GOSSEN METRAWATT
GMC-INSTRUMENTS GROUP

OPERATING INSTRUCTIONS

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METRALINE ISOCHECK

INSULATION MEASURING INSTRUMENT

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1 SAFETY INSTRUCTIONS



Read and follow these instructions carefully and completely in order to ensure safe and proper use.

The instructions must be made available to all persons who use the instrument.

Keep for future reference.

General

- The instrument may only be used by qualified electricians in the commercial field. It is not a consumer product.
- Observe and comply with all safety regulations which are applicable for your work environment.

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.
- 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.
- The instruments and accessories of Gossen Metrawatt GmbH are designed such as to ensure optimum compatibility with the Gossen Metrawatt GmbH products that are expressly provided for them. Unless otherwise expressly confirmed in writing by Gossen Metrawatt GmbH, they are not intended and suited for use with other products.
- 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 for longer periods of time. Overheating may cause damage to the instrument.
- 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 (rechargeable) batteries in undamaged condition only. Risk of explosion and fire in the case of damaged (rechargeable) batteries!
  Inspect the (rechargeable) batteries before use. Pay particular attention to leaky and damaged (rechargeable) batteries.
- When using (rechargeable) batteries, the respective test/measuring instrument may only be used with inserted and secured battery compartment lid. Otherwise, dangerous voltages may occur at the (rechargeable) battery contacts under certain circumstances.
- Only charge undamaged rechargeable batteries. Risk of explosion and fire in the case of damaged rechargeable batteries! Inspect the rechargeable batteries before charging. Pay particular attention to leaky and damaged rechargeable batteries.

Measurement Cables and Establishing Contact

- Plugging in the measurement cables must not necessitate any undue force.
- Never touch conductive ends (e.g. 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 appropriate contacting (e.g. on the test probes, crocodile clips, Kelvin probes, etc.).
- Do not move or remove contacts (e.g. the test probes, alligator clips, Kelvin probes etc.) until testing/measurement has been completed.
  Unwanted sparking may otherwise occur due to test current.

2 APPLICATION

Please read this important information!

2.1 INTENDED USE / USE FOR INTENDED PURPOSE

The iMETRALINE ISOCHECK permits the measurement of insulation resistance with test voltages between 40 V and 1000 V in accordance with VDE 0413-1,-2 (EN 61557-1, 2). The measuring range runs from 100 kΩ to 10 GΩ.

Further applications include the measurement of overvoltage protection devices (OPDs); either varistor protection devices (varistor SPDs) or gas discharger tubes (GDTs) with voltages of 40 V to 1000 V.

The test instrument allows checking of test objects for absence of AC and DC voltages.

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 purposes other than those intended may result in unforeseeable damage!

2.3 LIABILITY AND GUARANTEE

The warranty provided by Gossen Metrawatt GmbH, and its liability, are governed by the applicable contractual and mandatory statutory provisions.

3 DOCUMENTATION

3.1 INFORMATION CONCERNING THESE INSTRUCTIONS

Read these instructions carefully and attentively. 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.gossenmetrawatt.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
Fig. 1: Caption	Description of the content of a figure
Tab. 1: Table 1	Description of the content of a table
Footnote	Comment

Tab. 1: 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. 2: Icons used in this document

3.5 DEFINITION OF TERMS

Term	Definition
GDT	Gas discharger tube
OPD	Overvoltage protection device
SPD	Surge protection device

Tab. 3: Definition of terms

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 instrument and on the packaging.
   - Safety Instructions ➪🗎4
   - Application ➪🗎6
   - Documentation ➪🗎7
2. Familiarize yourself with the instrument ➪🗎10.
3. Familiarize yourself with the instrument's operation ➪🗎17.
4. Configure the instrument ➪🗎16.
5. Perform measurements/tests ➪🗎17.

Further topics of interest: Maintenance ➪🗎28.

5 THE INSTRUMENT

5.1 SCOPE OF DELIVERY

Please check the scope of delivery for completeness and intactness.

1	METRALINE ISOCHECK instrument with mobile test probe
4	Batteries (AAA)
1	Pouch
1	Condensed operating instructions
1	Test report

5.2 OPTIONAL ACCESSORIES

Some features necessitate optional accessories:

Charger METRALINE CHECK Series	Broad-range charger for charging optionally available batteries, e.g. Z507B.
	Plug adapter available for the following countries: EU, UK, US, AU
Akku-Set METRALINE CHECK Series	4 rechargeable batteries (AAA) for METRALINE ISOCHECK/ METRALINE RCDCHECK/METRALINE ZCHECK

5.3 DEVICE OVERVIEW

5.3.1 FRONT

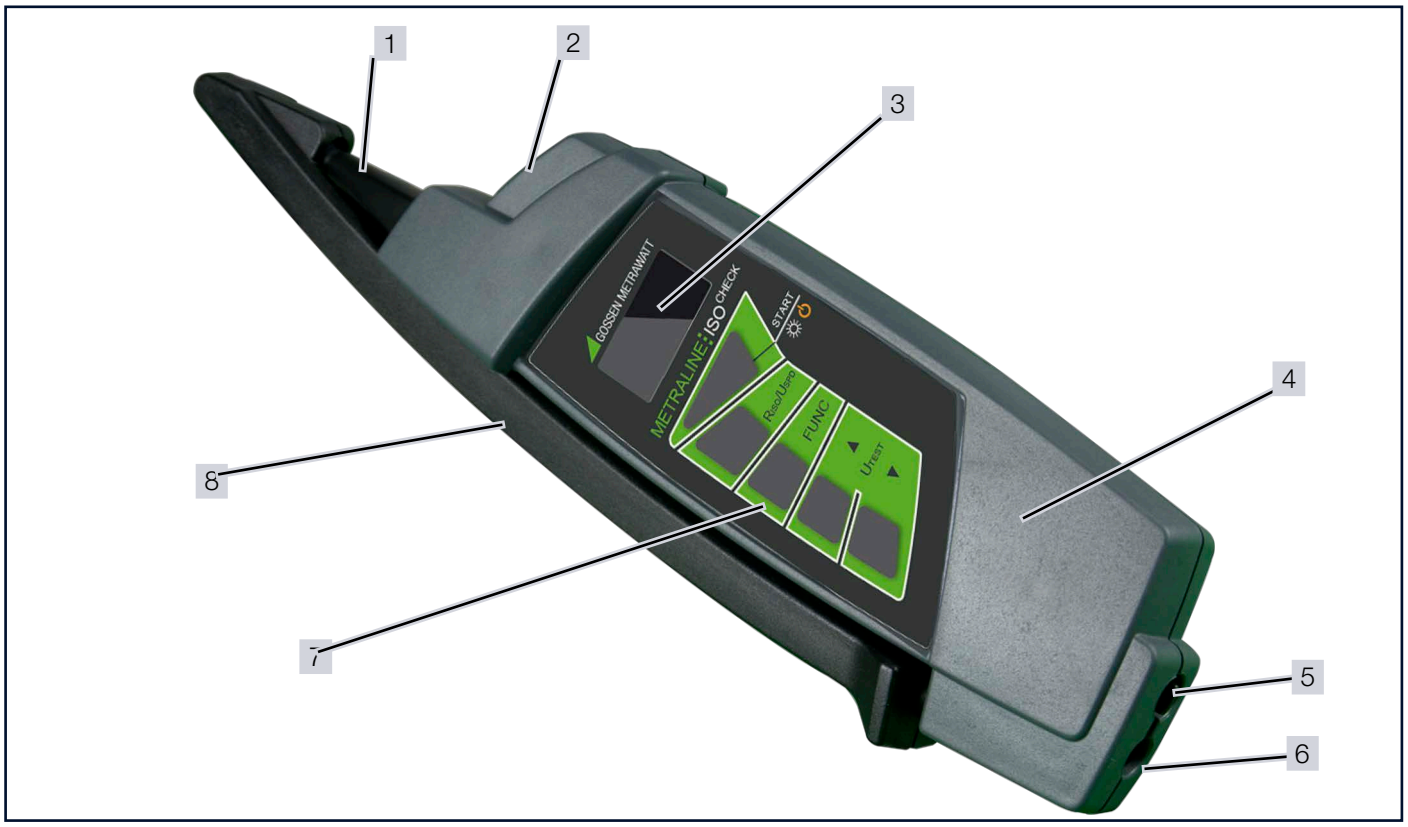


Fig. 1: Front panel

1	Fixed test probe attached to the device	5	Socket for charger
2	LED	6	Socket for flexible test probe
3	Display	7	Control panel
4	Plastic housing	8	Plug-in mobile test probe

5.3.2 BACK



Fig. 2: Back of instrument, detail view of the back panel with battery compartment lid

1	Battery compartment lid	3	Serial plate
2	Screws for battery compartment lid		

5.3.3 CONTROL PANEL

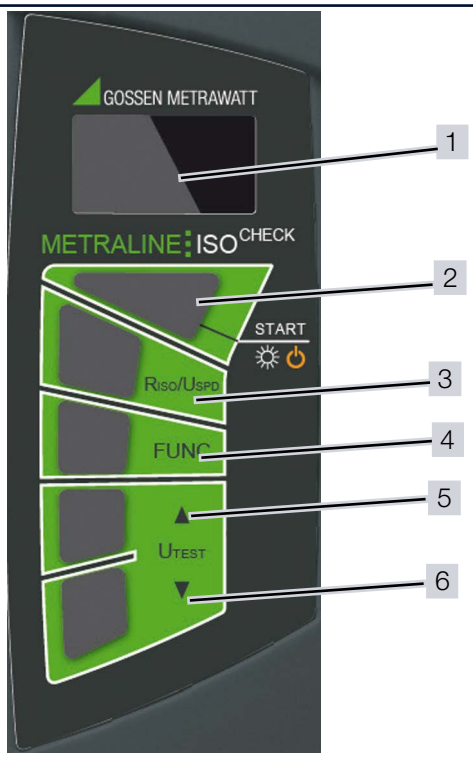


Fig. 3: Control panel

1	Display	4	FUNC key
2	START key	5	U_{TEST} up
3	R_{ISO}/U_{SPD} key	6	U_{TEST} down

5.4 KEYS AND FUNCTIONS

Key	Description	Action	Function
START	START	Press and hold until the display lights up	Switches on the instrument
		Press and hold until the measurement starts	Starts the measurement
		Press briefly	Switches illumination on or off
		Press twice briefly	Switches the instrument off
RISO/USPD	R_{ISO}/U_{SPD}	Press	Switches between insulation resistance and overvoltage protection device measurement
FUNC	FUNC	Press	Selects the desired type of overvoltage protection device measurement when U_{SPD} is activated
▲ UTEST	U_{TEST} up	Press	Selects measuring voltage, scrolling forwards Selects the type of overvoltage protection device, scrolling forwards
UTEST ▼	U_{TEST} down	Press	Selects measuring voltage, scrolling backwards Selects the type of overvoltage protection device, scrolling backwards

Tab. 4: Keys and functions

5.4.1 SYMBOLS ON THE INSTRUMENT AND THE INCLUDED ACCESSORIES

Icon	Meaning
	Warning concerning a point of danger (attention, observe documentation!)
	Double insulation (protection category II)
	European conformity marking
	The instrument may not be disposed of with household trash ⇨ "Disposal and Environmental Protection" 🗎33.
	Warning regarding dangerous electrical voltage

Tab. 5: Symbols on the instrument and the included accessories

5.5 FEATURES

- Insulation resistance measurement with test voltages of 40 V to 1000 V
- Voltage measurement up to 600 V
- Measurement of overvoltage protection devices with test voltages of 40 V to 1000 V
- Table of common varistors can be displayed
- Indication of dangerous touch voltage

5.6 RELEVANT STANDARDS

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

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
DIN EN IEC 61557-2	Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC - Equipment for testing, measuring or monitoring of protective measures – Part 2: Insulation resistance
DIN EN 61010-1 IEC 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements
DIN EN 61010-2-031 IEC 61010-2-031	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 031: Safety requirements for hand-held probe assemblies for electrical measurement and test
DIN EN 61326-1 IEC 61326-1	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
DIN EN 55022	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement (CISPR 22:2008, modified)
DIN EN 61000-4-2 IEC 61000-4-2	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electro-static discharge immunity test
DIN EN 61000-4-3 IEC 61000-4-3	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test
DIN EN 61000-4-4 IEC 61000-4-4	Electromagnetic compatibility (EMC) – Part 4-4:Testing and measurement techniques – Electrical fast transient/burst immunity test
DIN EN 61000-4-5 IEC 61000-4-5	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test
DIN EN 61000-4-6 IEC 61000-4-6	Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields

Tab. 6: Relevant standards

5.7 TECHNICAL DATA

Power Supply	Batteries	4 AAA (LR03), 1.5 V alkaline or 1.2 V NIMH (with at least 750 mAh)
	Number of measurements	with batteries at 800 mAh: approx. 1000 measurements (with 500 V test voltage on 500 kΩ)
Ambient Conditions	Operating temperatures:	+0 °C … +40 °C / +32 °F … +104 °F
	Storage temperatures:	–10 °C … +70 °C / +14 °F … +158 °F
	Relative atmospheric humidity, operation:	max. 85%, no condensation allowed
	Relative atmospheric humidity, storage:	max. 90% at –10 °C … +40 °C / +14 °F … +104 °F max. 80% at +40 °C … +70 °C / +104 °F … +158 °F
	Elevation:	max. 2000 m / 6562 ft.
Reference Conditions	Temperature	23 ± 2 °C
	Relative humidity	40% … 60%
Electrical Safety	Measuring category:	with safety cap on the test probe: CAT III 300 V without safety cap on the test probe: CAT II 600 V
	Pollution degree:	2
	Protection category:	II
	Surge protection	
Electromagnetic Compatibility (EMC)	Interference emission:	EN 55022, class B
	Interference immunity:	DIN EN 61326-1 / IEC 61326-1 EN 61000-4-2 / 3 / 4 / 5 / 6
Mechanical Design	Protection:	Housing: IP40 per DIN EN 60529 / IEC 60529 (Protection against ingress of solid foreign objects: ≥ 1.0 mm ∅ / 0.039"; protection against ingress of water: not protected)
	Housing (W × H × D):	Approx. 260 mm × 70 mm × 40 mm / 10.2" × 2.8" × 1.6"
	Weight:	Approx. 0.36 kg / 0.79 lb (including batteries)
	Display:	OLED, multicolored, backlit

Tab. 7: Technical data

5.8 CHARACTERISTIC VALUES

Measurement of Insulation Resistance R_{ISO}[a)]

Nominal range per DIN EN IEC 61557-2: 0.100 MΩ – R_{max}*

Range	Resolution	Intrinsic Uncertainty	Measuring Uncertainty
0.100 … 9.999 MΩ	0.001 MΩ	2 % of reading + 10 digit	3 % of reading + 20 digit
10.00 … 99.99 MΩ	0.01 MΩ	2 % of reading + 10 digit	3 % of reading + 20 digit
100.0 … 999.9 MΩ	0.1 MΩ	2 % of reading + 10 digit	3 % of reading + 20 digit
1.000 GΩ ... R_{max}*	0.001 GΩ	4 % of reading + 15 digit	5 % of reading + 25 digit

*The R_{max} value depends on the selected test voltage:

Nominal voltage of 40 V … 99 V	R_{max} = 1.999 GΩ
Nominal voltage of 100 V … 249 V	R_{max} = 3.999 GΩ
Nominal voltage of 250 V … 1000 V	R_{max} = 9.999 GΩ

Nominal measuring voltage	40 V … 1000 V, adjustable in steps of 1 V
Measuring voltage	–0 % / +10 % of nominal voltage
Nominal measuring current	≥1 mA (where $U_{mes} > U_{nom}$)
Short-circuit current	< 3 mA
Automatic discharging of the DUT	Yes
Number of measurements	approx. 250 (with new alkaline batteries)

Varistor Surge Protection Devices, Gas Discharger Tubes U_{SPD}[a)]

Range	Resolution	Intrinsic Uncertainty	Measuring Uncertainty
40 V … 1050 V	1 V	2 % of reading + 2 digit	3 % of reading + 3 digit

Measuring methods:

- Varistor SPD – increasing DC voltage and simultaneously measures the current through the varistor SPD
- GDT – increasing DC voltage until its sudden drop

Measurement of Direct and Alternating Voltage[a)]

(Frequency range: 45 Hz … 65 Hz)

Range	Resolution	Intrinsic Uncertainty	Measuring Uncertainty
0 V … 600 V	1 V	2 % of reading + 2 digit	3 % of reading + 3 digit

a) The TRMS value for alternating voltage is measured.

6 START UP

Unpacking and battery insertion are described in the short form operations. For battery replacement see ⇨ "Device Power Supply" 🗎28.

6.1 SWITCHING ON/OFF

6.1.1 SWITCHING ON THE INSTRUMENT

1. Press and hold **START**.

↳ The display lights up. The instrument is ready for operation.

Note

If no key is pressed and no voltage is applied to the test probes, the instrument reacts als follows:

- Power saving mode: After 30 seconds of inactivity the display brightness is reduced. Pressing any key or applying voltage to the test probes, the display turns back to full brightness.
- Auto power off: After 1 minute of inactivity, the instrument switches off automatically.

6.1.2 SWITCHING OFF THE INSTRUMENT

✓ No voltage is applied to the test probes.

1. Press **START** twice briefly.

↳ The instrument is switched off.

7 OPERATION

7.1 INSTRUCTIONS AN PRINCIPLES FOR ALL MEASUREMENTS

- The desired functions or parameters are selected with the **R_{ISO}/U_{SPD}**, **FUNC**, **U_{TEST} up** and **U_{TEST} down** keys. Measurements are triggered by pressing the **START** key. All selected functions or parameters remain valid until they are changed.
- If a (interference) voltage of greater than 10 V is applied to the test probes, this is indicated at the display in the **U_{IN}** field along with the measured value, as well as the **!** symbol. If this is the case, the **START** key is disabled.



Fig. 4: (Interference) voltage display

- If battery voltage is too low (only the red field is lit up in the battery symbol), measurement cannot be started. After pressing the **START** key, the depleted battery symbol appears for about 1 second (see figure below). Replace the batteries or charge the accumulators.



Fig. 5: Low battery voltage

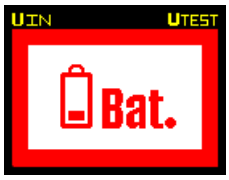


Fig. 6: Low battery voltage: display after pressing the START key

- When measuring high insulation resistance, the measurement cables must lay unobstructed in the room, or be placed upon a material with good insulating properties.
- Contact the device under test with the test probe before triggering measurement with the **START** key, thus causing any possible interference voltage to appear at the display.
- Before a measurement, check that there is no interference voltage present. To do so, contact the object of test (OUT) with the test probe and start the measurement with the **START** key. If there is interference voltage present, it will appear on the display.
- Do not remove the test probes prematurely during the course of the measurement, because this may lead to distorted measurement results.
- After the insulation measurement has been completed, any remaining residual voltage is displayed as **U_{IN}**, which may result from cable capacitance. Contact to the OUT must be maintained for as long as a capacitive OUT is being discharged via the test instrument's internal resistor. The falling voltage value can be observed directly at the **U_{IN}** display. Do not disconnect the OUT until voltage **U_{IN}** is less than 25 V!

7.2 MEASURING FUNCTIONS

DANGER

High-voltage!

Non-compliance with the safety precautions will result in death or serious injury.

Each time before measuring insulation resistance or surge protection, make sure that the object under test (OUT) is voltage-free!

Do not touch the OUT or the test probes during measurement, and for a short time thereafter as long the OUT is being discharged.

The OUT may be charged with as much as 1050 V during measurement, for which reason contact to the OUT must be maintained after measurement has been completed until it is fully discharged! Residual voltage appears at the display along with the **!** warning symbol.

Do not remove the test probes until voltage has dropped to a safe level and the **!** warning symbol has been cleared from the display.

All consuming devices must be disconnected and the switches must be turned on when measuring insulation resistance between conductors.

7.2.1 VOLTAGE MEASUREMENT

1. Connect the test instrument to the device under test.

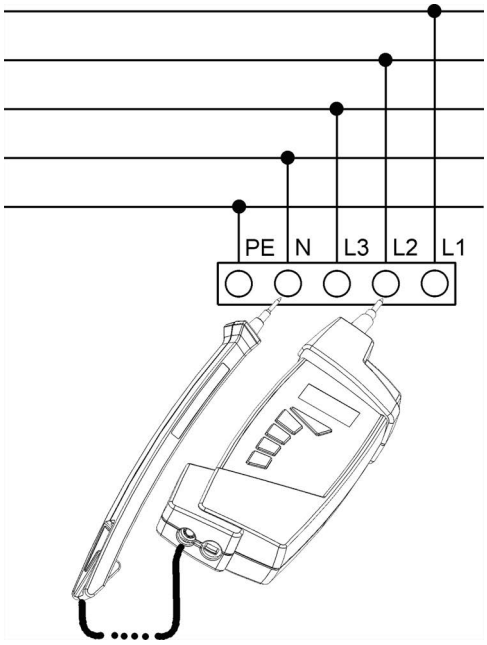


Fig. 7: Connection example for voltage measurement

↳ If a voltage of greater than about 10 V is present in the measured electrical circuit, its value is displayed in the **U_{IN}** field and the ~ symbol appears for AC or polarity is displayed for DC.
The + symbol lights up if the positive pole is connected to the fixed test probe, and – appears if the negative pole is connected to the fixed test probe.
! appears at the same time as a warning.
The **START** key is disabled.



Fig. 8: Display of (interference) voltage (R_{ISO} function)

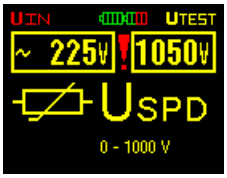


Fig. 9: Voltage measurement (U_{SPD} function)

7.2.2 INSULATION RESISTANCE MEASUREMENT

Note

Whistling or hissing noises may emanate from the test instrument during measurement.

1. Switch insulation measurement on by pressing the R_{ISO}/U_{SPD} key.



Fig. 10: Setting test voltage

2. Select the required measuring voltage with the help of the **U_{TEST} up** and **U_{TEST} down** keys. By briefly pressing the respective key, voltage is increased or decreased to one of the following nominal values: 50 V, 100 V, 250 V, 500 V or 1000 V.
   ↳ The selected test voltage appears at the display in the **U_{TEST}** field.
3. For individualized value settings, press and hold either the **U_{TEST} up** or **U_{TEST} down** key until the value can be changed in 1 V steps within a range of 50 V to 1000 V. The desired value is then selected by once again briefly pressing the respective key.
   ↳ Several seconds after one of these two keys has been activated for the last time, the test instrument is returned to the mode which allows for switching amongst nominal values of 50 V, 100 V, 250 V, 500 V or 1000 V only.
4. Contact the device under test with both test probes.

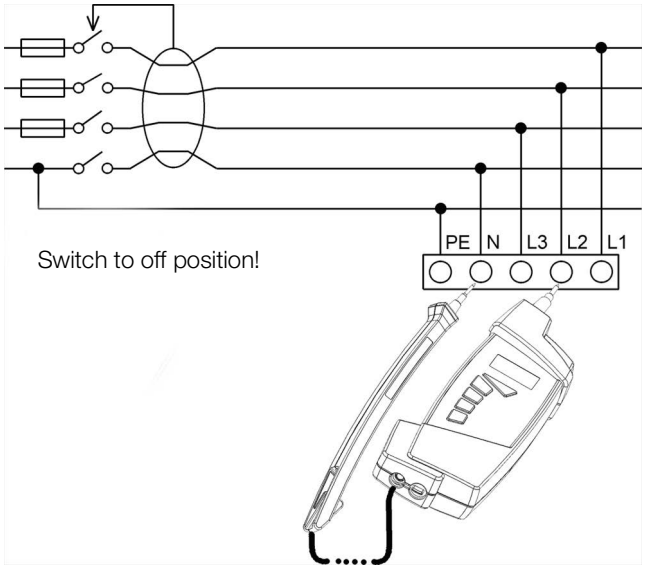


Fig. 11: Connection example

Note

If an interference voltage of greater than about 10 V is present in the measured electrical circuit, its value is displayed and the **START** key is disabled.

Eliminate the source of interference voltage before continuing with the measurement.

Observe the 5 electrical safety rules.

5. Trigger the measurement by pressing the **START** key. Release the key as soon as measurement is started.
   ↳ The rising measuring voltage is displayed by means of a bar graph (this may take several tens of seconds in the case of large capacitances). At the same time, the value appears at the display in the **U_{IN}** field. The measuring cycle is ended automatically.

Note

If the measurement needs to be continued for a longer period of time, the **START** key has to be pressed and held for the entire duration.

In contrast to this, the automatic cycle can be ended prematurely by briefly pressing the **START** key. No results are displayed in this case.

6. Read the measured insulation resistance value.

WARNING

Capacitive charging!

The next person touching the OUT receives an electric shock.

Do not disconnect the instrument from the OUT as long as ! is shown on the display. During this time, the OUT will discharge.



Fig. 12: Sample results for an insulation measurement (the DUT is being discharged)



Fig. 13: Insulation measurement results (the DUT has been fully discharged: U_{IN} = 0 V)

↳ If there is a varistor SPD or a GDT in the circuit where the insulation resistance is measured, the device will display the symbol of the varistor SPD and the so-called “voltage at the milliampere point” or the symbol of the GDT and its break-down voltage on the display.

Note

The presence of a varistor SPD or a GDT in the measured circuit may cause inadequate result of insulation resistance measurement. An indication of the presence of such an SPD or GDT in the measured circuit can facilitate the decision whether the cause of the inadequate insulation resistance is a fault in the wiring or an SPD or GDT that was not disconnected before the measurement.

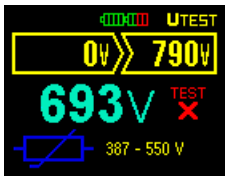


Fig. 14: Example of a measurement result (a varistor SPD is connected in the measured circuit)

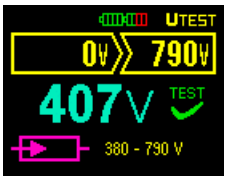


Fig. 15: Example of a measurement result (a GDT is connected in the measured circuit)

7.2.3 OVERVOLTAGE PROTECTION DEVICES (OPDS)

When measuring varistor surge protection device (varistor SPD), the instrument generates a gradually rising DC voltage in the range of about 40 V ÷ 1050 V and simultaneously measures the current flowing through the measured varistor SPD. When the current reaches a value of 1 mA, the voltage rise is finished and the varistor voltage (also so-called “voltage at the milliampere point”) of the varistor SPD is displayed.

If gas discharger tube (GDT) is measured, the instrument generates a gradually increasing DC voltage until its sudden drop (due to GDT breakdown). The magnitude of the voltage just before its sudden drop is breakdown voltage of the GDT.

Based on the characteristics of the measured voltage over the course of the measurement, the instrument automatically determines whether a GDT or a varistor SPD was measured.

The **FUNC** key can be used to select the measurement mode of the OPD:

DC	The instrument measures so-called "voltage at the milliampere point" of the varistor SPD or the breakdown voltage of the GDT - without evaluating the functionality of the OPD.
USER	One value of the minimum and maximum voltage of so-called "voltage at the milliampere point" of the varistor SPD or the breakdown voltage of the GDT can be set by the user. After measuring the OPD, the instrument performs an evaluation of the OPD according to these set limits
SPD LIST	The instrument evaluates the measurements for a specific selected OPD according to the data stored in the OPD database in the instrument memory.

Note

Although the name is "SPD LIST”, this list contains both varistor SPDs and GDTs.

According to the function selected by the **FUNC** key the automatic evaluation of measurement result of OPD is carried out, as indicated in the table below.

Selected Function	Symbol in the Display and its Meaning	
		
DC	Varistor voltage is measured	Varistor voltage is out of the instrument’s measuring range
USER_DCMAX	Varistor voltage is within the specified range	Varistor voltage is outside of the specified range
USER_DCMIN		
SPD LIST	Varistor SPD voltage or GDT breakdown voltage is within the specified range for the selected type of overvoltage protection device	Varistor SPD voltage or GDT breakdown voltage is outside of the specified range for the selected type of overvoltage protection device

Tab. 8: Symbol in the display and its meaning

OPD Measurement According to the List of Products and Manufacturers

If the **SPD LIST** function is selected (surge protection device table), a specific type of OPD can be selected from the list of products. The display shows the manufacturer and type of the specific OPD, as well as the breakdown voltage range of the GDT (if the OPD block contains it), the voltage range of the varistor voltage (milliampere point of the varistor) and any other information important for the measurement.

The required type of surge protection device can be selected with the **U_{TEST} up** and **U_{TEST} down** keys.

If the ⚠ symbol is included in the description of the surge protection device, the manufacturer's instructions must be observed for the respective device type.

It may, for example, be necessary to measure such OPD twice with different connections, etc. If you have any questions regarding the measurement of specific type of OPD, please contact the manufacturer of the respective OPD or its documentation.

Data on specific types of OPDs are stored in the instrument's memory, were obtained from individual manufacturers of OPDs and cannot be edited.

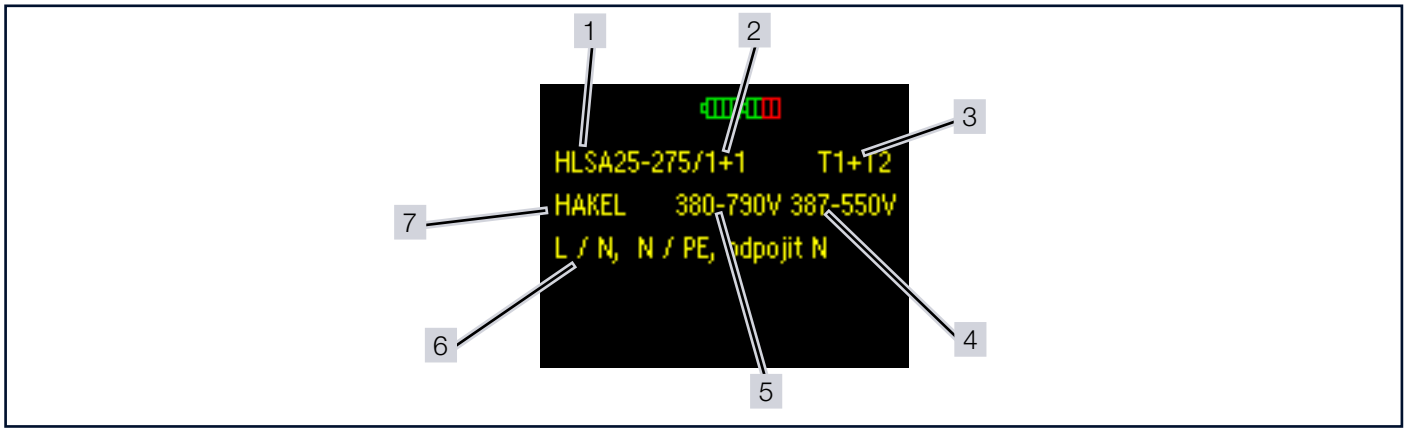


Fig. 16: Example of displaying the selected OPD on the instrument display

1	Marking of OPD	5	Voltage range of the varistor SPD voltage
2	Connection mode	6	Measurement instructions
3	Protection type	7	Manufacturer
4	GDT breakdown voltage range		

Table of the 10 last Measured Types of OPD

The instrument stores in its memory a table of the last ten measured types of OPD. This table enables quick selection from the most recently measured types of OPD.

After entering the complete table of OPDs, described above, press the **U_{TEST} down** key. The display shows the first item from the table of the ten most recently measured types of OPDs. It is indicated by the inscription **Last 10** in the upper left corner of the display and the yellow bar graph position indicator in the table in the upper right corner of the display. You can scroll through the table of the ten most recently measured types with the **U_{TEST} up** and **U_{TEST} down** keys. After scrolling with the **U_{TEST} up** and **U_{TEST} down** keys, before the first or after the last item in the table of the ten last measured types, scrolling goes to the complete table of OPDs stored in the instrument's memory, and continues with the next item after the item that was last displayed when entering the menu of the OPDs table.

Re-entry into the table of ten last measured types is possible after a new entry into the menu of the OPDs table. That is, after performing the measurement, after changing the menu with the **FUNC** or **R_{ISO}/U_{SPD}** keys, or after turning the instrument off and on again and after entering the complete table of OPDs with the **U_{TEST} down** key.

During measurement, the last measured type of OPD is stored in the first place in the table of ten last measured protection types, and the type from the last place in the table is deleted. When repeatedly measuring the same type of OPD, the item is not saved repeatedly. If an item is measured that is already in the table of the last ten measured types, it is only moved to the first place of the table.

If any item from the last ten measured types of OPDs is shown on the display, it is possible to block further saving in this table by pressing the **R_{ISO}/U_{SPD}** key. The inscription **Favourite** is displayed and the table remains unchanged during further measurements. Using the same procedure, the table can be unblocked again, the inscription **Last 10** is displayed and the last measured types are written into the table again.

Notes on the Practical Execution of OPD Measurements:

- Connect the instrument to the terminals of the OPD block according to the information in the bottom line of the display (if this information is displayed on the display for the selected type of OPD) or according to the product's technical documentation. Incorrect connection to the OPD terminals can cause an incorrect measurement result (e.g. measurement via two varistor SPDs or a varistor SPD and GDT in series).
- Measure all protective elements in the OPD block.
- If an unsatisfactory result is measured for the OPD protective element in the switchboard, remove the defective part from the switchboard and perform a control measurement of the element itself. When measuring in the switchboard, in some cases the measurement result may be distorted by the flow of the measuring current through other circuits of the electrical installation.
- If the optical signalling of a varistor SPD failure is performed using an LED, the polarity of the measuring voltage must be maintained so that the signalling LED remains in the reverse direction. Therefore, if the signalling LED lights up during the measurement, change the measuring tips of the device and perform the measurement with such a polarity of the measuring voltage that the LED does not light up during the measurement.
- If the OPD in the switchboard is connected between N and PE, it is necessary to disconnect the N wire before measuring it (by switching off the appropriate circuit breaker or by disconnecting the wire from the terminal of the measured element).
- When measuring GDT, the instrument can evaluate the first measurement as a faulty GDT (the measuring current affects the state of the GDT). In that case, perform a second (control) measurement immediately afterwards.

▶ OPD Measurement Procedure, with Table of the 10 Last Measured Types of OPD

WARNING

Capacitive charging!

The next person touching the OUT receives an electric shock.

Do not disconnect the instrument from the OUT as long as ! is shown on the display. During this time, the OUT will discharge.

✓ Before measuring, the OPD must be disconnected from the voltage (by switching off the appropriate circuit breaker, main switch, disconnecting the phase conductor, pulling the OPD block from the socket, etc.).

1. Select measurement of surge protection devices with the R_{ISO}/U_{SPD} key, and select the desired sub-function with the **FUNC** key. Example:



Fig. 17: Surge protection device measurement menu, DC function

2. Disconnect the measured OPD from the voltage.
3. Connect the test probes to the surge protection device in accordance with the manufacturer's instructions.

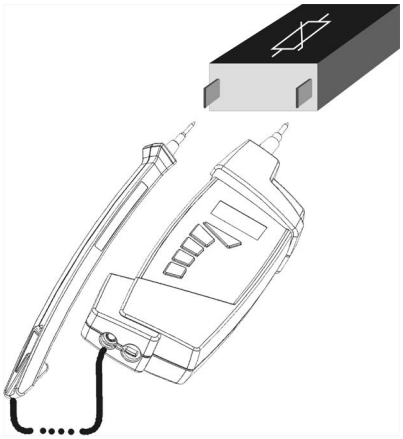


Fig. 18: Connection example

Note

If a voltage of greater than about 10 V is present at the measured surge protection device, its value is displayed and the **START** key is disabled.

Disconnect the source of this voltage before restarting the measurement.

4. Start the measurement by pressing the **START** key. Release the **START** key as soon as measurement is started.
   ↳ Rising current at the surge protection device is displayed by means of a bar graph. At the same time, the measuring voltage value appears at the display in the U_{IN} field. The measurement is ended automatically.

↳ The symbol of the measured element (varistor SPD or GDT) will appear in the lower left corner of the display. The display shows the measured voltage and the evaluation of the measurement.

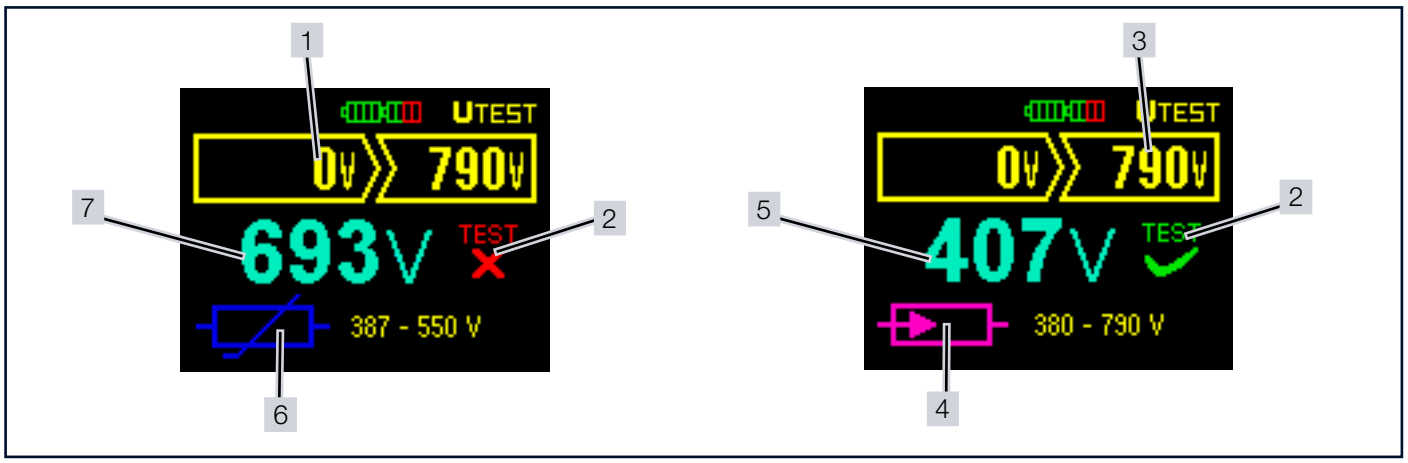


Fig. 19: Example of displaying the measurement result of the selected OPD on the device display

1	Actual voltage on the test probes
2	Measurement evaluation
3	Upper limit of OPD voltage
4	Symbol of the measured element – GDT
5	Measured GDT breakdown voltage
6	Symbol of the measured element – varistor SPD
7	Measured varistor voltage

OPD Measurement - Manual Setting of Limits

WARNING

Capacitive charging!

The next person touching the OUT receives an electric shock.

Do not disconnect the instrument from the OUT as long as ! is shown on the display. During this time, the OUT will discharge.

1. Select measurement of surge protection devices with the R_{ISO}/U_{SPD} key.
2. Press the **FUNC** key to select **USER DCMIN**.
3. Use the U_{TEST} **up** and U_{TEST} **down** key to set the lower voltage limit of the measured OPD.
4. Press the **FUNC** key to select **USER DCMAX**.
5. Use the U_{TEST} **up** and U_{TEST} **down** key to set the higher voltage limit of the measured OPD.
6. Disconnect the measured OPD from the voltage.
7. Connect the test probes to the surge protection device in accordance with the manufacturer's instructions.

Note

If a voltage of greater than about 10 V is present at the measured surge protection device, its value is displayed and the **START** key is disabled.

Disconnect the source of this voltage. before restarting the measurement.

8. Trigger measurement by pressing the **START** key. Release the **START** key as soon as measurement is started.

↳ Rising current at the surge protection device is displayed by means of a bar graph. At the same time, the measuring voltage value appears at the display in the U_{IN} field. Measurement is ended automatically.

↳ The symbol of the measured element (varistor SPD or GDT) will appear in the lower left corner of the display. The display shows the measured voltage and the evaluation of the measurement.

7.3 SELECT LANGUAGE, QUERY FIRMWARE VERSION

Before selecting a language or querying the firmware version, disconnect both test probes from the device under test / measuring circuit and switch the test instrument off.

1. Press and hold the **R_{ISO}/U_{SPD}** key while switching the test instrument on.
   ↳ The firmware version and other service information appears at the display, as well as the language selection menu.
2. Select the desired language with the corresponding key (EN = English, CZ = Czech).



Fig. 20: Language selection menu

↳ The instrument is switched back to normal operation after a language has been selected.

7.4 DISPLAY THE SERIAL NUMBER OF THE DEVICE

1. Hold down the **FUNC** key and turn on the instrument.

↳ The display shows the date the firmware was loaded to the instrument (in MM.YYYY format) and the serial number of the instrument as long as the **FUNC** key is pressed. Additional information (if available) may also be displayed.

7.5 CHANGE DISPLAY COLOUR OF THE MEASURED VALUE AND THE BAR GRAPH

1. Press and hold the **U_{TEST} up** or **U_{TEST} down** key and turn on the instrument.
   ↳ As long as the **U_{TEST} up** or **U_{TEST} down** key is pressed, the display lights up with the colour that will be used to display the measured value and the bar graph:
   U_{TEST} up – white colour
   U_{TEST} down – turquoise colour

7.6 MEASURING POINT ILLUMINATION WITH WHITE LED

1. Briefly press the **START** key.

↳ The LED is switched on or off.

Note

✓ The instrument must not contact anything.
✓ The test probes are not connected (no voltage applied).

7.7 DEVICE RESET FUNCTION

If the test instrument does not function as described in these instructions, we recommend a device reset. The test instrument must be switched off and neither of the test probes may be connected to an OUT. If device functions are still incorrect after switching the instrument back on again, remove the batteries, wait at least 10 seconds and then reinsert the batteries (or replace them with new ones).

If the test instrument still does not function as described, remove the batteries and contact our service department.

8 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 ambient conditions (temperature, humidity etc.) can be found in chapter ⇨ "Technical Data" 🗎14.

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" 🗎14.
- Only use the included pouch to transport the instrument.

9 MAINTENANCE

9.1 DEVICE POWER SUPPLY

CAUTION

Dangerous voltage in battery compartment!

Disconnect the test probes from the device under test and switch the instrument off before removing the battery compartment lid.

The device can be used with batteries or rechargeable batteries; ⇨ "Technical Data" 🗎14.

The battery charge level is continuously displayed.

If too little voltage is indicated, replace the batteries.

Note

We recommend removing the batteries during lengthy periods of non-use (e.g. vacation). This prevents excessive battery depletion or leakage, which may result in damage to the instrument under unfavorable conditions.

9.1.1 INSERTING AND REPLACING THE BATTERIES

1. Disconnect the test probes from the device under test and switch the instrument off before removing the battery compartment lid.
2. Switch off the instrument.
3. Loosen the two screws for the battery compartment lid at the back of the instrument and remove the lid.
4. Insert the batteries with correct polarity (refer to the embossed symbols at the bottom of the battery compartment). Always replace all four batteries at once.



Fig. 21: Correct battery polarity

5. Replace the battery compartment lid and retighten the screws.

9.1.2 RECHARGING THE BATTERIES

ATTENTION

Damage to the device!

Use only the charger (Z507A) which is offered as an optional accessory for this instrument to charge the batteries inserted in the instrument.

✓ Rechargeable batteries have been inserted with correct polarity.

✓ The test instrument has been disconnected from the measuring circuit at all poles.

1. Connect the charger to the charging socket of the device.
2. Connect the charger to the mains.

↳ Recharging of the batteries starts. The charging process is indicated by the red light of the LED, on the front of the device.
Charging takes approximately 5 hours and 30 minutes (integrated safety timer) if the batteries have been fully depleted.

9.2 CLEANING



DANGER

Life endangering due to electric shock!

The instrument and its accessories are operated with electrical power, therefore there is a general risk of electric shock. This can be fatal or cause serious injuries.

- 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.

ATTENTION

Unsuitable cleaning agents

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

- Use a soft cloth which has been slightly dampened with water for cleaning.
- Avoid the use of cleansers, abrasives or solvents.

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

Do not place the test instrument back into service until its surface is completely dry.

9.3 RECALIBRATION

Calibration capability is valid for 3 years in Germany. Recalibration by our state-approved test laboratory is possible at any time. Contact information ⇨ "Contact, Support and Service" 🗎31.

10 REPAIR

If your instrument requires repair, please contact our service department ⇨ "Contact, Support and Service" 🗎31.

Note

Loss of warranty and guarantee claims

Unauthorized modification of the instrument is prohibited. This also includes opening the instrument.

If it can be ascertained that the instrument has been opened by unauthorized personnel, no guarantee claims can be honored by the manufacturer with regard to personal safety, measuring accuracy, compliance with applicable safety measures or any consequential damages.

If the guarantee seal is damaged or removed, all guarantee claims are rendered null and void.

- The device may only be repaired or opened by authorized, qualified personnel who are familiar with the associated dangers.
- Original replacement parts may only be installed by authorized, qualified personnel.

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

Enquiries concerning training and seminars can also be submitted by e-mail and online:

training@gossenmetrawatt.com

https://www.gossenmetrawatt.com/training

Please contact GMC-I Service GmbH for repairs, replacement parts and calibration[1]:

+49-911-817718-0

service@gossenmetrawatt.com

https://www.gmci-service.com/en/

Beuthener Str. 41
90471 Nürnberg
Germany

1. DAkkS 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. The CE declaration is available upon request.

12.2 TEST REPORT

A test report is included with the instrument.

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.

13.1 DISPOSAL OF OLD DEVICES, BATTERIES AND RECHARGEABLE BATTERIES

Old devices and (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 depicting a crossed-out garbage can on wheels refers to the legal obligation of the owner or end-user not to dispose of old devices and batteries or rechargeable batteries with unsorted municipal waste ("household trash"). The (rechargeable) batteries must be removed from the old device (where possible) without destroying them and the old device and the (rechargeable) batteries must be disposed of separately. The type and chemical composition of the (rechargeable) battery are indicated on the battery's labelling. If the abbreviations "Pb" for lead, "Cd" for cadmium or "Hg" for mercury are included, the (rechargeable) battery exceeds the limit value for the respective metal.

You are obliged to comply with respective local requirements and implement them correctly on site. Further information can be obtained, for example, from the responsible authorities or the local distributor.

Please also 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.

13.2 DISPOSAL OF PACKAGING MATERIALS

Packaging and its parts must be correctly disposed of separately from unsorted municipal waste ("household trash").

You are obliged to comply with respective local requirements and implement them correctly on site. Further information can be obtained, for example, from the responsible authorities or the local distributor.

We recommend retaining the original packaging materials in case 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.

13.3 REGULATIONS FOR THE FEDERAL REPUBLIC OF GERMANY

The following comments refer specifically to the legal situation in the Federal Republic of Germany.

Old devices, electrical or electronic accessories and batteries or rechargeable batteries

Old devices, electrical or electronic accessories, batteries and 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. Batteries and rechargeable batteries must be returned in the discharged state or with appropriate precautions against short circuiting. Further information regarding returns can be found on our website.

Packaging Materials

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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