

Operating Instructions

METRACAL CM Serie

**METRACAL CM PRO (M275P) / METRACAL CM TECH (M275T) /
METRA-CAL CM XTRA (M275X) – MULTIMETER AND PROCESS
CALIBRATOR FOR MEASURING AND SIMULATING ELECTRICAL
QUANTITIES**



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1 Safety Regulations



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 device.

Keep for future reference.

1.1 General Information

- The device must only be used by qualified electricians in commercial applications. It is not a consumer product.
- Observe and comply with all safety regulations that apply to your work environment.
- The functioning of active medical devices (e.g., pacemakers, defibrillators) and passive medical devices may be affected by voltages, currents, and electromagnetic fields generated by the device, thereby impairing the health of their users. Implement corresponding protective measures in consultation with the manufacturer of the medical device and your physician. If any potential risk cannot be ruled out, do not use the device.
- Wear suitable and appropriate personal protective equipment (PPE) whenever working with the device.

1.2 Accessories

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

1.3 Handling

- Use the device only if it is in perfect condition.
Inspect the device before use. Pay particular attention to damage, interrupted insulation, or kinked cables. Damaged components must be replaced immediately.
- Use only accessories and cables that are in perfect condition.
Inspect accessories and all cables before use. Pay particular attention to damage, interrupted insulation, or kinked cables.
- If the device or its accessories do not function flawlessly, permanently remove the device/accessories from operation and secure them against being restarted inadvertently.
- If the device or accessories are damaged during use (e.g., if they are dropped), permanently remove the device/accessories from operation and secure them against being restarted inadvertently.
- If signs of interior damage to the device or accessories (e.g., loose parts in the housing) are apparent, permanently shut down the device/accessories and secure them against being restarted inadvertently.
- The device and accessories may only be used for the tests/measurements described in the documentation for the device.
- The devices and accessories of Gossen Metrawatt GmbH are designed 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 neither intended nor suited for use with other products.
- Route cables in an orderly fashion, e.g., the mains power cable and accessory cables. Loose, disorderly cables result in unnecessary danger of tripping and falling.

1.4 Tests / Measurements

- Be aware that unexpected voltages may occur on devices under test (e.g., defective devices). For example, capacitors may be dangerously charged.

- Be aware that dangerous pulsating voltages may occur in HF circuits.
- Do not perform any measurements in electrical circuits with corona discharge (high-voltage).
- As part of your routine equipment inspections, use a suitable calibrator to ensure that this device is functioning properly.

1.5 Operating Conditions

- Do not use the device and accessories after long periods of storage under unfavorable conditions (e.g., humidity, dust, temperature).
- Do not use the device and accessories after extraordinary stressing due to transport.
- Do not expose the device to direct sunlight for long periods of time. Overheating may cause damage to the device.
- Only use the device and accessories within the limits of the specified technical data and conditions (ambient conditions, IP protection code, measurement category, etc.).
- Do not use the device in potentially explosive atmospheres. Risk of explosion!
- Do not use the device in areas subject to the risk of fire. Risk of fire!
- Implement adequate measures for protection against electrostatic discharge (ESD).

1.6 (Rechargeable) Batteries

- Use (rechargeable) batteries that are in perfect condition. 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, you must only use the associated test/measuring instrument with the battery compartment cover properly inserted and closed. Otherwise, dangerous voltages may occur at the (rechargeable) battery terminals under certain circumstances.
- Do not use the device while the internal batteries are being charged.
- Only charge intact 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.

1.7 Fuses

- The device may only be used as long as the fuses are in flawless condition. Defective fuses must be replaced. This may only be performed by our repair service department.
- Never bridge the fuses. Never disable the fuses.

1.8 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, alligator clips, Kelvin probes, etc.).
- Move or remove contacts (e.g., the test probes, alligator clips, Kelvin probes, etc.) only after the test or measurement procedure has been completed.
Unwanted sparking may otherwise occur due to test current.

- Only use measurement cables and external cabling with a maximum length of 1 m.

1.9 Adjustment/Calibration

- Comply with national calibration regulations and laws.
- Comply with national adjustment regulations and laws.
- Calibration may only be carried out by authorized service centers.

1.10 Emissions

- The device is equipped with a Bluetooth® module. Determine whether or not use of the implemented frequency band of 2400 MHz to 2483.5 MHz is permissible in your country.

1.11 Data Security

- Always create a backup copy of your measurement/test data.
- Protect the device against unauthorized tampering. Use the functions provided by the device (e.g., key lock / sealing / lock) as well as other appropriate measures (e.g., restricting physical access to the device).

1.12 Documentation

- Test reports must be checked for correctness and signed by the inspector.

2 Application

Please read this important information!

2.1 Intended Use / Use for Intended Purpose

The METRACAL CM series features a range of portable, multifunctional process calibrators that can simultaneously generate, measure, store, and transmit calibration signals.

Dual Mode can be used to combine numerous functions in order to calibrate various sensors.

The devices are suitable for high-precision, 4-wire resistance and RTD measurements (Pt100, PT200, Pt500, Pt1000, Ni100, Ni120, Ni1000).

Up to four frequently used routines can be predefined and saved with user-specific settings, modes, and parameters.

Calibration signals can be generated as a constant signal or as various curves in the Interval, Ramp, and Table modes.

2.2 Use for Other Than Intended Purpose

Using the device for any purposes other than those described in these operating instructions or the quick start guide of the device is considered misuse. Use for other than the intended purpose may lead to unpredictable damage!

2.3 Liability and Guarantee

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

2.4 Opening the Instrument / Repairs

The device may only be opened by authorized, qualified personnel in order to ensure flawless, safe operation and to assure that the guarantee is not rendered null and void. Even original replacement parts may only be installed by authorized, qualified personnel.

Unauthorized modification of the device is prohibited.

If it can be ascertained that the device 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 protective measures, or any consequential damages.

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

3 Documentation

3.1 Information Concerning These Instructions

Read these instructions carefully and attentively. They contain all the information for safe use of this device. Follow them to protect yourself and others from injury and to avoid damage to the device.

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

<https://www.gossenmetrawatt.de/en/service-support/download-center/>



3.2 Errors and Suggestions for Improvement

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

3.3 Gender Equality

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

3.4 Trademark Law

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

3.5 Copyright

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

3.6 Identification of Warnings

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

They are 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 steps to take to prevent hazards.

**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.

3.7 Identifiers

The following identifiers are used in this documentation:

Hardware controls

Keys and other controls

Software buttons

Buttons, menus

- List

Bullet lists

- List

- **Procedure: Beginning of a procedural instruction**

- ✓ Prerequisite: A condition, etc., that must be fulfilled before a given action can be taken.

1. Step 1: Steps that must be completed in the specified order.

2. Step 2

- ↳ Interim result: Interim result of the steps

3. Step 3
- ↳ Result: Result of steps

Table 1:	Description of the content of a table
Figure 1:	Description of the content of a figure
Footnote ¹	Footnote

3.8 Symbols in the Documentation

The following symbols are used in this documentation:

Symbol	Meaning
	Read and follow to the product documentation.
	General warning symbol.
	Warning regarding electrical voltage.

Table 1: Symbols in this documentation

4 Device

4.1 Scope of Delivery

1	Multimeter and process calibrator with rubber case	M275A
1	KS25-4 cable set	Z275K
1	Battery pack	Z270G
1	USB PD power pack	Z270U
1	Micro USB cable	Z270V
1	HC 40 hard case, black	Z270K
1	DAkkS calibration certificate	
1	Quick start guide	

Table 2: Scope of delivery

4.2 Device Overview

4.2.1 Front



Fig. 1: Front panel

1	MENU: Key for accessing the five main menus
2	ESC: Operating mode menu: ■ Press key briefly: Exit the menu level – Return to a higher level, exit parameters entry without saving

	■ Press and hold: The device is switched off in standby mode. Restart the device by pressing and holding the OK key.
3	Scroll keys ▲▼◀▶ ■ Navigate in menus ■ Edit values/settings
4	Connections for measuring unit
5	Connections for calibration unit
6	Thermocouple connections for the calibration unit and measuring unit. The ground potential is always connected to the ground of the calibration unit. <u>Attention!</u> Damage to the product caused by inserting the plug with incorrect orientation. ■ Make sure that the orientation of the plug is correct when you connect the plug. One pin is wider than the other.
7	Rotary switch for selecting a function
8	OK: Key for acknowledgment and for restarting the device from the standby mode by pressing and holding
9	STORE: Save key
10	Softkeys Menu-dependent keys for switching functions, parameter selection, and to start/end functions
11	TFT color graphic display

4.2.2 Display

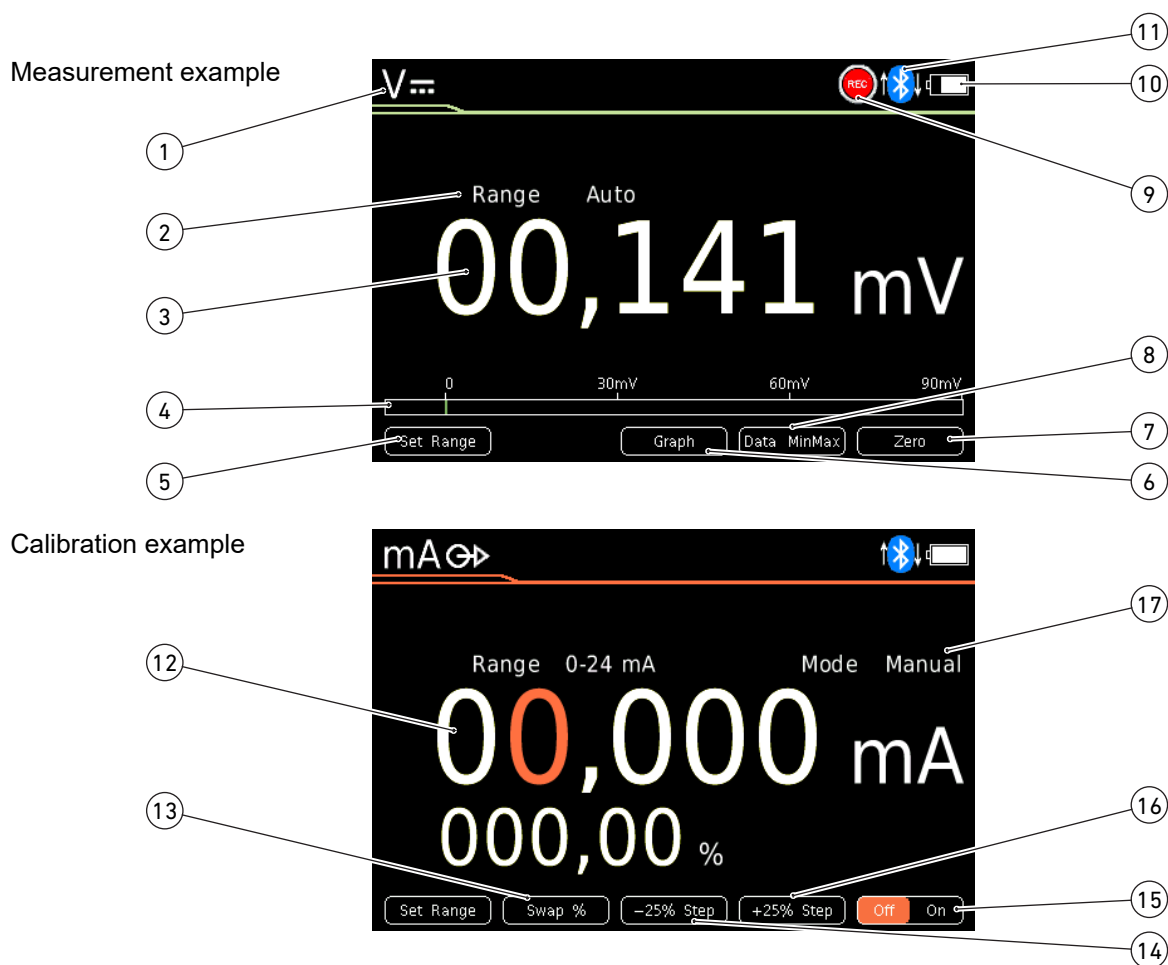


Fig. 2: Display

1	Current function
2	Set range Switch the range with the Set Range softkey
3	Current measured value Measuring range exceeded: OL is displayed
4	Scale for analog display
5	Set Range: Activate/deactivate setting the range. Switch the range with ◀▶
6	Graph/Num: Switch between graphical and numerical display ¹
7	Zero: Activate/deactivate zero point setting
8	Data MinMax: Switch between "Data" (freeze measured value), "Min-Max storage", and switch off both functions
9	Memory symbol
10	Battery pack charge level Optional when using the USB power module:  The device is powered by a charger without communication capabilities.  The device is connected to a device with communication capabilities (USB port on a PC).

11	Bluetooth® activity display
12	Adjustable calibration value Change the highlighted digit with ▲▼ Switch the highlighted digit with ◀▶
13	Swap %: Swap the absolute value and percentage value in the display
14	-25% Step: Calibration value is reduced by 25% of the range
15	Off/On: Switch on/off the calibration signal
16	+25% Step: Calibration value is increased by 25% of the range
17	Set calibration mode

¹ Requires Graph Z275X function extension.

Grayed-out functions are not available.

4.3 Symbols on the Device and the Included Accessories

Symbol	Meaning
	Warning concerning a source of danger (Attention, follow the documentation!)
	European conformity marking
	The device may not be disposed of with household trash. Follow the section "Disposal and Environmental Protection".

4.4 Included features

Function / Accessory	Article Number	METRACAL CM PRO (M275P)	METRACAL CM TECH (M275T)	METRACAL CM XTRA (M275X)
Multimeter and process calibrator with rubber case	M275A	✓		
	M275B		✓	
	M275C			✓
Measuring Functions				
V _{DC}		✓	✓	✓
mA _{DC}		✓	✓	✓
mA loop (24 V loop supply)		✓	✓	✓
Ω (4-, 3-, and 2-wire)		✓	✓	✓
TempTC (°C/°F)		✓	✓	✓
TempRTD (°C/°F)		✓	✓	✓
Hz (frequency)		✓	✓	✓
CPM (pulse counter)		✓	✓	✓
Calibration Functions				
V _{DC}		✓	✓	✓

mA $\rightarrow$ (source)		✓	✓	✓
mA $\leftarrow$ (sink)		✓	✓	✓
Ω		✓	✓	✓
TempTC (°C/°F)		✓	✓	✓
TempRTD (°C/°F)		✓	✓	✓
Hz (frequency generator)		✓	✓	✓
CPM (pulse generator)		✓	✓	✓
C1...C4 Four customizable memory locations for frequently used settings		✓	✓	✓
KS25-4 cable set Cable set for process calibrators 4 100 cm measuring cables (black, red, blue, yellow) with stackable 4 mm plugs and 4 mini alligator clips (black, red, blue, yellow)	Z275K	✓	✓	✓
Battery pack	Z270G	✓	✓	✓
USB PD power pack	Z270U	✓	✓	✓
Micro USB cable	Z270V	✓	✓	✓
HC 40 hard case, black	Z270K	✓	✓	✓
DAkkS calibration certificate		✓	✓	✓
3-year guarantee		✓	✓	✓
Function Extensions				
HART communication (highway addressable remote transducer) for direct communication with sensors	Z275T	●	✓	✓
Graph Graphical visualization of current and stored measured values	Z275X	●	●	✓
Expert sequence function Function extension from 1 test sequence with 63 test steps to 16 test sequences, each with 63 test steps.	Z270P	●	●	●
Quick start guide* * Detailed operating instructions available online for download at www.gossenmetrawatt.com		✓	✓	✓

✓ Scope of delivery ● Can be enabled

4.4.1 Measuring Unit

Rotary Switch Position	Function	METRACAL CM
V	V_{DC} ($R_i = 1\text{ M}\Omega$)	- 31 V ... +31 V
mA	Current measurement	-26 mA ... +26 mA
mA Loop	Loop current measurement (24 V_{DC})	-26 mA ... +26 mA
Ω	Resistance measurement (2, 3, 4-wire)	0 Ω ... 4.1000 k Ω
TempTC	TC (thermocouple)	K, L, N, R, S, T, U, XK, A, B, BP, C, E, J
TempRTD	RTD (resistance thermometer)	Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni1000
Hz	Frequency measurement	1 Hz ... 51 kHz
CPM	Pulse/RPM counter	60 CPM ... 3100 CPM

4.4.2 Calibration Unit

Rotary Switch Position	Function	METRACAL CM
V_{DC}	V_{DC}	- 90 mV ... +20 V
mA $\rightarrow$	Current source	0 mA ... 24 mA
mA $\leftarrow$	Current sink	0 mA ... 24 mA
Ω	Resistance simulation	0 Ω ... 4 k Ω
TempTC	TC (thermocouple)	K, L, N, R, S, T, U, XK, A, B, BP, C, E, J
TempRTD	RTD (resistance thermometer)	Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni1000
Hz	Frequency generator	0.1 Hz ... 50 kHz
CPM	Pulse generator	6 CPM ... 3000 CPM

4.4.3 Dual Mode

Dual Mode enables simultaneous operation of the calibration unit and measuring unit. In this way, a signal can be applied to the input of a transducer and the resulting output signal of the transducer displayed.

4.5 Relevant Standards

DIN 43710	Measurement and control; electrical temperature sensors; reference tables type U and type L for thermocouples
DIN 43760	Measurement and control; electrical temperature sensors; reference tables for nickel resistors for resistance thermometers
EN 60529 IEC 60529	Test instruments and test procedures – Degrees of protection provided by enclosures (IP code)
IEC 60584-1	Thermocouples – Part 1: EMF specifications and tolerances
EN IEC 60751	Industrial platinum resistance thermometers and platinum temperature sensors
EN 61010-1 IEC 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements

EN 61010-1 IEC 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2-033: Particular requirements for hand-held multimeters and other hand-held meters for domestic and professional use, capable of measuring line voltage
EN 61326-1 IEC 61326-1	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
EN 61326-2-1 IEC 61326-2-1	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-1: Particular requirements – Test arrangements, operating conditions, and performance characteristics for sensitive test and measuring equipment for applications without EMC protection measures Safety requirements for electrical measuring, control, regulation, and laboratory equipment – Part 1: General requirements
GOST R 8.585	State system for ensuring the uniformity of measurements. Thermocouples. Nominal static characteristics of conversion

Table 3: Relevant standards

4.6 Technical Data

Power Supply

Battery pack ¹	3.7 V 4000 mAh LiPo (approx. 25% self-discharge per year)
Operating time	Approximately 10 to 20 hours (depending on measurement and calibration functions, see operating time table)
Battery check	Charge level indicated by battery symbol. Current charge level shown as percentage via menu function
Auto OFF function	The device switches off automatically: ■ If battery voltage drops to below approx. 3.6 V ■ If none of the keys or the rotary switch are activated for an adjustable duration (10 ... 59 minutes) and the Auto OFF function is not switched off.
Power module	For continuous operation with Z270E USB + Power Module M27x with at least 1.5 A output current

¹ Rechargeable battery packs can only be recharged externally.

Table 4: Power supply

Ambient Conditions

Accuracy range:	0 °C ... +40 °C
Operating/storage temperatures with battery pack:	-10 °C ... +50 °C -20 °C ... +50 °C (with rubber case)
Storage temperatures without battery pack:	-25 °C ... +60 °C
Relative humidity:	40 ... 75%, no condensation allowed
Elevation:	Max. 2000 m
Place of use:	Indoors; outdoors: except within specified ambient conditions

Table 5: Ambient conditions

Electrical Safety

Measurement category:	None
Pollution degree:	2
Protection class:	III
Maximum voltage:	30 V
Maximum current:	30 mA

Table 6: Electrical safety

Electromagnetic Compatibility (EMC)

Interference emission:	EN 61326-1, class B
Interference immunity:	EN 61326-1 / IEC 61326-1 Short-term measured value deviation of up to 10% may occur during electromagnetic interference and reduce the specified operating quality.

Table 7: Electromagnetic compatibility (EMC)

Mechanical Design

Housing:	Impact-resistant plastic (ABS)
Dimensions (W × H × D):	Approx. 235 × 105 × 56 mm (without rubber case)
Weight:	Approx. 0.7 kg (with battery pack)
Protection:	IP52 housing (pressure equalization provided by housing) in accordance with EN 60529 / IEC 60529 (protection against ingress of solid foreign objects: protection against dust accumulation inside; protection against water ingress: protection against water droplets falling at any angle up to 15° from the vertical)

Table 8: Mechanical design

Display

TFT color graphic display (74 mm × 49 mm) with analog and digital display including unit of measure, type of current, and various special functions.	
Backlighting:	Activated backlighting can be regulated by means of a light sensor.
Analog bar graph	Scaling: linear Polarity display: with automatic switching Sampling rate: 40 measurements per second and display refresh

Table 9: Display

Digital Measured Value Display

Resolution / character height:	320 × 480 dots, 12 mm
Number of places:	Depends on parameter setting
Overload display:	“OL” is displayed when the measuring range is exceeded
Polarity display:	The “–” sign is displayed if the positive terminal is connected to “⏏”
Sampling rate:	10 measurements/s and 40 measurements/s with the MIN/MAX function, except for the frequency and CPM measuring functions

Refresh rate:	2 times per second, every 500 ms
---------------	----------------------------------

Table 10: Digital measured value display

Data Interfaces

Bluetooth © 4.2 wireless interface:	Frequency range: 2402 ... 2480 GHz Transmitting power: Class 2 (2.5 mW) Functions: ■ Query measuring functions and parameters ■ Query current measurement data
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Internal Memory

Memory capacity:	64 MBit for approx. 300,000 measured values with indication of date and time
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Table 11: Internal memory

Internal Clock

Time format:	DD.MM.YYYY hh:mm:ss
Resolution:	0.1 s (measured values timestamp)
Accuracy:	±1 min./month
Temperature influence:	50 ppm/K

Table 12: Internal clock

Overcurrent Protection

Electronic current limiter with automatic reset after overcurrent

4.7 Characteristic Values

4.7.1 Calibration Unit

4.7.1.1 Direct Voltage Source – V

Range	Range	Resolution	Max. Load Current	Accuracy under Reference Conditions ±(... % v. E. +... d)
90 mV	-90.000 mV ... +90.000 mV	0.001 mV	0.1 mA	0.015 + 10
5 V	0.0000 V ... +5.0000 V	0.0001 V	10 mA	0.015 + 5
10 V	0.0000 V ... +10.000 V	0.001 V	10 mA	0.015 + 5
20 V	0.0000 V ... +20.000 V	0.001 V	2 mA	0.05 + 5

Output impedance < 20 mΩ

4.7.1.2 Direct Current Source – mA

Range	Range ¹	Resolution	Max. Resistance	Max. Voltage	Accuracy under Reference Conditions ±(... % v. E. +... d)
0-24 mA	0.000 mA ... 24.000 mA	0.001 mA	1 kΩ	25 V	0.015 + 3

Range	Range ¹	Resolution	Max. Resistance	Max. Voltage	Accuracy under Reference Conditions ±(... % v. E. +... d)
4-20 mA	4.000 mA ... 20.000 mA				
4-24 mA	4.000 mA ... 24.000 mA				

¹ The different ranges are used to adjust the “percentage keys” to the measuring range of the test object.

4.7.1.3 Direct Current Sink – mA

Range	Range ¹	Resolution	External Voltage	Accuracy under Reference Conditions ±(... % v. E. +... d)
0-24 mA	0.000 mA ... 24.000 mA	0.001 mA	5 V ... 28 V	0.015 + 3
4-20 mA	4.000 mA ... 20.000 mA			
4-24 mA	4.000 mA ... 24.000 mA			

¹ The different ranges are used to adjust the “percentage keys” to the measuring range of the test object.

4.7.1.4 Resistance Source – Ω

Range	Range	Resolution	Measuring Current	Accuracy under Reference Conditions ±(... % v. E. +... d)
400 Ω	0.00 Ω ... 400.00 Ω	0.01 Ω	500 µA ... 4 mA	0.015 + 3
4kΩ	0.0000 kΩ ... 4.0000 kΩ	0.1 Ω	50 µA ... 400 µA	

4.7.1.5 Temperature Simulation, Thermocouple – Temp TC

Thermocouple Type	Temperature Range	Resolution	Accuracy Cold Junction Compensation ON	Accuracy Cold Junction Compensation OFF
K	-270.0 °C ... -200.0 °C	0.1 °C	Not defined	Not defined
	-200.0 °C ... 0.0 °C		0.8 °C	0.6 °C
	0.0 °C ... 1000.0 °C		0.5 °C	0.3 °C
	1000.0 °C ... 1372.0 °C		0.7 °C	0.5 °C
E	-270.0 °C ... -240.0 °C	0.1 °C	Not defined	Not defined
	-240.0 °C ... -100.0 °C		0.8 °C	0.6 °C
	-100.0 °C ... 0.0 °C ... 1000.0 °C		0.4 °C	0.4 °C
J	-210.0 °C ... 0.0 °C	0.1 °C	0.6 °C	0.4 °C
	0.0 °C ... 800.0 °C		0.4 °C	0.2 °C
	800.0 °C ... 1200.0 °C		0.5 °C	0.3 °C
C	0.0 °C ... 1000.0 °C	0.1 °C	0.8 °C	0.6 °C
	1000.0 °C ... 2315.0 °C		2.5 °C	2.3 °C
T	-270.0 °C ... -240.0 °C	0.1 °C	Not defined	Not defined
	-240.0 °C ... 0.0 °C		0.8 °C	0.6 °C
	0.0 °C ... 400.0 °C		0.4 °C	0.2 °C

Thermo-couple Type	Temperature Range	Resolution	Accuracy	
			Cold Junction Compensation ON	Cold Junction Compensation OFF
L	-200.0 °C ... 0.0 °C	0.1 °C	0.5 °C	0.3 °C
	0.0 °C ... 900.0 °C		0.4 °C	0.2 °C
U	-200.0 °C ... 0.0 °C	0.1 °C	0.7 °C	0.5 °C
	0.0 °C ... 600.0 °C		0.5 °C	0.3 °C
A	0.0 °C ... 1000.0 °C	0.1 °C	0.8 °C	0.6 °C
	1000.0 °C ... 2500.0 °C		2.5 °C	2.3 °C
R	-50.0 °C ... -20.0 °C	0.1 °C	Not defined	Not defined
	-20.0 °C ... 0.0 °C		2 °C	1.8 °C
	0.0 °C ... 1768.0 °C		1.4 °C	1.2 °C
S	-50.0 °C ... -20.0 °C	0.1 °C	Not defined	Not defined
	-20.0 °C ... 0.0 °C		2 °C	1.8 °C
	0.0 °C ... 1768.0 °C		1.4 °C	1.2 °C
B	0.0 °C ... 600.0 °C	0.1 °C	Not defined	Not defined
	600.0 °C ... 800.0 °C		1.4 °C	1.2 °C
	800.0 °C ... 1000.0 °C		1.5 °C	1.3 °C
	1000.0 °C ... 1820.0 °C		1.7 °C	1.5 °C
N	-270.0 °C ... -200.0 °C	0.1 °C	Not defined	Not defined
	-200.0 °C ... 0.0 °C		1 °C	0.8 °C
	0.0 °C ... 1300.0 °C		0.6 °C	0.4 °C
BP	0.0 °C ... 800.0 °C	0.1 °C	1.1 °C	0.9 °C
	800.0 °C ... 1800.0 °C		2.3 °C	2.1 °C
XK	-200.0 °C ... 800.0 °C	0.1 °C	0.4 °C	0.2 °C

4.7.1.6 Temperature Simulation, Resistance Thermometer – Temp RTD

RTD Type	Temperature Range	Resolution	Measuring Current	Accuracy
Pt100 - 3851	-200.00 °C ... 0.00 °C ... 100.00 °C	0.01 °C	500 µA ... 4 mA	0.15 °C
	100.00 °C ... 300.00 °C			0.25 °C
	300.00 °C ... 600.00 °C			0.35 °C
	600.00 °C ... 850.00 °C			0.45 °C
Pt200 - 3851	-200.00 °C ... 0.00 °C ... 100.00 °C	0.01 °C	50 µA ... 400 µA	0.75 °C
	100.00 °C ... 300.00 °C			0.85 °C
	300.00 °C ... 600.00 °C			0.95 °C
	600.00 °C ... 850.00 °C			1.1 °C
Pt500 - 3851	-200.00 °C ... 0.00 °C ... 100.00 °C	0.01 °C	50 µA ... 400 µA	0.35 °C
	100.00 °C ... 300.00 °C			0.45 °C
	300.00 °C ... 600.00 °C			0.55 °C

RTD Type	Temperature Range	Resolution	Measuring Current	Accuracy
	600.00 °C ... 850.00 °C			0.65 °C
Pt1000 - 3851	-200.00 °C ... 0.00 °C ... 100.00 °C	0.01 °C	50 µA ... 400 µA	0.15 °C
	100.00 °C ... 300.00 °C			0.25 °C
	300.00 °C ... 600.00 °C			0.35 °C
	600.00 °C ... 850.00 °C			0.45 °C
Ni100 - 618	-60.00 °C ... 0.00 °C ... 180.00 °C	0.01 °C	500 µA ... 4 mA	0.15 °C
Ni120 - 672	-60.00 °C ... 0.00 °C ... 180.00 °C	0.01 °C	500 µA ... 4 mA	0.15 °C
Ni1000 - 618	-60.00 °C ... 0.00 °C ... 180.00 °C	0.01 °C	50 µA ... 400 µA	0.15 °C

4.7.1.7 Frequency Generator – Hz

Range	Range	Resolution	Voltage Range	Duty Cycle	Max. Load Current	Accuracy under Reference Conditions ±D
30 Hz	0.100 Hz ... 30.000 Hz	0.001 Hz	1 V ... 10 V	50%	10 mA	3
300 Hz	0.10 Hz ... 300.00 Hz	0.01 Hz				
3 kHz	0.0001 kHz ... 3.000 kHz	0.1 Hz				
50 kHz	0.001 kHz ... 50.000 kHz	1 Hz				

4.7.1.8 Pulse Generator – CPM

Range	Range	Resolution	Output Voltage	Accuracy under Reference Conditions ±(... % v. E. +... d)
3000 CPM	6.0 CPM ... 3000.0 CPM	0.1 CPM	5 V square-wave voltage	0.05 + 3

4.7.2 Measuring Unit

4.7.2.1 Direct Voltage Measurement – V

Range	Measuring Range	Resolution	Input Impedance	Accuracy under Reference Conditions ±(... % rdg. +... d)
90 mV	-100.000 mV ... +100.000 mV	0.001 mV	>1 GΩ	0.015 + 10
5 V	-5.1000 V ... +5.1000 V	0.0001 V	1 MΩ	0.015 + 5
10 V	-11.000 V ... +11.000 V	0.001 V	1 MΩ	0.015 + 5
30 V	-31.000 V ... +31.000 V	0.001 V	1 MΩ	0.015 + 5

4.7.2.2 Direct Current Measurement – mA

Range	Measuring Range	Resolution	Input Impedance	Accuracy under Reference Conditions $\pm(\dots \% \text{ rdg. } + \dots \text{ d})$
25 mA	-26.000 mA ... 26.000 mA	0.001 mA	~20 Ω	0.01 + 3

4.7.2.3 Direct Current Measurement – mA Loop

Range	Measuring Range	Resolution	Max. Load Current	Accuracy under Reference Conditions $\pm(\dots \% \text{ rdg. } + \dots \text{ d})$
25 mA	-26.000 mA ... 26.000 mA	0.001 mA	26 mA	0.01 + 3

A direct voltage of 24 V (open-circuit voltage 22 V ... 24 V) is output between the **Loop** socket and the **24V LOOP** socket during this measurement.

4.7.2.4 Resistance Measurement – Ω

Range	Measuring Range	Resolution	Measuring Current	Accuracy under Reference Conditions, 2- and 3-Wire Connection ¹ $\pm(\dots \% \text{ rdg. } + \dots \text{ d})$	Accuracy under Reference Conditions, 4-Wire Connection $\pm(\dots \% \text{ rdg. } + \dots \text{ d})$
400 Ω	0.00 Ω ... 410.00 Ω	0.01 Ω	0.1 mA ... 1.2 mA	0.1 + 5	0.015 + 5
4 k Ω	0.0000 k Ω ... 4.1000 k Ω	0.1 Ω	0.05 mA ... 0.4 mA		

¹ Zero offsetting executed in advance.

4.7.2.5 Temperature Display, Thermocouple – Temp TC

Thermocouple Type	Temperature Range	Resolution	Accuracy Cold Junction Compensation ON	Accuracy Cold Junction Compensation OFF
K	-270.0 °C ... -200.0 °C	0.1 °C	Not defined	Not defined
	-200.0 °C ... 0.0 °C		1.0 °C	0.6 °C
	0.0 °C ... 1000.0 °C		0.5 °C	0.3 °C
	1000.0 °C ... 1372.0 °C		0.7 °C	0.5 °C
E	-240.0 °C ... -100.0 °C	0.1 °C	0.8 °C	0.6 °C
	-100.0 °C ... 0.0 °C ... 1000.0 °C		0.4 °C	0.4 °C
J	-210.0 °C ... 0.0 °C	0.1 °C	0.6 °C	0.4 °C
	0.0 °C ... 800.0 °C		0.4 °C	0.2 °C
	800.0 °C ... 1200.0 °C		0.5 °C	0.3 °C
C	0.0 °C ... 1000.0 °C	0.1 °C	0.8 °C	0.6 °C
	1000.0 °C ... 2315.0 °C		2.5 °C	2.3 °C
T	-270.0 °C ... -240.0 °C	0.1 °C	Not defined	Not defined

Thermocouple Type	Temperature Range	Resolution	Accuracy Cold Junction Compensation ON	Accuracy Cold Junction Compensation OFF
	-240.0 °C ... 0.0 °C		0.8 °C	0.6 °C
	0.0 °C ... 400.0 °C		0.4 °C	0.2 °C
L	-200.0 °C ... 0.0 °C	0.1 °C	0.5 °C	0.3 °C
	0.0 °C ... 900.0 °C		0.4 °C	0.2 °C
U	-200.0 °C ... 0.0 °C	0.1 °C	0.7 °C	0.5 °C
	0.0 °C ... 600.0 °C		0.5 °C	0.3 °C
A	0.0 °C ... 1000.0 °C	0.1 °C	0.8 °C	0.6 °C
	1000.0 °C ... 2500.0 °C		2.5 °C	2.3 °C
R	-50.0 °C ... -20.0 °C	0.1 °C	Not defined	Not defined
	-20.0 °C ... 0.0 °C		2 °C	1.8 °C
	0.0 °C ... 1768.0 °C		1.4 °C	1.2 °C
S	-50.0 °C ... -20.0 °C	0.1 °C	Not defined	Not defined
	-20.0 °C ... 0.0 °C		2 °C	1.8 °C
	0.0 °C ... 1768.0 °C		1.4 °C	1.2 °C
B	0.0 °C ... 600.0 °C	0.1 °C	Not defined	Not defined
	600.0 °C ... 800.0 °C		1.4 °C	1.2 °C
	800.0 °C ... 1000.0 °C		1.5 °C	1.3 °C
	1000.0 °C ... 1820.0 °C		1.7 °C	1.5 °C
N	-270.0 °C ... -200.0 °C	0.1 °C	Not defined	Not defined
	-200.0 °C ... 0.0 °C		1 °C	0.8 °C
	0.0 °C ... 1300.0 °C		0.6 °C	0.4 °C
BP	0.0 °C ... 800.0 °C	0.1 °C	1.1 °C	0.9 °C
	800.0 °C ... 1800.0 °C		2.3 °C	2.1 °C
XK	-200.0 °C ... 800.0 °C	0.1 °C	0.4 °C	0.2 °C

4.7.2.6 Temperature Display, Resistance Thermometer – Temp RTD

RTD Type	Temperature Range	Measuring Current	Resolution	Accuracy, 2- and 3-Wire Connection ¹ [°C]	Accuracy, 4-Wire Connection [°C]
Pt100 - 3851	-200.00 °C ... 0.00 °C ... 100.00 °C	0.1 mA ... 1.2 mA	0.01 °C	0.2 °C	0.15 °C
	100.00 °C ... 300.00 °C			0.3 °C	0.25 °C
	300.00 °C ... 600.00 °C			0.4 °C	0.35 °C
	600.00 °C ... 850.00 °C			0.5 °C	0.45 °C
Pt200 - 3851	-200.00 °C ... 0.00 °C ... 100.00 °C	0.05 mA ... 0.4 mA	0.01 °C	0.8 °C	0.75 °C
	100.00 °C ... 300.00 °C			0.9 °C	0.85 °C
	300.00 °C ... 600.00 °C			1 °C	0.95 °C

RTD Type	Temperature Range	Measuring Current	Resolution	Accuracy, 2- and 3-Wire Connection ¹ [°C]	Accuracy, 4-Wire Connection [°C]
	600.00 °C ... 850.00 °C			1.15 °C	1.1 °C
Pt500 - 3851	-200.00 °C ... 0.00 °C ... 100.00 °C	0.05 mA ... 0.4 mA	0.01 °C	0.4 °C	0.35 °C
	100.00 °C ... 300.00 °C			0.5 °C	0.45 °C
	300.00 °C ... 600.00 °C			0.6 °C	0.55 °C
	600.00 °C ... 850.00 °C			0.7 °C	0.65 °C
Pt1000 - 3851	-200.00 °C ... 0.00 °C ... 100.00 °C	0.05 mA ... 0.4 mA	0.01 °C	0.2 °C	0.15 °C
	100.00 °C ... 300.00 °C			0.3 °C	0.25 °C
	300.00 °C ... 600.00 °C			0.4 °C	0.35 °C
	600.00 °C ... 850.00 °C			0.5 °C	0.45 °C
Ni100 - 618	-60.00 °C ... 0.00 °C ... 180.00 °C	0.1 mA ... 1.2 mA	0.01 °C	0.2 °C	0.15 °C
Ni120 - 672	-60.00 °C ... 0.00 °C ... 180.00 °C	0.1 mA ... 1.2 mA	0.01 °C	0.2 °C	0.15 °C
Ni1000 - 618	-60.00 °C ... 0.00 °C ... 180.00 °C	0.05 mA ... 0.4 mA	0.01 °C	0.2 °C	0.15 °C

¹ For a 2-wire connection, the lead resistance (R_{leads}) must be entered or measured beforehand.

4.7.2.7 Internal Temperature Measurement at the TC Connection (Internal Reference Point)

Temperature Range	Accuracy
-10 °C ... 42 °C	0.1 °C
42 °C ... 50 °C	0.2 °C

4.7.2.8 Frequency Measurement

Range	Measuring Range	Resolution	Peak-to-Peak Voltage (square-wave signal)	Peak-to-Peak Voltage (sinusoidal signal)	Accuracy under Reference Conditions ±(... % rdg. + ... d)
30 Hz	1.000 Hz ... 30.000 Hz	0.001 Hz	0.5 V ... 30 V	1 V ... 30 V	0.005 + 3
300 Hz	30.00 Hz ... 300.00 Hz	0.01 Hz	0.5 V ... 30 V	1 V ... 30 V	0.005 + 3
3 kHz	300.0 Hz ... 3000.0 Hz	0.1 Hz	0.5 V ... 30 V	1 V ... 30 V	0.005 + 3
50 kHz	3.0000 kHz ... 50.000 kHz	0.001 kHz	0.5 V ... 30 V	1 V ... 30 V	0.005 + 3

4.7.2.9 Pulse Counter

Range	Measuring Range	Resolution	Measuring Voltage	Accuracy under Reference Conditions $\pm(\dots \% \text{ rdg.} + \dots \text{ d})$
3000 CPM	60.0 CPM ... 3100.0 CPM	0.1 CPM	up to 5 V	0.05 + 3

Internal impedance 100 k Ω

4.7.3 Dual Mode

4.7.3.1 Simultaneous Measuring/Calibration Functions

Measuring Function	Calibration Signal							
	V	mA (source)	mA (sink)	Hz	CPM Pulse Counter	Ω	RTD	TC
VDC	■	■	■	■	■	■	■	■
mA	■	■	■	■	■	■	■	■
mA loop	■	■	■	■	■	■	■	■
Frequency	■	■	■	■	■	■	■	■
CPM (pulse counter)	■	■	■	■	■	■	■	■
TC	□	□	□	□	□	□	□	
Ω	■	■	■	■	■	■	■	■
Ω , 3-wire	■	■	■	■	■	■	■	■
Ω , 4-wire	■	■	■	■	■	■	■	■
RTD	■	■	■	■	■	■	■	■
RTD, 3-wire	■	■	■	■	■	■	■	■
RTD, 4-wire	■	■	■	■	■	■	■	■

■ The calibration unit and measuring unit are electrically isolated.

□ The TC sockets are not electrically isolated from the calibration unit.

Voltage between the ground terminals of the measuring and calibration units must not exceed 50 V.

5 Initial Startup

First, supply the instrument with electrical power. The device is powered by the battery pack included in the scope of delivery.

Alternatively, it can be supplied with power via the optionally available USB power module.

The battery pack, as well as the USB power module, is equipped with a patented, contact-protected module socket, which makes replacement possible without interrupting the measuring circuit.

5.1 Battery Pack

NOTE



Follow the safety regulations regarding the battery pack (⇒ **"(Rechargeable) Batteries "** 7).

A quick-change, rechargeable lithium polymer battery (Z270A) with matching USB power pack, as well as a micro USB cable (Z270V), are included with the device.

For initial startup, first charge the battery pack. Then insert it into the device.

The battery pack is subject to self-discharging at a rate of roughly 25% per year.

ATTENTION

Deep discharge during long periods of non-use

The integrated quartz clock draws power from the battery pack even when the device is switched off. This can lead to deep discharge and, under unfavorable conditions, damage to the battery pack.

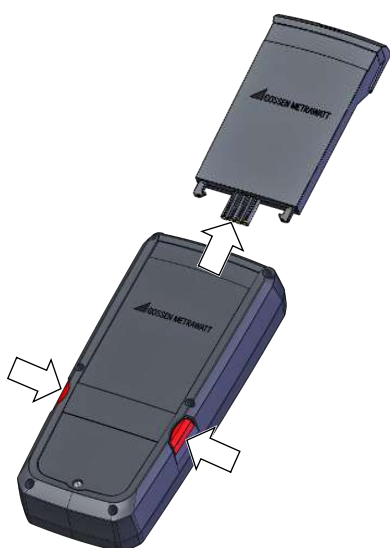
— Remove the battery pack from the device before long periods of non-use (e.g., vacation).

5.1.1 Switching and Charging a Battery Pack

NOTE



Observe the currently applicable safety instructions for lithium-ion batteries!



1. Press both keys at the same time to unlock the battery pack.
2. Pull the battery pack out of the device.



3. Charge the battery pack using the micro USB cable and the USB PD power pack.
↳ The LED lights up green when the battery pack is fully charged.



4. Slide the battery pack into the device again until it audibly clicks into place.

5.1.2 Battery Pack Charge Level

The current charge level is displayed at the top right of the display.

The exact charge level can be queried as a percentage under the **Info** submenu in the **General Setup** menu:

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Info** menu.
↳ The charge level is displayed as a percentage.

When you use the USB power module, "USB Detected" is displayed instead of the battery charge indicator.

5.2 USB Power Module

Alternatively, the device can be operated with a USB power module (Z270E) instead of with a battery pack. The USB power module is inserted into the device and connected to a PC via a USB-C cable, or used with a USB-C cable and a USB power pack, such as the 65 W USB PD power pack (Z270U), for mains operation.

The USB power module is available as an optional accessory and may only be used in devices of the METRAHIT IM series and the METRACAL CM series.

NOTE

If the secondary current of the power pack is lower than 500 mA, the device cannot be switched on. Depending on the secondary current of the utilized power pack, measuring functions with high electrical power demand may either not be possible at all or to a limited degree only.

— Use a Power Delivery power pack for full functionality.

► Operation with a USB Power Module

1. Slide the USB power module into the device until it audibly clicks into place.
 2. Connect the USB cable to the type C USB port on the USB power module.
 3. Power supply via USB port:
Connect the other end of the USB charging cable to the type B USB port on a PC.
 4. Power supply via electrical outlet:
Connect the other end of the USB charging cable to the type C USB connection on the USB PD power pack (Z270U).
 5. Then plug the USB power pack into an electrical outlet.
- ↳ The device is ready for operation.

Removing the USB Power Module**NOTE**

Switch the device off and disconnect it from the measuring circuit before you remove the USB power module.

Stored measurement data are not lost when the USB power module is removed. Selected operating parameters are retained in memory.

6 System Settings

After initial startup, you have to select basic system settings, such as the date and time. You can change system settings at any time.

You can access the system settings in the **General Setup** menu.

1. Press the **Menu** key.
2. Press the **General Setup** softkey.

6.1 Digital Keyboard

Text is entered at the device using an on-screen keyboard:



1	Entry prompt
2	Input field
3	Keypad
4	Shift Keypad: Switch between uppercase/lowercase and symbols
5	< Input field: Scroll left
6	> Input field: Scroll right
7	Backspace Input field: Delete characters from right
8	Enter Input field: Apply data from input field
9	Scroll keys ▲▼◀▶: Select characters on the keypad
10	OK: Transfer characters from the keypad to the input field

1. Use the **scroll keys** to select the individual characters from the keypad.
The position of the cursor is indicated by the key highlighted in green.
 2. Press the **OK** key. The selected character will be entered into the input field.
 3. Select additional characters.
 4. Press the **Enter** softkey to accept the entire entry.
- Press the **BackSp** (Backspace) softkey to delete the last character(s) entered.
 - Use the < or > softkeys to move the flashing cursor in the input field to the desired position in the word to insert characters or delete them using the **BackSp** softkey.
 - Use the **Shift** to toggle between uppercase and lowercase letters, as well as to switch to numbers and special characters.

6.2 Firmware

► To see the current firmware version of the device, do the following steps:

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Info** menu.
4. The **Version** parameter indicates the current firmware version.
5. Press the **ESC** key twice to return to measurement mode.

Proceed as follows in order to run a firmware update:

Complete information concerning current software and firmware, as well as device updates and options, can be found in the myGMC portal. Please register for free. After that, you will have access to the downloads and will receive the latest information about your device.

<https://www.gossenmetrawatt.de/service-support/mygmc/>

To update the firmware, download the current firmware as a ZIP file and unzip it.

Follow the instructions in the README file in order to install the firmware update.

6.3 Language Selection

► To select the language for the user interface:

1. Press the **Menu** key.
 2. Press the **General Setup** softkey.
 3. Press the **scroll keys** ▲▼ to select the **Language** menu.
 4. Press the **scroll key** ► to switch to the submenu.
 5. Press the **scroll keys** ▲▼ to select the desired language.
 6. Press the **OK** key.
 7. Press the **ESC** key twice to return to measurement mode.
- ↳ The language of the user interface has been set.

6.4 Setting the Time / Date

► To set the time/date:

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **System** menu.

4. Press the **scroll key** ► to switch to the submenu.
 5. Press the **scroll keys** ▲▼ to select the **Time** or **Date** parameter.
 6. Press the **OK** key.
 7. Press the **scroll keys** ◀►▲▼ to make the desired setting.
 8. Press the **OK** key.
 9. Press the **ESC** key three times to return to measurement mode.
- ↳ The date/time has been set.

6.5 Setting the Display

You can adjust the brightness and display profile (normal or inverted) of the display.

6.5.1 Brightness

The brightness of the digital display can be set between **1** (lowest brightness) and **9** (maximum brightness).

You can also set it to **Auto**. In this mode, the brightness of the digital display is adjusted depending on the intensity of the light which strikes the brightness sensor.

► To set the brightness:

1. Press the **Menu** key.
 2. Press the **General Setup** softkey.
 3. Press the **scroll keys** ▲▼ to select the **System** menu.
 4. Press the **scroll key** ► to switch to the submenu.
 5. Press the **scroll keys** ▲▼ to select the **Brightness** parameter.
 6. Press the **OK** key.
 7. Press the **scroll keys** ▲▼ to select the desired setting.
 8. Press the **OK** key.
 9. Press the **ESC** key three times to return to measurement mode.
- ↳ The brightness of the digital display has been set.

6.5.2 Display Profile

You can choose between two display modes: white text on a dark background (Normal) or the reverse (Inverted).

► To set the display profile:

1. Press the **Menu** key.
 2. Press the **General Setup** softkey.
 3. Press the **scroll key** ► to switch to the submenu.
 4. Press the **scroll keys** ▲▼ to select the **Display profiles** parameter.
 5. Press the **scroll keys** ▲▼ to select the desired setting.
 6. Press the **ESC** key three times to return to measurement mode.
- ↳ The display profile has been set.

6.6 Viewing Device Names

To distinguish between devices, each device has a unique name. The name consists of "MetraCal CM" and the last two elements of the device's hardware address.

To identify the current device, e.g., when it is connected to a PC, you must know the device name.

The name cannot be changed.

► **To view the device name:**

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Interface** menu.
 - ↳ The **Name** parameter specifies the name of the device.
4. Press the **ESC** key twice to return to measurement mode.

6.7 Installing a Function Extension

You can purchase extended functions. For information on available function extensions, refer to the scope of services or scope of delivery (⇒ "**Included features**" ☐ 17), or the data sheet, which also contains the order information.

After purchase, you will receive a feature key (password) to activate the additional function. You must enter the feature key on the device.

ATTENTION

When ordering, specify the serial number of the device for which you would like to purchase the function extension. The feature key can only be used on this device.

TIP



You can find the serial number on the home screen of your device. When switching on the device, press the **ESC** key to keep the home screen displayed longer.

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **System** menu.
4. Press the **scroll key** ► to switch to the submenu.
5. Press the **scroll keys** ▲▼ to select the **Function ext.** parameter.
6. Press the **OK** key.
 - ↳ A list of function extensions appears. Features that are not enabled are marked in the list.
7. Press the **scroll keys** ▲▼ to select the purchased function extension.
8. Press the **Activate** softkey.
 - ↳ **Password** appears in the header and prompts you to enter your feature key.
9. Enter the feature key using the digital keyboard (⇒ "**Digital Keyboard**" ☐ 33).
10. Press the **Enter** softkey.
 - ↳ A message confirms that the feature has been successfully activated. In the list, the activated feature is marked with a checkmark.

6.8 Switching the Battery Tester Off

You can switch of the device manually. The device switches itself off automatically as well (Auto OFF).

6.8.1 Switching the Device Off Manually

1. Turn the **rotary switch** to the **OFF** position.
 - ↳ The device is switched off. The display disappears.

6.8.2 Automatic Shutdown (Auto OFF)

NOTE



If the set Auto OFF time is shorter than the set recording duration and the device switches off, the recording continues.
In this case, do not manually switch on the device until the end of the recording time. Otherwise, certain presets may be reset.

— Keep the Auto OFF time in mind when you set the duration of the recording.

The period of time after which the device automatically switches off, regardless of whether a measurement or menu view is open, can be set between 10 and 59 minutes.

Alternatively, automatic shutdown can be deactivated for continuous operation.

Continuous operation is indicated by a symbol in the display header. 

The device switches off automatically if the measured value remains constant for a long time and neither a key nor the rotary switch has been pressed for a preset number of minutes.

► To set the automatic shutdown:

1. Press the **Menu** key.
 2. Press the **General Setup** softkey.
 3. Press the **scroll keys** ▲▼ to select the **System** menu.
 4. Press the **scroll key** ► to switch to the submenu.
 5. Press the **scroll keys** ▲▼ to select the **Auto OFF** parameter.
 6. Press the **OK** key.
 7. Press the **scroll keys** ▲▼ to select the desired setting.
 8. Press the **OK** key.
 9. Press the **ESC** key three times to return to measurement mode.
- ↳ Automatic shutdown has been set.

NOTE



The setting is retained only until the next time the device is switched off. After restarting, the parameter reverts to 10 minutes.

6.9 Default Settings (device reset)

You can reset all of your customized settings to default settings.

TIP



Test sequences (⇒ "**Test Sequences**"  **68**) are retained.

► To reset the device to default settings:

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **System** menu.

4. Press the **scroll key** ► to switch to the submenu.
 5. Press the **scroll keys** ▲▼ to select the **Default settings** parameter.
 6. Press the **OK** key.
 7. Confirm the security prompt.
 8. Press the **ESC** key three times to return to measurement mode.
- ↳ The device has been reset to default settings.

6.10 General Setup – Parameter Overview

The following parameters are available:

System

Time	hh:mm:ss
Date	dd.mm.yy
Brightness	Auto, 1 (min.) ... 9 (max.)
Auto OFF	Off, 10 ... 59 min.
Leading zeros	000.0 (not editable)
Key press tone	Yes / no
Display profile	Normal / inverted
Default settings	After confirmation, reset to default settings
Function extension	Overview and installation of function extensions

Table 13: Parameters: System

Memory

Recording	Start / Stop
Recording type	Recurrent / data value
Sampling rate	00:00,1 [mm:ss:s/10] ... 9:00.00 [h:mm:ss]
Recording time	00:00:00 ... 90:00:00 [hh:mm:ss] / unlimited
Hysteresis	00001 ... 10000 digits / off
Trigger	Within / outside / off
Lower limit value	
Upper limit value	
Groups	Manage groups for sorting and storing measured values
Clear memory	After confirmation, clear the device memory

Table 14: Parameters: Memory

Sequence

Storage of measured values	Automatic / manual
----------------------------	--------------------

Table 15: Sequence

Interface

USB	Detected / not detected (USB power module)
Bluetooth	On / off
PIN	Change the device PIN
Name	Device name (cannot be changed)
Address	Device address (cannot be changed)

*Table 16: Interface***Info**

Battery	Charge level in %
Version	Firmware version of the device
Calibration date	dd.mm.yy
Balancing date	dd.mm.yy
Recalibration date	dd.mm.yy
Time	hh:mm:ss
Date	dd.mm.yy
Memory usage	Usage of the memory in %
Ambient light	
Temperature	Internal reference point temperature

*Table 17: Info***Language**

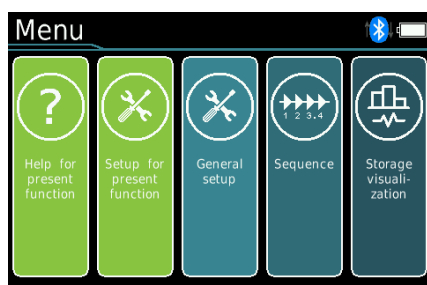
Language selection for the user interface.



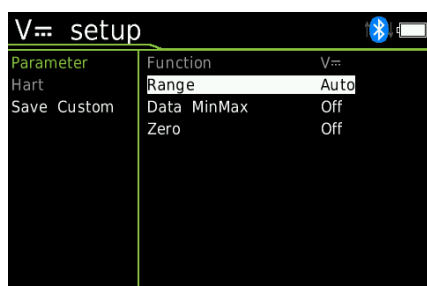
7.2 Setup for present function – Example: Set range



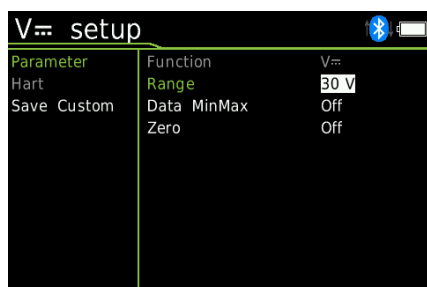
1. Turn the **rotary switch** to the desired function.
2. Press the **Menu** key.



3. Press the **Setup for present function** softkey.



4. Use the **scroll keys** to navigate to the desired setting.
5. Press the **OK** key.



6. Press the **scroll keys** to make the desired setting.
7. Press the **OK** key.
8. Press the **ESC** key twice to return to measurement mode.

TIP



The settings made in **Setup for present function** are lost when the device is switched off. If you want to retain settings, save them in one of the memory locations **C1 ... C4**. (⇒ "**C1 ... C4**" 67)

7.3 Selecting Measuring Functions and Measuring Ranges

7.3.1 Automatic Measuring Range Selection

The device is equipped with auto-ranging for all measuring functions except for temperature measurements. Auto-ranging is active as soon as the device is switched on. The device automatically selects the measuring range that allows for the highest possible resolution of the applied measured quantity.

7.3.2 Manual Measuring Range Selection

You can switch off auto-ranging and select the ranges manually (⇒ "**Characteristic Values**"  25).

1. Press the **Set Range** softkey.
2. Press the **scroll keys**  to select the desired range.

The device returns to automatic range selection if you press the key, turn the rotary switch, or switch the device off and on again.

7.3.3 Quick Measurements

If you need to measure faster than is possible with automatic range selection, you must set the appropriate measuring range manually. The following two functions ensure fast measurement:

- Manual measuring range selection, i.e., selecting the measuring range with the best resolution (⇒ "**Manual Measuring Range Selection**"  42).
- The **DATA** function (⇒ "**Measured Value Storage – DATA Function**"  44). Here, the appropriate measuring range is automatically set after the first measurement, so that subsequent measurements are taken more quickly.

For both functions, the selected measuring range remains set for subsequent series of measurements.

7.4 Zero Offsetting / Relative Measurements

Depending on the deviation from zero, a zero point setting or a reference value for relative measurements can be stored.

This is possible for the following measurements: V, mA, mA loop, Ω

For each measurement function, the corresponding reference or correction value is subtracted as an offset from all future measurements and remains stored until it is deleted or the multimeter is switched off.

The zero point or reference value can be set both during automatic range selection and for the manually selected measuring range.

7.4.1 Setting the Zero Point

NOTE



The Zero function is deactivated if the currently measured value is greater than 50% of the measuring range.

You can subtract currently measured values from future measurements.

1. Press the **Zero** softkey.
 - ↳ The value determined for **Zero** is saved and appears above the measurement display.
 - ↳ The **Zero** softkey is highlighted in green.
 - ↳ Future measurements are automatically compensated.

2. To clear the value, press **Zero**, change the measuring functions, or switch the device off.
 - ↳ The value is cleared from the display.
 - ↳ The **Zero** softkey is no longer highlighted in green.

7.4.2 Specifying the Reference Value

Connect the measuring cables to the device and measure a reference value (max. 50% of the measuring range).

1. Press the **Zero** softkey.
 - ↳ The value determined for **Zero** is saved and appears above the measurement display.
 - ↳ The **Zero** softkey is highlighted in green.
 - ↳ Future measurements are automatically compensated.
2. To clear the value, press **Zero**, change the measuring functions, or switch the device off.
 - ↳ The value is cleared from the display.
 - ↳ The **Zero** softkey is no longer highlighted in green.

NOTE



Relative measurement applies only to the digital display. The analog display continues to show the original measured value.

7.5 Display (TFT Color Graphic Display)

7.5.1 Digital Display

Measured Value, Unit of Measure, Type of Current, Polarity

The digital display shows the measured value with the correct decimal point and sign. The selected unit of measure and current type are also displayed. When measuring DC quantities, a minus sign appears before the digits if the positive terminal of the measured quantity is connected to the "⊖" input.

Exceeded Measuring Range

If the upper range limit is exceeded, "OL" (overload) is displayed.

7.5.2 Analog Display

Measured Value, Polarity

The analog display has the dynamic behavior of a moving-coil meter.

This display is especially advantageous for observing measured value fluctuations and for calibration procedures.

It is displayed as a horizontal (green) bar that indicates the current measured value in real-time.

When you measure positive values in a single-range mode, the analog scale displays a small negative range on the left, allowing you to closely monitor fluctuations in the measured value around "zero". If the measured value exceeds a certain negative range, the polarity of the analog display switches.

For DC measurements of negative values, the analog scale displays a small positive range on the left, allowing you to closely monitor fluctuations around "zero" here as well.

Scaling of the analog scale is automatic. This is very helpful for manual measuring range selection.

Exceeded Measuring Range

Exceeding the measuring range is indicated exclusively via the digital display.

Refresh Rate

The analog display is refreshed 40 times per second.

7.6 Measured Value Storage – DATA Function

► General

With the DATA (Auto-Hold) function, you can automatically "freeze" a single measured value.

► Application

This function is useful, for example, when contacting the measuring points with the test probes requires your full attention. After the measuring signal is applied and the measured value has settled in accordance with the "condition" listed in the table below, the device freezes the measured value on the digital display and emits an acoustic signal. You can now remove the test probes from the measuring points and read the measured value on the digital display. If the measuring signal falls below the limit specified in the table, the function is reactivated for storage of the next value.

The **Data** function can be activated in all measuring functions.

► Procedure

1. Connect the measured quantity to the device.
2. Press the **Set Range** softkey to set the measuring range.
3. Press the **Data / MinMax** softkey to activate the **Data** function.

↳ **Data** appears with a green background.

↳ **Set Range** is grayed out, if available, and cannot be changed until **Data / MinMax** is deactivated.

If automatic measuring range selection was active before **Data**, it cannot be changed while **MinMax** is active either.

Data and the associated value appear between the digital and analog displays.

NOTE



Data is only displayed with a value when the measured value exceeds 10% of the selected measuring range.

► Measured Value Comparison (DATA Compare)

If the currently frozen value deviates from the first saved value by less than 100 digits, the acoustic signal sounds twice.

If deviation is greater than 100 digits, only a brief acoustic signal sounds.

NOTE



The Data function has no effect on the analog display. You can still read the current measured value there. However, when the digital display is "frozen", the decimal point is fixed as well (fixed measuring range, Man is highlighted in gray-green).

1. Press the **Data / MinMax** softkey to activate the **Data** function (⇒ "**Saving Minimum and Maximum Values – MinMax**" " 45).

↳ The **Data** function is switched off.

Changing the measuring function and switching the device off and on also end the **Data** function.

Data function	Data / MinMax softkey	Condition		Response on Device	
		Measuring Function	Measuring Signal	Display Data + MV	Beep
Activate	Brief			Is displayed	1 ×
Store (stabilized measured value)		V, A, Hz	> 10% rdg.	Is displayed	1 × 2 × ¹
		Ω	≠ 0L		
Reactivate ²		V, A, Hz	< 10% rdg.	Stored MV	
		Ω	= 0L		
Switch to MinMax	Brief			Is hidden	1 ×

¹ Two beeps are emitted the first time a measured value is saved as a reference value. For subsequent data hold, two acoustic signals are only emitted if the currently frozen value deviates from the first saved value by less than 100 digits.

² Reactivation results from falling short of specified measured value limits.

Legend: MV = measured value, rdg. = measuring range

7.7 Saving Minimum and Maximum Values – “MinMax”

► General

The MIN/MAX function lets you “hold” the minimum and maximum measured value that was present at the meter's input in the time after the activation of MinMax.

► Application

The most important use of this function is the determination of minimum and maximum values during long-term monitoring of measured quantities.

The **MinMax** function can be activated in all measuring functions.

MinMax has no effect on the analog display. You can still read the current measured value there.

► Procedure

1. Connect the measured quantity to the device.
2. Press the **Set Range** softkey to set the measuring range.
3. Press the **Data / MinMax** softkey to activate the **MinMax** function.
 - ↳ **MinMax** appears with a green background.
 - ↳ **Set Range** is grayed out, if available, and cannot be changed until **Data / MinMax** is deactivated.

If automatic measuring range selection was active before **Data**, it cannot be changed while **MinMax** is active either.

Both **Min** and **Max**, as well as the associated values, are displayed between the digital and analog displays along with the time of their occurrence.

After you press **Data / MinMax** again, the minimum and maximum values are displayed together with the average value (“Avg.”). The Min Avg Max display appears without a timestamp.

4. Press the **Data / MinMax** softkey.
 - ↳ The **MinMax** function is switched off.

Changing the measuring function and switching the device off and on also end the **MinMax** function.

MinMax Function	Data / MinMax softkey	Min. and Max. Measured Values	Response on Device	
			Display Min + MV Max + MV	Beep
Activate and save	Brief	Are saved	Is displayed	1 ×
Save and display		Storage continues in background, new min. and max. values are displayed	Stored min. value	1 ×
			Stored max. value	
Stop	Brief	Are deleted	Is hidden	1 ×

7.8 Measured Value Storage – STORE Function

The following options are available for the storage of measured values:

- Store on the device by pressing the **STORE** key on the device
- Store on the device by pressing the **STORE** key in the MetraCal CM Utility (remote control) software

7.9 Data Logging

The device offers the option to save measurement data once by pressing a button or repeatedly as a measurement series over longer periods of time.

Data is stored in a battery-backed memory and is retained even after the device is switched off.

The system records measured values relative to real time.

NOTE



Measurement data recording is ended automatically as soon as internal memory is full. No measurement data is overwritten.

— Clear the memory to record additional measurement data.

Stored measurement data can be read out via Bluetooth® or the USB interface on the optional USB power module.

7.9.1 One-Time (Manual) Storage

The **STORE** key is used for one-time storage of a data value. The recording type must be set to **Data Value**.

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
4. Press the **scroll key** ► to switch to the submenu.
5. Press the **scroll keys** ▲▼ to select the **Recording types** parameter.
6. Press the **OK** key.
7. Press the **scroll keys** ▲▼ to select the **Data value** parameter.
8. Press the **OK** key.
- ↳ The setting is made.
9. Press the **ESC** key three times to return to measurement mode.

7.9.2 Measurement Series (Automatic Storage)

For measurement series, you must first set the recording type to **Recurrent** and configure several basic parameters, such as the sampling rate.

NOTE



Take the available memory space into account when configuring the settings!

Afterwards, you can start storage mode at any time and then the measuring function.

This section describes the general procedure. The following subsections explain the respective parameters and their configuration in detail.

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
4. Press the **scroll key** ► to switch to the submenu.
5. Press the **scroll keys** ▲▼ to select the **Recording types** parameter.
6. Press the **OK** key.
7. Press the **scroll keys** ▲▼ to select the **Recurrent** parameter.
8. Press the **OK** key.
9. Set the sampling rate (⇒ "**Sampling rate**" □ 48).
10. Set the recording time. (⇒ "**Recording time**" □ 48)
11. Set a trigger function if required. (⇒ "**Trigger Mode**" □ 49)
12. If necessary, create a group to store the measured values in sorted order. (⇒ "**Managing Groups**" □ 50)
13. Check the current memory usage. (⇒ "**Memory usage**" □ 51)
14. Before you record measurement values for an extended period, check the charge level of the battery pack, (⇒ "**Battery Pack Charge Level**" □ 31) or use the USB power module (⇒ "**USB Power Module**" □ 31).

To start the recording:

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
4. Press the **scroll key** ► to switch to the submenu.
5. Press the **scroll keys** ▲▼ to select the **Start recording** parameter.
6. Press the **OK** key.
- ↳ The message "Recording has started." is displayed.
- ↳ The Recording parameter changes from Start to Stop.
- ↳ The red REC memory symbol appears in the display header.
7. Press the **ESC** key three times to return to measurement mode.
8. Select the desired measuring function and an appropriate measuring range.
9. Perform the measurement.

To stop the recording:

1. Press the **Menu** key.
2. Press the **General Setup** softkey.

3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
4. Press the **scroll key** ► to switch to the submenu.
5. Press the **scroll keys** ▲▼ to select the **Stop recording** parameter.
6. Press the **OK** key.
- ↳ The message "Recording has finished." is displayed.
- ↳ The red REC memory symbol in the display header disappears.
7. Press the **ESC** key three times to return to measurement mode.

Alternatively, storage mode can be exited by switching the device off.

7.9.2.1 To set the sampling rate:

This parameter cannot be set during storage mode.

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
4. Press the **scroll key** ► to switch to the submenu.
5. Press the **scroll keys** ▲▼ to select the **Sampling rate** parameter.
6. Press the **OK** key.
7. Change the value using the **scroll keys** ▲▼.

Formats: [h:mm:ss] or [mm:ss:s/10]

8. Press the **OK** key.
- ↳ The sampling rate has been set.

7.9.2.2 To set the recording time:

NOTE



If the set Auto OFF time is shorter than the set recording duration and the device switches off, the recording continues.

In this case, do not manually switch on the device until the end of the recording time. Otherwise, certain presets may be reset.

— Keep the Auto OFF time in mind when you set the duration of the recording.

This parameter cannot be set during storage mode.

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
4. Press the **scroll key** ► to switch to the submenu.
5. Press the **scroll keys** ▲▼ to select the **Recording time** parameter.
6. Press the **OK** key.
7. Change the value using the **scroll keys** ▲▼.

Formats: [h:mm:ss]

8. Press the **OK** key.
- ↳ The recording time has been set.

7.9.2.3 To set the hysteresis:

The hysteresis setting allows for efficient use of memory space.

During storage mode, new measurement data are only saved if they deviate from the previously stored value by an amount which exceeds the selected hysteresis value.

Hysteresis can be selected in any steps from 1 to 10,000 digits. These digits are related to the measuring range as follows: the position of the selected digit in the specified hysteresis value corresponds to the same position within the measuring range, although counting is started at the left.

Example: A specified hysteresis of 00100 for the 30.00 V measuring range means that only the measured values that deviate from the last measured value by more than 001.00 V are saved to memory.

TIP



Due to the fact that the value is specified in digits (highest place all the way to the left), and thus depends on the measuring range, it is advisable to use the function with a fixed measuring range only.

This parameter cannot be set during storage mode.

1. Press the **Menu** key.
 2. Press the **General Setup** softkey.
 3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
 4. Press the **scroll key** ► to switch to the submenu.
 5. Press the **scroll keys** ▲▼ to select the **Hysteresis** parameter.
 6. Press the **OK** key.
 7. If the parameter is set to off, activate hysteresis by a pressing the **scroll key** ▲.
 8. Press the **scroll keys** ◀► to select the desired position within the parameter.
Press the **scroll keys** ▲▼ to change the value.
 9. Press the **OK** key.
- ↳ The sampling rate has been set.

7.9.2.4 Trigger Mode

You can use the settings **Off**, **Outside** or **Within** to specify how the recording of measured values is started and stopped:

- **Trigger = Off:** Storage is started with Recording > Start and ended with Recording > Stop.
- **Trigger = Outside:** Storage starts only when a measured value falls outside the set measurement limits and ends as soon as the measurement limits are met again or the set recording time is exceeded.
- **Trigger = Within:** Storage begins as soon as a measured value falls within a defined range and ends after the value leaves the range or after the maximum recording time has elapsed.

The range is defined by the lower limit (Lower Limit) and the upper limit (Upper Limit). The range limits are entered in digits and defined by the upper range limit. In the case of DC, for example, this is 30,000 (–30,000 bis +30,000).

For measuring functions with a narrow measuring range, setting the trigger threshold above the upper limit of the measuring range is not advisable. It is therefore recommended to perform measurement with a fixed measuring range.

The actual measurement is always performed at the selected sampling rate.

TIP



Measurements performed close to the trigger level may result in an incorrect display.

- If this is the case, select a smaller voltage measuring range.

7.9.2.5 To activate the trigger:

This parameter cannot be set during storage mode.

1. Press the **Menu** key.
 2. Press the **General Setup** softkey.
 3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
 4. Press the **scroll key** ► to switch to the submenu.
 5. Press the **scroll keys** ▲▼ to select the **Trigger** parameter.
 6. Press the **OK** key.
 7. Press the **scroll keys** ▲▼ to select the desired setting.
 8. Press the **OK** key.
- ↳ The trigger is activated.

7.9.2.6 To set the trigger thresholds:

This parameter cannot be set during storage mode.

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
4. Press the **scroll key** ► to switch to the submenu.
5. Press the **scroll keys** ▲▼ to select the **Below limit value** or **Above limit value** parameter.
6. Press the **OK** key.

7.9.2.7 Managing Groups

Create a group to store the measured values in sorted order. You can manage these groups.

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
4. Press the **scroll key** ► to switch to the submenu.
5. Press the **scroll keys** ▲▼ to select the **Groups** parameter.
6. Press the **OK** key.
7. Manage the groups using the **New**, **Edit**, and **Delete** softkeys.
To enter text, use the digital keyboard (⇒ "**Digital Keyboard** "  33).

7.9.2.8 Selecting a Group

Before starting the respective measurement, select a suitable group from the list you created under which the measured values will be saved.

1. Press the **Menu** key.
 2. Press the **General Setup** softkey.
 3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
 4. Press the **scroll key** ► to switch to the submenu.
 5. Press the **scroll keys** ▲▼ to select the **Groups** parameter.
 6. Press the **OK** key.
 7. Press the **scroll keys** ▲▼ to select the desired group.
 8. Press the **Select** softkey.
- ↳ The group is selected.
9. Press the **ESC** key four times to return to measurement mode.

7.9.3 Memory

The device has 64 Mbit of memory for approximately 300,000 measured values with indication of the date and time. You can check the memory usage and clear the memory if necessary.

7.9.3.1 To view the memory usage:

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Info** menu.
- ↳ The Memory Usage parameter displays the current value.

You can view the memory usage before the save process begins, as well as during the save process.

7.9.3.2 To clear the memory (delete measured values):

NOTE



This function deletes all measured values from memory!

This parameter cannot be set during storage mode.

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Memory** menu.
4. Press the **scroll key** ► to switch to the submenu.
5. Press the **scroll keys** ▲▼ to select the **Clear memory** parameter.
6. Confirm the security prompt.
- ↳ The memory has been cleared. A confirmation message is displayed.

7.10 Memory Visualization (Only with Graph Function Extension)

Saved measurements are listed in the memory visualization.

1. Press the **Menu** key.
2. Press the **Memory visualization** softkey.

The list displays an symbol for the measurement type, date, time, measuring function, and group.

The symbols have the following meanings:

Symbols	Meaning
	Measurement series (automatic storage)
	Individual measurement
	Sequence

Table 18: Symbols in the memory visualization

In the list, you can scroll using the **Page** ⏪/**Page** ⏩ softkeys, search for a date, and filter by sequence or group.

Pressing the OK key displays all data stored for the selected measurement.

For a series of measurements, the measurement trend is displayed graphically and can be analyzed (⇒ **"Data Display for Measurement Series"** 52).

Date Search

The date search jumps to the first entry in the list with the specified date, or the one closest to it.

Filters

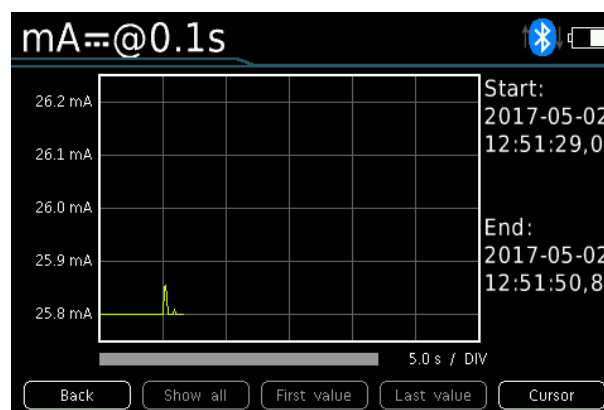
When using filters, only the measurements which match the filter criteria are displayed.

The **Group** filter allows you to filter by groups that are available under **General setup > Memory > Groups**.

The **Sequence** and **Group** filters can be used simultaneously. The **softkey** of an active filter turns green.

7.10.1 Data Display for Measurement Series

Overview



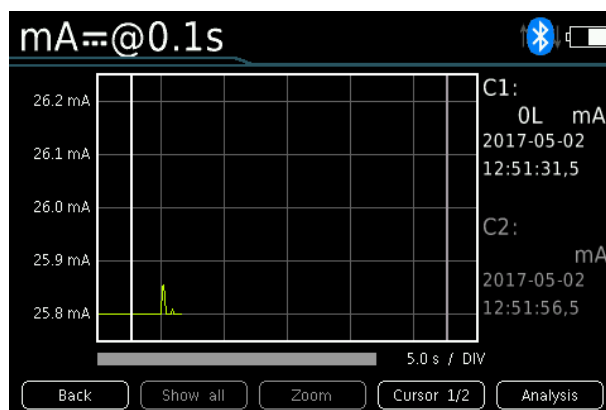
The header displays the type of measurement and the sampling rate.

The start and end times of the measurement are displayed to the right of the diagram.

The time scale is displayed underneath the diagram.

Key	Meaning
Softkeys	
Back	Displays the list of stored measurements.
All Values	The display shows the complete measurement history (only when the display is zoomed in).
First Value	The display jumps to the start of the measurement (only when the display is zoomed in).
Last Value	The display jumps to the end of the measurement (only when the display is zoomed in).
Cursor	Switches to the "Cursor" display.
Keys	
▲▼	Zoom + / Zoom -
▶	Shifts the display of measurement data to the right.
◀	Shifts the display of measurement data to the left.

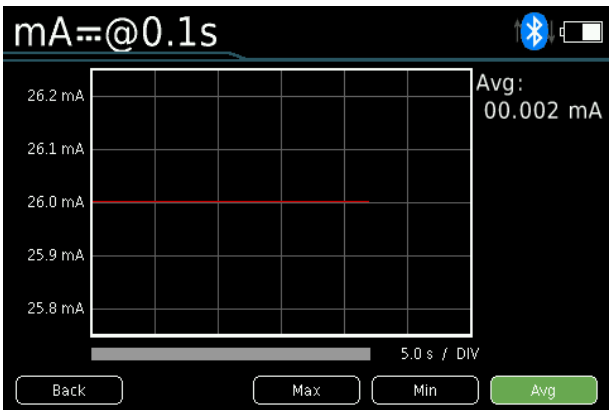
Cursor



The measured values at cursor 1 (C1) and cursor 2 (C2) are displayed to the right of the diagram.

Key	Meaning
Softkeys	
Back	Returns to the "Overview" screen.
All Values	The display shows the complete measurement history (only when the display is zoomed in).
Zoom	Zooms the display to the area between cursor 1 and cursor 2.
Cursor 1/2	Toggle between cursor 1 and cursor 2. The selected cursor and the associated measured value are highlighted.
Analysis	Switches to the "Analysis" display.
Keys	
▲▼	Zoom + / Zoom -
▶	Brief: Shifts the selected cursor one pixel to the right. Long: Shifts the selected cursor continuously to the right as long as the key is pressed.
◀	Brief: Shifts the selected cursor one pixel to the left. Long: Shifts the selected cursor continuously to the left as long as the key is pressed.

Analysis



Depending on the selection, the maximum, minimum, or average value of the measurement is displayed to the right of the diagram.

Key	Meaning
Softkeys	
Back	Returns to the "Cursor" screen.
Max	The maximum value of the measurement is marked with a cursor and the value is displayed to the right of the diagram. Press again to show or hide the cursor.
Min	The minimum value of the measurement is marked with a cursor and the value is displayed to the right of the diagram. Press again to show or hide the cursor.
Avg	The average value of the measurement is marked with a cursor and the value is displayed to the right of the diagram. Press again to show or hide the cursor.

7.11 Measuring Electrical Quantities

Measuring functions are marked in green on the rotary switch.

7.11.1 V

NOTE



The device may display incorrect measurement results when measuring voltages with an AC component.

— Make sure that the voltage to be measured does not contain any AC components!

To perform the measurement:



1. Turn the **rotary switch** to the desired function.

2. Connect the device to the device under test as shown in the connection diagram.

⇒ **"Calling up the Help Text and Connection Diagram "**  **40**

3. Make the desired setting in **Setup** for present function.

⇒ **"Setup for present function – Example: Set range "**  **41**

4. If necessary, perform a zero adjustment using the **Zero** softkey.

⇒ **"Setting the Zero Point "**  **42**

5. If necessary, use the measured value storage – **Data** function.

⇒ **"Measured Value Storage – DATA Function "**  **44**

6. If necessary, use the minimum and maximum value storage **MinMax**.

⇒ **"Saving Minimum and Maximum Values – "MinMax" "**  **45**

7.11.2 mA

To perform the measurement:



1. Turn the **rotary switch** to the desired function.

2. Connect the device to the device under test as shown in the connection diagram.

⇒ **"Calling up the Help Text and Connection Diagram "**  **40**

3. Make the desired setting in **Setup** for present function.

⇒ **"Setup for present function – Example: Set range "**  **41**

- 4. If necessary, perform a zero adjustment using the **Zero** softkey.
⇒ **"Setting the Zero Point "** 42
- 5. If necessary, use the measured value storage – **Data** function.
⇒ **"Measured Value Storage – DATA Function "** 44
- 6. If necessary, use the minimum and maximum value storage **MinMax**.
⇒ **"Saving Minimum and Maximum Values – “MinMax” "** 45

7.11.3 mA Loop

The calibrator uses the Loop Current measuring function to feed the circuit of a 2-wire transmitter directly with a stable direct voltage. In this case, a sensor can also be operated without an external power supply while also measuring or simulating its output signal. This simplifies mobile testing in the field and reduces the cost of additional equipment.

To perform the measurement:



- 1. Turn the **rotary switch** to the desired function.
- 2. Connect the device to the device under test as shown in the connection diagram.
⇒ **"Calling up the Help Text and Connection Diagram "** 40
- 3. Make the desired setting in **Setup** for present function.
⇒ **"Setup for present function – Example: Set range "** 41
- 4. If necessary, perform a zero adjustment using the **Zero** softkey.
⇒ **"Setting the Zero Point "** 42
- 5. If necessary, use the measured value storage – **Data** function.
⇒ **"Measured Value Storage – DATA Function "** 44
- 6. If necessary, use the minimum and maximum value storage **MinMax**.
⇒ **"Saving Minimum and Maximum Values – “MinMax” "** 45

7.11.3.1 HART Communication

A 0 mA to 24 mA current interface is used, in which the sensor (transmitter) modulates supply current in order to transmit analog measurement information to a downstream evaluation unit (e.g., PLC or process control system).

The process calibrator uses the HART communication function to read, process, and configure digital signals from HART-capable field devices, in addition to the analog 4 mA ... 20 mA signal. This allows parameters such as measurement range, attenuation, or TAG name to be set directly on the calibrator. This facilitates initial startup, troubleshooting, and calibration without a separate HART modem.

Supported HART commands:

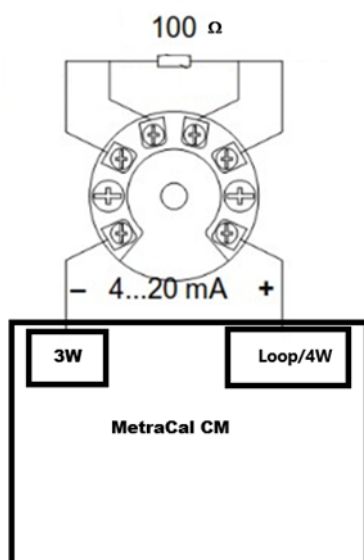
Command 0:	Read unique identifier	Command 34:	Write primary variable damping value
Command 2:	Read loop current and percent of range	Command 35:	Write primary variable range values

Command 3:	Read dynamic variables and percentage of range	Command 40:	Enter/Exit fixed current mode
Command 8:	Read dynamic variable classification	Command 43:	Set primary variable zero
Command 13:	Read tag, descriptor, date	Command 44:	Write primary variable units
Command 15:	Read device information	Command 45:	Trim loop current zero
Command 18:	Write tag, descriptor, date	Command 46:	Trim loop current gain

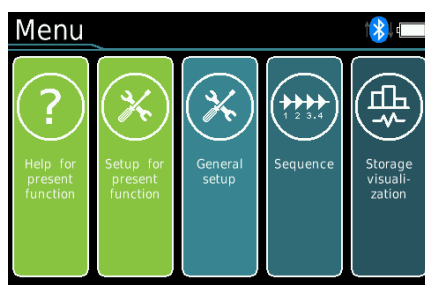
Table 19: HART commands

To connect a HART sensor:

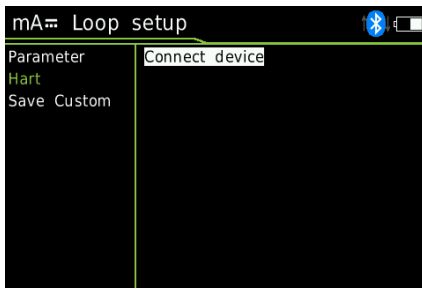
1. Connect the HART cable to the device.



2. Turn the rotary switch to the desired function.
3. Press the Menu key.



4. Press the **Setup for present function** softkey.
5. Press the **scroll keys** ▲▼ to select the **HART** parameter.
6. Press the **scroll key** ► to switch to the submenu.



7. Press the **OK** key.
 - ↳ The connection is established. The connection is established when the HART sensor has received data under **Info**.

7.11.4 Ω

To perform the measurement:



1. Turn the **rotary switch** to the desired function.

2. Connect the device to the device under test as shown in the connection diagram.

⇒ "Calling up the Help Text and Connection Diagram " 40

3. Make the desired setting in **Setup for present function**.

⇒ "Setup for present function – Example: Set range " 41

4. If necessary, perform a zero adjustment using the **Zero** softkey.

⇒ "Setting the Zero Point " 42

5. If necessary, use the measured value storage – **Data** function.

➔ **"Measured Value Storage – DATA Function "** 📄 44

6. If necessary, use the minimum and maximum value storage **MinMax**.

⇒ "Saving Minimum and Maximum Values – "MinMax" " 45

7.11.5 Temp. TC

Temperature measurement with thermocouples, with the option of temperature compensation via internal reference or manual setting.

ATTENTION

Damage to the product caused by inserting the plug with incorrect orientation.

- Make sure that the orientation of the plug is correct when you connect the plug. One pin is wider than the other.

To perform the measurement:



1. Turn the **rotary switch** to the desired function.

2. Connect the thermocouple to the device as shown in the connection diagram.

⇒ "Calling up the Help Text and Connection Diagram " 40

3. Make the desired setting in **Setup for present function.**

⇒ "Setup for present function – Example: Set range " 41

4. If necessary, use the measured value storage – **Data** function.

⇒ "Measured Value Storage – DATA Function " 44

5. If necessary, use the minimum and maximum value storage **MinMax**.

⇒ "Saving Minimum and Maximum Values – "MinMax" "

7.11.6 Temp. RTD

Temperature measurement with a temperature sensor.

To perform the measurement:



1. Turn the **rotary switch** to the desired function.

2. Connect the temperature sensor to the device as shown in the connection diagram.

⇒ "Calling up the Help Text and Connection Diagram " 40

3. Make the desired setting in **Setup** for present function.

⇒ "Setup for present function – Example: Set range " 41

Compensate for the lead resistance:

4. Press the **Rleads** softkey.
 5. Short-circuit the measurement cables.
 6. Press the **Save** softkey.
- ↳ The lead resistance is compensated.

7.11.7 Hz

Frequency measurement up to 50 kHz.

To perform the measurement:



1. Turn the **rotary switch** to the desired function.

2. Connect the device to the device under test as shown in the connection diagram.

⇒ "Calling up the Help Text and Connection Diagram " 40

3. Make the desired setting in **Setup** for present function.

⇒ "Setup for present function – Example: Set range" 41

4. If necessary, use the measured value storage – **Data** function.

➔ "Measured Value Storage – DATA Function " 44

5. If necessary, use the minimum and maximum value storage **MinMax**.

⇒ "Saving Minimum and Maximum Values – "MinMax" " 45

7.11.8 CPM

For measurements on pulse outputs that switch back and forth between high and low impedance and must be supplied externally with a measuring voltage.

For measurements on speed sensors with more than one pulse per round, the measured CPM (counts per minute) can be dynamically converted into RPM (rounds per minute) during the measurement using an adjustable divider factor **IpU** (2 ... 9999) set in the **Setup for the present function** menu and also displayed in the upper left corner of the screen (**RPM** softkey for activation/deactivation).

To perform the measurement:



1. Turn the **rotary switch** to the desired function.

2. Connect the device to the device under test as shown in the connection diagram.

⇒ "Calling up the Help Text and Connection Diagram " 40

3. Make the desired setting in **Setup for present function.**

⇒ "Setup for present function – Example: Set range " 41

4. If necessary, use the measured value storage – **Data** function.

➡ **"Measured Value Storage – DATA Function "** 📄 44

5. If necessary, use the minimum and maximum value storage **MinMax**.

⇒ "Saving Minimum and Maximum Values – "MinMax" " 45

7.12 Simulating Electrical Quantities

Calibration functions are marked in orange on the rotary switch.

7.12.1 Calibration Modes

The calibration functions (except for Hz and CPM) have four modes:

► Manual

In this mode, a single, fixed calibration value is output. For Hz and CPM, this is the only mode available.

1. Press the **scroll keys**     to make the desired setting.

Table

In this mode, any desired calibration values are read out with any desired duration. The next step can be triggered automatically (time per step: 1 second ... 60 minutes) or manually.

The calibration signal can be defined with the help of a table with up to 100 lines.

Ramp

In this mode, calibration values are read out steplessly between given start and end values.

Ramp duration for rising and falling ramps, as well as dwell time at minimum and maximum values (can be set within a range of 1 second to 60 minutes).

Interval

In this mode, calibration values are read out continuously in steps between given start and end values. The next step can be triggered automatically (time per step: 1 second ... 60 minutes) or manually.

The modes are set under **Menu > Setup for present function > Mode.**

How the modes are executed is defined under **Menu > Setup for present function > Mode > Process**.

Manual: **Scroll key**  starts the next step in the table.

Once: The **Start** softkey starts exactly one run.

Repeat: The **Start** softkey initiates repeated runs until the **Stop** softkey is pressed.

The Table, Ramp, and Interval modes can be loaded from a PC or saved to a PC using the MetraCal Utility software (⇒ "METRACAL CM Utility Software" 74).

The device automatically sets the appropriate measuring range when processing the calibration signals (Table, Ramp, Interval).

7.12.2 V

To perform the simulation:



1. Turn the **rotary switch** to the desired function.

2. Connect the device to the device under test as shown in the connection diagram.

⇒ "Calling up the Help Text and Connection Diagram " 40

3. Make the desired setting in **Setup for present function**.

⇒ "**Setup for present function – Example: Set range**" 41

Depending on the selected calibration mode (⇒ "**Calibration Modes**" 61), additional information is shown on the display.

4. Press the **Off/On** softkey to switch the calibration signal on/off.
5. Depending on the selected calibration mode, press the **Start** softkey to start the simulation.
 - ↳ The current simulation is shown on the display (Status: Run)
6. Depending on the selected calibration mode, press the **Stop** softkey to end the simulation.
 - ↳ The completed simulation is shown on the display (Status: Stop)

7.12.3 mA Source ➤

To perform the simulation:



1. Turn the **rotary switch** to the desired function.

2. Connect the device to the device under test as shown in the connection diagram.

⇒ "**Calling up the Help Text and Connection Diagram**" 40

3. Make the desired setting in **Setup for present function**.

⇒ "**Setup for present function – Example: Set range**" 41

Depending on the selected calibration mode (⇒ "**Calibration Modes**" 61), additional information is shown on the display.

4. Press the **Off/On** softkey to switch the calibration signal on/off.
5. Depending on the selected calibration mode, press the **Start** softkey to start the simulation.
 - ↳ The current simulation is shown on the display (Status: Run)
6. Depending on the selected calibration mode, press the **Stop** softkey to end the simulation.
 - ↳ The completed simulation is shown on the display (Status: Stop)

7.12.4 mA Sink

To perform the simulation:



1. Turn the **rotary switch** to the desired function.

2. Connect the device to the device under test as shown in the connection diagram.

⇒ **"Calling up the Help Text and Connection Diagram "**  **40**

3. Make the desired setting in **Setup for present function**.

⇒ **"Setup for present function – Example: Set range "**  **41**

Depending on the selected calibration mode (⇒ **"Calibration Modes "**  **61**), additional information is shown on the display.

4. Press the **Off/On** softkey to switch the calibration signal on/off.
5. Depending on the selected calibration mode, press the **Start** softkey to start the simulation.
 - ↳ The current simulation is shown on the display (Status: Run)
6. Depending on the selected calibration mode, press the **Stop** softkey to end the simulation.
 - ↳ The completed simulation is shown on the display (Status: Stop)

7.12.5 Ω

To perform the simulation:



1. Turn the **rotary switch** to the desired function.

2. Connect the device to the device under test as shown in the connection diagram.

⇒ **"Calling up the Help Text and Connection Diagram "**  **40**

3. Make the desired setting in **Setup for present function**.

⇒ **"Setup for present function – Example: Set range "**  **41**

Depending on the selected calibration mode (⇒ **"Calibration Modes "**  **61**), additional information is shown on the display.

4. Press the **Off/On** softkey to switch the calibration signal on/off.
5. Depending on the selected calibration mode, press the **Start** softkey to start the simulation.
 - ↳ The current simulation is shown on the display (Status: Run)

6. Depending on the selected calibration mode, press the **Stop** softkey to end the simulation.
↳ The completed simulation is shown on the display (Status: Stop)

7.12.6 Temp. TC

To perform the simulation:



1. Turn the **rotary switch** to the desired function.

2. Connect the device to the device under test as shown in the connection diagram.

⇒ "Calling up the Help Text and Connection Diagram " 40

3. Make the desired setting in **Setup for present function**.

⇒ "Setup for present function – Example: Set range " 41

Depending on the selected calibration mode (⇒ **"Calibration Modes"** **61**), additional information is shown on the display.

4. Press the **Off/On** softkey to switch the calibration signal on/off.
5. Depending on the selected calibration mode, press the **Start** softkey to start the simulation.
 - ↳ The current simulation is shown on the display (Status: Run)
6. Depending on the selected calibration mode, press the **Stop** softkey to end the simulation.
 - ↳ The completed simulation is shown on the display (Status: Stop)

7.12.7 Temp. RTD

To perform the simulation:



1. Turn the **rotary switch** to the desired function.

2. Connect the device to the device under test as shown in the connection diagram.

⇒ "Calling up the Help Text and Connection Diagram " 40

3. Make the desired setting in **Setup** for present function.

⇒ "Setup for present function – Example: Set range " 41

Depending on the selected calibration mode (⇒ **"Calibration Modes"** **61**), additional information is shown on the display.

4. Press the **Off/On** softkey to switch the calibration signal on/off.
5. Depending on the selected calibration mode, press the **Start** softkey to start the simulation.
 - ↳ The current simulation is shown on the display (Status: Run)
6. Depending on the selected calibration mode, press the **Stop** softkey to end the simulation.
 - ↳ The completed simulation is shown on the display (Status: Stop)

7.12.8 Hz

To perform the simulation:



1. Turn the **rotary switch** to the desired function.
2. Connect the device to the device under test as shown in the connection diagram.
- ⇒ **"Calling up the Help Text and Connection Diagram "**  **40**
3. Make the desired setting in **Setup for present function**.
- ⇒ **"Setup for present function – Example: Set range "**  **41**
4. Press the **Off/On** softkey to switch the calibration signal on/off.

7.12.9 CPM

To simulate a pulse output with 5 V high level and 0 V low level.

To perform the simulation:



1. Turn the **rotary switch** to the desired function.
2. Connect the device to the device under test as shown in the connection diagram.
⇒ **"Calling up the Help Text and Connection Diagram "**  **40**
3. Make the desired setting in **Setup for present function**.
⇒ **"Setup for present function – Example: Set range "**  **41**
4. Press the **Off/On** softkey to switch the calibration signal on/off.

7.13 Dual

Dual Mode enables simultaneous operation of the calibration unit and measuring unit. In this way, a signal can be applied to the input of a transducer and the resulting output signal of the transducer displayed.

The calibration unit and measuring unit are electrically isolated.

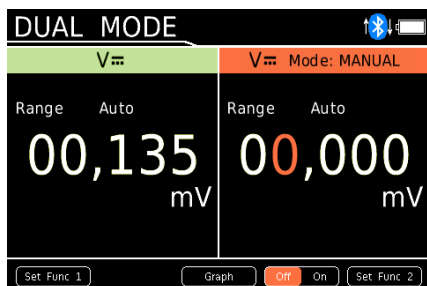
NOTE



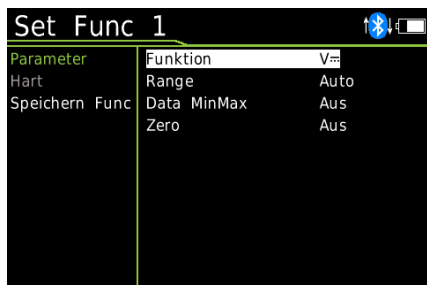
Voltage between the ground terminals of the measuring and calibration units must not exceed 50 V.



1. Turn the rotary switch to **DUAL**.

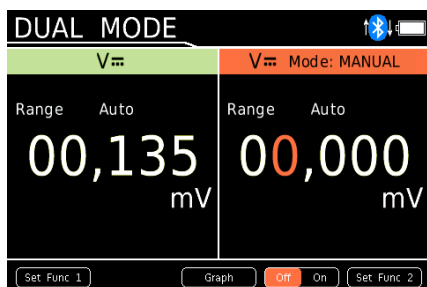


2. Press the **Set Func 1** softkey.

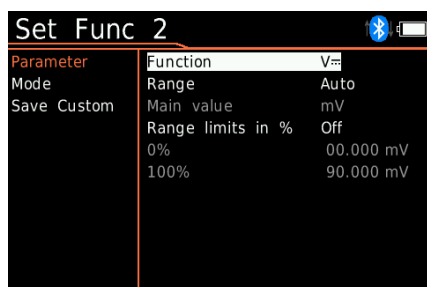


3. Select the desired measuring function under **Parameter > Function**.

4. Press the **ESC** key until the Dual Mode window is displayed again.



5. Press the **Set Func 2** softkey.



6. Select the desired calibration function under **Parameter > Function**.
 7. Press the **ESC** key until the Dual Mode window is displayed again.
- ↳ Dual Mode is set up for the selected functions.

TIP



The settings for Dual Mode can be assigned to one of the rotary switch positions **C1 ... C4** via **Set Func 1** or **Set Func 2 > Save Custom**.

7.14 C1 ... C4

User-specific settings, modes, and parameters for functions can be predefined and stored in rotary switch positions **C1 ... C4**.

NOTE

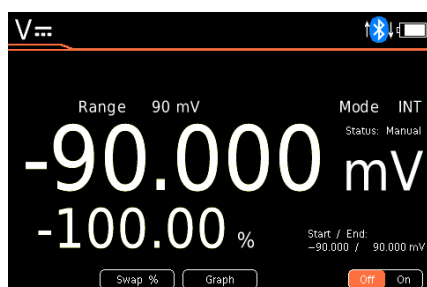


These user-specific settings override the current settings on the device. For example, a Bluetooth® connection can be activated or deactivated regardless of the current settings on the device.

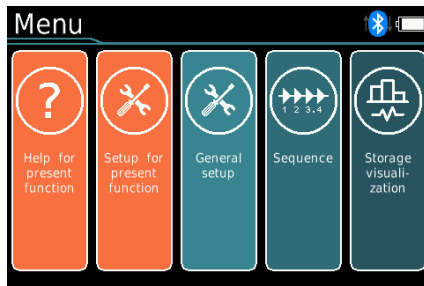
To save user-specific settings:



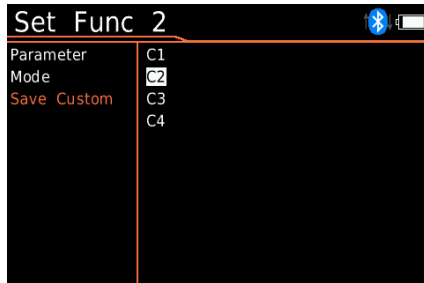
1. Turn the **rotary switch** to the desired function.



2. Make the desired settings for the modes and parameters.
3. Press the **Menu** key.



4. Press the **Help for present function** softkey.



5. Press the **scroll keys** ▲▼ to select **Save Custom**.
6. Press the **scroll key** ► to switch to the memory locations.
7. Press the **scroll keys** ▲▼ to select the desired memory location.
8. Press the **OK** key.
 - ↳ The function is assigned to the desired memory location.
9. Press the **ESC** key to return to the menu.

7.15 Test Sequences

If the same sequence of functions needs to be performed repeatedly, followed by documentation, it is advisable to use test sequences.

A test sequence with a maximum of 63 steps can be created in the device. The steps can include both functions and notes.

With the Sequence Function Expert function extension, the number can be increased to 16 test sequences with a maximum of 63 measurement steps.

For information on how to install the function extension, see ⇒ **"Installing a Function Extension"** □ 36.

Automatic test sequences can be performed in all rotary switch positions except for **OFF**.

7.15.1 Creating a Test Sequence

1. Turn the **rotary switch** to a position other than **OFF**.
2. Press the **Menu** key.
3. Press the **Off/On** softkey to switch the calibration signal on/off.
 - ↳ The sequences are displayed.
4. Press the **New** softkey.
5. Enter a name using the digital keyboard (⇒ **"Digital Keyboard"** □ 33).
6. Press the **Enter** softkey.
 - ↳ The sequences are displayed.
7. Press the **scroll keys** ▲▼ to select the new sequence.
8. Press the **Edit** softkey.
9. Press the **Enter func** softkey.
10. Turn the rotary switch to the desired function.
11. Press the **STORE** key.
 - The **Information > Sequence draft > Accept function with STORE key** window is displayed periodically every 5 seconds for a duration of 1 second.
12. Press the **Enter check** softkey to insert a manual test step, such as a visual inspection.
13. Press the **Enter text** softkey to insert a note.
14. Press the **Comment** to add a comment to any step (function, check, or test).
15. Press the **ESC** key to end the editing of the sequence.

To delete individual measurement steps, select the desired measurement step with the cursor and then press the **Delete** softkey.

7.15.2 Editing Test Sequences

1. Turn the **rotary switch** to a position other than **OFF**.
2. Press the **Menu** key.
3. Press the **Off/On** softkey to switch the calibration signal on/off.
- ↳ The sequences are displayed.
4. Press the **scroll keys ▲▼** to select the sequence that you want to edit.
5. Press the **Edit** softkey.
6. Press the **Enter func** softkey.
7. Turn the rotary switch to the desired function.
8. Press the **STORE** key.
The **Information > Sequence draft > Accept function with STORE key** window is displayed periodically every 5 seconds for a duration of 1 second.
9. Press the **Enter check** softkey to insert a manual test step, such as a visual inspection.
10. Press the **Enter text** softkey to insert a note.
11. Press the **Comment** to add a comment to any step (function, check, or test).
12. Press the **ESC** key to end the editing of the sequence.

To delete individual measurement steps, select the desired measurement step with the cursor and then press the **Delete** softkey.

7.15.3 Renaming a Test Sequence

1. Turn the **rotary switch** to a position other than **OFF**.
2. Press the **Menu** key.
3. Press the **Off/On** softkey to switch the calibration signal on/off.
- ↳ The sequences are displayed.
4. Press the **scroll keys ▲▼** to select the sequence that you want to edit.
5. Press the **Rename** softkey.
6. Change the name using the on-screen keyboard.
7. Press the **Enter** softkey.
- ↳ The name is changed.

7.15.4 Deleting a Test Sequence

1. Turn the **rotary switch** to a position other than **OFF**.
2. Press the **Menu** key.
3. Press the **Off/On** softkey to switch the calibration signal on/off.
4. Press the **scroll keys ▲▼** to select the desired test sequence.
5. Press the **Delete** softkey.
6. Confirm the security prompt.
- ↳ The sequences are displayed.

7.15.5 Specifying Value Storage for Test Sequences

There are various ways to perform value storage when executing a test sequence:

- **Automatic**
The value is saved by pressing the **STORE** key. The next sequence step is started automatically.
- **Manual**

The value is saved by pressing the **STORE** key.

The next sequence step is not started until the **OK** key is pressed.

1. Turn the **rotary switch** to a position other than **OFF**.
 2. Press the **Menu** key.
 3. Press the **General Setup** softkey.
 4. Press the **scroll keys** ▲▼ to select the **Sequence** menu.
 5. Press the **scroll key** ► to switch to the submenu.
 6. Press the **scroll keys** ▲▼ to select the **Measured value storage** parameter.
 7. Press the **OK** key.
 8. Press the **scroll keys** ▲▼ to select the desired setting.
 9. Press the **OK** key.
 10. Press the **ESC** key three times to return to measurement mode.
- ↳ The type of data storage has been specified.

7.15.6 Performing a Test Sequence

1. Turn the **rotary switch** to a position other than **OFF**.
2. Press the **Menu** key.
3. Press the **Off/On** softkey to switch the calibration signal on/off.
4. Press the **scroll keys** ▲▼ to select the desired test sequence.
5. Press the **Start** softkey.

General information concerning the sequence is displayed at first:

OK: Pressing the **OK** key saves the measured value, completes the current sequence step, and proceeds to the next step.

NOTE



If **Manual** is selected under **Menu > General setup > Sequence > Measured Value Storage**, the measured value is stored but the system does not automatically advance to the next measurement step. In this case, additionally press the **OK** key to start the next step (⇒ "**Specifying Value Storage for Test Sequences**" 70).

ESC: **ESC** cancels the current sequence. The values saved up to this point in time are stored under a name.

6. Press the red highlighted **Start** softkey.
 - ↳ Information about the pending measurement step is displayed: Sequence step x/x: Measuring function XY and measuring instructions, if applicable.
7. Confirm this information by pressing the **OK** softkey highlighted in green.
 - ↳ The active sequence is displayed by the **SEQ** symbol in the status bar.
 - ↳ The respective measuring function starts automatically.
8. Press the **OK** key to save the measured value.
 - ↳ Information about the pending measurement step is displayed: Sequence step x/x: Measuring function XY and measuring instructions, if applicable.

9. Confirm this information by pressing the **OK** softkey highlighted in green.

↳ The next measurement step starts.

If the last measurement step of the measuring sequence is ended by pressing the **OK** key, the first measurement steps or measuring functions are displayed and stored with a value, date, and time.

10. Press the **STORE** key to end the sequence.

↳ A corresponding message is displayed.

8 Interface Operation and Software

The device features a Bluetooth® interface and can connect to a PC, smartphone (Android™), or tablet (Android) via this interface.

The device can also be equipped with a USB interface using the optionally available USB power module. The USB interface not only supplies power to the device but also allows it to be connected to a PC.

The Bluetooth® and USB connections are independent of each other and can be used simultaneously.

8.1 Bluetooth®

NOTE



If previously paired Bluetooth® devices are nearby, unintended connections with these devices may occur.

- Before you establish a Bluetooth® connection, make sure there are no other previously paired devices nearby.

The receiving device must have Bluetooth® functionality or a connected Bluetooth® adapter that meets the following minimum technical requirements: Bluetooth 4.2 + EDR, class 2.

8.1.1 Activating / Deactivating the Interface

NOTE



Bluetooth® remains (de)activated even after the device has been switched on/off.

-
1. Press the **Menu** key.
 2. Press the **General Setup** softkey.
 3. Press the **scroll keys** ▲▼ to select the **Interface** menu.
 4. Press the **scroll key** ► to switch to the submenu.
 5. Press the **scroll keys** ▲▼ to select the **Bluetooth** parameter.
 6. Press the **OK** key.
 7. Press the **scroll keys** ▲▼ to select the desired setting.
 - ↳ Bluetooth® is (de)activated.
 8. Press the **ESC** key three times to return to measurement mode.

8.1.2 Configuring Interface Parameters

A PIN is provided to protect the Bluetooth® connection.

The PIN has to be entered at the remote terminal when you establish the connection.

Default PIN = 1234

NOTE



Use a custom device PIN to prevent third parties from accessing your devices and data.

1. Press the **Menu** key.
2. Press the **General Setup** softkey.
3. Press the **scroll keys** ▲▼ to select the **Interface** menu.
4. Press the **scroll key** ► to switch to the submenu.
5. Press the **scroll keys** ▲▼ to select the **PIN** parameter.
6. Press the **OK** key.
7. Press the **scroll keys** ◀▶ to select the desired position within the parameter.
Press the **scroll keys** ▲▼ to change the value.
8. Press the **OK** key.
- ↳ The PIN has been changed.
9. Press the **ESC** key three times to return to measurement mode.

8.1.3 Establishing a Bluetooth® Connection

NOTE



If you have several devices, make sure that connection is established to the correct device! The device name helps with clear identification (⇒ "**Viewing Device Names**" 35).

Establish a connection to your PC using the method that is standard for your system.

Read the documentation included with the receiving device.

8.2 USB

System requirements: For safe operation when powered via the PC connection, a USB 3.0 or BCP (Battery Charging Port) connection is recommended.

For direct mains operation, a USB power pack with a minimum output current of 1.5 A is recommended.

TIP



System requirements:

For safe operation when powered via the PC connection, a USB 3.0 or BCP (Battery Charging Port) connection is recommended.

For direct mains operation, a USB power pack with a minimum output current of 1.5 A is recommended.

Optionally, the device can be connected to a PC via the USB power module (⇒ "**USB Power Module**" 31). The connection to a PC is indicated by a corresponding symbol (⇒ "**Display**" 16).

The following software can be used via the USB interface:

- MetraCal CM Utility

8.3 METRACAL CM Utility Software

The MetraCal CM Utility software is available only in English.

It includes the following features:

- Data Reader
 - Transfer and read measurement data from the device to the PC. The data values can then be saved as a CSV file.
- Sequence Manager
 - Create and manage test sequences
- Function Manager
 - Create functions for the calibration modes Interval, Ramp, and Table
 - Import and export functions
 - Reading from the device / writing to the device
- Remote Control
 - Remote control of the device
 - Taking screenshots of the display

For detailed information, please refer to the software's Help.

Download and Installation

Complete information concerning current software and firmware, as well as device updates and options, can be found in the myGMC portal. Please register for free. After that, you will have access to the downloads and will receive the latest information about your device.

<https://www.gossenmetrawatt.de/service-support/mygmc/>

9 Storage and Transport

ATTENTION

Improper storage

Damage to the product and measuring errors due to environmental influences.

- Store the device in a protected location and only within the limits of the specified permissible ambient conditions.

ATTENTION

Improper transport

Damage to the product and measuring errors.

- Transport the device only within the limits of the permissible ambient conditions.
 - For best possible protection, we recommend using the accessories which are available for the device (carrying case, cover, etc.). Refer to the data sheet of the device for further details.
-

10 Maintenance

This section includes information concerning the various maintenance procedures required for the test instrument. Depending on the type of measure required, you must perform it (or have it performed) on a regular basis (e.g., safety inspections and recalibration), or perform it (or have it performed) when necessary (e.g., fuse replacement).

10.1 Cleaning



DANGER

Danger to life due to electric shock!

The device and its accessories are operated with electricity, thus resulting in a general risk of electric shock. This can be fatal or cause serious injuries.

- The device, the accessories, and all connected conductors must be voltage-free before and during cleaning. Switch the device off and disconnect it from the power supply.
- Never immerse the device/accessories in water or other liquids.
- Never touch the device/accessories with wet hands.

ATTENTION

Unsuitable cleaning agents

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

- Clean the device by wiping it gently with a damp cloth.
- Avoid the use of cleansers, abrasives or solvents.

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

10.2 Calibration

Use of your device and the resulting stress affect the device and lead to deviations from the guaranteed accuracy. We recommend regularly checking the accuracy with a suitable (if necessary, certified) test instrument.

In the case of strict measuring accuracy requirements, as well as in the event of severe stressing (e.g., severe climatic or mechanical stress), we recommend a relatively short calibration interval of 1 year. If this is not the case, a calibration interval of 2 to 3 years is usually adequate.

Please contact GMC-I Service GmbH for calibration services, ⇨ **"Contact, Support, and Service"** 79.

NOTE



Date on calibration certificate / Calibration interval begins upon receipt

Your device is delivered with a calibration certificate that shows a date. This date may be further in the past if your device has been stored for some time prior to sale.

The devices are stored in accordance with the specified conditions. Drift is therefore negligible over a period of 1 year. Longer storage periods do not typically occur.

The performance of the device thus remains within specifications, and you can specify the first calibration interval as of the date of receipt.

Setting Calibration and Recalibration Dates

The calibration and recalibration dates are registered in the device. The dates of the last adjustment and calibration are set by the calibration center.

You can adjust the date and time of the next calibration (recalibration date) yourself.

Viewing the Dates of the Last Adjustment and Calibration

You can view the date and time of the last adjustment or calibration:

Menu > General setup > Info

Changing the (Re)Calibration Date via Data Interfaces

You can set or change the date and time of the next recalibration via a data interface (Bluetooth® or USB).

Data is transferred bidirectionally via a virtual COM port.

The required driver can be installed using the **Driver Control** software.

The software is available for download on our website.

www.gossenmetrawatt.com

After the data transfer, the device must be restarted for the changes to take effect.

Transfer parameters:

Description	Rotary Switch Position	Command	Response	Parameter	Example
Set: adjustment date	Not OFF	SET:TCAL <Date>	OK	Date:<ddmmyy>	SET:TCAL 130199
Set: date for next (future) recalibration	Not OFF	SET:TRECAL<-Date>	OK	Date:<ddmmyy>	SET:TRECAL 241222

10.3 Fuses

WARNING



Risk of electric shock and damage to the device if unauthorized modifications are made.

The device is equipped with internal, resettable electronic fuses that are an integral part of the device's hardware and are not accessible to the user.

- Do not operate the device with defective fuses.
- Have defective fuses replaced exclusively by an authorized repair service.
- Never bridge, tamper with, or disable fuses.

11 Repair

If your device requires repair, please contact our service department, ⇒ **"Contact, Support, and Service "**  **79**.

NOTE



Loss of warranty and guarantee entitlements

Unauthorized modification of the device is prohibited. This also includes opening the device. If it can be ascertained that the device 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 protective 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.
- The device may only be put back into service after troubleshooting, repair, and a final inspection of the calibration and dielectric strength at our factory or by one of our service centers.

NOTE



Data Protection

Data can be stored on the device. Data can be stored on the device, including personal and/or sensitive data.

Make a backup copy of your data before sending the device in for repair.

Please also note that the owner or end user is responsible for protecting personal data and, if applicable, other sensitive data on the device before handing it over.

12 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:	08:00 a.m. – 4:00 p.m.
	Friday:	08:00 a.m. – 2:00 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

You can also request training courses and seminars by e-mail and online:

training@gossenmetrawatt.com

<https://www.gossenmetrawatt.de/en/knowledge/webinars>



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

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

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



¹ DAkkS calibration laboratory per DIN EN ISO/IEC 17025.

Accredited by the Deutsche Akkreditierungsstelle GmbH under reference number D-K-15080-01-01.

13 Certifications

The device fulfills all requirements of applicable EU directives and national regulations. We confirm this with the CE mark.

13.1 CE Declaration

Gossen Metrawatt GmbH	Begleitende Formulare zum PEP EU-Konformitätserklärung / EU Declaration of Conformity	Form E0F34
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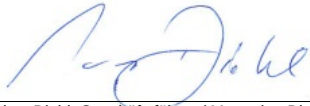
Hersteller / Manufacturer: Gossen Metrawatt GmbH
 Anschrift / Address: Südwestpark 15, 90449 Nürnberg
 Produktbezeichnung/ Prozesskalibrator und Multimeter
 Product Name: Process calibrator and multimeter
 Typ / Type: METRACAL CM PRO / TECH / XTRA
 Bestell-Nr / Order No: M275A / B / C / P / T / X
 Zubehör / Accessories: Z275K, Z270E, G , U , V

Der oben beschriebene Gegenstand der Erklärung* erfüllt die einschlägigen
 Harmonisierungsvorschriften der Union: / The object of the declaration** described above is in
 conformity with the relevant Union harmonisation legislation:

2014/53/EU	Funkanlagenrichtlinie	Radio Equipment Directive (RED)
EN/Norm/Standard: EN 301 489-1 V2.2.3 : 2019 , EN 301 489-17 V3.2.4 : 2020 , EN 300 328 V2.2.2 : 2019		
Anforderungen an die elektromagnetische Verträglichkeit gemäß 2014/30/EU (EMV Richtlinie) / Requirements for electromagnetic compatibility according to 2014/30/EU (EMC Directive)		
<u>EN/Norm/Standard:</u> EN IEC 61326-1 : 2021		

2011/65/EU	RoHS - Richtlinie	RoHS Directive
(EU) 2015/863	Delegierte Richtlinie	Delegate Directive
<u>EN/Norm/Standard:</u> EN IEC 63000 : 2018		

Nürnberg, 10.02.2026
 Ort, Datum / Place, Date:


 Dr. Markus Diehl, Geschäftsführer / Managing Director

*) Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt
 der Hersteller. Sie beinhaltet jedoch keine Zusicherung von Eigenschaften.
 Die Sicherheitshinweise der mitgelieferten Produktdokumentationen sind zu beachten.

**) This Declaration of Conformity is issued under the sole responsibility of the manufacturer
 but does not include a property assurance. The safety notes given in the product
 documentation which are part of the supply, must be observed.

Datei: 26-1-M275X-CE-Entwurf	Ausgabe: 15.01.2021	Erstellt: Eckl	Freigabe: Weiß
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This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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