GOSSEN METRAWATT
GMC-INSTRUMENTS GROUP

OPERATING INSTRUCTIONS

4/10.25

3-349-697-03



METRALINE ZCHECK

LOOP RESISTANCE MEASURING INSTRUMENT

TABLE OF CONTENTS

1 Safety Instructions 4

2 Application 6

2.1 Intended Use / Use for Intended Purpose 6

2.2 Use for Other than Intended Purpose 6

2.3 Liability and Guarantee 6

3 Documentation 7

3.1 Information Concerning these Instructions 7

3.2 Identification of Warnings 7

3.3 Identifiers 8

3.4 Symbols in the Documentation 8

3.5 Definition of Terms 8

4 Getting Started 9

5 The Instrument 10

5.1 Scope of Delivery 10

5.2 Optional Accessories 10

5.3 Device Overview 10

5.3.1 Front 10

5.3.2 Back 11

5.3.3 Control Panel 11

5.4 Keys and Functions 12

5.4.1 Symbols on the Instrument and the Included Accessories 12

5.5 Features 13

5.6 Relevant Standards 13

5.7 Technical Data 14

5.8 Characteristic Values 15

5.9 Table of Protective Devices Stored to the Instrument 16

5.9.1 Fuse Type NV 16

5.9.2 Fuse Type gG 16

5.9.3 Fuse Type B 17

5.9.4 Fuse Type C 17

5.9.5 Fuse Type K 18

5.9.6 Fuse Type D 18

6 Start Up 19

6.1 Switching on/off 19

6.1.1 Switching on the Instrument 19

6.1.2 Switching off the Instrument 19

7 Operation 20

7.1 Data Presentation 20

7.2 Instructions an Principles for All Measurements 20

7.3 Measurement of Fault Loop Impedance and Line Impedance 22

7.3.1 Measurement in Circuits without RCD – ~ Function 22

7.3.2 Measurement in Electrical Circuits with RCD 23

7.3.3 Displaying Further Measured/Calculated Values 24

7.4 Automatic Evaluation of Measured Impedance 25

7.5 Phase Detection ... 26
7.6 Selecting Brief or Detailed presentation, Information on Firmware Version ... 26
7.7 Measuring Point Illumination with White LED ... 26
7.8 Display the Serial Number of the Device ... 26
7.9 Device Reset Function ... 26
8 Storage and Transport ... 27
9 Maintenance ... 28
9.1 Device Power Supply ... 28
9.1.1 Inserting and Replacing the Batteries ... 28
9.1.2 Recharging the Batteries ... 28
9.2 Fuse Replacement ... 29
9.3 Cleaning ... 29
9.4 Recalibration ... 29
10 Repair ... 30
11 Contact, Support and Service ... 31
12 Certifications ... 32
12.1 CE Declaration ... 32
12.2 Test Report ... 32
13 Disposal and Environmental Protection ... 33
13.1 Disposal of Old Devices, Batteries and Rechargeable Batteries ... 33
13.2 Disposal of Packaging Materials ... 33
13.3 Regulations for the Federal Republic of Germany ... 33
Figures ... 34
Tables ... 36

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 METRALINE ZCHECK allows for the evaluation of measured fault loop/line resistance and for evaluating the compliance of protective devices. Minimal prospective fault current depends on the type, rated current and disconnecting time of the fuse.

A table with the parameters of various protective devices (fuse types/disconnecting times/rated currents) is included in device memory.

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

Product designations used in this document may be subject to brand law and patent law. They are of the property of their respective owner.

Copyright

This document is protected by copyright. Content modifications, reproduction, duplication, processing or translation in any form (including excerpts) are only permissible after previously obtaining written consent from Gossen Metrawatt GmbH. This applies in particular to storage and processing in electronic systems provided they do not exclusively serve legitimate internal purposes.

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
OUT	Object under test

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 ➪🗎20.
4. Configure the instrument ➪🗎19.
5. Perform measurements/tests ➪🗎20.

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 ZCHECK 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

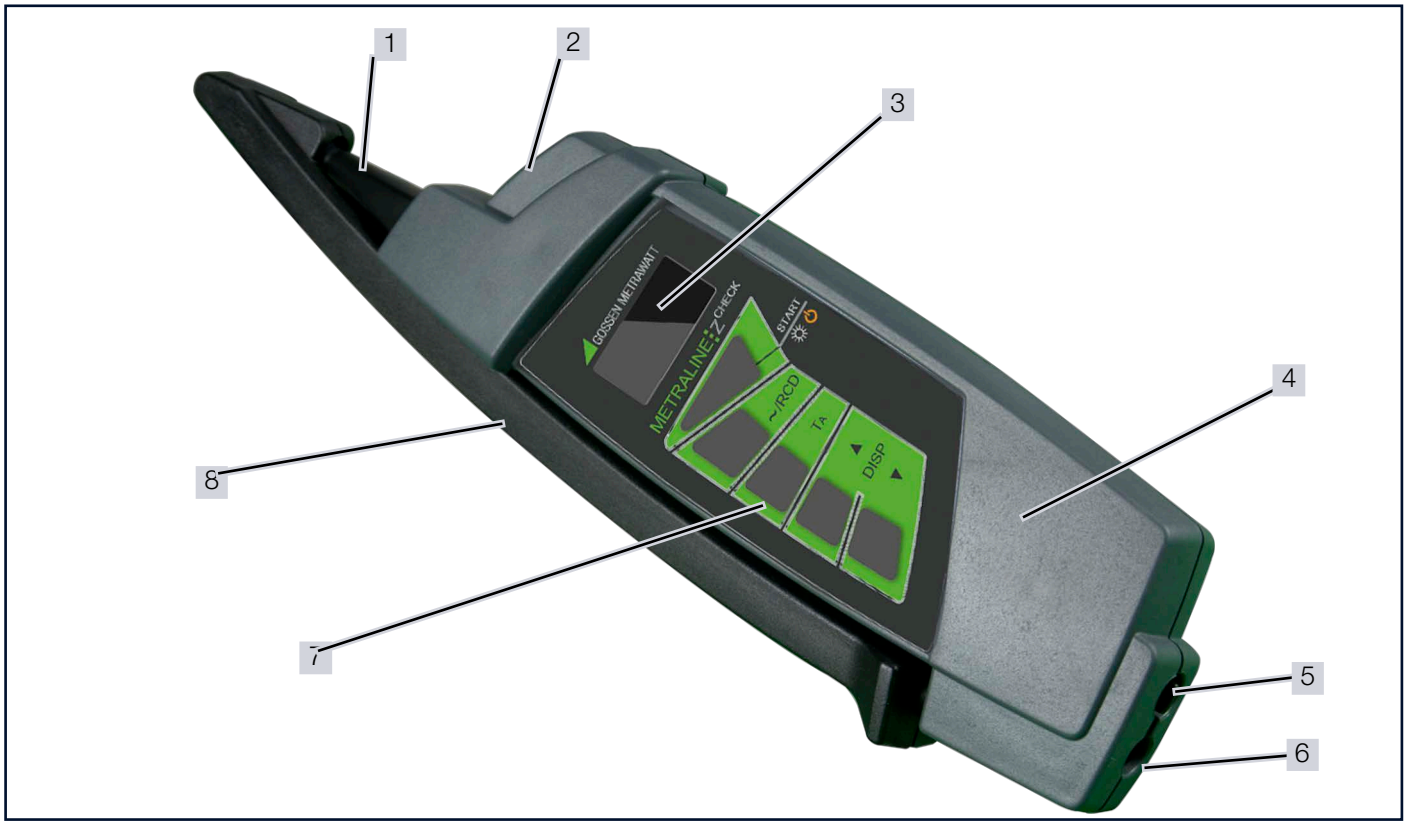


Fig. 1: Front panel

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

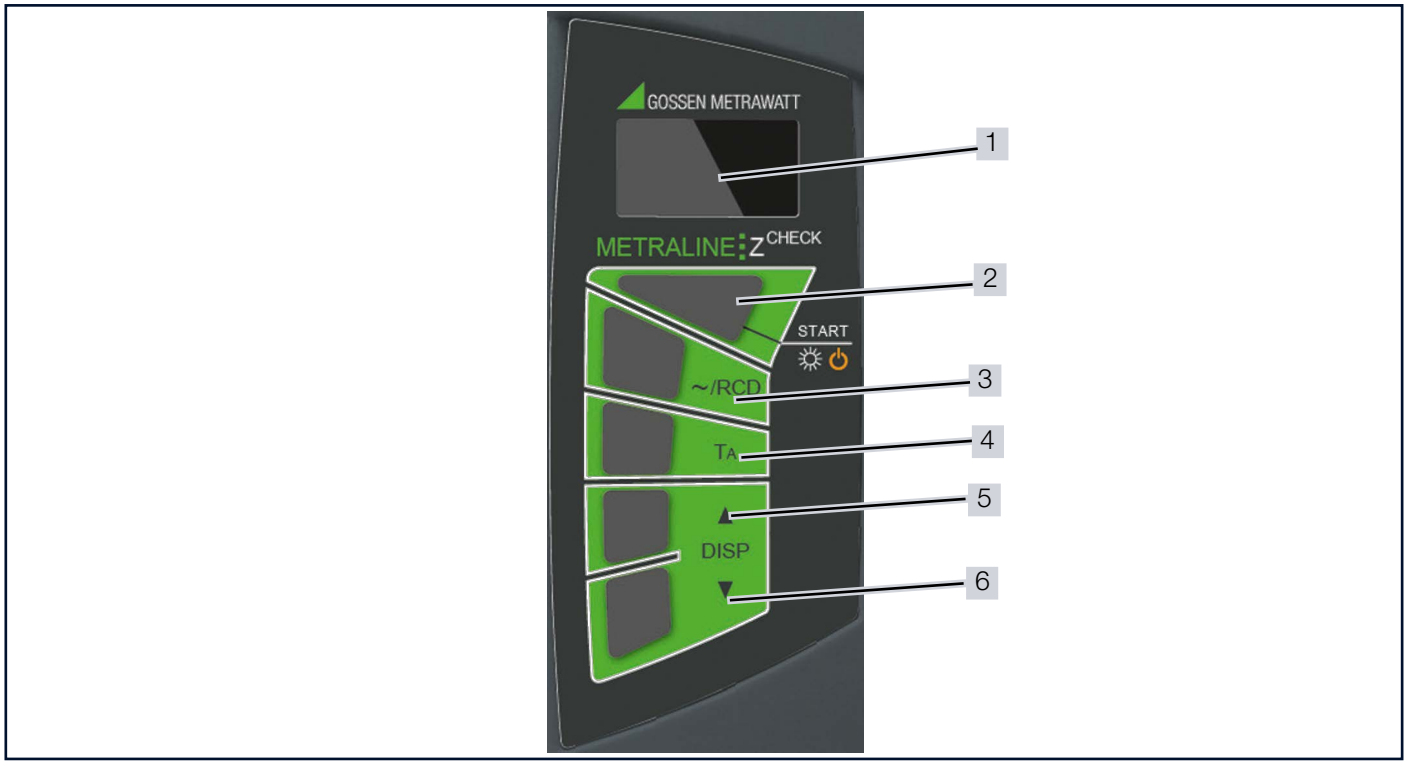


Fig. 3: Control panel

1	Display	4	T_A key
2	START key	5	DISP up
3	~ / RCD key	6	DISP down

5.4 KEYS AND FUNCTIONS

Key	Description	Action	Function
	**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
	**~ / RCD**	Press	Switches between measuring functions with or without RCCB
	**T_A**	Press	Selects the value from the table of protective devices, which is used to adjust disconnection time for evaluating measured values
	**DISP up**	Press	Selects measuring voltage, scrolling forwards Selects the type of overvoltage protection device, scrolling forwards
	**DISP down**	Press	Selects protective device for the evaluation of measured values, scrolling backwards Selects protective device for the evaluation of measured values, 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

- Fault loop impedance with short-circuit current (and without tripping the RCD)
- Line impedance with short-circuit current
- Line voltage
- Phase detection

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 61557-3	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 3: Loop impedance
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 – Electrostatic 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. 3000 measurements
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
	Mains voltage	190 V … 255 V / 45 Hz … 65 Hz
	Elevation:	max. 2000 m / 6562 ft.
Reference Conditions	Temperature	23 ± 2 °C
	Relative humidity	40% … 60%
	Mains voltage	230 V ± 2 % / 50 Hz ± 1 %
Electrical Safety	Measuring category:	with safety cap on the test probe: CAT III 300 V without safety cap on the test probe: CAT II 300 V
	Pollution degree:	2
	Protection category:	II
	Fuse	SIBA ceramic fuse 6.3 mm × 32 mm, F1 A/600 V switching capacity 50 kA at 600 V
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. 255 mm × 70 mm × 40 mm / 10" × 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

Fault Loop Impedance / Line Impedance [a)]

Nominal range per DIN EN IEC 61557-3: 0.27 Ω … 200 Ω

Range	Resolution	Intrinsic Uncertainty	Measuring Uncertainty
0.00 Ω … 4.99 Ω	0.01 Ω	±3 % of reading + 5 digit	±4 % of reading + 7 digit
5.0 Ω … 49.9 Ω	0.1 Ω	±3 % of reading + 3 digit	±4 % of reading + 4 digit
50 Ω … 200 Ω	1 Ω	±3 % of reading	±4 % of reading

Voltage range: 190 V … 260 V / 48 Hz … 52 Hz

Load resistance: 50 Ω (variable number of pulses at 10 ms)

Fault Loop Impedance Without Tripping the RCCB [a)]

Nominal range per DIN EN IEC 61557-3: 0.8 Ω … 200 Ω

Range (Ω)	Resolution	Intrinsic Uncertainty	Measuring Uncertainty
0.0 Ω … 4.9 Ω	0.1 Ω	±5 % of reading + 2 digit	±6 % of reading + 2 digit
5 Ω … 200 Ω	1 Ω	±7 % of reading	±8 % of reading

Voltage range: 190 V … 260 V / 48 Hz … 52 Hz

Load resistance: 50 Ω (variable number of pulses and pulse width)

Short-Circuit Current [a)]

Range	Resolution	Intrinsic Uncertainty	Measuring Uncertainty
0 A … 999 A	1 A	Depending on measuring error for loop impedance ±1 digit	Depending on measuring error for loop impedance ±1 digit
1.0 kA … 9.9 kA	0.1 kA		
10 kA … 23 kA	1 kA		

Alternating Voltage (TRMS)

Range	Resolution	Intrinsic Uncertainty	Measuring Uncertainty
24 V … 260 V	1 V (basic display mode) 0.1 V (detailled display mode)	±2 % of reading + 2 digit	±3 % of reading + 3 digit

Frequency range: 48 Hz … 52 Hz

a) The measuring uncertainties specified for fault loop impedance, line impedance and short-circuit current are only valid if the line voltage is stable during measurement and if no other electrical circuits parallel to the measured circuit are in use.

5.9 TABLE OF PROTECTIVE DEVICES STORED TO THE INSTRUMENT

5.9.1 FUSE TYPE NV

	Disconnecting Time				
	35 ms	0.1 s	02 s	0.4 s	5 s
Nominal Current (A)	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

5.9.2 FUSE TYPE GG

	Disconnecting Time				
	35 ms	0.1 s	02 s	0.4 s	5 s
Nominal Current (A)	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

5.9.3 FUSE TYPE B

	Disconnecting Time				
	35 ms	0.1 s	02 s	0.4 s	5 s
Nominal Current (A)	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

5.9.4 FUSE TYPE C

	Disconnecting Time				
	35 ms	0.1 s	02 s	0.4 s	5 s
Nominal Current (A)	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

5.9.5 FUSE TYPE K

	Disconnecting Time				
	35 ms	0.1 s	02 s	0.4 s	5 s
Nominal Current (A)	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	

5.9.6 FUSE TYPE D

	Disconnecting Time				
	35 ms	0.1 s	02 s	0.4 s	5 s
Nominal Current (A)	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 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 DATA PRESENTATION

Data can be presented on the display in two different ways:

- **Brief presentation:** Measured values appear on the display as large numbers, but no evaluation of the measurement data is included.
- **Detailed presentation:** Measured values appear on 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.



Fig. 4: Example of brief presentation



Fig. 5: Example of detailed presentation

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

7.2 INSTRUCTIONS AN PRINCIPLES FOR ALL MEASUREMENTS

- The desired functions and parameters are selected with the **~ / RCD**, **TA, DISP up** and **DISP down** 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 on the display and measurements cannot be started by pressing the **START** key.
- Before a measurement, check that there is no interference voltage present. To do so, contact the 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.
- 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.



Fig. 6: Voltage < 24 V (brief presentation)



Fig. 7: Voltage < 24 V (detailed presentation)

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



Fig. 8: Blown fuse example (detailed presentation)

- 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.



Fig. 9: Voltage measurement (brief presentation)



Fig. 10: Voltage measurement (detailed presentation)

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



Fig. 11: Low battery voltage (detailed presentation)



Fig. 12: Display after pressing START (detailed presentation)

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



Fig. 13: High temperature display (brief presentation)



Fig. 14: High temperature display (detailed presentation)

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.



Fig. 15: Overheating display – STOP symbol



Fig. 16: Overheating display after pressing the START key

- Securely contact the object under test with the test probes. Always assure good contact during measurement in order to prevent distortion of the measurement results. Check to see whether or not the displayed line voltage value is stable.
- The test instrument evaluates deviation while the measurement is being performed. If considerable interference occurs within the object under test 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 the line voltage is unstable while the measurement is being performed, or if other electrical circuits parallel to the measured circuit are in use, measurement results may be distorted and the permissible measuring error may be exceeded.

7.3 MEASUREMENT OF FAULT LOOP IMPEDANCE AND LINE IMPEDANCE

7.3.1 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.

1. Connect the instrument between L and PE in order to measure fault loop impedance or between L and N in order to measure line impedance.

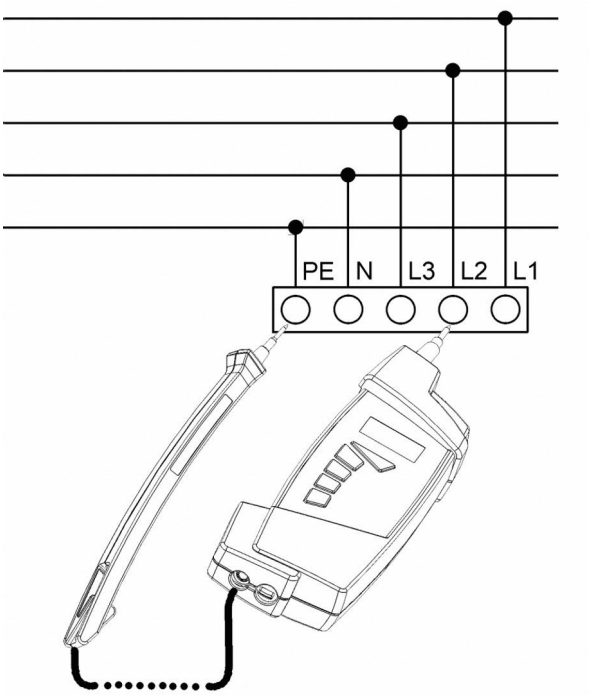


Fig. 17: Connection Example: Loop Impedance Measurement, L2–PE

2. Wait until the voltage value has settled in.
3. Briefly press the **START** key in order to start the measurement. The results are displayed after completion of the measurement:



Fig. 18: Sample results for impedance measurement (brief presentation)



Fig. 19: Sample results for impedance measurement (detailed presentation)

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)

4. Remove the instrument.

7.3.2 MEASUREMENT IN ELECTRICAL CIRCUITS WITH RCD

The **RCD** function is suitable for loop impedance measurement in circuits with RCD (no-tripping of RCD).

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

1. Connect the instrument between L and N in order to measure line impedance.
   ↳ The voltage value has settled in.
2. Briefly press the **~ / RCD** key, which starts measurement of line impedance without tripping the RCD.
3. Disconnect the test probe from N and connect it to PE.
4. Start the measurement by pressing the **START** key.
   ↳ After the measurement has been completed, the results are displayed as follows:



Fig. 20: Impedance downstream from an RCCB (brief)

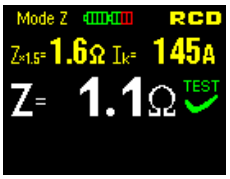


Fig. 21: Impedance downstream from an RCCB (detailed)

Z: Measured impedance (Ω)

Z × 1.5: Multiplier for measured impedance Z (Ω)

IK: Short-circuit current calculated as: I_{SC} = 230 / (Z × 1.5) (A)

↳ Several seconds after the measurement cables have been removed from the object 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 7.3.2 on page 23 must be repeated.

↳ In order to display additional measured/calculated values, proceed as described in section 7.3.2 on page 23.

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 sure that:

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

Note

RCD under test can trip even if the **~/RCD** function is selected!

Possible causes: RCDs which are too sensitive to short current peaks (applies especially to $I_{\Delta N}$ = 10 mA and 30 mA types), faulty RCDs, or leakage current flow via RCD under test.

7.3.3 DISPLAYING FURTHER MEASURED/CALCULATED VALUES

Stated briefly: The following can be displayed, one after the other, by pressing the **DISP up** and **DISP down** keys:

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



Fig. 22: Short-circuit current



Fig. 23: Times impedance



Fig. 24: Impedance + measuring error



Fig. 25: Measured impedance

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



Fig. 26: Measured impedance + measuring error

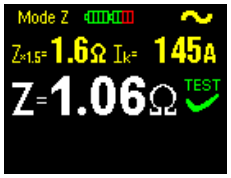


Fig. 27: Measured impedance

7.4 AUTOMATIC EVALUATION OF MEASURED IMPEDANCE

Automatic evaluation is only possible within the detailed presentation.

- Protective device parameters are stored to memory or to the database. Type, nominal current I_n, and disconnection time t_a appear at the top of the display. After pressing the T_A key for the first time, the disconnection time t_a and the smallest short-circuit current IF_{min} required for shutdown appear at the bottom of the display.



Fig. 28: 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 up** or **DISP down** 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, the short-circuit current calculated from impedance is greater than the minimum short-circuit current required for triggering the selected protective device.

  However, if the calculated short-circuit current is less than this value, the TEST symbol is displayed.

7.5 PHASE DETECTION

If the ☒ symbol appears in the lower right-hand corner of the display, 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.



Fig. 29: Phase display (brief)



Fig. 30: Phase display (detailed)

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.

7.6 SELECTING BRIEF OR DETAILED PRESENTATION, INFORMATION ON FIRMWARE VERSION

1. Press the **START** key to switch the instrument on while pressing and holding the **~ / RCD** key.
   ↳ The version number is displayed along with corresponding symbols for the desired presentation.

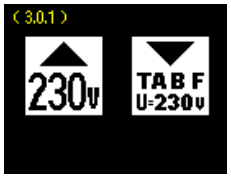


Fig. 31: Selecting brief or detailed presentation, firmware version

2. Select the presentation mode with the **DISP up** (brief) or **DISP down** (detailed) key.
   ↳ After selection, the instrument is switched back to normal operation.

7.7 MEASURING POINT ILLUMINATION WITH WHITE LED

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

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

↳ The LED is switched on or off.

7.8 DISPLAY THE SERIAL NUMBER OF THE DEVICE

1. Hold down the T_A 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 T_A key is pressed. Additional information (if available) may also be displayed.

7.9 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 instrument from operation, secure it against inadvertent use 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.

ATTENTION

Battery leakage!

Leaking batteries will cause damage to the device.

Remove the batteries for longterm storage.

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. 32: 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 instrument has been disconnected from the measuring circuit at all poles.
✓ The instrument is turned off.

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 FUSE REPLACEMENT

ATTENTION

Unsuitable fuse

If any fuse other than the one specified is inserted into the instrument, this may result in damage to the instrument and/or danger for the user.

- Replace the fuse only with the fuse type specified in section ⇨ "Technical Data" 🗎14.

1. Loosen the two screws for the battery compartment lid and remove the lid.
2. Remove the blown fuse from the fuse holder.
3. Replace the fuse with a new one.
4. Replace the lid and retighten the screws.
5. Check the instrument for correct functioning.

9.3 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.

9.4 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.

FIGURES

Front panel 10
Back of instrument, detail view of the back panel with battery compartment lid 11
Control panel 11
Example of brief presentation 20
Example of detailed presentation 20
Voltage < 24 V (brief presentation) 20
Voltage < 24 V (detailed presentation) 20
Blown fuse example (detailed presentation) 20
Voltage measurement (brief presentation) 20
Voltage measurement (detailed presentation) 20
Low battery voltage (detailed presentation) 21
Display after pressing START (detailed presentation) 21
High temperature display (brief presentation) 21
High temperature display (detailed presentation) 21
Overheating display – STOP symbol 21
Overheating display after pressing the START key 21
Connection Example: Loop Impedance Measurement, L2–PE 22
Sample results for impedance measurement (brief presentation) 22
Sample results for impedance measurement (detailed presentation) 22
Impedance downstream from an RCCB (brief) 23
Impedance downstream from an RCCB (detailed) 23
Short-circuit current 24
Times impedance 24
Impedance + measuring error 24
Measured impedance 24
Measured impedance + measuring error 24
Measured impedance 24
Display of smallest short-circuit current for shutting down a B16 breaker 25
Phase display (brief) 26
Phase display (detailed) 26
Selecting brief or detailed presentation, firmware version 26
Correct battery polarity 28

TABLES

Identifiers in this document....8
Icons used in this document....8
Definition of terms....8
Keys and functions....12
Symbols on the instrument and the included accessories....12
Relevant standards....13
Technical data....14

GOSSEN METRAWATT
GMC-INSTRUMENTS GROUP

YOUR CONTACT PARTNER

Gossen Metrawatt GmbH
Südwestpark 15
90449 Nürnberg
Germany

+49 911 8602-0
+49 911 8602-669
info@gossenmetrawatt.com
www.gossenmetrawatt.com

© Gossen Metrawatt GmbH
Prepared in Germany • Subject to change, errors excepted •
A pdf version is available on the Internet

All trademarks, registered trademarks, logos, product names, and company names are the property of their respective owners.