

METRACAL CM SERIES

METRACAL CM PRO (M275P) / METRACAL CM TECH (M275T) / METRACAL CM XTRA (M275X)
MULTIMETER AND PROCESS CALIBRATOR FOR MEASUREMENT AND SIMULATION OF ELECTRICAL QUANTITIES



- Dual mode for simultaneous simulation and measurement
 - 4-, 3- and 2-wire resistance and RTD measurement¹
 - Galvanically isolated calibration and measurement unit
 - Precision instrument: VDC, mA, mA loop, &, TC, RTD, Hz, CPM2/RPM3
 - Precision temperature measurement/generator °C and °F for RTD and TC sensors
 - Separate thermocouple connections
 - Frequency generator: 0.1 Hz to 50 kHz
 - Calibration signal generator in Manual / Interval / Ramp and Table modes
 - DC source and sink
 - Data logger for series and single measurements, thanks to integrated memory module and real-time clock
 - Programmable sequences for test routines
 - Four individually adjustable memory slots (C1&C4) for frequently used settings
 - Modular power supply with standard quick-swap battery or mains module
 - Protection IP52
 - Bluetooth® (standard) and USB interface (optional network module)
 - Device upgrade through unlockable feature extensions in the field (HART communication, Graph and Sequence function Expert)
 - Device protection by self-resetting electronic overcurrent protection
1. RTD: Resistance Temperature Detector (Resistance thermometer)
2. CPM: Counts per minute (pulse counter)
3. RPM: Revolutions per minute (revolutions per minute)

APPLICATION

The METRACAL CM series devices are portable multi-function process calibrators that calibrate signals simultaneously. They can generate, measure, store and transmit signals. The dual mode can be used for many function combinations to calibrate different 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.

The calibration signals can be generated as a constant signal or as various curves in the Interval, Step and Table modes.

SCOPE OF PERFORMANCE AND DELIVERY

Function / Accessories	Item number	METRACAL CM PRO (M275P)	METRACAL CM TECH (M275T)	METRACAL CM XTRA (M275X)
Multimeter and process calibrator with rubber protective-cover	M275A M275B M275C			
Measurement functions				
V $\overline{\text{---}}$				
mA $\overline{\text{---}}$				
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 $\overline{\text{---}}$				
mA (Source)				
mA (Sink)				
Ω				
TempTC (°C/°F)				
TempRTD (°C/°F)				
Hz (frequency generator)				
CPM (pulse generator)				
C1...C4 Four individually configurable memory slots for frequently used settings				
Cable set KS25-4 Cable set for process calibrators 4 measurement cables (black, red, blue, yellow), 100 cm each long with stackable 4 mm plugs and 4 mini-alligator clips (black, red, blue, yellow)	Z275K			
Accumulator module	Z270G			
USB PD power supply	Z270U			
Micro USB cable	Z270V			
Hard-shell case HC 40 black	Z270K			
DAkkS calibration certificate				
3 years warranty				
Function extensions				
HART communication (Highway Addressable Remote Transducer) for direct communication with sensors	Z275T			
Graph Graphic visualization of current as well as stored measurement values	Z275X			
Sequence function Expert Function extension to 16 test sequences with each up to 63 test steps	Z270P			

Function / Accessories	Article number	METRACAL CM PRO (M275P)	METRACAL CM TECH (M275T)	METRACAL CM XTRA (M275X)
Quick operating manual* *Detailed operating manuals available in the Internet for download at www.gossenmetrawatt.com				

Scope of delivery ● unlockable

CALIBRATION PART

Rotary switch position	Function	METRACAL CM
V $\equiv$	VDC	-90 mV ... +20 V
mA $\rightarrow$	Current source	0 mA ... 24 mA
mA $\leftarrow$	Current sink	0 mA ... 24 mA
Ω	Resistance simulation	0 k Ω ... 4 k Ω
TempTC	TC (Thermocouple)	K, L, N, R, S, T, U, XK, A, B, BP, C, E, J
TempRTD	RTD (Resistance Temperature Detector)	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 $\equiv$	VDC (R _i = 1 M Ω)	-100 mV ... +31 V
mA $\equiv$	Current measurement	-26 mA ... +26 mA
mA loop	Loop current measurement (24 VDC)	-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 Temperature Detector)	Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni1000
Hz	Frequency measurement	1 Hz ... 51 kHz
CPM	Pulse/RPM counter	60 CPM ... 3100 CPM

DUAL MODE

The dual mode enables simultaneous operation of the calibration and measurement parts. For example, a signal can be fed to the input of a signal conditioner and the resulting output signal of the signal conditioner displayed.

FEATURE DESCRIPTION

Kelvin connection for four-wire measurement (4-wire) milliohm measurement

With the 4-wire measurement, the non-negligible influences of lead and contact resistance during the measurement of very small resistances are compensated.

Automatic/manual measurement range selection

The measurements are selected with the rotary switch. The measurement range is automatically adjusted to the measured value or manually set for repeated fast measurements.

Color graphic display

The display of the measured values and the menu guidance is provided via a high-resolution transmissive 3.5" TFT color graphic display with 320 × 480 dots. The display is readable from all viewing angles and also under difficult lighting conditions (brightness can be automatically controlled by a light sensor). Thanks to the graphical representation, a user-friendly menu guidance with further help texts is provided.

Analog bar graph for quick trend indication

The bar graph (for equal values, additionally with a negative axis offset) enables quicker detection of measurement value changes compared to the digital readout.

Display resolution

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

Automatic measurement value storage

The DATA HOLD function automates capturing the stabilized measurement value. After a patented procedure, it is ensured that during rapid changes no random value, but the actual measurement value is stored. The stored measurement value is shown as a digital value. The bar graph continuously displays the current measurement value.

Maximum voltage

If a voltage of 30 V is exceeded, the device displays 'OL' (Overload) and enters the self-protection mode.

Rapid-swap battery

The battery charge status is displayed precisely on the graphical display.

The device automatically powers off if the measurement value remains unchanged between 10 and 59 minutes (adjustable) during which no control has been operated and continuous operation is not activated.

Protective case for rugged operation

A soft rubber case with a stand-up handle protects the device from damage due to impact or drop. The gum-mimaterial ensures stability even on vibrating surfaces.

mA Loop

With the Loop Current measurement function, the calibrator directly feeds the circuit of a 2-wire transmitter with a stable DC supply. This allows a sensor to operate without external power and have its output signal measured or simulated simultaneously. This simplifies mobile field tests and reduces the need for additional equipment.

HART communication

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

With the HART communication function, the process calibrator can read, process, and configure digital signals from HART-enabled field devices, in addition to the analog 4 mA ... 20 mA signal. This allows parameters such as measurement range, attenuation, or TAG names to be set directly on the calibrator. It facilitates commissioning, 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

For simulating a pulse output with 5 V high level and 0 V low level.

Pulse counter – CPM/RPM

For measurements on pulse outputs that switch between high and low impedance and must be externally powered with a measurement voltage.

For measurements on speed sensors with more than one pulse per revolution, the measured CPM (Counts per Minute / Pulses per Minute) can dynamically, during measurement, be converted to RPM (Rounds per Minute / Revolutions per Minute) via an adjustable divider factor (2 ... 9999) and displayed additionally.

Data interfaces

Via Bluetooth® or the USB interface of the optional power module, the device can be remotely configured and the current or stored measurement data can be read out.

For PCs, the free METRACAL CM Utility software is required.

Interface protocol on request.

Voluntary manufacturer warranty

36 months for material and manufacturing defects.¹

1 year for calibration.

DAkkS calibration certificate

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

After the expiration of the self-determined calibration interval (recommended 1 to 3 years), the multimeter can be recalibrated in our DAkkS calibration laboratory.

Calibration signal interval

In this mode, calibration values are continuously output in steps between a start and end value. The next step can be automatic (time per step: 1 sec. ... 60 min) or triggered manually.

Calibration signal ramp

In this mode, calibration values are output continuously between a start and end value.

Ramp duration for rising and falling ramps as well as dwell time at minimum and maximum values are adjustable (1 sec. ... 60 min).

Calibration signal table

In this mode, any calibration values with any duration are output. The next step can be automatic (time per step: 1 sec. ... 60 min) or triggered manually.

The calibration signal can be defined by a table of up to 100 rows.

TECHNICAL DATA

Power supply	Battery module	3.7 V 4000 mAh LiPo (approx. 25% self-discharge per year)
	Operating time	approx. 10 ... 20 hours (depending on measurement and calibration functions, see table operating time)
	Battery monitoring	Display of charge status via battery symbol. Display of the current, exact state of charge in % via menu function
	Auto-OFF function	The device automatically shuts down: ■ when the battery voltage drops below approx. 3.6 V ■ when no button or rotary knob has been pressed for an adjustable period (10 & 59 min) and the Auto-OFF function is not disabled. and the Auto-OFF function is not disabled.
	Power module	For continuous operation with USB-PD power supply with at least 1.5 A output current
Ambient-conditions	Accuracy range: 0 °C ... +40 °C	
	Operating temperatures/	–10 °C ... +50 °C
	Storage temperatures with	–20 °C ... +50 °C (with rubber protective cover)
	Battery module:	
	Storage temperatures without battery module:	–25 °C ... +60 °C
	Relative humidity: 40 ... 75 %, dew condensation must be excluded	
	Altitude above sea level: max. 2000 m	
	Location of use:	inside buildings; outside: only within the specified environmental conditions

¹ Detailed information and conditions at

<https://www.gossenmetrawatt.de/ueber-uns/unternehmen/allgemeine-geschaeftsbedingungen-der-gossen-metrawatt-gm>

Electrical safety	Measurement category:	without
	Pollution degree: 2	
	Protection class:	III
	Maximum voltage:	30 V
Electromagnetic compatibility (EMC)	Maximum current:	30 mA
	Emissions of interference:	EN 61326-1 Class B
	Immunity to interference:	EN 61326-1 / IEC 61326-1
		During an electromagnetic disturbance, a short-term measurement-error of up to 10% may occur and the specified operating quality may be impaired.
Mechanical design	Housing:	Impact-resistant plastic (ABS)
	Dimensions (W × H × D):	approx. 235 × 105 × 56 mm (without rubber protective cover)
	Weight:	approx. 0,7 kg (with battery module)
	Protection rating:	Housing IP52 (pressure equalization via housing) according to EN 60529 / IEC 60529 (Protection against ingress of solid foreign objects: protection against dust ingress—build-up inside; Protection against ingress of water: protection against water falling at an angle—water droplets from any angle up to 15° from the vertical)
Display	TFT color graphic display (74 mm × 49 mm) with analog and digital display and with indication of measurement unit, type of current and various special functions.	
	Backlight-	The activated backlight is via a light sensor adjustable.
	analog bargraph (bargraph)	Scaling: linear Polarity indicator: with automatic switching
		Measurement rate: 40 measurements/s and display refresh
Digital measured value-show	Resolution/Digit height:	320 × 480 dots, 12 mm
	Digits:	dependent on parameter setting
	Overflow indicator:	„OL“ is shown when the measurement range overflows
	Polarity indicator:	“-“ sign is shown when the positive pole is connected to “□”
	Measurement rate	10 measurements/s and 40 measurements/s with MIN/MAX function excluded measured functions frequency and CPM
	Display refresh:	2 ×/s, every 500 ms
Data interfaces	Radio interface Bluetooth® 4.2:	Frequency range: 2.402 ... 2.480 GHz Transmit power: max. 91 mW Functions: - Querying of measurement functions and parameters - Querying current measurement data
Internal memory	Memory size:	64 Mbit for approx. 300,000 measurements with date and time stamp
Internal clock	Time format:	DD.MM.YYYY hh:mm:ss
	Resolution:	0.1 s (timestamp of measurements)
	Accuracy:	±1 min/month
	Temperature drift	50 ppm/K
Overcurrent protection	Electronic current limiter with automatic reset after overcurrent	

a battery modules must be charged externally.

Operating duration¹

Measurement function	Operating duration approx. [h]	
	Bluetooth® ON	Bluetooth® OFF
VDC	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	Operating duration approx. [h]	
	Bluetooth® ON	Bluetooth® OFF
VDC	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

APPLIED REGULATIONS AND STANDARDS

EN 61010-1 IEC 61010-1	Safety requirements for electrical measuring, control, regulating and laboratory equipment – Part 1: General requirements
EN 61010-1 IEC 61010-1	Safety requirements for electrical measuring, control, regulating and laboratory equipment – Part 2-033: Particular requirements for hand-held multimeters and other hand-held measuring instruments for household and professional use, suitable for measuring mains voltages
EN 61326-1 IEC 61326-1	Electrical measuring, control, regulating and laboratory equipment – EMC requirements – Part 1: General requirements
EN 61326-2-1 IEC 61326-2-1	Electrical measuring, control, regulating and laboratory equipment – EMC requirements – Part 2-1: Particular requirements – Test arrangements, operating conditions and performance specifications for sensitive test and measuring equipment for applications without EMC protection measures
EN 60529 IEC 60529	Test equipment and testing procedures Ingress protection by enclosure (IP code)
EN IEC 60751 IEC 60584-1	Industrial platinum resistance thermometers and platinum temperature sensors Thermocouples - Part 1: Electromotive force and tolerance limits
DIN 43710	Measurement, control, regulation; electrical measuring sensors; basic values of thermoelectric voltages for thermocouples, type U and type L
GOST R 8.585	State system for ensuring the uniformity of measurements. Thermocouples. Nominal static characteristics of conversion
DIN 43760	Measurement, control, regulation; electrical temperature sensors; basic values of nickel resistance values for resistance thermometers

¹ 1. Calculated values at brightness level 4; actual values may vary

TECHNICAL SPECIFICATIONS

ABBREVIATIONS

v. Reading (from measured value)
v. S. (from set value) from the set value
D Digits

REFERENCE CONDITIONS

Temperature range: +23 °C ± 5 °C
Thermal stability: 0.005% of the range end value /°C
Relative humidity: 40% ... 75%
Supply voltage: 3.9 VDC ... 4.6 VDC

CALIBRATION PART

DC voltage source – V 

Range	Range	Resolution	Max. load current	Accuracy under reference conditions ±(... % v. S. +... 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

DC source – mA 

Range	Field range	Resolution	Max. resistance- state	Max. span- ning	Accuracy under reference- conditions ±(... % of full scale +... 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 adapt the 'percent keys' to the measurement range of the test object

DC sink – mA 

Range	Field range	Resolution	External voltage	Accuracy under reference- conditions ±(... % of full scale +... 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 adapt the “percent keys” to the measurement range of the test object

Resistance source – Ω

Range	Range	Resolution	Measuring current	Accuracy under reference-conditions ±(... % of full scale + ... 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 thermoelement – Temp TC

Thermoelementtype	Temperature range	Resolution	Accuracy	
			Reference junction compensation ON	Reference 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-	Accuracy under reference-
				ness	current	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 ±(... % of E. +... D)
3000 RPM	6.0 RPM ... 3,000.0 RPM	0.1 RPM	5 V Rectangular voltage	0.05 + 3

MEASUREMENT UNIT

DC voltage measurement – V ===

Range	Measuring range	Resolution	Input impedance-	Accuracy under reference-
			danz	conditions ±(... % of MW. +... 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	Measurement range	Resolution	Input impedance-danz	Accuracy under reference-conditions ±(... % of MW. +... D)
25 mA	-26,000 mA ... 26,000 mA	0.001 mA	~20 Ω	0.01 + 3

Direct current measurement – mA Loop

Range	Measurement range	Resolution	Max. load current	Accuracy under reference-conditions ±(... % of MW. +... D)
25 mA	-26,000 mA ... 26,000 mA	0.001 mA	26 mA	0.01 + 3

In this measurement, an output between the LLoop and the socket +24V LOOP a DC voltage of 24 V (no-load-socket voltage 22 V ... 24 V) is provided.

Resistance measurement – Ω

Range	Measurement range	Resolution	Measuring current	Accuracy under Reference conditions 2- and 3-wire connections ±(... % v. MW. +... D)	Accuracy under Reference conditions 4- Wire connection ±(... % v. MW. +... 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-point correction performed previously.

Temperature display Thermocouple – Temp TC

Thermoelement-menttype	Temperature range	Resolution	Accuracy Reference junction-compensation ON	Accuracy Reference junction-compensation OFF
K	-270.0 °C ... -200.0 °C	0.1 °C	undefined	undefined
	-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	-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

Thermoelementtype	Temperature range	Resolution	Accuracy Comparison points- compensation ON	Accuracy Comparison points- compensation OFF
R	-50.0 °C ... -20.0 °C	0.1 °C	undefined	undefined
	-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	undefined	undefined
	-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	undefined	undefined
	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 2-wire connection, the lead resistance (R_{leads}) must first be entered or measured.

Internal temperature measurement at the TC connection (internal reference junction)

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 (Sine-wave signal)	Accuracy under Reference conditions ±(... % of MV. +... 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	Measurement range	Resolution	Measurement voltage	Accuracy under reference- conditions ±(... % of MW. +... 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 measurement/calibration functions

Measurement 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-conductor								
RTD								
RTD 3-wire								
RTD 4-wire								

Calibration and measurement part are galvanically isolated.

The TC jacks are not galvanically isolated from the calibration part.

The voltage between the ground terminals of the measurement and calibration parts must not exceed 50 V.

ORDER DETAILS

DEVICES

Type	Description	Item number
METRACAL CM PRO	Multimeter and Process Calibrator for measurement and simulation of electrical sizes	M275P
METRACAL CM TECH	Multimeter and Process Calibrator for measurement and simulation of electrical sizes with HART communication	M275T
METRACAL CM XTRA	Multimeter and Process Calibrator for measurement and simulation of electrical sizes with HART communication and function expansion Graph	M275X

an upgrade of the devices at any time via function expansions is possible (See "Performance and scope of delivery" on page 2).

ACCESSORIES

Type	Description	Item number
KS25-4 Cable set for process controllers	4 test cables (black, red, blue, yellow), each 100 cm long with stackable 4 mm plugs and 4 mini crocodile clips (black, red, blue, yellow)	Z275K
USB+Power Module M27x	Power supply module with USB interface for METRAHIT TECH, XTRA, E-DRIVE, METRACAL CM	Z270E
Lithium-Polymer Battery M27x 14.8 Wh	Lithium-Polymer Battery M27x 14.8 Wh for METRAHIT TECH, XTRA, E-DRIVE, METRACAL CM	Z270G
Hardshell case HC 40 Black	Hardshell case black with foam insert and cutouts for 1 METRAHIT IM or 1 METRACAL CM, 2 batteries and charger as well as 2 Universal compartments for accessories	Z270K
Function HART	Function extension for METRACAL CM: HART protocol	Z275T
Function Graph	Function extension for METRACAL CM: Graph	Z275X
USB PD power supply 65 W EU/UK/US/Asia	AC adapter USB Power Delivery 1×USB-C, 1×USB-A, 65 W with interchangeable primary connection for EU, UK, US, Asia	Z270U
Micro USB Cable	USB cable with USB-A and USB-B connectors, 1 m long, for charging of Battery Z270G	Z270V
Sequence function Expert	Function extension to 16 test sequences with up to 63 test steps each	Z270P

Further information can be found at:

- in the catalog for measurement and testing technology
- on the internet at www.gossenmetrawatt.com



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