7	
					5	1.0	
					7	0.7	
					10	0.5	
		√		1	1.2	8.7	1.3
					3	3.5	
					5	2.1	
					7	1.5	
					10	1.0	
			√	1	1.2	13.1	1.4
					3	5.2	
					5	3.1	
					7	2.2	
					10	1.5	

Times of charging and discharging the tested object at measuring voltage of 1.025 U_{ISO}

Meter	Measuring voltage			Capacitance	Charging the object		Discharging the object
	5 kV	10 kV	15 kV	[µF]	Current [mA]	Maximal time [s]	down to voltage of 50 V [s]
MIC-5005 / MIC-5010	√			1	1.2	4.2	0.4
					3	1.7	
MIC-5050 / MIC-05s1	√			1	1.2	4.2	0.4
					3	1.7	
					6	0.8	
MIC-10k1 / MIC-10s1	√			1	1.2	4.2	0.9
					3	1.7	
					6	0.8	
		√		1	1.2	8.5	1.0
					3	3.4	
					6	1.7	
MIC-15k1	√			1	1.2	4.2	1.1
					3	1.7	
					5	1.0	
					7	0.7	
					10	0.5	
		√		1	1.2	8.5	1.3
					3	3.4	
					5	2.0	
					7	1.4	
					10	1.0	
			√	1	1.2	12.8	1.4
					3	5.1	
					5	3.0	
					7	2.1	
					10	1.5	


max measure-
ment voltage [V]
15000
10000
5000
2500
1000
500
MIC-10
MIC-30
MIC-2501
MIC-5001
MIC-5005
MIC-5010
(+ continuity measurement)
MIC-5050
MIC-05s1
(+ wider filtration
for result
stabilization)
MIC-10k1
MIC-10s1
(+ wider filtration
for result
stabilization)
MIC-15k1
weight [kg]
7
6
5
4
3
2
1
0.6 kg
0.6 kg
1.0 kg
1.0 kg
5.6 kg
5.6 kg
5.6 kg
6.3 kg
10 G
100 G
1 T
5 T
15 T
20 T
40 T
40 T
max measure-
ment range [Ω]
• housing
• telecommunication
• small industrial plants
• street lighting
• factories
• medium voltage power grids
• electric motors
• transformers
• high voltage power grids
• power companies
• electric generators