GOSSEN METRAWATT

# METRALINE Z^CHECK

## Loop Resistance Measuring Instrument

3-349-697-03
2/4.13

## Table of Contents



# 1 Introduction

### 1.1 Scope of Delivery

1 Test instrument with mobile test probe
4 Batteries (AAA)
1 Pouch
1 Condensed operating instructions
1 CD ROM with operating instructions in available languages
1 Factory calibration certificate

### 1.2 Optional accessories

4 ea. rechargeable AAA NIMH batteries (Z507B)
1 battery charger (Z507A)

### 1.3 Safety Precautions

**Read the operating instructions thoroughly and carefully before using your instrument. Follow all instructions contained therein. Make sure that the operating instructions are available to all users of the instrument.**

### Meanings of Symbols on the Instrument


This device is equipped with double or reinforced insulation.


Danger of injury due to electrical current, warning regarding dangerous electrical voltage


Warning concerning a source of danger (attention, observe documentation!)


EC mark of conformity:
This instrument fulfills all requirements of applicable European directives.

Before using the instrument, it must be assured that it is safe. Do not use if:

- Visible damage is apparent
- The battery compartment lid is missing
- The device has been stored under unfavorable conditions for a lengthy period of time
- The device has been handled impermissibly, e.g. has been dropped from a height of 1 meter or more
- The test instrument does not function as described in these operating instructions (if this is the case, we recommend resetting the device as described in section 3.6 on page 7).

### CAUTION

- Do not touch electrically conductive parts, test probes etc. when the device is switched on and voltage might still be conducted by a test probe – DANGER OF INJURY!
- Only use test probes which are included with the instrument or are available as accessories.
- The device must be switched off and no voltage may be applied when exchanging accessories.
- It is absolutely essential to adhere to all safety precautions, regulations and standards when performing measurements.
- No keys may be pressed when connecting the instrument to a device under test.
- The test instrument may not be subjected to the influence of aggressive substances, gases, vapors, liquids or dust.
- The test instrument may only be used under the conditions listed in the technical data in section 4 on page 8.
- If the device is moved from a colder to a warmer room, condensation may occur, in which case a brief period of acclimatization is advisable.
- We recommend removing the batteries during lengthy periods of storage.
- **Testing without tripping of RCCB:** During measurement, the RCCB may be tripped unintentionally. This may be attributable to a high degree of sensitivity towards short current peaks, especially with those variants with IΔN = 10 mA and 30 mA, or the RCCB may be defective or a certain leakage current may flow through the measured electrical circuit which, in addition to the current that is produced by the test instrument, trips the RCCB.
- Two relatively strong magnets are integrated into the test instrument. Avoid close proximity to magnetically sensitive objects such as watches, credit cards and the like.
- The illustrations in these operating instructions are drawings and may therefore deviate from reality.

### Exclusion of Liability

When **testing systems with RCCBs**, the latter may switch off. This may occur even though the test does not normally provide for it. Leakage currents may be present which, in combination with the test current of the test instrument, exceed the shutdown threshold value of the RCCB. PCs which are operated in proximity to such RCCB systems may switch off as a consequence. This may result in inadvertent loss of data. Before conducting the test, precautions should therefore be taken to ensure that all data and programs are adequately saved and the computer should be switched off if necessary. The manufacturer of the test instrument assumes no liability for any direct or indirect damage to equipment, computers, peripheral equipment or data bases when performing the tests.

- Use original accessories only.
- Max. permissible voltage between test probe and ground is 300 V!
- Maximum permissible voltage between the test probes is 300 V!

### Opening of Equipment / Repair

The equipment may be opened only by authorized service personnel to ensure the safe and correct operation of the equipment and to keep the warranty valid.

Even original spare parts may be installed only by authorized service personnel.

In case the equipment was opened by unauthorized personnel, no warranty regarding personal safety, measurement accuracy, conformity with applicable safety measures or any consequential damage is granted by the manufacturer.

## 1.4 General Device Description

The test instrument is enclosed in a compact housing with a patented means of retaining the test probes.

The high-contrast, four-color OLED display assures excellent legibility. When performing measurements under unfavorable light conditions, measuring point illumination can be switched on – white LED at the front.

The following measurements can be performed with the **Metraline $Z^{check}$**:

- Fault loop impedance with short-circuit current
- Fault loop impedance with short-circuit current without tripping the RCCB for measurements of RCCBs with a nominal current of 100 mA or 300 mA
- Line impedance with short-circuit current
- Line voltage
- Phase detection

The Metraline $Z^{check}$ allows for the evaluation of measured impedance in consideration of type, nominal current and disconnection time. A table with the parameters of various protective devices is included in device memory (see section 5 on page 9 in these operating instructions.

## 1.5 Applicable Standards

| Measurement | EMC | Safety |
|---|---|---|
| EN 61557-1 | EN 55022 class B | EN 61010-1 |
| EN 61557-3 | EN 61326-1 | EN61010-031 |

## 1.6 Environment

The shipping package is made of recyclable cardboard. Batteries must be disposed of in accordance with applicable regulations.

This device may not be disposed of with the trash. Further information regarding the WEEE mark can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term “WEEE”.

# 2 Device Description

## 2.1 Housing

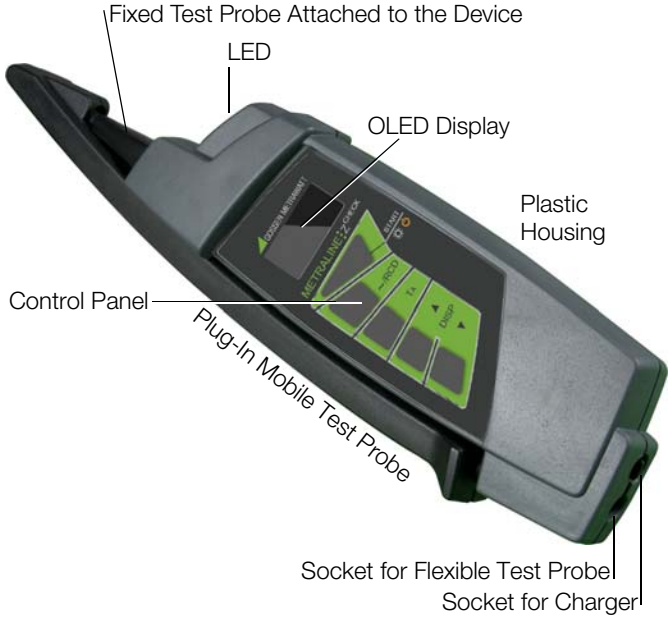


Figure 2.1: Top View

For transport purposes, the movable test probe can be attached to the housing and retained by a magnet such that both metal tips are simultaneously recessed and protected.

In order to charge batteries which have been inserted into the instrument, the flexible test probe’s connector plug must be removed and the slide must be pushed to the left, so that the socket at the right is made accessible and the charger can be plugged into it.

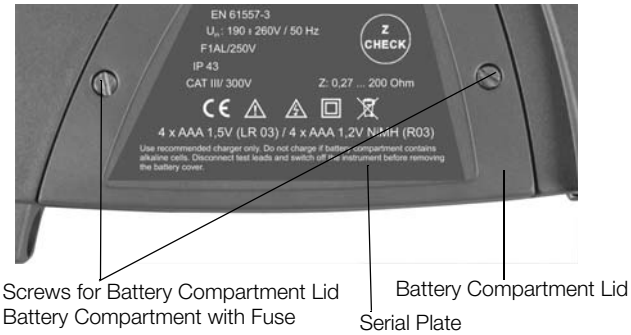


Figure 2.2: Detail View of the Back Panel with Battery Compartment Lid

## 2.2 Control Panel

1 Graphic OLED Display

2 **START** key:
– **Switch on**:
Press and hold until the display lights up.
– **Start measurement**:
Press and hold until measurement starts.
– **Measurement point illumination**:
Press briefly to switch illumination on and off.
– **Switch off**:
Press twice briefly to switch the instrument off.

3 **~ / RCD** key
Measuring function selection: with/without RCCB

4 The $T_A$ key is used to select the value from the table of protective devices, which is used to adjust disconnection time for evaluating measured values.

5 **DISP ▲** and **DISP ▼** keys for selecting the protective device for the evaluation of measured values


Figure 2.3: Control Panel and OLED Display

Data can be represented at the OLED display in two different ways:

- **Brief representation:** Measured quantities appear at the display with large numbers, but no evaluation of the measurement data is included.
- **Detailed representation:** Measured quantities appear at the display along with information from the protective devices database, as well as the symbol for “corresponds / does not correspond with the measured impedance”.

Phase and battery level are displayed in both modes.

Refer to the description in section 3.5 on page 7


Figure 2.4: Example of Brief Representation


Figure 2.5: Example of Detailed Representation

The information which appears at the display varies depending on the selected function.

## 2.3 Initial Start-Up

After inserting the batteries in accordance with section 6.1 on page 10, the measuring instrument is ready for operation.

# 3 Performing Measurements

## 3.1 Switching the Instrument On and Off, Energy-Saving Mode, Automatic Shutdown

The instrument is switched on by pressing and holding the **START** key. Briefly press the **START** key twice in order to switch the instrument off, during which no voltage may be applied to the test probes! The instrument is switched to the standby mode after several seconds (reduced brightness), if none of the keys has been pressed and no voltage is applied to the test probes. The instrument is switched out of the standby mode (i.e. back to full brightness) by pressing any key or applying voltage to the test probes. The instrument is shutdown automatically if it has remained inactive for about 1 minute, i.e. if no keys have been pressed and no voltage has been applied to the test probes during this time.

## 3.2 Instructions and Principles with Validity for All Measurements

- The desired functions and parameters are selected with the **~ / RCD**, $T_A$, **DISP ▲** and **DISP ▼** keys. Measurement is triggered by pressing the **START** key. All selected functions or parameters remain valid until they are changed.
- If a voltage of **< 24 V or > 260 V** is applied to the test probes, corresponding information appears at the display and measurement cannot be triggered by pressing the **START** key.
- If a voltage within a range of **24 V to 190 V** is applied to the test probes, the **START** key is disabled and “< 190 V” is displayed.


Figure 3.1:Voltage < 24 V (brief representation)

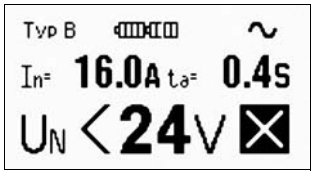


Figure 3.2: Voltage < 24 V (detailed representation)

- If the test instrument displays voltage applied to the test probes after the **START** key has been pressed, although no measurement ensues and the blown fuse symbol appears at the display, the fuse must be replaced.

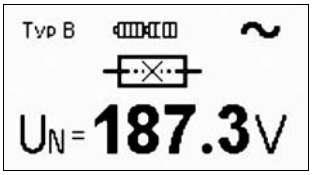


Figure 3.3: Blown Fuse Example (detailed representation)

- If voltage within a range of 190 V to 260 V is applied to the test probes, the momentary measured value appears at the display and measurement can be triggered by pressing the **START** key.


Figure 3.4: Voltage Measurement (brief representation)

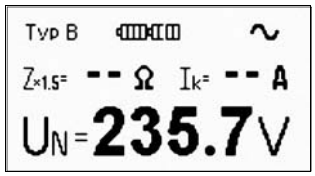


Figure 3.5: Voltage Measurement (detailed representation)

- 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 as described in section 6.1 on page 10.

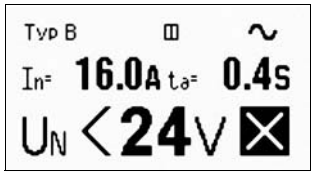


Figure 3.6: Low Battery Voltage (detailed representation)

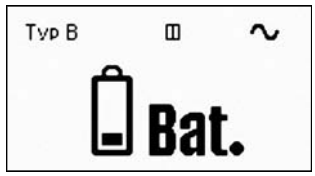


Figure 3.7: Display After Pressing START (detailed representation)

- If several impedance measurements are performed one after the other, internal warming of the instrument is displayed by means of the red indicator – “**T**” symbol. As temperature increases, the field is gradually filled in and becomes wider.

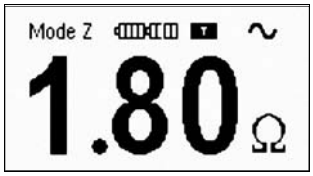


Figure 3.8: High Temperature Display (brief representation)

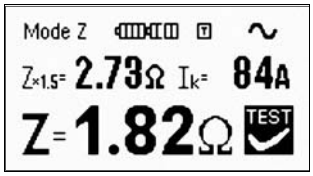


Figure 3.9: High Temperature Display (detailed representation)

When the maximum permissible internal temperature has been exceeded, the "**T**" symbol is replaced with the "**STOP**" symbol. If the **START** key is pressed and held for approximately 1 second, overheating is displayed and any further measurements are disabled. Allow the instrument to cool down!


Figure 3.10: Overheating Display – STOP Symbol

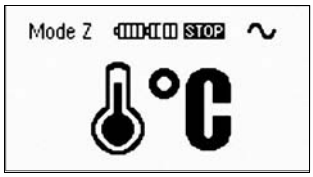


Figure 3.11: Overheating Display After Pressing the Start Key

- ➪ Securely contact the device under test with the test probes. Afterwards, check to see whether or not the displayed line voltage value is stable. Always assure good contact during measurement in order to prevent distortion of the measurement results.
- The test instrument evaluates deviation while measurement is being performed. If considerable interference occurs within the measured system during measurement which would lead to inaccurate impedance measurement results, impedance does not appear at the display and the instrument is switched to voltage measurement after measurement has been completed. The measurement must be repeated!
- If line voltage is unstable while measurement is being performed, or if other electrical circuits parallel to the measured circuit are in use, measurement results may be distorted and permissible measuring error may be exceeded.

## 3.3 Measurement of Fault Loop Impedance and Line Impedance

### 3.3.1 Measurement in Circuits without RCD – ~ Function

The "~" function is suitable for measuring fault loop impedance in electrical circuits without RCCBs, as well as line impedance.

- ➪ After switching the instrument on, connect it between **L** and **PE** in order to measure fault loop impedance, and between **L** and **N** to measure line impedance.

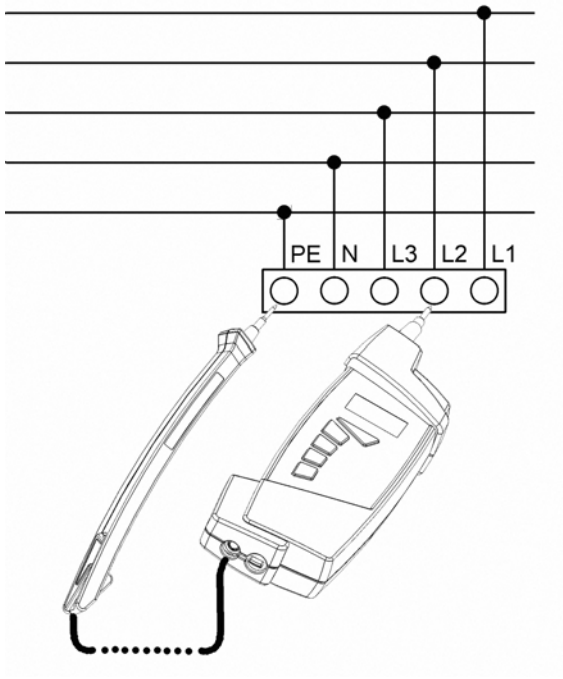


Figure 3.12: Connection Example: Loop Impedance Measurement, L2–PE

- ➪ After the voltage value has settled in, briefly press the **START** key in order to trigger measurement. Assure good contact between the test probes and the device under test while measurement is being performed!

Results after completion of the measurement:


Figure 3.13: Sample Results for Impedance Measurement (brief representation)


Figure 3.14: Sample Results for Impedance Measurement (detailed representation)

**Key:**

Z Measured impedance (Ω)

Z x 1.5 Multiplier for measured impedance Z (Ω)

Ik Short-circuit current calculated as: $I_{SC}$ = 230 / (Z x 1.5) (A)

- ➪ Remove the instrument.

### 3.3.2 Displaying Further Measured/Calculated Values

**Stated briefly:** The following are displayed, one after the other, by pressing the **DISP** ▲ and **DISP** ▼ keys:

– Short-circuit current
– 1.5 times measured impedance
– Impedance corrected by a value equal to measuring error
– Measured impedance

Figure 3.15: Short-Circuit Current

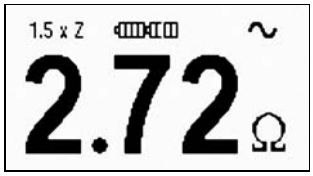

Figure 3.16: 1.5 Times Impedance

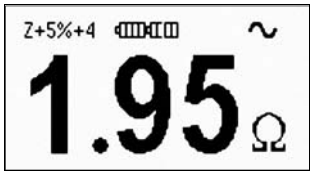

Figure 3.17: Impedance + Measuring Error

Figure 3.18: Measured Impedance

**In detail:** Impedance corrected by a value equal to measuring error is displayed by pressing the **DISP** ▲ key, and only the measured value without correction is displayed by pressing the **DISP** ▼ key.

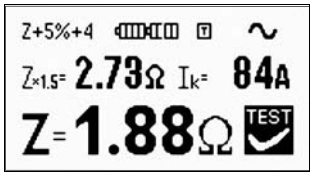

Figure 3.19: Measured Impedance + Measuring Error

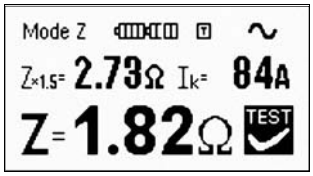

Figure 3.20: Measured Impedance

### 3.3.3 Measurement in Electrical Circuits with RCD

#### Testing Without Tripping the RCCB

Select the "**RCD**" function if loop impedance needs to be measured via an RCCB, without causing it to trip.

➪ After switching the instrument on, connect it between **L** and **N** in order to measure line impedance.
➪ After the voltage value has settled in, briefly press the **~ / RCD** key, which starts measurement of line impedance without tripping the RCD. This is important if loop impedance needs to be measured via an RCCB.
➪ Assure good contact between the test probes and the device under test while measurement is being performed!

**Attention!**
This function is only possible for RCCB's (RCD's) with IΔN ≥ 100 mA. It cannot be guaranteed for 10 mA and 30 mA, see also Safety Precautions in chapter 1.3.

The results appear at the display, and the "~" symbol is replaced with the "**RCD**" symbol at the same time.

#### Testing With Tripping of the RCCB

➪ Connect the test probe from **N** to **PE** (see example in figure 3.12).
➪ Start the measurement by pressing the **START** key. Assure good contact between the test probes and the device under test while measurement is being performed!

After the measurement has been completed, the results are displayed as follows:

Figure 3.21: Impedance Downstream from an RCCB (brief)

Figure 3.22: Impedance Downstream from an RCCB (detailed)

**Key:**

Z Measured impedance (Ω)
Z x 1.5 Multiplier for measured impedance Z (Ω)
IK Short-circuit current calculated as: IK = 230 / (Z x 1.5) (A)

➪ Several seconds after the measurement cables have been removed from the device under test, the test instrument is switched back to the "~" function. In order to perform further loop impedance measurements, the entire procedure in accordance with section 3.3.3 on page 6 must be repeated.
➪ In order to display additional measured/calculated values, proceed as described in section 3.3.2 on page 6, "Displaying Further Measured/Calculated Values".

**Note:** Contact **PE with the mobile test probe.** Press the **START** key. If no voltage is present, loop impedance measurement is not started. Assure that the test probes make good contact with **L** and **PE**.
Make certain that:

– **L** and **PE** are contacted
– **PE** is securely connected

## 3.4 Automatic Evaluation of Measured Impedance

Automatic evaluation is only possible with the detailed representation.

- Protective device parameters are stored to memory or to the database. Type, nominal current **In** and disconnection time **ta** appear at the top of the display (see example in figure 2.5). After pressing the $T_A$ key for the first time, disconnection time **ta** and the smallest short-circuit current **IFmin** required for shutdown appear at the bottom of the display.

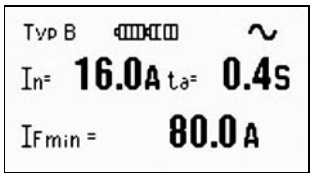


Figure 3.23: Display of Smallest Short-Circuit Current for Shutting Down a B16 Breaker

- Another protective device type and nominal current can be selected immediately after activating the $T_A$ **key** by pressing and holding the **DISP** ▲ or **DISP** ▼ key. After selection, wait about 5 seconds, after which the initial status for voltage measurement is displayed.
- Another disconnection time can be selected immediately after activating the $T_A$ key by pressing the $T_A$ key once again. After selection, wait about 5 seconds, after which the initial status for voltage measurement is displayed.
- If the TEST symbol is displayed along with the results of the impedance measurement after its completion, short-circuit current calculated from impedance is greater than the minimum short-circuit current required for triggering the selected protective device.
  However, if calculated short-circuit current is less than this value, the TEST symbol is displayed.

## 3.5 Further Device Functions

### Phase Detection

If the ☒ symbol appears in the lower right-hand corner of the display (see figures 2.4 and 2.5), and if a phase is contacted with the fixed test probe, the symbol is changed to L.
The other test probe may not be connected anywhere or make any contact at all!


Figure 3.24: Phase Display (brief)


Figure 3.25: Phase Display (detailed)

**Note**

As usual, the test instrument must be gripped in the hand!
In order to obtain a correct display, the fixed test probe must remain connected to the phase for at least 2 seconds.
Phase voltage to ground must be ≥ 190 V / 48 to 52 Hz, because the display will otherwise be incorrect.

### Measuring Point Illumination with White LED

The LED can be switched on and off by briefly pressing the **START** key.

No voltage may be applied to the test probes.

### Selecting Brief or Detailed Representation, Information on Firmware Version

➪ Press the **START** key to switch the instrument on while pressing and holding the **~ / RCD** key. The version number appears at the display, for example V 1.0.0, along with corresponding symbols for the desired representation.

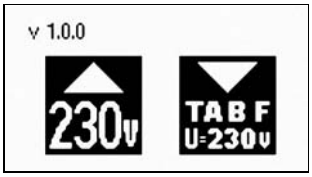


Figure 3.26: Selecting Brief or Detailed Representation, Firmware Version

➪ Select the representation mode with the **DISP** ▲ (brief) or **DISP** ▼ (detailed) key. After selection, the instrument is switched back to normal operation.

## 3.6 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 a DUT. If device functions are still incorrect after switching the instrument back on again, remove the batteries as described in section 6.1 on page 10, 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.

# 4 Technical Data

## 4.1 Individual Device Functions

### Fault Loop Impedance / Line Impedance

Nominal Range per EN 61557-3: 0.27 Ω to 200 Ω

| Range | Resolution | Intrinsic Uncertainty | Measuring Uncertainty |
|---|---|---|---|
| 0.00 to 4.99 Ω | 0.01 Ω | ±(3% rdg. + 5 D) | ±(4% rdg. + 7 D) |
| 5.0 to 49.9 Ω | 0.1 Ω | ±(3% rdg. + 3 D) | ±(4% rdg. + 4 D) |
| 50 to 200 Ω | 1 Ω | ±3% rdg. | ±4% rdg. |

Voltage range: 190 to 260 V / 48 to 52 Hz
Load resistance:50 Ω (variable number of pulses at 10 ms)

### Fault Loop Impedance Without Tripping the RCCB

Nominal Range per EN 61557-3: 0.8 Ω to 200 Ω

| Range | Resolution | Intrinsic Uncertainty | Measuring Uncertainty |
|---|---|---|---|
| 0.0 to 4.9 Ω | 0.1 Ω | ±(5% rdg. + 2 D) | ±(6% rdg. + 2 D) |
| 50 to 200 Ω | 1 Ω | ±7% rdg. | ±8% rdg. |

Voltage range: 190 to 260 V / 48 to 52 Hz
Load resistance:50 Ω (variable number of pulses and pulse width)

### Short-Circuit Current

| Range | Resolution | Intrinsic Uncertainty | Measuring Uncertainty |
|---|---|---|---|
| 0 to 999 A | 1 A | Depending on measuring error for loop impedance ± **1 D** | Depending on measuring error for loop impedance ±**1 D** |
| 1.0 to 9.9 kA | 0.1 kA | | |
| 10 to 23 kA | 1 kA | | |

### **Alternating Voltage** (TRMS)

| Range | Resolution | Intrinsic Uncertainty | Measuring Uncertainty |
|---|---|---|---|
| 24 to 260 V | 1 V [1]<br>0.1 V [2] | ±(2% rdg. + 2 D) | ±(3% rdg. + 3 D) |

Frequency range: 48 to 52 Hz

[1] Display for brief representation
[2] Display for detailed representation

### Key:

a) The measuring uncertainties specified here for fault loop impedance, line impedance and short-circuit current are only valid if line voltage is stable during measurement and if no other electrical circuits parallel to the measured circuit are in use.
c) rdg. means reading, i.e. measured value, D = digits (i.e. number of the decimal place with the least significance)

## 4.2 General Data

### Reference Conditions

| | |
|---|---|
| Temperature | 23 ± 2° C |
| Relative humidity | 40 to 60% |
| Line voltage | 230 V ±2% / 50 Hz ±1% |
| Device position | any |

### Ambient Conditions

#### Operating Conditions

| | |
|---|---|
| Operating temperature | 0 to 40° C |
| Relative Humidity | max. 85 %, no condensation allowed |
| Line voltage | 190 to 260 V / 48 to 52 Hz |
| Device position | any |

#### Storage Conditions

| | |
|---|---|
| Temperature | -10 to 70° C |
| Relative Humidity | max. 90% at -10 to +40° C<br>max. 80% at +40 to +70° C |
| Device position | any |

### Power Supply

| | |
|---|---|
| Batteries | 4 ea. 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. 3,000 measurements |

### Electrical Safety

| | |
|---|---|
| Measuring category | with safety cap applied to measuring probe: CAT III 300 V<br>without safety cap applied to measuring probe: CAT I I 300 V |
| Pollution degree | 2 |
| Protection class | II |
| Fuse | SIBA ceramic fuse<br>6.3 mm x 32 mm, F1 A/600 V<br>switching capacity 50 kA at 600 V |

### Mechanical Design

| | |
|---|---|
| Display | OLED, multicolored, graphic |
| Protection | IP 43 |
| Dimensions | approx. 260 x 70 x 40 mm |
| Weight | approx. 0.36 kg with batteries |

# 5 Table of Protective Devices Stored to the Instrument

## Fuse Type NV

| Nominal Current (A) | Disconnecting Time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 02 | 0.4 | 5 |
| | Min. Short-Circuit Current (A) | | | | |
| 2 | 32.5 | 22.3 | 18.7 | 15.9 | 9.1 |
| 4 | 65.6 | 46.4 | 38.8 | 31.9 | 18.7 |
| 6 | 102.8 | 70 | 56.5 | 46.4 | 26.7 |
| 10 | 165.8 | 115.3 | 96.5 | 80.7 | 46.4 |
| 16 | 206.9 | 150.8 | 126.1 | 107.4 | 66.3 |
| 20 | 276.8 | 204.2 | 170.8 | 145.5 | 86.7 |
| 25 | 361.3 | 257.5 | 215.4 | 180.2 | 109.3 |
| 35 | 618.1 | 453.2 | 374 | 308.7 | 169.5 |
| 50 | 919.2 | 640 | 545 | 464.2 | 266.9 |
| 63 | 1217.2 | 821.7 | 663.3 | 545 | 319.1 |
| 80 | 1567.2 | 1133.1 | 964.9 | 836.5 | 447.9 |
| 100 | 2075.3 | 1429 | 1195.4 | 1018 | 585.4 |
| 125 | 2826.3 | 2006 | 1708.3 | 1454.8 | 765.1 |
| 160 | 3538.2 | 2485.1 | 2042.1 | 1678.1 | 947.9 |
| 200 | 4555.5 | 3488.5 | 2970.8 | 2529.9 | 1354.5 |
| 250 | 6032.4 | 4399.6 | 3615.3 | 2918.2 | 1590.6 |
| 315 | 7766.8 | 6066.6 | 4985.1 | 4096.4 | 2272.9 |
| 400 | 10577.7 | 7929.1 | 6632.9 | 5450.5 | 2766.1 |
| 500 | 13619 | 10933.5 | 8825.4 | 7515.7 | 3952.7 |
| 630 | 19619.3 | 14037.4 | 11534.9 | 9310.9 | 4985.1 |
| 710 | 19712.3 | 17766.9 | 14341.3 | 11996.9 | 6423.2 |
| 800 | 25260.3 | 20059.8 | 16192.1 | 13545.1 | 7252.1 |
| 1000 | 34402.1 | 23555.5 | 19356.3 | 16192.1 | 9146.2 |
| 1250 | 45555.1 | 36152.6 | 29182.1 | 24411.6 | 13070.1 |

## Fuse Type gG

| Nominal Current (A) | Disconnecting Time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 02 | 0.4 | 5 |
| | Min. Short-Circuit Current (A) | | | | |
| 2 | 32.5 | 22.3 | 18.7 | 15.9 | 9.1 |
| 4 | 65.6 | 46.4 | 38.8 | 31.9 | 18.7 |
| 6 | 102.8 | 70 | 56.5 | 46.4 | 26.7 |
| 10 | 165.8 | 115.3 | 96.5 | 80.7 | 46.4 |
| 13 | 193.1 | 144.8 | 117.9 | 100 | 56.2 |
| 16 | 206.9 | 150.8 | 126.1 | 107.4 | 66.3 |
| 20 | 276.8 | 204.2 | 170.8 | 145.5 | 86.7 |
| 25 | 361.3 | 257.5 | 215.4 | 180.2 | 109.3 |
| 32 | 539.1 | 361.5 | 307.9 | 271.7 | 159.1 |
| 35 | 618.1 | 453.2 | 374 | 308.7 | 169.5 |
| 40 | 694.2 | 464.2 | 381.4 | 319.1 | 190.1 |

## Fuse Type B

| Nominal Current (A) | Disconnecting Time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 02 | 0.4 | 5 |
| | Min. Short-Circuit Current (A) | | | | |
| 6 | 30 | 30 | 30 | 30 | 30 |
| 10 | 50 | 50 | 50 | 50 | 50 |
| 13 | 65 | 65 | 65 | 65 | 65 |
| 16 | 80 | 80 | 80 | 80 | 80 |
| 20 | 100 | 100 | 100 | 100 | 100 |
| 25 | 125 | 125 | 125 | 125 | 125 |
| 32 | 160 | 160 | 160 | 160 | 160 |
| 40 | 200 | 200 | 200 | 200 | 200 |
| 50 | 250 | 250 | 250 | 250 | 250 |
| 63 | 315 | 315 | 315 | 315 | 315 |

## Fuse Type C

| Nominal Current (A) | Disconnecting Time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 02 | 0.4 | 5 |
| | Min. Short-Circuit Current (A) | | | | |
| 05 | 5 | 5 | 5 | 5 | 2.7 |
| 1 | 10 | 10 | 10 | 10 | 5.4 |
| 1.6 | 16 | 16 | 16 | 16 | 8.6 |
| 2 | 20 | 20 | 20 | 20 | 10.8 |
| 4 | 40 | 40 | 40 | 40 | 21.6 |
| 6 | 60 | 60 | 60 | 60 | 32.4 |
| 10 | 100 | 100 | 100 | 100 | 54 |
| 13 | 130 | 130 | 130 | 130 | 70.2 |
| 16 | 160 | 160 | 160 | 160 | 86.4 |
| 20 | 200 | 200 | 200 | 200 | 108 |
| 25 | 250 | 250 | 250 | 250 | 135 |
| 32 | 320 | 320 | 320 | 320 | 172.8 |
| 40 | 400 | 400 | 400 | 400 | 216 |
| 50 | 500 | 500 | 500 | 500 | 270 |
| 63 | 630 | 630 | 630 | 630 | 340.2 |

## Fuse Type K

| Nominal Current (A) | Disconnecting Time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 02 | 0.4 | |
| | Min. Short-Circuit Current (A) | | | | |
| 05 | 7.5 | 7.5 | 7.5 | 7.5 | |
| 1 | 15 | 15 | 15 | 15 | |
| 1.6 | 24 | 24 | 24 | 24 | |
| 2 | 30 | 30 | 30 | 30 | |
| 4 | 60 | 60 | 60 | 60 | |
| 6 | 90 | 90 | 90 | 90 | |
| 10 | 150 | 150 | 150 | 150 | |
| 13 | 195 | 195 | 195 | 195 | |
| 16 | 240 | 240 | 240 | 240 | |
| 20 | 300 | 300 | 300 | 300 | |
| 25 | 375 | 375 | 375 | 375 | |
| 32 | 480 | 480 | 480 | 480 | |

## Fuse Type D

| Nominal Current (A) | Disconnecting Time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 02 | 0.4 | 5 |
| | Min. Short-Circuit Current (A) | | | | |
| 05 | 10 | 10 | 10 | 10 | 2.7 |
| 1 | 20 | 20 | 20 | 20 | 5.4 |
| 1.6 | 32 | 32 | 32 | 32 | 8.6 |
| 2 | 40 | 40 | 40 | 40 | 10.8 |
| 4 | 80 | 80 | 80 | 80 | 21.6 |
| 6 | 120 | 120 | 120 | 120 | 32.4 |
| 10 | 200 | 200 | 200 | 200 | 54 |
| 13 | 260 | 260 | 260 | 260 | 70.2 |
| 16 | 320 | 320 | 320 | 320 | 86.4 |
| 20 | 400 | 400 | 400 | 400 | 108 |
| 25 | 500 | 500 | 500 | 500 | 135 |
| 32 | 640 | 640 | 640 | 640 | 172.8 |

# 6 Maintenance

## 6.1 Device Power Supply

**Caution: Dangerous Voltage!**
**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 instrument may not be placed into service if the battery compartment lid has not been inserted and secured with the screws.

Either alkaline batteries or rechargeable NiCD/NiMH batteries may be used to supply the instrument with electrical power (4 each, size: AAA, type: LR03).

The battery charge level is continuously displayed (see section 3.2 on page 4).

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.

### 6.1.1 Inserting and Replacing the Batteries

Loosen the two screws at the back of the instrument and remove the battery compartment lid. Insert the batteries assuring correct polarity!

Figure 6.1: Correct Battery Polarity

Always replace all 4 batteries at once, and use high quality batteries. Replace the battery compartment lid and retighten the screws.

### 6.1.2 Recharging the Batteries

**Attention!**
Use only the charger (Z507A) which is offered as an optional accessory for this instrument to charge the **batteries** inserted in the instrument.
**Make sure that the following conditions have been fulfilled before connecting the charger to the charging socket:**
– rechargeable batteries have been inserted with correct polarity, **no** normal batteries
– The test instrument has been disconnected from the measuring circuit at all poles
– The instrument must remain off during charging.

Recharging of the batteries begins as soon as the charger is connected to the mains and to the charging socket (see figure 6.1). Charging takes 5 hours and 30 minutes (integrated safety timer) if the batteries have been fully depleted.

**Safety Precautions**

- Do not attempt to recharge alkaline batteries: they may leak, explode etc. The test instrument may be severely damaged or destroyed as a result.
- After initially charging new batteries and after rechargeable batteries have not been used for a lengthy period of time (several months), operating hours after charging may be significantly less than usual. If this is the case, repeat the charging procedure several times.
  Autonomous, intelligent charging stations execute charging/discharging cycles of this sort automatically (see instructions included with the charging station). This procedure increases the capacity of the batteries, thus making longer periods of operation possible between charging cycles.
- If no improvement is achieved in this way, one or more of the rechargeable batteries may no longer fulfill the original specifications. If this is the case, the defective rechargeable battery should be identified, e.g. with the help of the voltage measurement, and replaced.
- Battery capacity is gradually reduced as a result of long and frequent use. When you notice that this is the case, all of the rechargeable batteries should be replaced.

### 6.1.3 Replacing the Fuse

**Attention!**
The fuse may only be replaced with the fuse type specified in section “Technical Data” . If any other fuse is inserted, this may result in damage to the instrument and/or danger for the user!

## 6.2 Cleaning

Use a soft cloth and soapy water for cleaning. Do not place the test instrument back into service until its surface is completely dry.

**Attention!**
Do not use cleaning agents which contain benzine or alcohol! Prevent liquids from penetrating into the test instrument’s interior.

### 6.3 Recalibration

The measuring tasks performed with your instrument, and the stressing it's subjected to, influence aging of its components and may result in deviation from the specified levels of accuracy.

In the case of strict measuring accuracy requirements, as well as in the event of use at construction sites with frequent stress due to transport and considerable temperature fluctuation, we recommend a relatively short calibration interval of once per year. If your instrument is used primarily in the laboratory and indoors without considerable climatic or mechanical stressing, a calibration interval of once every 2 to 3 years is sufficient as a rule.

During recalibration* at an accredited calibration laboratory (DIN EN ISO/IEC 17025), deviations from traceable standards demonstrated by your measuring instrument are documented. Ascertained deviations are used to correct displayed values during later use of the instrument.

We would be happy to perform DAkkS or factory calibration for you at our calibration laboratory. Further information is available at our website:

www.gossenmetrawatt.com (→ Company → DAkkS Calibration Center or → FAQs → General – Calibration Questions and Answers ).

Recalibration of your instrument at regular intervals is essential for the fulfillment of requirements according to quality management systems per DIN EN ISO 9001.

## 7 Repair and Replacement Parts Service Calibration Center and Rental Instrument Service

If required please contact:

GMC-I Service GmbH
**Service Center**
Thomas-Mann-Str. 20
90471 Nürnberg, Germany
Phone: +49 911 817718-0
Fax: +49 911 817718-253
E-mail service@gossenmetrawatt.com
www.gmci-service.com

This address is only valid in Germany. Please contact our representatives or subsidiaries for service in other countries.

## 8 Product Support

If required please contact:

GMC-I Messtechnik GmbH
**Product Support Hotline**
Phone: +49-911-8602-0
Fax: +49 911 8602-709
E-mail: support@gossenmetrawatt.com

* Examination of the specification, as well as adjustment, are not included in calibration. However, in the case of our own products, any required adjustment is performed and adherence to the specification is confirmed.

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