

OPERATING INSTRUCTIONS

1/8.24

3-447-247-03



METRALINE EARTH

TESTER FOR THE MEASUREMENT OF EARTH
RESISTANCE AND THE TESTING OF LOW-RESISTANCE
PROTECTIVE CONDUCTOR CONTINUITY AND CONTACT
RESISTANCE


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1 SAFETY INSTRUCTIONS

	<p>Read and follow these instructions carefully and completely in order to ensure safe and proper use.</p> <p>The instructions must be made available to all persons who use the instrument.</p> <p>Keep for future reference.</p>
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General

- The device may only be used in the commercial field by qualified electricians.
- Observe the five safety rules in accordance with EN 50110-1, Operation of electrical installations– Part 100: General requirements.
(1: Shut down entirely. 2: Secure against restart. 3: Assure absence of voltage at all poles. 4: Ground and short circuit. 5: Cover neighboring live components, or make them inaccessible.
- Observe and comply with all safety regulations which are applicable for your work environment.
- Wear suitable and appropriate personal protective equipment (PPE) whenever working with the instrument.
- The functioning of active medical devices (for example pacemakers, defibrillators) and passive medical devices may be affected by voltages, currents and electromagnetic fields generated by the tester and the health of their users may be impaired. Implement corresponding protective measures in consultation with the manufacturer of the medical device and your physician. If any potential risk cannot be ruled out, do not use the instrument.

Accessories

- Use only the specified accessories (included in the scope of delivery or listed as options) with the instrument.
- Carefully and completely read and adhere to the product documentation for optional accessories. Retain these documents for future reference.

Handling

- Use the instrument in undamaged condition only.
Inspect the instrument before use. Pay particular attention to damage, interrupted insulation or kinked cables. Damaged components must be replaced immediately.
- Use the accessories and all cables in undamaged condition only.
Inspect accessories and all cables before use. Pay particular attention to damage, interrupted insulation or kinked cables.
- If the instrument or its accessories don't function flawlessly, permanently remove the instrument/accessories from operation and secure them against inadvertent use.
- If the instrument or accessories are damaged during use, for example if they're dropped, permanently remove the instrument/accessories from operation and secure them against inadvertent use.
- If there are any signs of interior damage to the instrument or accessories (e.g. Loose parts in the housing), permanently remove the instrument/accessories from operation and secure them against inadvertent use.
- The instrument and the accessories may only be used for the tests/measurements described in the documentation for the instrument.
- Route cables in an orderly fashion, e.g. the mains power cable and accessories cable. Loose, disorderly cables result in unnecessary danger of tripping and falling.

Operating Conditions

- Do not use the instrument and its accessories after long periods of storage under unfavorable conditions (e.g. humidity, dust or extreme temperature).
- Do not use the instrument and its accessories after extraordinary stressing due to transport.
- Do not expose the instrument to direct sunlight.
- Only use the instrument and its accessories within the limits of the specified technical data and conditions (ambient conditions, IP protection code, measuring category etc.).
- Do not use the instrument in potentially explosive atmospheres. Danger of explosion!
- Do not use the instrument in atmospheres subject to fire hazard. Danger of fire
- Implement adequate measures for protection against electrostatic discharge (ESD).

Rechargeable or Regular Batteries

- Use batteries in undamaged condition only. Risk of explosion and fire in the case of damaged batteries! Inspect the batteries before use. Pay particular attention to leaky and damaged batteries.
- If you use batteries or rechargeable batteries, you may use the respective test and measuring instrument only with the battery compartment cover properly inserted and closed. Otherwise, dangerous voltages may occur at the (rechargeable) battery terminals under certain circumstances.
- Do not use the device while the internal batteries are being charged.
- Recharge batteries in undamaged condition only. Risk of explosion and fire in the case of damaged rechargeable batteries! Inspect the batteries before use. Pay particular attention to leaky and damaged batteries.

Fuses

- The instrument may only be used as long as the fuses are in flawless condition. Defective fuses must be replaced. Fuses may only be replaced by our repair service department.
- Never bridge the fuses. Never put the fuses out of operation.

Measurement Cables and Establishing Contact

- Plugging in the measurement cables must not necessitate any undue force.
- Never touch conductive ends (for example of test probes).
- Fully unroll all measurement cables before starting a test/measurement. Never perform a test/measurement with the measurement cable rolled up.
- Avoid short circuits due to incorrectly connected measurement cables.
- Ensure that alligator clips, test probes or Kelvin probes make good contact.
- Do not move or remove as far as possible plugs, test probes, alligator clips or Kelvin probes until testing/measurement has been completed.
Unwanted sparking may otherwise occur due to test current.
- Only use measurement cables and external cabling with a maximum length of 1 m.

Adjustment / Calibration

- Comply with national recalibration regulations and laws.
- Comply with national calibration regulations and laws.

Emissions

- Switch off nearby cell phones while performing tests/measurements with the instrument. Cell phone signals may impair the correct functioning of the device due to interference.

Data Security

- Always create a backup copy of your measurement/test data.
- The device is equipped with a data memory to which personal and/or sensitive data can be stored. Observe and comply with the applicable national data protection regulations. Use the corresponding functions provided by the test instrument (such as access protection), as well as other appropriate measures to prevent unauthorized access to the data.
- Protect the device against unauthorized tampering. Use the functions provided by the instrument (e.g. key lock/sealing/lock function) as well as other appropriate measures (e.g. restricting physical access to the instrument).

2 APPLICATIONS

Please read this important information!

2.1 INTENDED USE / USE FOR INTENDED PURPOSE

METRALINE EARTH is a multifunctional tester for the measurement of earth resistance and the testing of low-resistance protective conductor continuity and contact resistance. It is designed to perform the following measurement types:

- Low resistance
- Continuity
- Earth resistance

Safety of the user, as well as that of the instrument, is only assured when it's used for its intended purpose.

2.2 USE FOR OTHER THAN INTENDED PURPOSE

Using the instrument for any purposes other than those described in the condensed operating instructions or these instrument operating instructions is contrary to use for intended purpose. Use for Other than Intended Purpose may lead to unpredictable damage!

2.3 LIABILITY AND GUARANTEE

Liability and guarantee granted by Gossen Metrawatt GmbH complies with the applicable contractual and mandatory legal regulations.

3 DOCUMENTATION

3.1 INFORMATION CONCERNING THESE INSTRUCTIONS

Read these instructions attentively and carefully. They contain all necessary information for safe use of the instrument. Comply with them in order to protect yourself and others from injury, and to avoid damaging the instrument.

The latest version of these instructions is available on our website:

<https://www.gmc-instruments.de/en/services/download-center/>



Errors and Suggestions for Improvement

These instructions have been prepared with utmost care in order to ensure correctness and completeness. Unfortunately, errors can never be entirely avoided. Continuous improvement is part of our quality goal, so we always appreciate your comments and suggestions.

Gender Equality

For better readability, only the masculine form is used in these instructions in a grammatically impartial sense. The feminine and diverse forms are of course always implied as well.

Trademark Law

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3.2 IDENTIFICATION OF WARNINGS

Instructions for your safety and for the protection of the instrument and its environment are provided as warnings and notes at certain points within these instructions.

They're laid out as shown below and are graded in terms of the severity of the respective hazard. They also describe the nature and cause of the hazard, the consequences of non-observance and what must be done to avoid it.



DANGER

Death or serious injury is almost certain.



WARNING

Death or serious injury is possible.



CAUTION

Minor or moderate injury is possible.

ATTENTION

Damage to the product or the environment is possible.



Note

Important information.

**Tip**

Useful additional information or application tip.

3.3 IDENTIFIERS

The following identifiers are used in this documentation:

Identifier	Meaning
Control Element	Keys, buttons, menus and other controls
✓ Prerequisite	A condition etc. which must be fulfilled before a given action can be taken
▶ Procedure	Beginning of a procedural instruction
1. Procedural step	Steps of a procedure which must be completed in the specified order
↳ Result	Result of a procedural step
■ Enumeration ■ Enumeration	Bullet lists
Abb. 1: <i>Caption</i>	Description of the content of a figure
Tab. 1: <i>Table 1</i>	Description of the content of a table
Footnote	Comment

Tab. 2: *Identifiers in this document*

3.4 SYMBOLS IN THE DOCUMENTATION

The following icons are used in this documentation:

Icon	Meaning
	Read and adhere to the product documentation.
	General warning symbol.
	Warning regarding electrical voltage.

Tab. 3: *Icons used in this document*

4 GETTING STARTED

This chapter gives you an overview of the initial steps with the instrument.

1. Read and adhere to the product documentation. In particular, observe all safety information in the documentation, on the tester and on the packaging.
 - Safety Instructions → 4
 - Applications → 6
 - Documentation → 7
2. Familiarize yourself with the tester.
 - The Tester → 10
3. Familiarize yourself with the display and instrument operation.
 - Menu and Functions → 14
4. Install the tester.
 - Installation → 19
5. Configuration and operation.
6. Operation → 20

Further topics of interest: Maintenance → 31

5 THE TESTER

5.1 SCOPE OF DELIVERY

Please check the scope of delivery for completeness and intactness.

1	METRALINE EARTH (M590R)	1	USB cable type A to type B
1	Carrying case	6	Rechargeable batteries 1.5 V
1	Earth tester set with three measurement cables (green: 5 m; red: 20 m; blue: 40 m)	2	Earth spikes
1	Power supply	1	Condensed operating instructions
3	Crocodile clips	1	Software METRAreport (Download) https://www.gossenmetrawatt.de/en/services/mygmc/

5.2 DEVICE OVERVIEW

5.2.1 FRONT



Fig. 2: Front Panel

- 1 TFT color display

5.2.2 BACK

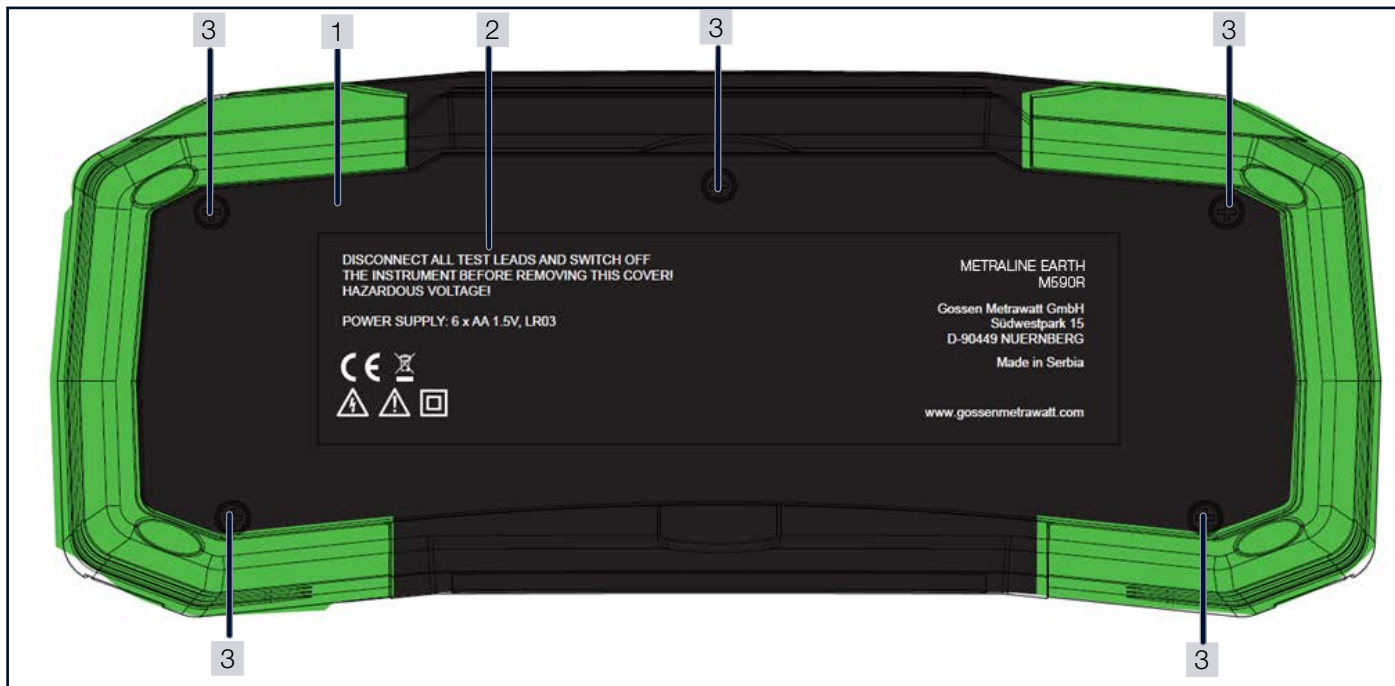


Fig. 3: Back of Instrument

- 1 Battery compartment cover
- 2 Information label
- 3 Fixing screws for battery/fuse compartment cover

5.2.3 BATTERY COMPARTMENT

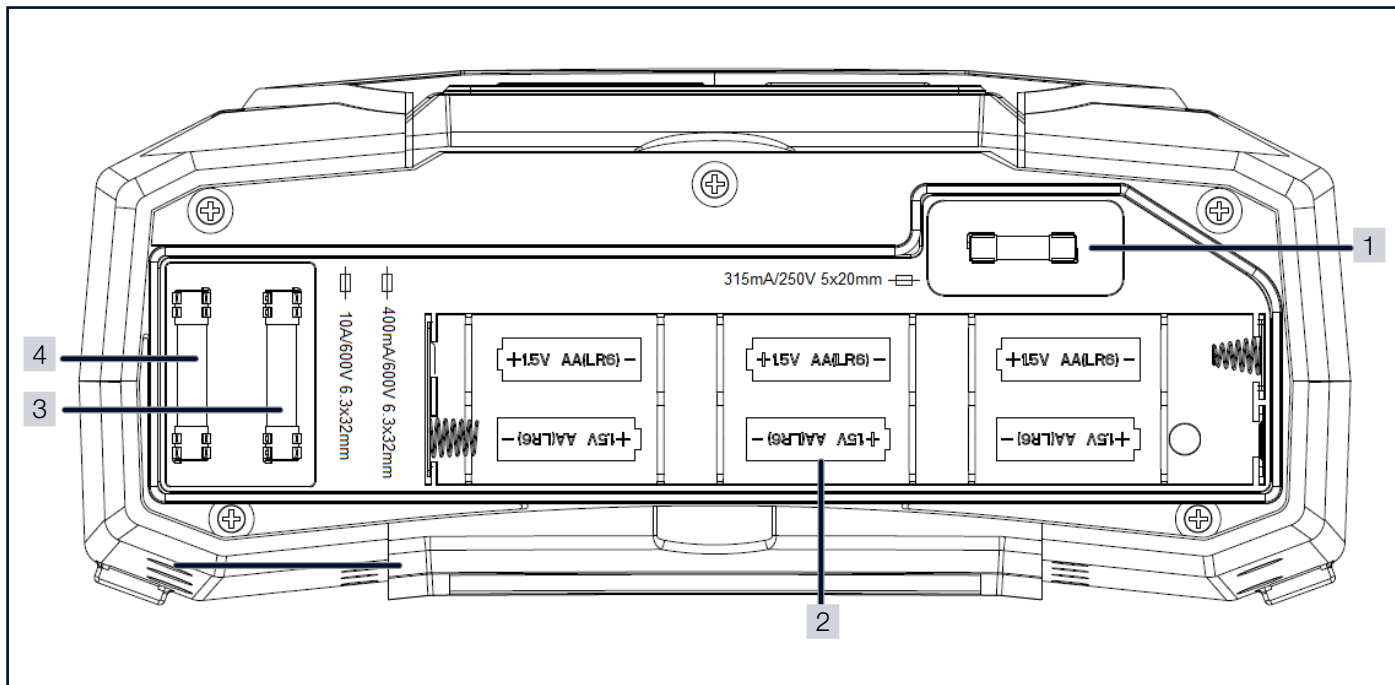


Fig. 4: Battery Compartment

- 1 Fuse F3
- 2 Battery cells
- 3 Fuse F2
- 4 Fuse F3

5.2.4 TOP



Fig. 5: Top of Instrument

- 1 Test lead sockets
- 2 Mains socket
- 3 USB port

5.2.5 Symbols on the Tester and the Included Accessories

Symbol	Meaning
	Warning concerning a point of danger (attention, observe documentation!)
	Warning regarding electrical voltage
	Double insulation (protection category II)
	European conformity marking
	The tester may not be disposed of with household trash ⇒ "Disposal and Environmental Protection" 36.
	Power supply socket polarity

Tab. 4: Symbols on the Tester and the Included Accessories

5.3 RELEVANT STANDARDS

The instrument has been manufactured and tested in accordance with the following safety regulations:

DIN EN 60529 IEC 60529	Test instruments and test procedures Degrees of protection provided by enclosures (IP code)
DIN EN 61010-1 IEC 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements
DIN EN 61010-031	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 031: Safety requirements for hand-held and hand-manipulated probe assemblies for electrical test and measurement
DIN EN IEC 61326-1	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
DIN EN IEC 61557-1	Electrical safety in low voltage distribution systems up to 1000 V _{AC} and 1500 V _{DC} – Equipment for testing, measuring or monitoring of protective measures – Part 1: General requirements

5.4 TECHNICAL DATA

Power Supply		9 V _{DC} (6 × 1.5 V Ni-MH batteries, size AA)
Ambient Conditions	Operating temperatures:	0 ... +40 °C
	Storage temperature:	–10 ... +70 °C
	Relative atmospheric humidity:	Max. 95%, no condensation allowed
	Elevation:	Max. 2000 m
Electrical Safety	Pollution degree:	2
	Protection category:	II
	Surge protection	600 V CAT III 300 V CAT IV
Electromagnetic Compatibility (EMC)	Interference emission:	EN 61326-1 class B
	Interference immunity:	DIN EN 61326-1 / IEC 61326-1 DIN EN 61326-2-33 / IEC 61326-2-33 EN 55011:2016 + A1:2017
Mechanical Design	Protection:	Housing: IP42 per DIN EN 60529 / IEC 60529 (protection against ingress of solid foreign objects: ≥ 1.0 mm dia., Ø; protection against ingress of water: protected against dripping water when the housing is tilted up to 15°)
	Housing (W × H × D):	Approx. 25 × 10.7 × 13.5 cm
	Weight:	Approx. 1.30 kg (without batteries)
	Display:	480 × 320 TFT LCD
Data Interfaces	COM-port:	USB
Internal memory		1000 measurements

5.5 CHARACTERISTIC VALUES












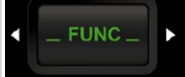

Function	Measured variable	Display range
Continuity	Test current min. 200 mA	0.00 Ω ... 1999 Ω
Earth resistance (R _E)	3-wire, 4-wire	0.00 Ω ... 9999 Ω
	Specific earth resistance	0.0 Ω ... 9999 Ω

6 MENU AND FUNCTIONS

The instrument is operated via function keys on the front panel.

The settings and values are displayed on the display.

6.1 FUNCTION KEYS

Key	Description	Function
	save	Saves a measurement or a setting
	zero	Compensates the test lead resistance in low-value resistance measurements
	help	Access the help menu
	light	Configure or turn off the display backlight
	set	Opens the setup menu
	esc	Exit a menu and return to the previous level
	on/off	Short keystroke: Instrument on Long keystroke: Instrument off The instrument will automatically switch off (APO) after the last key press if no voltage is applied
	up	Scroll upwards in a list
	down	Scroll downwards in a list
	left	Decrease a value Switch to the previous option
	right	Increase a value Switch to the next option
	FUNC	Switch between different measurement modes
	START/enter	Start a test Enter a submenu Confirm an action

Tab. 5: Function Keys

6.2 USER INTERFACE

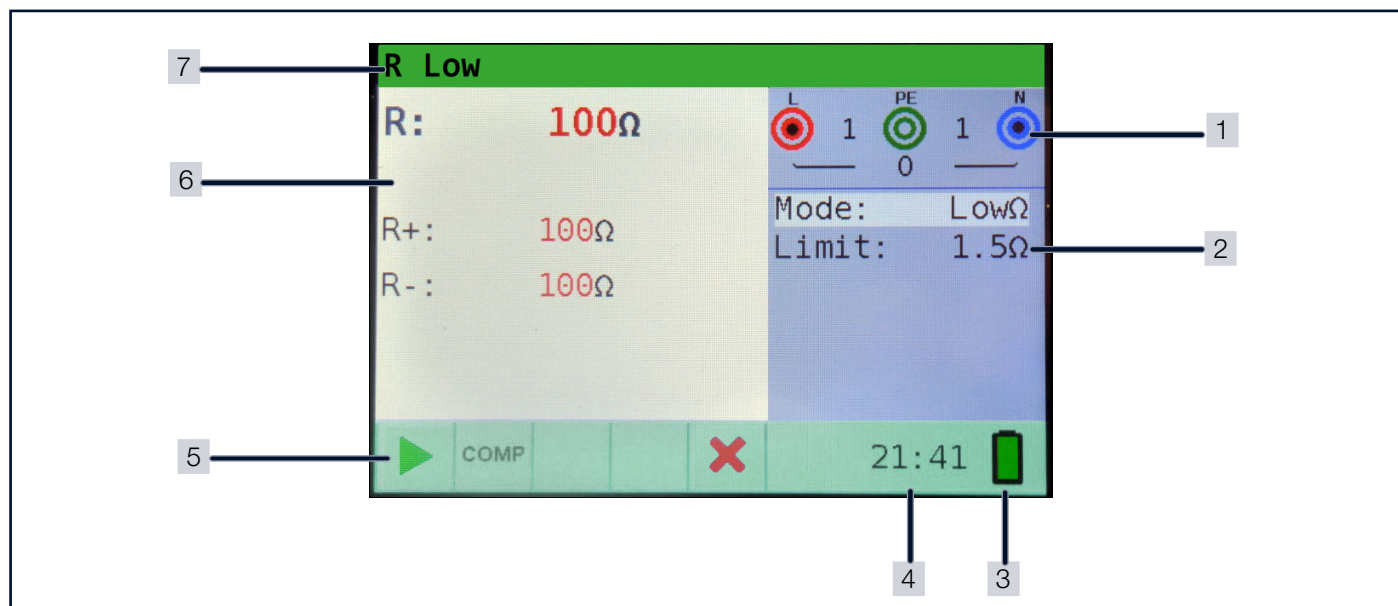
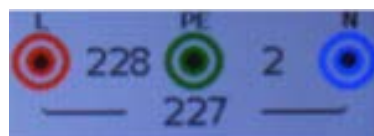


Fig. 6: Display

- 1 Online voltage and output monitor
- 2 Options field
- 3 Message field - battery status indicator
- 4 Current time
- 5 Status field
- 6 Result field
- 7 Function line

6.2.1 VOLTAGE AND OUTPUT TERMINAL MONITOR

Online voltages are displayed together with test terminal indication. All three test terminals are used for selected measurement.



Online voltages are displayed together with test terminal indication. L and N test terminals are used for selected measurement.














6.2.2 BATTERY STATUS INDICATION

Indicator	Description
	Battery power indication Here: Battery partially charged
	Battery low or empty Battery pack is too weak to guarantee correct result. Replace the batteries.

Tab. 6: Battery Status Indication

The recharge process is indicated by a LED near the power supply socket.

6.2.3 STATUS FIELD

Icon	Description
	Dangerous voltage
COMP	Test leads are compensated
	Not ready for measurement
	Dangerous voltage on PE
	Result ok
	Result not ok
	Ready for measurement
	Temperature too high
	Swap test leads
	Wait
	Noise on signal
	Check fuses

Tab. 7: Status Field Icons

6.2.4 ACOUSTIC WARNINGS

Sound	Description
Short high sound	Button is pressed
Increasing alarm	Dangerous voltage is applied
Short sound	Power off, end of measurement
Decreasing alarm	Warnings: <ul style="list-style-type: none"> ■ Temperature ■ Voltage and input ■ Start not possible
Periodic alarm	Warning! Phase voltage on the PE terminal! Stop all the measurements immediately and eliminate the fault before proceeding with any activity!

Tab. 8: Acoustic Warnings

6.3 MEASUREMENT FUNCTIONS

The following measurements can be selected by pressing **FUNC**:

- Earth resistance (Ro, Re)
- Continuity (Continuity, R Low)

6.4 MEASUREMENT SETTINGS

Parameters	Description
Mode	Sets the measurement mode
Limit	Sets the limit value
Distance	Earth resistance Ro: Sets the distance "a" between test rods

Tab. 9: Measurement Settings

6.5 SETUP MENU

Submenu	Description
Date/time	<ul style="list-style-type: none"> Year Month Day Hour Minute Sets date and time
Start function	<ul style="list-style-type: none"> Last function Earth resistance Re Continuity Sets the start function
Device info	Displays information about the device: SN, Firmware, next calibration
Language	<ul style="list-style-type: none"> English German Dutch French Spanish Italian Changes the language of the user interface
Buzzer	<ul style="list-style-type: none"> Alarm and errors Alarm only All sounds Sets the options, when the buzzer should be active

Tab. 10: Setup Menu

- Press the key **set** to enter the setup menu.
- Press **up / down** to select the submenu.
- Press **START/enter** to enter the submenu.
- Press **left / right** to increase or decrease the value.

6.6 HELP SCREEN

The help screens contain diagrams that show the correct use of the device for every kind of measurement.

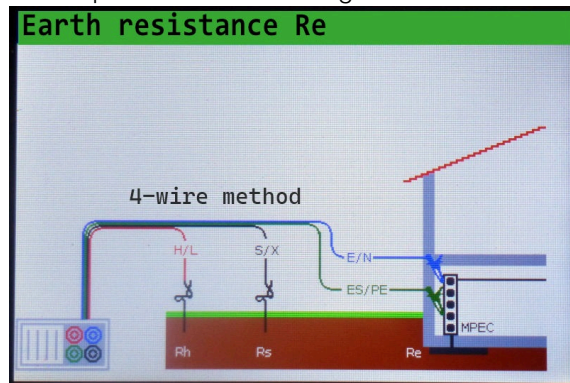


Fig. 7: Help Screen

- Press the key **help** to enter the help screen.
- Press **left** to switch to the previous help screen.
- Press **right** to switch to the next help screen.
- Press **help** or **esc** to close the help screen.

7 INSTALLATION

7.1 UNPACKING THE INSTRUMENT

1. Carefully remove instrument and accessories from the packaging.
2. Check delivery for completeness and possible damage.
3. In case of detected damages, hidden defects and short deliveries, document type and scope and contact the manufacturer or supplier immediately.
4. Keep packing material for further transport.

7.2 ESTABLISHING POWER SUPPLY

1. Remove the screws of the battery compartment cover on the back side of the instrument.
2. Remove the battery/fuse compartment cover.
3. Insert 6 1.5 V AA batteries into the battery tray. Ensure the correct polarity.
4. Place the battery compartment cover onto the battery tray.
5. Fix the screws of the battery compartment cover.

7.3 SWITCHING ON/OFF

7.3.1 SWITCHING ON THE INSTRUMENT

1. Briefly press the key **on/off**.
2. The firmware version is displayed on the screen for a few seconds. Afterwards, the last set mode is displayed on the screen. The instrument is ready for operation.

7.3.2 SWITCHING OFF THE INSTRUMENT

1. Press the key **on/off** for a few seconds.
2. The instrument is switched off.

8 OPERATION

8.1 SELECTING A FUNCTION OR SUBFUNCTION

1. Press **up** or **down** to select the the parameter or limit value you want to edit.
 2. Press **left** or **right** to set the value for the selected parameter.
- ↳ The settings are retained until new changes are made.

8.2 PERFORMING A MEASUREMENT



Note

The indicator **Not ready for measurement** means that the selected measurement cannot be performed because of irregular conditions on input terminals.

Continuity functions and earth resistance measurements can only be performed on de-energized objects. **PASS / FAIL** indication is enabled when limit is set. Apply appropriate limit value for evaluation of measurement results.

In the case that only two of the three wires are connected to the electrical installation under test, only voltage indication between these two wires is valid.

1. Select the measurement function.
 2. According to the measurement function, select the measurement mode.
 3. According to the measurement function, select the limit values and/or parameters.
 4. Connect the test leads to the instrument as described in the measurement function's **help** diagram.
 5. Connect the test cables to the DUT as described in the measurement function's **help** diagram.
 6. Check the status field for warnings.
 - ✓ The symbol **Ready for measurement** is displayed in the status field.
 7. Press **START/enter**.
- ↳ The test is performed.
The result value is displayed.
The result is marked with the symbol for the test status:
Result ok = Test passed
Result not ok = Test not passed.

8.3 CONTINUITY MEASUREMENT

- R Low (ca. 240 mA) continuity test with automatic polarity reversal

8.3.1 R LOW TEST

This function is used to test the resistance between two different points of the installation to ensure that a conductive path exists between them. The test ensures that all protective conductors, earth conductors or bonding conductors are correctly connected, terminated and have the correct resistive value.

The measurement of the R Low resistance is performed with a test current of more than 200 mA. An automatic pole reversal of the test voltage and the test current is performed during the test. This test checks for any components (e.g. diodes, transistors, SCRs) that may have a rectifying effect on the circuit which could cause problems when a voltage is applied.

This measurement completely complies with EN 61557-4 regulations.

Measuring Range (Ω)	Resolution (Ω)	Accuracy
Measurement range according to 61557: 0.1 Ω ... 1999 Ω		
0.1 ... 20.0	(0.10 ... 19.99) 0.01 (2.00 ... 80.00) 0.01	±(3% of reading + 3 digits)
20 ... 1999	(20.0 ... 99.9) 0.1 (100 ... 1999) 1	±(5% of reading)

Open circuit voltage	5 V _{DC}
Measuring current	min. 200 mA into load resistance of 2 Ω
Test lead compensation	up to 5 Ω
Number of possible tests with a new set of batteries	up to 1400 (with 2300 mAh battery cells)
Automatic polarity reversal of the test voltage	

► Performing an R Low Test



WARNING

Risk of electric shock!

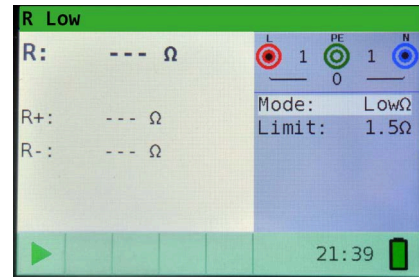
- Perform the measurements only on de-energized objects.
- Parallel impedances or transient currents may influence test results.



Note

If voltages of higher than 10 V (AC or DC) are detected between test terminals, the measurement will not be performed.

1. Press **FUNC** and select **Continuity** or **R Low**.
2. Select **Mode** to set the test mode **LowΩ**.
3. Select **Limit** to set the limit resistance value.



4. Connect the test leads to the instrument.
5. Short test leads.

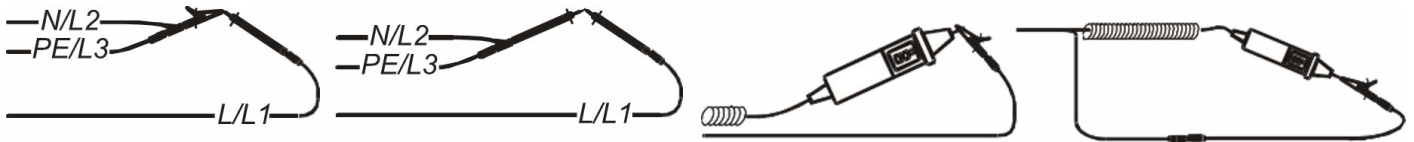
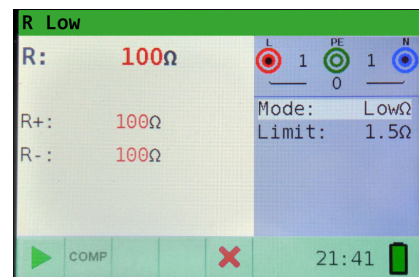


Fig. 8: Shorting of test Leads

6. Press **zero** to start compensation of test lead resistance.
 - ↳ After successful compensation, the indicator **zero** is displayed in the status field.
7. Press **zero** again to remove the compensation of test lead resistance.
 - ↳ After having removed compensation, the indicator **zero** disappears from the status field.
8. Make sure no voltages are present on the DUT.
9. Connect the test cables to the DUT.



10. Check the status field for warnings.
11. If the icon **Ready for measurement** is displayed, press **START/enter**.
 - ↳ The test is performed.
 - ↳ The test result is displayed.



Result	Description
✓	Result ok
✗	Result not ok
R	Main LowΩ resistance result (average of R+ and R- results)
R+	LowΩ resistance sub-result with positive voltage at L terminal
R-	LowΩ resistance sub-result with positive voltage at N terminal

8.4 EARTH RESISTANCE MEASUREMENT

8.4.1 EARTH RESISTANCE MEASUREMENT (RE), 3-WIRE, 4-WIRE

Measuring Range (Ω)	Resolution (Ω)	Accuracy
Measuring range according to EN61557-5 is 100 Ω ... 1999 Ω		
1.0 ... 9999	(1.00 ... 19.99) 0.01 (20 ... 199.9) 0.1 (200 ... 9999) 1	±(5 % of reading + 5 digits)

Max. auxiliary earth electrode resistance Rh 100 RE or 50 kΩ (whichever is lower)

Max. probe resistance Rs 100 RE or 50 kΩ (whichever is lower)

Rh and Rs values are indicative

Additional probe resistance error at Rh- ±(10 % of reading + 10 digits)
max or Rs_{max}

Additional error at 3 V voltage noise ±(5 % of reading + 10 digits)
(50 Hz)

Open circuit voltage <30 V_{AC}

Short circuit current <30 mA

Test voltage frequency 126.9 Hz

Test voltage shape Sine wave

Automatic measurement of auxiliary electrode resistance and probe resistance

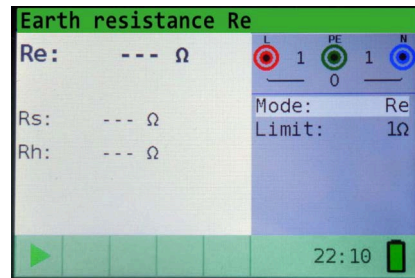
► Performing Earth Resistance Measurement



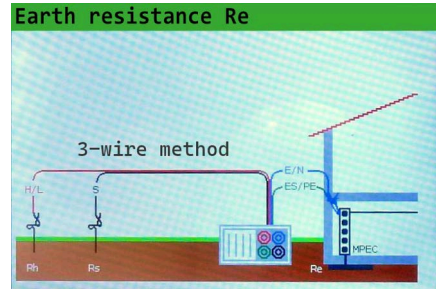
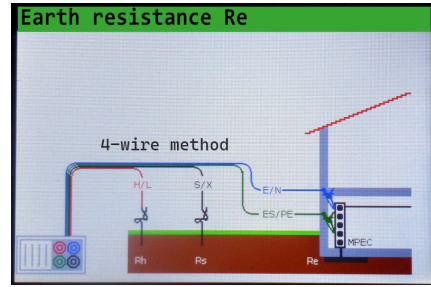
Note

If a voltage of higher than 10 V exists between test terminals, the earth resistance measurement will not be performed.

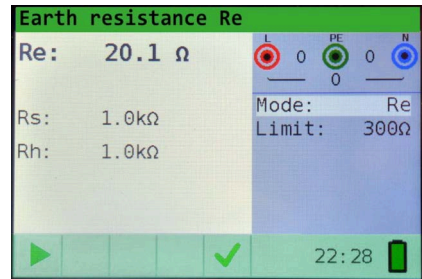
1. Press **FUNC** and select **Earth resistance**.
2. Select **Mode** and set the **Re** mode.
3. Select **Limit** to set the limit resistance value.



4. Connect the test leads to the instrument.
5. Connect the test cables to the DUT.



6. Check the status field for warnings.
7. If the icon **Ready for measurement** is displayed, press **START/enter**.
 - ↳ The test is performed.
 - The test result is displayed.



Result	Description
✓	Result ok
✗	Result not ok
Re	Resistance to earth
Rs	Resistance of S (potential) probe
Rh	Resistance of H (current) probe

8.4.2 SPECIFIC EARTH RESISTANCE MEASUREMENT (RO)

It is advisable to measure Earth Resistivity, when defining parameters of earthing system (required length and surface of earth electrodes, most appropriate depth of installing earthing system etc.) to reach more accurate calculations.

Measuring Range (Ω)	Resolution (Ω)	Accuracy
Rh and Rs values are indicative		
6.0 Ω m ... 99.9 Ω m	0.1 Ω m	$\pm(5\%$ of reading + 5 digits)
100 Ω m ... 999 Ω m	1 Ω m	$\pm(5\%$ of reading + 5 digits)
1.0 k Ω m ... 9.99 k Ω m	0.01 k Ω m	$\pm(10\%$ of reading for Re 2 k Ω ... 19.99 k Ω)
10.0 k Ω m ... 99.9 k Ω m	0.1 k Ω m	$\pm(10\%$ of reading for Re 2 k Ω ... 19.99 k Ω)
100 k Ω m ... 9999 k Ω m	1 k Ω m	$\pm(20\%$ of reading for Re >20 k Ω)
Principle: $\rho = 2 \cdot \pi \cdot d \cdot Re$, where Re is a measured resistance in 4-wire method and d is distance between the probes.		

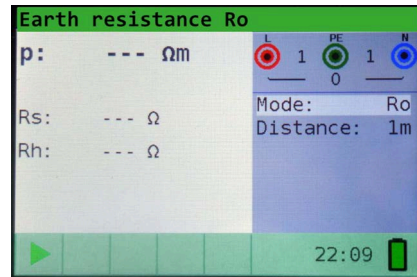
► **Performing Specific Earth Resistance Measurement (Ro)**



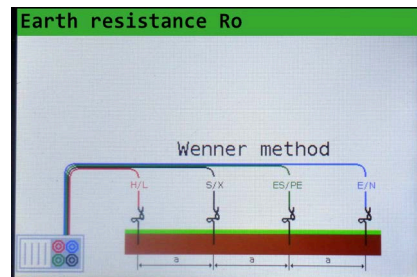
Note

If a voltage of higher than 10 V exists between test terminals, the earth resistance measurement will not be performed.

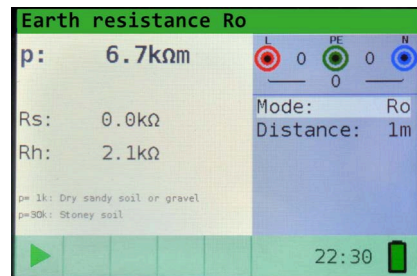
1. Press **FUNC** and select **Earth resistance**.
2. Select **Mode** and set the **Ro** mode.
3. Select **Distance** to set the distance "a" between test rods.



4. Connect the test leads to the instrument.
5. Connect the test cables to the DUT.



6. Check the status field for warnings.
7. If the icon **Ready for measurement** is displayed, press **START/enter**.
 ↳ The test is performed.
 The test result is displayed.



Result	Description
✓	Result ok
✗	Result not ok
Re	Resistance to earth

Result	Description
Rs	Resistance of S (potential) probe
Rh	Resistance of H (current) probe

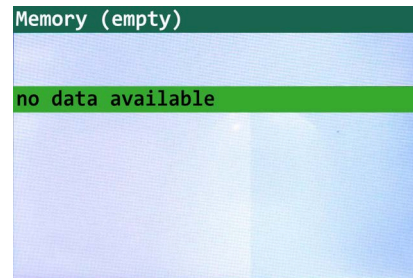
8.5 STORING MEASUREMENTS

After the measurement is completed, results can be stored in internal memory of the instrument together with the sub-results and function parameters.

- The instrument can store up to 1000 measurements
- The list of records can be stepped through
- A single record or all records can be deleted
- The IDs for customer, location and object can be edited

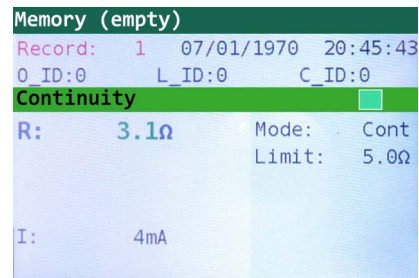
8.5.1 OVERVIEW

- ✓ No actual measurement is made.
 - ✓ No records are stored.
1. Press the key **save**.
 - ↳ An empty memory screen is displayed.



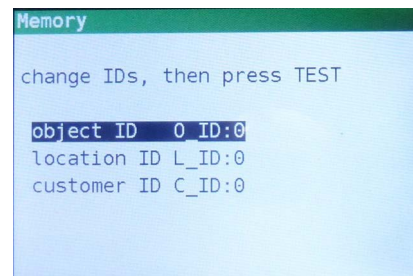
8.5.2 SAVING RESULTS

- ✓ A measurement has been performed.
 - ✓ The results are displayed.
1. Press **save**.
 - ↳ The following saved results are displayed:
 - Next record number (in red letters)
 - Current date (day/month/year)
 - Time (hour:minutes:seconds)
 - Object ID
 - Location ID
 - Customer ID
 - Measurement function
 - Measurement Results
 - Measurement Mode
 - Measurement Limit



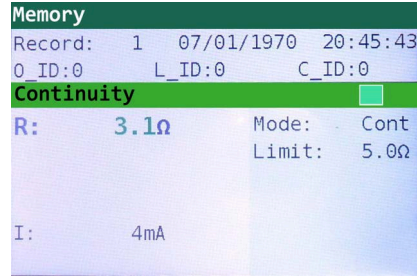
Change Customer ID, Location ID or Object ID

1. Press **left**.
 - ↳ The ID editor is displayed.
2. Use **up / down** to select the ID type you want to change.
3. Use **left / right** to increase or decrease the value of the ID.
4. Press **esc** to return to the record screen without changing the IDs.
5. Press **START/enter** to save the IDs in the actual record.
 - ↳ The new IDs will be used for the following new records.



Store the Result of a Measurement

1. Press **START/enter**.
 - ↳ The result is saved in the internal memory with the next record number. The record number changes from red to black letters.
 - ↳ Each result is displayed in colored letters:
 - Green: measured and passed
 - Red: measured but failed
 - Black: measured but not judged
 - ↳ The green function bar contains a colored field that indicates the overall result of the measurement:
 - Green: measured and passed
 - Red: measured but failed
 - Brown: measured but not judged
2. To abort the saving, press **esc**.



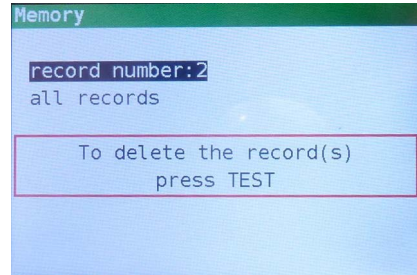
8.5.3 RECALLING RESULTS

1. Press **save**.
 - ↳ The last record is displayed.
2. Use **up / down** to scroll through the records.

8.5.4 DELETING RESULTS

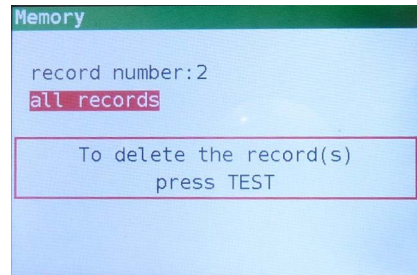
Delete a Single Record

1. Press **save**.
 - ↳ The last record is displayed.
2. Use **up / down** to select the record you want to delete.
3. Press **right**.
4. The delete screen is displayed.
5. Press **START/enter**.
6. The selected record is deleted.



Delete All Records

1. Press **save**.
 - ↳ The last record is displayed.
2. Press **right**.
3. The delete screen is displayed.
4. Use **down** to select **all records**.
5. Press **START/enter**.
6. All records are deleted.



Note

When a single record is deleted, the record number of the deleted record is not used for new records. When all records are deleted, all IDs and numbers are reset.

8.5.5 SAVING MEASUREMENT RESULTS TO PC

Installing the METRAreport software

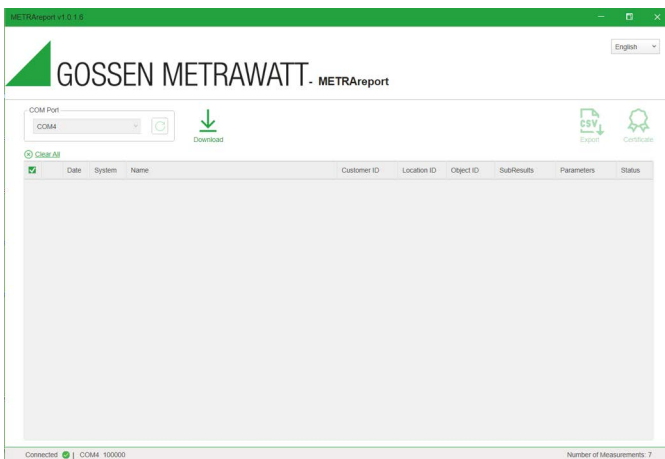
1. Go to the website <https://www.gmc-instruments.de/services/mygmc>.
2. Log in with your credentials.
3. Download the **METRAreport** installation package.
4. Unpack the **METRAreport** installation package on the PC.
5. Follow the installing instructions on the PC.

Connecting the Instrument to a PC

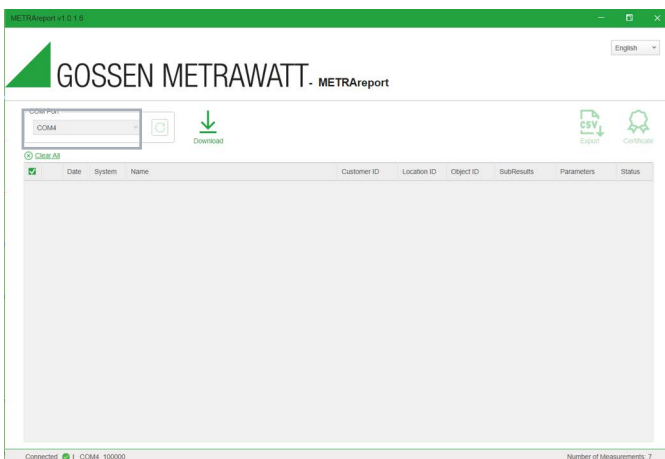
- ✓ All test objects and test leads have been removed from the instrument.
1. Insert in the USB-B plug into the USB port of the instrument.
 2. Insert the USB-A Plug into the USB port of the PC.
- ↳ The USB driver is installed automatically on a free COM port on the PC.

Copy Measurement Results to a PC

- ✓ The instrument is connected to the PC.
1. Start the **METRAreport** software on the PC.
- ↳ The **METRAreport** home screen is displayed.

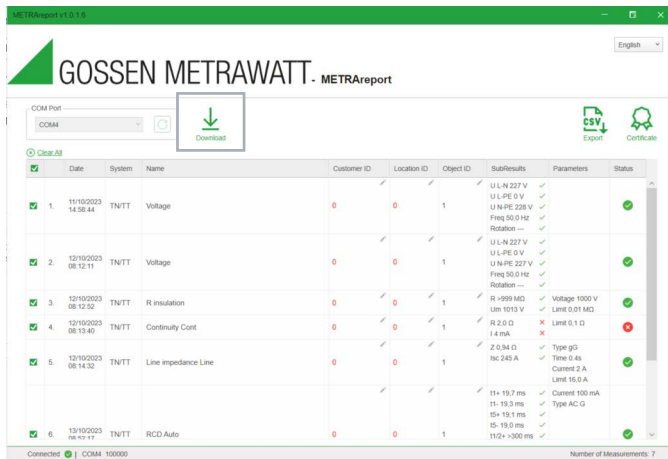


2. Click on the button **Refresh** .
3. In the dropdown menu **COM Port**, select the COM port the USB plug has been assigned to.

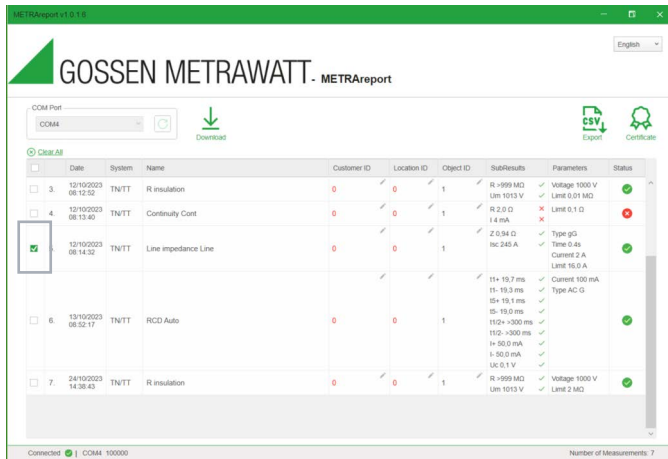


4. Click on the button **Download**.

↳ The records saved in the instrument's internal memory is displayed.

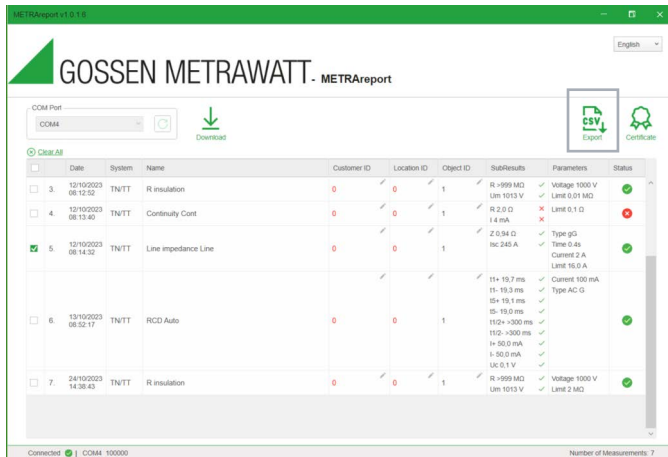


5. Select the checkboxes of the measurements you want to download.



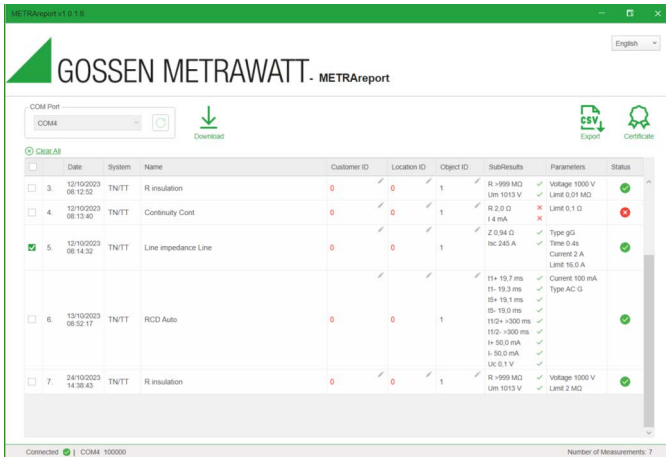
6. Click on the button **CSV Export**.

↳ The selected records are transferred to the PC as*.csv file.



Create a Certificate

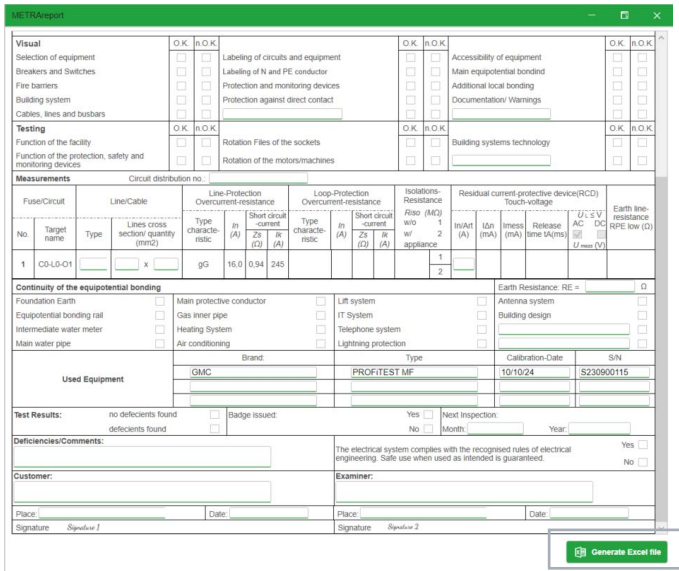
7. Select one single record from the displayed measurements.
8. Click on the button **Certificate**.



↳ A certificate with the data from the selected record is generated.

9. Click on the button **Generate Excel file**.

↳ The selected record is transferred to the PC as*.xlsx file.



9 STORAGE AND TRANSPORT

ATTENTION

Improper Storage

Damage to the product and measuring error due to environmental influences

- Store the instrument in a protected location and only within the limits of permissible ambient conditions. The respective ambient conditions (temperature, humidity etc.) can be found under ⇒ "Technical Data" 13.
-

ATTENTION

Improper Transport

Damage to the product and measuring error

- Transport the instrument only within the limits of permissible ambient conditions (temperature, humidity etc.) ⇒ "Technical Data" 13.
 - Only use the included carrying case to transport the instrument.
-

10 MAINTENANCE

10.1 CLEANING



DANGER

Life endangering due to electric shock!

The instrument and its accessories are operated with electric power. Therefore there is a general risk of electric shock which can be fatal or cause severe injury.

- The instrument, the accessories and all connected conductors must be voltage-free before and during cleaning. Switch the test instrument off and disconnect it from the mains power supply.
- Never immerse the instrument/accessories in water or other fluids.
- Never touch the instrument/accessories with wet or moist hands.
- Allow the instrument to dry completely before use.

ATTENTION

Unsuitable cleaning agents

Unsuitable cleaning agents such as aggressive or abrasive cleansers result in damage to the instrument/accessories.

- Use a cloth which has been slightly dampened with water or alcohol for cleaning.
- Avoid the use of cleansers, abrasives, solvents or liquids based on petrol or hydrocarbon.

Keep the outside surfaces of the instrument and any accessories clean.

10.2 CALIBRATION

Use of your instrument and resultant stressing influence the instrument and lead to deviation from warranted accuracy values.

In the case of strict measuring accuracy requirements, as well as in the event of severe stressing (e.g. severe climatic or mechanical stress), we recommend a calibration interval of 3 years.

Please contact GMC-I Service GmbH for calibration services ⇒ "Contact, Support and Service" 34.



Note

Date on Calibration Certificate / Calibration Interval Begins Upon Receipt

Your instrument is furnished with a calibration certificate on which a date appears. This date may be further in the past if your instrument has been stored for some time prior to sale.

The instruments are stored in accordance with the specified conditions. Drift is thus negligible for a duration of 1 year and longer storage periods are highly unusual.

Consequently, the instrument's characteristic values lie within the specifications and the first calibration interval can be determined as of the date of receipt.

10.3 REPLACING A FUSE



WARNING

Risk of injury due to incorrect fuse!

If a fuse of the wrong type is used, the instrument can be overloaded and cause fire or failure of protective devices.

- Replace any blown fuses with exactly the same type of fuse.

Fuse	Type	Function
F1	F 4 A / 500 V, 32 6.3 mm	General input protection fuses for the L/L1 and N/L2 test terminals.
F2	F 4 A / 500 V, 32 6.3 mm	General input protection fuses for the L/L1 and N/L2 test terminals.
F3	M 0.315 A / 250 V, 20 5 mm	Protects internal circuitry of low-value resistance function if test probes are connected to the mains supply voltage by mistake

- ✓ The instrument has been turned off.
 - ✓ Any measuring accessory has been removed from the instrument.
1. Unfasten the screws and take off the battery cover on the rear of the instrument.
 2. Replace the fuse with exactly the same type of fuse.
 3. Close the battery cover and fasten the screws.

10.4 BATTERY MAINTENANCE

10.4.1 CHANGING THE BATTERIES



WARNING

Risk of injury due to hazardous voltage!

When connected to an installation, the instruments battery compartment can contain hazardous voltage inside.

- Before opening the battery compartment cover, disconnect any measuring accessory connected to the instrument and turn off the instrument.

- ✓ The instrument has been turned off.
 - ✓ Any measuring accessory has been removed from the instrument.
1. Unfasten the screws and take off the battery cover on the rear of the instrument.
 2. Replace the batteries. Use rechargeable Ni-MH batteries (size AA) with a capacity of ≥ 2300 mAh.
 3. Close the battery cover and fasten the screws.

10.4.2 CHARGING THE BATTERIES



WARNING

Risk of injury due to hazardous voltage or fire!

If a power supply adapter with the wrong polarity is used, the instrument can cause fire or electric shock.

- Use only the original power supply adapter.
- Ensure the correct polarity displayed on the power supply adapter.



Note

The charger in the instrument is a pack cell charger. The cells are connected in series during the charging process. To achieve full charging performance all batteries must have similar charging status, type and age.

- ✓ Rechargeable Ni-MH batteries (size AA) with a capacity of ≥ 2300 mAh are inserted in the battery compartment.
1. Connect the power supply adapter to the instrument.
- ↳ The batteries are being charged.

10.4.3 IMPROVEMENT OF BATTERY SERVICE LIFE

Prevent memory effect

Discharge and recharge the nickel-metal hydride batteries full once in a while. This helps to keep the battery healthy by avoiding crystal development in discharged areas.

Exercise the battery

Use the batteries regularly to extend their service life.

If the instrument is not to be used for a long period of time, remove all batteries from the battery compartment. Apply a new battery break-in procedure to a dormant battery to regain its ability to work properly.

New battery break-in

New batteries must be fully charged before use. It is essential to charge and discharge the battery completely so that it can regain its maximum rated capacity.

11 CONTACT, SUPPORT AND SERVICE

Gossen Metrawatt GmbH can be reached directly and simply – we have a single number for everything! Whether you require support or training, or have an individual inquiry, we can answer all of your questions here:

+49-911-8602-0 Monday to Thursday: 8 a.m. to 4 p.m.
Friday: 8 a.m. to 2 p.m.

Or contact us by e-mail at: info@gossenmetrawatt.com

Do you prefer support by e-mail?

Measuring and Test Technology: support@gossenmetrawatt.com

Industrial Measuring Technology: support.industrie@gossenmetrawatt.com

Please contact GMC-I Service GmbH for repairs, replacement parts and calibration¹:

+49-911-817718-0 Beuthener Str. 41
service@gossenmetrawatt.com 90471 Nürnberg
www.gmci-service.com/en Germany



1. DAKS calibration laboratory per DIN EN ISO/IEC 17025
accredited by the Deutsche Akkreditierungsstelle GmbH under reference number D-K-15080-01-01.

12 CERTIFICATIONS

12.1 CE DECLARATION

The instrument fulfills all requirements of applicable EU directives and national regulations. We confirm this with the CE mark. You can find the CE declaration on our website:

<https://www.gmc-instruments.de/en/services/download-center/>



12.2 CALIBRATION CERTIFICATE

A calibration certificate is available on demand ⇨ "Contact, Support and Service" 34.

12.3 TEST REPORT

A test report is available at:

<https://www.gossenmetrawatt.de/en/services/mygmc/>

13 DISPOSAL AND ENVIRONMENTAL PROTECTION

Proper disposal makes an important contribution to the protection of our environment and the conservation of natural resources.

ATTENTION

Environmental Damage

Improper disposal results in environmental damage.

- Follow the instructions concerning return and disposal included in this section.

The following comments refer specifically to the legal situation in the Federal Republic of Germany. Owners or end users who are subject to other regulations must comply with the respective local requirements and implement them correctly on site. Further information can be obtained, for example, from the responsible authorities or the local distributor.

Waste Electrical Equipment, Electrical or Electronic Accessories and Waste Batteries (including rechargeable batteries)

Electrical equipment and batteries (including rechargeable batteries) contain valuable raw materials that can be recycled, as well as hazardous substances which can cause serious harm to human health and the environment, and they must be recycled and disposed of correctly.



The symbol at the left depicting a crossed-out garbage can on wheels refers to the legal obligation of the owner or end user (German electrical and electronic equipment act ElektroG and German battery act BattG) not to dispose of used electrical equipment and batteries with unsorted municipal waste ("household trash"). Waste batteries must be removed from the old device (where possible) without destroying them and the old device and the waste batteries must be disposed of separately. The battery type and its chemical composition are indicated on the battery's labeling. If the abbreviations "Pb" for lead, "Cd" for cadmium or "Hg" for mercury are included, the battery exceeds the limit value for the respective metal.

Please observe the owner's or end user's responsibility with regard to deleting personal data, as well as any other sensitive data, from old devices before disposal.

Old devices, electrical or electronic accessories and waste batteries (including rechargeable batteries) used in Germany can be returned free of charge to Gossen Metrawatt GmbH or the service provider responsible for their disposal in compliance with applicable regulations, in particular laws concerning packaging and hazardous goods. Waste batteries must be handed over in discharged state and/or with appropriate precautionary measures against short-circuiting. Further information regarding returns can be found on our website.

Packaging Materials

We recommend retaining the respective packaging materials for the case that you might require servicing or calibration in the future.



WARNING

Danger of Asphyxiation Resulting from Foils and Other Packaging Materials

Children and other vulnerable persons may suffocate if they wrap themselves in packaging materials, or their components or foils, or if they pull them over their heads or swallow them.

- Keep packaging materials, as well as their components and foils, out of the reach of babies, children and other vulnerable persons.

In accordance with German packaging law (VerpackG), the user is obligated to correctly dispose of packaging and its components separately, and not together with unsorted municipal waste ("household trash").

Private end consumers can dispose of packaging free of charge at the responsible collection point. Packaging which is not subject to so-called system participation is returned to the appointed service provider. Further information regarding returns can be found on our website.



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