DATA SHEET
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GOSSEN METRAWATT
GMC-INSTRUMENTS GROUP

METRACAL CM SERIES

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

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-K-15080-01-00

- Dual Mode for simultaneous simulation and measurement
- 4-, 3-, and 2-wire resistance and RTD measurement[1]
- Electrically isolated calibration and measuring units
- Precision measuring instrument: V_{DC}, mA, mA Loop, Ω, TC, RTD, Hz, CPM[2]/RPM[3]
- Precision temperature measurement/generator, °C and °F for RTD and TC sensors
- Separate thermocouple terminals
- Frequency generator: 0.1 Hz to 50 kHz
- Calibration signal generator in manual, interval, ramp, and table modes
- Direct current source and sink
- Data logger for measurement series and individual measurements thanks to integrated memory module and real-time clock
- Programmable sequences for test routines
- Four customizable memory locations (C1…C4) for frequently used settings
- Modular power supply with standard quick-change battery or mains module
- IP 52 protection
- Bluetooth® (standard) and USB port (optional mains module)
- Instrument upgrade via feature activations which can be enabled in the field (HART communication, graph, and expert sequence function)
- Instrument protection through resetting electronic overcurrent protection

1. RTD: resistance temperature detector
2. CPM: counts per minute (pulse counter)
3. RPM: Rounds per minute

APPLICATION

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 instruments 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, step, and table modes.

SCOPE OF DELIVERY AND PERFORMANCE FEATURES

Function / Accessory	Article Number	METRACAL CM PRO (M275P)	METRACAL CM TECH (M275T)	METRACAL CM XTRA (M275X)
Multimeter and process calibrator with rubber holster	M275A	✓		
	M275B		✓	
	M275C			✓
Measuring Functions				
V ⎓		✓	✓	✓
mA ⎓		✓	✓	✓
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 ⎓		✓	✓	✓
mA ⏚▷ (source)		✓	✓	✓
mA ◁⏚ (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		✓	✓	✓
Feature Activation				
HART communication (highway addressable remote transducer) for direct communication with sensors	Z275T	●	✓	✓
Graph Graphical visualization of current and stored measured values	Z275X	●	●	✓

Function / Accessory	Article Number	METRACAL CM PRO (M275P)	METRACAL CM TECH (M275T)	METRACAL CM XTRA (M275X)
Expert sequence function Feature activation from 1 test sequence with 10 test steps to 16 test sequences with up to 63 test steps each	Z270P	●	●	●
Condensed operating instructions* * Set of complete operating instructions available on the Internet for download from www.gossenmetrawatt.com		✓	✓	✓

✓ Scope of delivery ● Can be enabled

CALIBRATION UNIT

Rotary Switch Position	Function	METRACAL CM
V ⎓	V_{DC}	-90 mV … +20 V
mA	Current source	0 mA … 24 mA
mA	Current sink	0 mA … 24 mA
Ω	Resistance simulation	0 kΩ … 4 kΩ
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

MEASURING UNIT

Rotary Switch Position	Function	METRACAL CM
V ⎓	V_{DC} (R_i = 1 MΩ)	-100 mV … +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 kΩ
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

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 measuring transformer and the resulting output signal of the measuring transformer displayed.

DESCRIPTION OF FEATURES

Kelvin Connection for 4-Wire Measurement (4-W) (milliohm measurement)

4-wire measurement compensates for influences resulting from cable and contact resistances which must not be neglected when measuring very small resistances.

Automatic/Manual Measuring Range Selection

Measured quantities are selected with the rotary switch. The measuring range can be automatically matched to the measured value, or selected manually for quick, repetitive measurements.

Color Graphic Display

A high-resolution, transmissive 3½" TFT color graphic display with 320 × 480 dots is used for measured values and menu navigation. The display is easy to read from any angle, as well as under adverse lighting conditions (brightness can be adjusted automatically by a light sensor). Graphic representation permits user-friendly menu navigation including help texts.

Analog Bar Graph for Quick Trend Displays

The bar graph (with additional negative axis range for zero-frequency quantities) permits faster detection of measured value changes as compared with digital value displays.

Display Resolution

High resolution with up to 90,000 digits (with 90 mV measurement).

Automatic Storage of Measured Values

The DATA HOLD function automates the storage of measured values after they have settled in. A patented process assures that random values are not saved to memory in the case of rapidly changing measured quantities, but rather the actual measured value. The stored measured value is displayed as a digital value. The bar graph continuously indicates the momentary measured value.

Maximum Voltage

If the voltage exceeds 30 V, “OL” (overload) appears at the display and the instrument enters the self-protection mode.

Quick-Change Rechargeable Battery

The battery charge level is accurately indicated in the graphic display.

The instrument is switched off automatically if the measured value remains unchanged for a period of between 10 and 59 minutes (adjustable), if none of the controls are activated during this time and continuous operation is not enabled.

Protective Cover for Harsh Conditions

The instrument is protected against damage in the event of impacts or dropping by means of a soft rubber cover with tilt stand. The rubber material also ensures that the instrument does not wander if it is set up on a vibrating surface.

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.

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 start-up, 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

Pulse Generator – CPM

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

Pulse Counter – CPM/RPM

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

converted dynamically during the measurement via an adjustable divider factor (2 … 9999) into RPM (rounds per minute) and also displayed.

Data Interfaces

The instrument can be remote configured and momentary and saved measurement data can be read out via Bluetooth® or the USB port at the optional mains module.

Free METRACAL CM Utility software is required for PCs.

The interface protocol is available upon request.

Voluntary Manufacturer's Guarantee

36 months for materials and workmanship.[1]

1 year for calibration.

DAkkS calibration certificate

The multimeter is supplied with a DAkkS calibration certificate, which is also recognized internationally (EA, ILAC).

After the user-specified calibration interval has elapsed (recommended interval: 1 to 3 years), the multimeter can be recalibrated in our own DAkkS calibration laboratory.

Calibration Signal 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.

Calibration Signal 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.

Calibration Signal 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.

TECHNICAL DATA

Power Supply	**Battery pack**[a]	3.7 V, 4000 mAh, LiPo (approx. 25% self-discharging per year)
	Operating time	Approximately 10 to 20 hours (depending on measurement and calibration functions, see operating time table)
	Battery charge indicator	Charge level indicated by battery symbol – display of momentary charge level as percentage via menu function
	Auto OFF function	The instrument is switched 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 disabled
	Mains module	For continuous operation with USB-PB power pack with at least 1.5 A output current
Ambient Conditions	Accuracy range:	0 °C … +40 °C
	Operating/storage temperatures with battery pack:	-10 °C … +50 °C -20 °C … +50 °C (with rubber holster)
	Storage temperatures without battery pack:	-25 °C … +60 °C
	Relative atmospheric humidity:	40 … 75%, no condensation allowed
	Elevation:	Max. 2000 m
	Place of use:	Indoors; outdoors: except within specified ambient conditions

1. Detailed information and conditions can be viewed at https://www.gossenmetrawatt.de/en/about-us/company/general-terms-and-conditions-of-gossen-metrawatt-gmbh/

Electrical Safety	Measuring category:	None
	Pollution degree:	2
	Protection class:	III
	Maximum voltage:	30 V
	Maximum current:	30 mA
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.
Mechanical Design	Housing:	Impact resistant plastic (ABS)
	Dimensions (W × H × D):	Approx. 235 × 105 × 56 mm (without rubber holster)
	Weight:	Approx. 0.7 kg (with battery pack)
	Protection:	Housing: IP52 (pressure equalization via the housing) per EN 60529 / IEC 60529 (protection against ingress of solid foreign objects: protection against dust deposits on the inside; protection against water ingress: protection against water droplets falling at any angle up to 15° from the vertical)
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.	
	Background illumination:	Activated background illumination 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
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 plus pole 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
Data Interfaces	Wireless Bluetooth© 4.2 interface:	Frequency range: 2402 … 2480 GHz Transmission power: Class 2 (2.5 mW) Functions: – Query measuring functions and parameters – Query momentary measurement data
Internal Memory	Memory capacity:	64 MBit for approx. 300,000 measured values with indication of date and time
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
Overcurrent protection	Electronic current limiter with automatic reset after overcurrent	

a Rechargeable battery packs can only be recharged externally.

Operating time[1]

Measuring Function	Approx. Operating Time [h]	
	Bluetooth® ON	Bluetooth® OFF
V_{DC} ⎓	14.5	15.5
mA ⎓	15.5	16.5
mA Loop	14.5	15.5
Ω	15.5	15.5
Temp. TC	14.5	15.5
Temp. RTD	14.5	16.5
Hz	15.5	15.5
CPM	15.5	17.5
DUAL	10.5	11.5

Calibration Function	Approx. Operating Time [h]	
	Bluetooth® ON	Bluetooth® OFF
V_{DC} ⎓	16.5	18.5
mA (source)	12.5	13.5
mA (sink)	12.5	13.5
Ω	16.5	18.5
Temp. TC	17.5	18.5
Temp. RTD	17.5	18.5
Hz	15.5	16.5
CPM	15.5	17.5

APPLICABLE REGULATIONS AND STANDARDS

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 mains 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 configurations, operational conditions, and performance criteria for sensitive test and measurement equipment for applications without EMC protection measures
EN 60529 IEC 60529	Test devices and test procedures Degrees of protection provided by enclosures (IP code)
EN IEC 60751	Industrial platinum resistance thermometers and platinum temperature sensors
IEC 60584-1	Thermocouples - Part 1: EMF specifications and tolerances
DIN 43710	Measurement and control; electrical temperature sensors; reference tables type?U and type?L for thermocouples
GOST R 8.585	State system for ensuring the uniformity of measurements. Thermocouples. Nominal static characteristics of conversion
DIN 43760	Measurement and control; electrical temperature sensors; reference tables for nickel resistors for resistance thermometers

1. Calculated values with brightness level 4, actual values may vary

CHARACTERISTIC VALUES

ABBREVIATIONS

rdg.	of the measured value read
sv	of the set value
d	Digits

REFERENCE CONDITIONS

Temperature range:	+23 °C ± 5 °C Thermal stability: 0.005% of the full scale value /°C
Relative humidity:	40% ... 75%
Supply voltage:	3.9 V_{DC} … 4.6 V_{DC}

CALIBRATION UNIT

Direct Voltage Source – V ⎓

Range	Range	Resolution	Max. Load Current	Accuracy under Reference Conditions ±(…% sv +… 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

Direct Current Source – mA

Range	Range[a]	Resolution	Max. Resistance	Max. Voltage	Accuracy under Reference Conditions ±(…% sv +… d)
0-24 mA	0.000 mA … 24.000 mA	0.001 mA	1 kΩ	25 V	0.015 + 3
4-20 mA	4.000 mA … 20.000 mA				
4-24 mA	4.000 mA … 24.000 mA				

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

Direct Current Sink – mA

Range	Range[a]	Resolution	External Voltage	Accuracy under Reference Conditions ±(…% sv +… 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			

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

Resistance Source – Ω

Range	Range	Resolution	Measuring Current	Accuracy under Reference Conditions ±(…% sv +… 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	

Temperature Simulation, Thermocouple – Temp TC

Thermo-couple 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
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

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
	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

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				

Pulse Generator – CPM

Range	Range	Resolution	Output Voltage	Accuracy under Reference Conditions ±(…% sv +… d)
3000 CPM	6.0 CPM … 3000.0 CPM	0.1 CPM	5 V Square wave voltage	0.05 + 3

MEASURING UNIT

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

Direct Current Measurement – mA ⎓

Range	Measuring Range	Resolution	Input Impedance	Accuracy under Reference Conditions ±(… % rdg. +… d)
25 mA	-26.000 mA … 26.000 mA	0.001 mA	~20 Ω	0.01 + 3

Direct Current Measurement – mA Loop

Range	Measuring Range	Resolution	Max. Load Current	Accuracy under Reference Conditions ±(… % rdg. +… 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.

Resistance Measurement – Ω

Range	Measuring Range	Resolution	Measuring Current	Accuracy under Reference Conditions, 2- and 3-Wire Connection[a] ±(… % rdg. +… d)	Accuracy under Reference Conditions, 4-Wire Connection ±(… % rdg. +… 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 kΩ	0.0000 kΩ … 4.1000 kΩ	0.1 Ω	0.05 mA … 0.4 mA		

a Zero offsetting executed in advance.

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
	-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

Thermocouple Type	Temperature Range	Resolution	Accuracy cold junction compensation ON	Accuracy cold junction compensation OFF
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

Temperature Display, Resistance Thermometer – Temp RTD

RTD type	Temperature Range	Measuring Current	Resolution	Accuracy, 2- and 3-Wire Connection[a] [°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
	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

a For a 2-wire connection, the lead resistance (Rleads) must be entered or measured beforehand.

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

Frequency Measurement – Hz

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

Pulse Counter – CPM

Range	Measuring Range	Resolution	Measuring Voltage	Accuracy under Reference Conditions ±(… % rdg. +… d)
3000 CPM	60.0 CPM … 3100.0 CPM	0.1 CPM	up to 5 V	0.05 + 3

Internal impedance 100 kΩ

DUAL MODE

Simultaneous Measuring/Calibration Functions

Measuring Function	Calibration Signal V ⎓	mA (source)	mA (sink)	Hz	CPM Pulse counter	Ω	RTD	TC
V_{DC}	■	■	■	■	■	■	■	■
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.

ORDER INFORMATION

INSTRUMENTS

Type[a]	Description	Article Number
METRACAL CM PRO	Multimeter and process calibrator for measuring and simulating electrical quantities	M275P
METRACAL CM TECH	Multimeter and process calibrator for measuring and simulating electrical quantities with HART communication	M275T
METRACAL CM XTRA	Multimeter and process calibrator for measuring and simulating electrical quantities with HART communication and graph feature activation	M275X

a The instruments can be upgraded at any time with feature activations (See “Scope of Delivery and Performance Features” on page 2).

ACCESSORIES

Type	Description	Article Number
KS25-4 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
M27x USB+Power module	Mains supply module with USB port for METRAHIT TECH, XTRA, E-DRIVE, and METRACAL CM	Z270E
M27x rechargeable lithium-polymer battery, 14.8 Wh	M27x rechargeable lithium-polymer battery, 14.8 Wh, for METRAHIT TECH, XTRA, E-DRIVE, and METRACAL CM	Z270G
HC 40 hard case, black	Black hard case with foam insert and compartments for 1 METRAHIT IM or 1 METRACAL CM, 2 rechargeable batteries and power pack plus 2 universal compartments for accessories	Z270K
HART function	Feature activation for METRACAL CM: HART report	Z275T
Graph function	Feature activation for METRACAL CM: Graph	Z275X
USB PD power pack, 65 W, EU/UK/US/Asia	USB Power Delivery plug-in power supply, 1 ea. USB-C, 1 ea. USB-A, 65 W with interchangeable power plug for EU, UK, US, Asia	Z270U
Micro USB cable	USB cable with USB-A and USB-B connectors, 1 m long for charging the Z270G battery	Z270V
Expert sequence function	Feature activation to 16 test sequences with up to 63 test steps each	Z270P

Further information is available:

- Our Measuring Instruments and Testers catalog
- On the Internet at www.gossenmetrawatt.com

GOSSEN METRAWATT
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