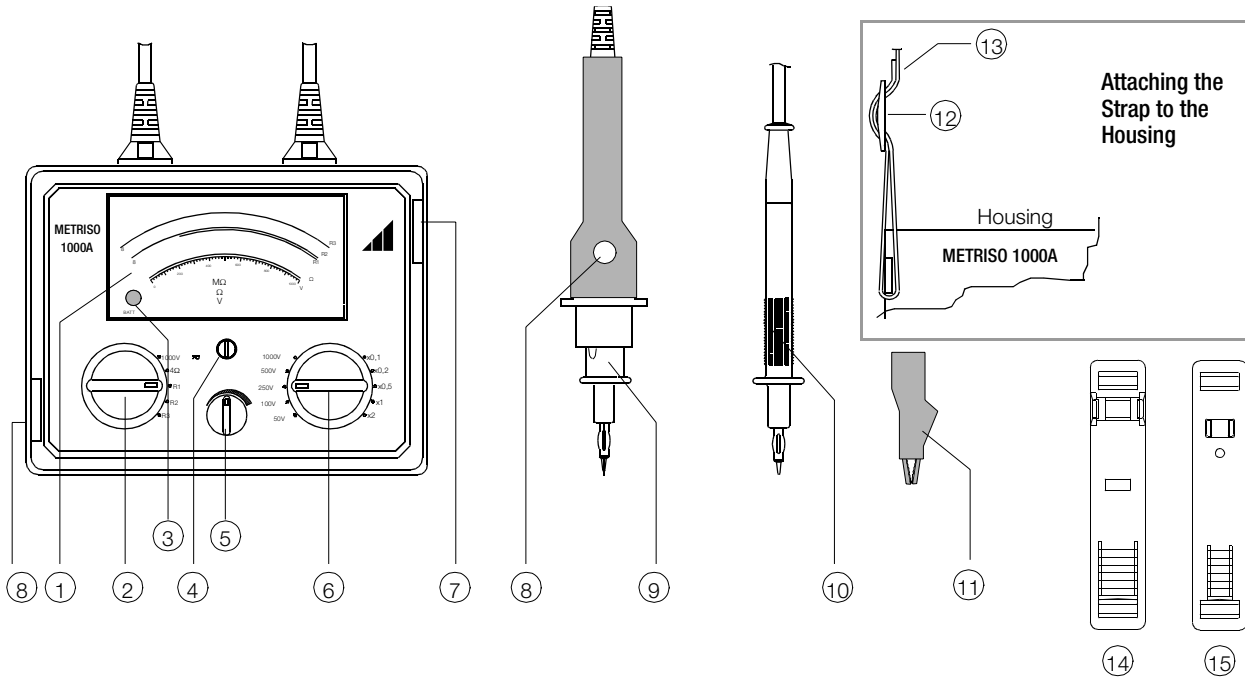


# METRISO<sup>®</sup> 1000A

## Insulation Tester

3-348-773-37  
4/1.02





- 1 Analog display
- 2 Function selector switch
- 3 Battery voltage indicator lamp
- 4 Adjusting screw for mechanical zero adjustment
- 5 Rotary knob for electrical zero adjustment
- 6 Rotary switch for nominal voltage selection
- 7 Studs for fastening the carrying strap
- 8 Measurement key

- 9 Test probe with lamp
- 10 Test probe
- 11 Alligator clip
- 12 Latch
- 13 Carrying strap
- 14 Holder for test probe with lamp (10)
- 15 Holder for test probe (11)

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## 1 Safety Precautions

The METRISO®1000A insulation tester has been manufactured and tested in accordance with the following standards:

IEC 61010-1/EN 61010-1/VDE 0411-1,  
DIN VDE 0413 part 1: 1980 and part 4: 1977,  
IEC 61557-2/EN 61557-2/VDE 0413-2  
IEC 61557-4/EN 61557-4/VDE 0413-4

In order to maintain flawless technical safety conditions and to assure safe use, it is imperative that you read the operating instructions carefully and thoroughly before placing your instrument into service, and that you follow all points contained therein.

### Repair and Parts Replacement

Voltage conducting parts may be exposed when the instrument is opened. The instrument must be disconnected from all sources of voltage before repair or replacement of parts. If the repair of an open, live instrument cannot be avoided, this may only be performed by trained personnel who are familiar with the dangers involved.

### Malfunctions and Extraordinary Strains

If it may be assumed that the instrument can no longer be operated safely, it must be removed from service and secured against unintentional use. Safe operation can no longer be relied upon:

- If the instrument demonstrates visible damage
- If the instrument no longer functions
- After lengthy periods of storage under unfavorable conditions
- After excessive strain during transport



#### Attention!

The permanently attached measurement cables are double insulated with insulation materials of two different colors. Exposure of the light colored inner insulation is an early indicator of excessive cable wear.

## 2 Applications

The METRISO®1000A insulation tester complies with DIN VDE 0413 “Regulations for Devices for the Testing of Protective Measures in Electrical Systems”

Part 1: insulation testers, and

Part 4: ohmmeters.

It is suitable for the measurement of insulation resistance at voltage-free devices and systems with nominal voltages of up to 1000 V, as well as for testing resistance at earthing conductors, protective conductors and bonding conductors including their connections and terminals.

The instrument has also been equipped with a 1000 V measuring range for direct and alternating voltage. This is especially advantageous for testing for the absence of voltage at devices under test, and for discharging capacitive devices under test.

## 3 Initial Start-Up

### 3.1 Battery Installation



#### Attention!

Before opening the housing base make, certain that the function selector switch has been set to the “1000 V” position, and that the instrument has been fully disconnected from all external electrical circuits.

- ⇨ Unscrew the housing base.
- ⇨ Insert 6 commercially available, type IEC R20 or IEC LR20 1.5 V batteries (single cell) with plus and minus poles aligned in accordance with the symbols in the battery compartment.
- ⇨ Replace the housing base and screw into place.

### 3.2 Testing the Batteries

Each time the measurement key is activated, the instrument automatically tests the batteries. Momentary drain on the batteries resulting from the function selector switch position and the pre-selected nominal voltage are taken into consideration during this test. Battery condition is indicated by the color of the indicator lamp at the left-hand portion of the scale area.

Green Lamp: Batteries are OK.

Red Lamp: The batteries are too weak for the currently selected measurement function.

### 3.3 Switching the Tester On and Off

The tester remains activated as long as the measurement key in the test probe is depressed. We recommend setting the function selector switch to the 1000 V position during transport and maintenance, in order to prevent the tester from being switched on inadvertently.

### 3.4 Analog Display

Measurement values are plainly displayed at analog scales. Each of the function selector switch positions has its own scale. A battery status indicator lamp is located at the left-hand portion of the scale area.

### 3.5 Fusing

The instrument is protected with a single common fuse during low-impedance and insulation resistance measurements. The fuse blows if an extraneous voltage is inadvertently applied when the instrument is set to the resistance measuring range.

Voltage measurement is possible regardless of the condition of the fuse.

#### 3.5.1 Checking the Fuse

The  $\Omega$  and  $M\Omega$  ranges are no longer functional after the fuse has blown.

Low-Impedance Measuring Range:

The needle remains at the mechanically set zero point when the measurement key is activated.

Insulation Resistance Measuring Range:

With short-circuited test probes, the needle remains at the mechanically set zero point when the measurement key is activated.

See chapter 8.2 on page 9, “Replacing the Fuse”.

## 4 Measuring Direct and Alternating Voltage

Direct voltages and sinusoidal alternating voltages with frequencies ranging from 40 to 200 Hz can be measured with this instrument. Needle deflection is always positive for direct voltage measurements regardless of polarity at the terminal connections. Alternating voltage is displayed as an RMS value.

- ↪ Set the function selector switch to the “1000 V” position.
- ↪ Make certain that the needle points to the “0” mark at the V scale in the idle state. Readjust the needle if necessary with the adjusting screw for mechanical zero adjustment.
- ↪ Rotary switch position is irrelevant for voltage measurement.
- ↪ Probe the measuring point with both test probes.
- ↪ Read the measurement value from the V scale.

### Notes

- Allowable overload capacity for the voltage measuring range is 1200 V.
- Input impedance for the voltage measuring range is 0.9 M $\Omega$ .
- Devices under test with capacitive charges are automatically discharged by the test instrument. The corresponding drop in voltage can be observed at the display.

## 5 Measuring Insulation Resistance

Before performing measurement, make certain that the device under test is voltage-free (see chapter 4).

### 5.1 Measurement Procedure

- ↪ First set the function selector switch to the R1 position.
- ↪ Briefly short circuit the test probes and press the measurement key to check for full-scale deflection for R1 = 0 M $\Omega$  (zero adjustment). The needle must point to the above indicated full-scale deflection mark in the idle state. Readjust the needle if necessary with the rotary knob for electrical zero adjustment.
- ↪ Depending upon the nominal voltage of the device under test, select a test voltage of either 50 V, 100 V, 250 V, 500 V or 1000 V with the rotary switch.

### Note

Full-scale deflection must be tested in the following cases, and must be readjusted if required in order to attain a measuring accuracy of 1.5%:

- Each time a different nominal voltage is selected
- For resistance measurements of long duration
- ↪ Probe the measuring point with both test probes.
- ↪ Press the measurement key and read the measurement value from the appropriate scale.
- ↪ If needle deflection is insufficient, switch to the next highest measuring range, i.e. R2 or R3, with the function selector switch.
- ↪ Multiply the displayed value by the conversion factor which appears opposite the selected nominal voltage:

Nominal Voltage:	50 V	100 V	250 V	500 V	1000 V
Conversion Factor:	x 0.1	x 0.2	x 0.5	x 1	x 2



### Attention!

Do not touch the conductive ends of the two test probes after the instrument has been activated for the measurement of insulation resistance.

If measurement is being performed at a purely ohmic device under test, current may flow over your body, which, although it does not reach life endangering levels, causes a clearly discernible shock.

When measurements are made at capacitive devices under test, e.g. cables, the DUT may be charged with voltages of up to approximately 1200 V, depending upon selected nominal voltage. Contact with the device under test after measurement is, in this case, life endangering!

For this reason, the DUT must be discharged in a controlled fashion as described in chapter 4 on page 5.

## 5.2 Evaluation of Measurement Values

In order to assure that insulation resistance values do not fall below those required by DIN VDE regulations, insulation tester inherent deviation must be taken into consideration.

Required minimum display values for insulation resistance which take maximum operational measurement deviation of the METRISO®1000A into consideration (under nominal conditions of use) can be determined with the following table. These are the minimum values which must be displayed, in order to assure that actual values do not fall below the required limit values (DIN VDE 0413 part 1). Intermediate values can be interpolated.

**The table applies to a nominal voltage of 500 V.** The values in the table must be multiplied by a conversion factor for other nominal voltages.

Scale R1		Scale R2		Scale R3	
Limit Value [MΩ]	Display Value [MΩ]	Limit Value [MΩ]	Display Value [MΩ]	Limit Value [MΩ]	Display Value [MΩ]
0.1	0.13	0.2	0.25	2	2.5
0.2	0.25	0.3	0.38	3	3.8
0.3	0.38	0.4	0.5	4	5.0
		0.5	0.63	5	6.3
		1	1.25	10	12.5

## 5.3 Rapid Testing of Insulation Resistance

In addition to illuminating the measuring point, the lamp in the test probe can also be used for rapid GO/NO-GO testing of insulation resistance. As long as the lamp is lit, minimum values for insulation resistance are fulfilled in accordance with DIN VDE 0100. The signal remains lit as long as insulation resistance demonstrates the following values:

Insulation Resistance	> 0.1 MΩ	> 0.2 MΩ	> 0.5 MΩ	> 1 MΩ	> 2 MΩ
Nominal Voltage	50 V	100 V	250 V	500 V	1000 V

## 6 Measuring Low-Impedance Resistance (0 to 4 Ω)



### Attention!

Make certain that the device under test is voltage-free before performing measurements in the low-impedance measuring range.

The measurement key should not be depressed if a high-impedance device under test is probed, or if the test probes are idle.

- ↪ Set the function selector switch to the “4 Ω” position.
- ↪ Briefly short circuit the test probes and press the measurement key to check for full-scale deflection at “0 Ω”. The needle must point to the “0” mark at the 4 Ω scale in the idle state. Readjust the needle if necessary with the adjusting screw for mechanical zero adjustment.
- ↪ Probe the two points between which low-impedance resistance is to be measured with the test probes.
- ↪ Activate the measurement key and read the measurement value from the 4 Ω scale.

### Notes:

- Resistance is measured with direct current. If it can be expected that the measurement value will be influenced by the polarity of the measuring current (e.g. if a diode is included in the measuring circuit), reverse the test probes and repeat the measurement.
- Resistance values which fluctuate at the beginning of the measurement include, for example:
  - Resistance with a high inductive component
  - Incandescent lamp resistance values which change due to warming caused by the measuring current
  - Poor contact resistance at contact points

## 7 Characteristic Values

Measuring Function	Measuring Range	Inherent Deviation at Reference Conditions <sup>1)</sup>	Measuring Error <sup>2)</sup>	Nominal Voltage $U_N$	Nominal / Measuring Current	Open-Circuit Voltage $U_0$	Frequency / Short-Circuit Current $I_k$	Internal Resistance $R_i$	Switching Value for Resistance	Overload Capacity	
										Value	Duration
1000 V $\overline{\approx}$	0 ... 1000 V $\overline{\approx}$	$\pm 2.5\%$	—	—	—	—	DC / 40 ... 200 Hz	900 k $\Omega$	—	1200 V $\overline{\approx}$	continuous
R1, R2, R3 $U_N = 50\text{ V}$	0 ... 40 k $\Omega$	$\pm 1.5\%$	$\pm 25\%$ of reading	50 V		60 V		30 k $\Omega$	> 100 k $\Omega$	1200 V $\overline{\approx}$	max. 10 s
	20 k $\Omega$ ... 1 M $\Omega$							10 k $\Omega$			
	200 k $\Omega$ ... 20 M $\Omega$							40 k $\Omega$			
R1, R2, R3 $U_N = 100\text{ V}$	0 ... 80 k $\Omega$	$\pm 1.5\%$	$\pm 25\%$ of reading	100 V		120 V		60 k $\Omega$	> 200 k $\Omega$	1200 V $\overline{\approx}$	max. 10 s
	40 k $\Omega$ ... 2 M $\Omega$							20 k $\Omega$			
	400 k $\Omega$ ... 40 M $\Omega$							80 k $\Omega$			
R1, R2, R3 $U_N = 250\text{ V}$	0 ... 200 k $\Omega$	$\pm 1.5\%$	$\pm 25\%$ of reading	250 V	$I_N \geq 1.0\text{ mA}$	300 V		150 k $\Omega$	> 500 k $\Omega$	1200 V $\overline{\approx}$	max. 10 s
	100 k $\Omega$ ... 5 M $\Omega$							50 k $\Omega$			
	1 M $\Omega$ ... 100 M $\Omega$							200 k $\Omega$			
R1, R2, R3 $U_N = 500\text{ V}$	0 ... 400 k $\Omega$	$\pm 1.5\%$	$\pm 25\%$ of reading	500 V		600 V		300 k $\Omega$	> 1 M $\Omega$	1200 V $\overline{\approx}$	max. 10 s
	200 k $\Omega$ ... 10 M $\Omega$							100 k $\Omega$			
	2 M $\Omega$ ... 200 M $\Omega$							400 k $\Omega$			
R1, R2, R3 $U_N = 1000\text{ V}$	0 ... 0.8 M $\Omega$	$\pm 1.5\%$	$\pm 25\%$ of reading	1000 V		1200 V		600 k $\Omega$	> 2 M $\Omega$	1200 V $\overline{\approx}$	max. 10 s
	400 k $\Omega$ ... 20 M $\Omega$							200 k $\Omega$			
	4 M $\Omega$ ... 400 M $\Omega$							800 k $\Omega$			
4 $\Omega$	0 ... 4 $\Omega$	$\pm 1.5\%$	$\pm 10\%$ of reading	—	$I_m \geq 200\text{ mA}$	9 V		—	—	0.315 A	continuous

<sup>1)</sup> As related to scale length

Scale lengths: R1 l = 46 mm  
R2 l = 71 mm  
R3 l = 80 mm  
 $\Omega$  l = 67 mm  
U l = 66 mm

<sup>2)</sup> Within the marked area of the respective scale (nominal range of use)

### Reference Conditions

Positioning	horizontal
Temperature	+23° C ± 2K
Relative Humidity	45 ... 55%
Measured Quantity	
Frequency	45 ... 65 Hz
Measured Quantity	
Waveshape	sine
Deviation between Effective and Rectified Values	< 0.5%
Battery Voltage	9 V ± 0.5 V

### Nominal Conditions of Use

Temperature	0 ... 40° C
Positioning	horizontal or vertical
Battery Voltage	7 ... 10 V

### Power Supply

Batteries: 6 ea. 1.5 V single cell (6 x D-size) zinc-coal, type R20 or alkaline-manganese, type LR 20, in accordance with IEC

### Battery Service Life

Number of measurements possible with 6 ea. type R20 batteries (with indicator lamp in test probe switched off): at least 3000 measurements of an insulation resistance of 1 MΩ  
( $U_N = 1000$  V, 5 s measurement, 25 s pause and so forth)

### Electrical Safety

Safety Class	II
Nominal Voltage	1000 V
Test Voltage	5.55 kV~
Overvoltage Category	II
Contamination Level	2

### Electromagnetic Compatibility (EMC)

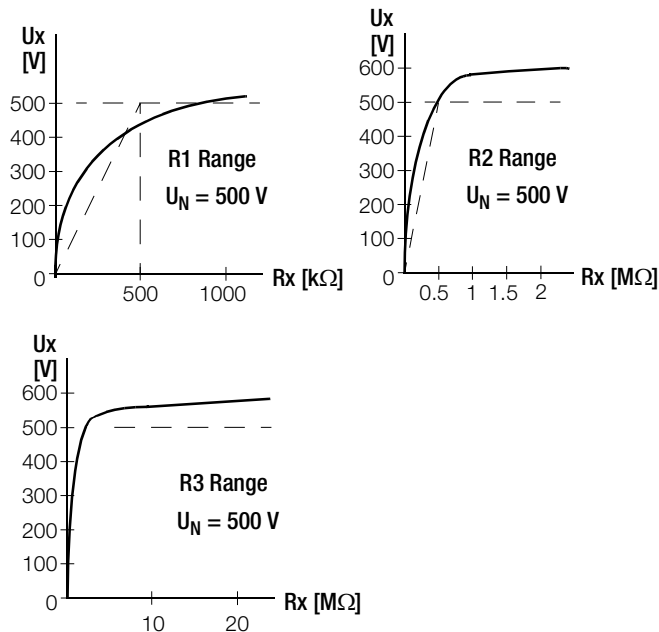
Interference Emission	IEC/EN 61326-1
Interference Immunity	IEC/EN 61326/A1

### Mechanical Design

Protection	housing: IP 52
Dimensions	165 mm x 125 mm x 110 mm
Weight	1.6 kg with batteries

### Making Capacity for the Measurement of Insulation Resistance

Electronic voltage limiting prevents voltage at the device under test from substantially exceeding nominal voltage during the making operation (see following characteristic curve).





## 8 Maintenance



### Attention!

Completely disconnect the instrument from all external electrical circuits before replacing the batteries or the fuse. We recommend setting the function selector switch to the 1000 V position during transport and maintenance, in order to prevent the tester from being switched on inadvertently.

### 8.1 Batteries

The condition of the batteries should be checked from time to time. A dead or deteriorating battery must be removed from the battery compartment. If battery leakage occurs, electrolyte must be completely removed from the instrument and the batteries must be replaced.

The batteries must also be replaced if the red lamp at the left-hand portion of the scale area lights up during the **battery test** described in chapter 3.2 on page 4.

Replace batteries as described in chapter 3.1 on page 4. Always replace batteries as a complete set!

### 8.2 Replacing the Fuse

The fuse blows if maximum allowable voltage is exceeded when the test instrument is connected to the measuring circuit.

**A replacement fuse is located in the battery compartment.**



### Attention!

Use only specified, original type FF 0.315 A/1000 V fuses! Bridging the fuse holder or repairing fuses is prohibited! Instrument components may be damaged if fuses with other current ratings, other breaking capacities or other blowing characteristics are used!

### The fuse is replaced as follows:

- Unscrew the housing base.
- Screw the threaded cap out of the fuse holder with the help of a screwdriver.
- Screw the threaded cap back into place along with a new fuse.
- Replace the housing base and screw into place.

### 8.3 Testing for Functionality and Accuracy

Using the tester ISO-Kalibrator 1 (accessories: article number M662A), you can quickly and rationally test measuring instruments for insulation resistances and low-ohmic resistances for their functionality and accuracy, and thus ensure their proper function.



### 8.4 Housing

No special maintenance is required for the housing. Keep outside surfaces clean. Use a slightly dampened cloth for cleaning. Avoid the use of cleansers, abrasives or solvents.

## 8.5 Carrying Bag

The measuring instrument can be securely fixed in the bag by pulling the carrying strap of the instrument through the internal studs situated on the right and left of the housing. The studs can be released for this purpose on one side by pressing the silver push-buttons.

The flap of the bag serves as a place for keeping documents, or else, for example, as a writing pad (see Figure 1). Moreover, the flap can be turned beyond its rear attachment and folded away under the bottom of the bag where it can be fixed with a lock (Figure 2).

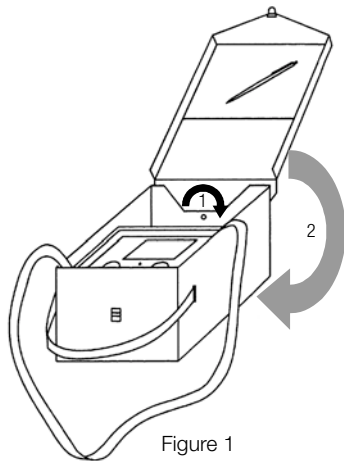


Figure 1

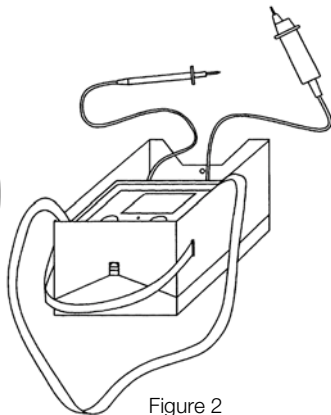


Figure 2

## 9 Repair and Replacement Parts Service DKD Calibration Lab and Rental Instrument Service

When you need service, please contact:

GOSEN-METRAWATT GMBH  
Service-Center  
Thomas-Mann-Strasse 20  
90471 Nürnberg, Germany  
Phone +49 911 86 02 - 410 / 256  
Fax +49 911 86 02 - 2 53  
e-mail [service@gmc-instruments.com](mailto:service@gmc-instruments.com)

This address is only valid in Germany.

Please contact our representatives or subsidiaries for service in other countries.

## 10 Product Support

When you need support, please contact:

GOSEN-METRAWATT GMBH  
Product Support Hotline  
Phone +49 911 86 02 - 112  
Fax +49 911 86 02 - 709  
e-mail [vmp.info@gmc-instruments.com](mailto:vmp.info@gmc-instruments.com)

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