GOSSEN METRAWATT

METRAport | 40S
Digital Multimeter

3-349-410-03
3/5.09

- Precision multimeter (V, A, Ω, F, Hz, %, °C/°F), resolution: 10 µV, 10 nA, 10 mΩ 4¾-place
- TRMS measurement for V AC and I AC to 10 kHz
- DC measurement of 10 nA to 10 A via a single socket and a resetable fuse (**auto-fuse**), overload and blown fuse indicators
- Current measurement with clip-on current sensors: The transformation ratio is adjustable from 1 mV:1 mA to 1 mV:1 A, and is accounted for by the display.
- Temperature measurement with automatic Pt sensor recognition
- Temperature measurement with type K thermocouple
- Capacitance and diode measurement
- Frequency measurement via V AC or I AC to 10 kHz
- Frequency and keying ratio measurement at 2 to 5 V signals up to 1 MHz
- RPM Measurement with Inductive Sensor (accessory)
- Automatic and manual measuring range selection
- Large backlit digital display with additional analog scale
- Measured value storage and min./max. recording
- DKD certificate and 3 year guarantee

Applications

METRAport | 40S digital multimeters are very well suited for universal use in general electrical engineering, electronics applications and for automotive service. Ideal reading angle adjustment is made possible by the tilt stand, and when suspended from the neck strap both hands are free for performing measurements. The instrument is switched off automatically when folded closed, and the display and the control panel are protected against damage.

Features

RMS Value with Distorted Waveshape

The utilized measuring method allows for waveshape independent TRMS AC measurement for voltage and current at up to 10 kHz.

Automatic / Manual Measuring Range Selection

Measured quantities are selected with the rotary switch. The measuring range is automatically matched to the measured values. The measuring range can be selected manually as well with the help of the AUTO/MAN key. Direct current measurement in all ranges via a single socket: measurement cable does not have to be replugged. Clip-on current measurement is performed via a separate socket.

Automatic Storage of Measured Values

The DATA function allows for storage of the digitally displayed measured value. A special 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 appears at the digital display. The analog display continues to read out the current measured value.

Storage of Min-Max Values

In addition to displaying the current measured value, the minimum or maximum value can be continuously refreshed and saved to memory.

Continuity and Diode Testing, I_k = 1 mA

This function can be used to test the polarity of diodes, and to test electrical circuits for short-circuits and interruptions. The test voltage source makes it possible to measure LEDs and reference diodes with up to 5.1 V. In addition to the display, an acoustic signal is generated during continuity testing of resistors within a range of 0 to 2 Ω.

Keying Ratio Measurement – Measurement of 5 V Square-Wave Signals

This function makes it possible to test circuits and transmission cables by measuring the frequency and the keying ratio of pulses with amplitudes of 2 to 5 V and frequencies of 100 Hz to 10 kHz.

Battery Charging Status – Power Saving Circuit

The battery charging status is indicated by means of a symbol with four different levels. The device is switched off automatically if the measured value remains unchanged for a period of 10 minutes, and if none of the controls are activated during this time. Automatic shutdown can be deactivated by switching the instrument to continuous operation.

Auto-Fuse and Fuse Detection for all Current Ranges

User-friendly thanks to resetable auto-fuses. Fuse detection: The FUSE message is displayed in order to indicate that the auto-fuse has blown. The fuse interrupts the current measuring ranges only. All other ranges remain functional.

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Technical Data

Meas. Function	Measuring Range	Resolution at Upper Range Limit 30 000	Resolution at Upper Range Limit 3 000	Input Impedance ⎓	Input Impedance ~
µV DC	30 mV		10 µV	50 kΩ	—
V	300 mV	10 µV		> 11 MΩ	11 MΩ // < 50 pF
	3 V	100 µV		11 MΩ	11 MΩ // < 50 pF
	30 V	1 mV		10 MΩ	10 MΩ // < 50 pF
	300 V	10 mV		10 MΩ	10 MΩ // < 50 pF
	600 V [4]	100 mV		10 MΩ	10 MΩ // < 50 pF
				Approx. voltage drop at MRU	
A	300 µA	10 nA		160 mV	
	3 mA	100 nA		160 mV	
	30 mA	1 µA		180 mV	
	300 mA	10 µA		250 mV	
	3 A	100 µA		360 mV	
	10 A	1 mA		920 mV	
				Open-circuit voltage	Measuring current at MRU
Ω	30 Ω		10 mΩ	1.3 V	max. 250 µA
	300 Ω	10 mΩ		1.3 V	Max. 250 µA
	3 kΩ	100 mΩ		1.3 V	Max. 150 µA
	30 kΩ	1 Ω		1.3 V	Max. 30 µA
	300 kΩ	10 Ω		1.3 V	Max. 3 µA
	3 MΩ	100 Ω		1.3 V	Max. 0.36 µA
	30 MΩ	1 kΩ		1.3 V	Max. 0.1 µA
🔊	300 Ω	0.1 Ω [3]		Max. 8.4 V	Ik = 1 mA
⏩	5.1 V [1]	1 mV		Max. 8.4 V	Ik = 1 mA

		40S		Discharge resistance	$U_{0\,max}$
F	30 nF		10 pF	10 MΩ	0.7 V
	300 nF		100 pF	1 MΩ	0.7 V
	3 µF		1 nF	100 kΩ	0.7 V
	30 µF		10 nF	11 kΩ	0.7 V
	300 µF		100 nF	3 kΩ	0.7 V
		40S		f_{min} [2]	Power limit
Hz [5]	300.00 Hz	0.01 Hz		1 Hz	3 x 10^6 V x Hz
	3.0000 kHz	0.1 Hz		1 Hz	
	30.000 kHz	1 Hz		1 Hz	
	300.00 kHz	10 Hz		1 Hz	
	1000.0 kHz	100 Hz		1 Hz	
%	15...300 Hz: 2.0 ... 98.0%	0.1 Hz		1 Hz	3 x 10^6 V x Hz
	... 3 kHz: 5.0 ... 95.0%	0.1 Hz		1 Hz	
	... 10 kHz: 10.0 ... 90.0%	0.1 Hz		1 Hz	
		Revolutions per Pulse			
Upm1	60 ... 30 000	1			
Upm2	60 ... 30 000	2			
°C/°F	– 200.0 ... +850.0 °C	**Pt100**	0.1 °C		
	– 150.0 ... +850.0 °C	**Pt1000**	0.1 °C		
	– 250.0 ... +1372.0 °C	**K NiCr-Ni**	0.1 °C		

[1] To max. 5.1 V diode voltage, above which overload display appears: "OL".
[2] Lowest measurable frequency for sinusoidal measuring signals symmetrical to the zero point
[3] Resolution with an upper range limit of 3000
[4] Corresponds to 600 V CAT I
[5] Input sensitivity, signal/sine: Hz (V): 10 to 100% MR except for mV: as of 30% MR; H (I): 20 to 100% MR except for 3 A: as of 30% MR; Hz (clip): as of 30% MR

Key: d = digit(s), rdg. = reading (measured value), MR = measuring range MRU = upper range limit

Meas. Range	Intrinsic Uncertainty for Max. Resolution under Reference Conditions ±(...% rdg. + ... d) ⎓ [6]	Intrinsic Uncertainty for Max. Resolution under Reference Conditions ±(...% rdg.. + ... d) ~ [2] [6]	Overload Capacity [1] Value	Overload Capacity [1] Time
30 mV	1 + 5	1 + 5	300 V ⎓ (DC) ~ (AC) TRMS, sine	Continuous
300 mV	0.2 + 5 [4]	1 + 30		
3 V	0.2 + 3	0.5 + 30		
30 V	0.2 + 3	0.5 + 30		
300 V	0.2 + 3	0.5 + 30		
600 V	0.2 + 3	0.5 + 30	600 V CAT I	
	⎓ [6]	~ [2] [6]		
300 µA	0.5 + 5	1.5 + 30	0.36 A	Continuous
3 mA	0.5 + 5	1.5 + 30		
30 mA	0.5 + 5	1.5 + 30		
300 mA	0.5 + 5	1.5 + 30		
3 A	0.7 + 5	1.5 + 30	10 A [3]	
10 A	0.7 + 5	1.5 + 30		
30 Ω	1 + 5		300 V ⎓ (DC) ~ (AC) RMS Sine	Max. 10 s
300 Ω	0.2 + 5 [4]			
3 kΩ	0.2 + 5 [4] [7]			
30 kΩ	0.2 + 5			
300 kΩ	0.2 + 5			
3 MΩ	0.2 + 5			
30 MΩ	2 + 10			
🔊	3 + 5			
⏩ 5.1 V	0.5 + 3			

30 nF	1 + 6 [4]		300 V ⎓ (DC) ~ (AC) RMS Sine	Max. 10 s
300 nF	1 + 6			
3 µF	1 + 6			
30 µF	1 + 6			
300 µF	5 + 6			
3 mF	5 + 6			
		Max. measuring voltage		
300.00 Hz	0.1 + 5 [6] (sinusoidal input voltage > 2 ... 5 V)	300 V	300 V	Max. 10 s
3 kHz		300 V		
30 kHz		300 V		
300 kHz		100 V		
1000 kHz		30 V		
%	0.1% rdg. ±8 d		300 V	Max. 10 s
	0.1 % rdg./kHz ±8 d			
	0.1 % rdg./kHz ±8 d			
		±Upm		
Upm1	60 ... 30 000	2	300 V	Continuous
Upm2	60 ... 30 000	2		
	Measuring Range	±(... % rdg.. + ... d)		
Pt100	–200.0 ... +850.0° C	0.5% + 15 [5]	300 V ⎓ (DC) / ~ (AC) TRMS, sine	Max. 10 s
Pt1000	–150.0 ... +850.0° C	0.5% + 15 [5]		
K NiCr-Ni	– 250.0 ... +1372.0 °C	1% + 5 K [5]		

[1] At 0° ... + 40° C
[2] Values of less than 2 mV are suppressed in the 300 mV range, 15 (20) ... 45 ... 65 Hz ... 10 kHz sinusoidal.
[3] After measurement with 10 A: at least 10 minute cool-down period
[4] ZERO is displayed for "zero balancing" function.
[5] Plus sensor deviation
[6] Specified intrinsic error is valid for 3 to 100% of the AC measuring ranges. With short-circuited test probes: Residual value of 1 to 30 d at zero point due to TRMS converter
[7] to 1 kΩ: ±(0.2 + 9 D)

Applicable Regulations and Standards

IEC/EN 61010-1:2001 VDE 0411-1:2002	Safety requirements for electrical equipment for measurement, control and laboratory use
DIN EN 61326-1 VDE 0843-20-1	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
DIN EN 60529 DIN VDE 0470, part 1	Test instruments and test procedures – degrees of protection provided by enclosures (IP code)

Reference Conditions

Ambient temperature	+23 °C ±3 K
Relative humidity	40 ... 75%
Measured qty. frequency	45 ... 65 Hz
Measured qty. waveshape	Sine
Battery voltage	3 V ±0.1 V

Display

LCD panel (95 x 40 mm) with analog and digital display including unit of measure, type of current and various special functions

Type	COG (chip on glass) for good legibility from various directions

Background illumination

Background illumination (by means of LEDs) is activated with two keys, and is switched off automatically after approximately 1 minute.

Analog

Display	LCD scale with pointer
Scale length	80 mm for V ⎓ and A ⎓, 67 mm for all other ranges
Scaling	∓ 5 ... 0 ... ± 30 with 35 scale divisions for ⎓, 0 ... 30 with 30 scale divisions in all other ranges
Polarity display	With automatic switching
Overflow display	With triangle
Measuring rate	20 measurements per second

Digital

Display / char. height	7-segment characters / 20 mm
Number of places	4¾ places ≙ 31000 steps
Overflow display	"OL" appears
Polarity display	"–" (minus sign) is displayed if plus pole is connected to "⊥"
Measuring rate	2 measurements per second

Refresh rate

V ⎓ (DC) , V~ (AC), A, Ω, ⊣⊢, °C (Pt100, Pt1000)	2 per second
Hz	1 per second
°C (K)	0.5 per second

Power Supply

Battery	2 ea. 1.5 V mignon cell, alkaline manganese per IEC LR6, zinc-carbon per IEC R6
Service life	With alkaline manganese: approx. 200 h With zinc-carbon: approx. 80 h
Battery test	Battery capacity display with battery symbol in 4 segments: " ▭ "
Power saving circuit	The device is switched off automatically: – If the measured value remains unchanged for a period of approximately 10 minutes, and if none of the controls are activated during this time. Automatic shutdown can be deactivated. – If battery voltage drops to below approx. 1.8 V

Fuses

Range	
300 µA to 10 A	– Resetable auto-fuse 15 A, 240 V AC, 50 V DC – A slow-blow fuse is additionally connected in series to the auto-fuse, the blowing or absence of which is detected automatically (display "FUSE"): T16A/500V AC, 6.3 mm x 32 mm 1.5 kA switching capacity at 500 V AC and ohmic load

Electrical Safety

Safety class	II per IEC 61010-1:2001/EN 61010-1:2001/VDE 0411-1:2002
Measuring category	CAT II
Operating voltage	300 V
Fouling factor	2
Test voltage	2.3 kV~ per IEC 61010-1:2001/ EN 61010-1:2001/VDE 0411-1:2002

Electromagnetic Compatibility (EMC)

Interference emission	EN 61326-1:2006 class B
Interference immunity	EN 61326-1:2006 EN 61326-2-1:2006

Ambient Conditions

Accuracy range	0 °C ... +40 °C
Operating temp. range	–10 °C ... +50 °C
Storage temp. range	–25 °C ... +70 °C (without batteries)
Relative humidity	Max. 75%, no condensation allowed
Elevation	To 2000 m
Deployment	Indoors, except within specified ambient conditions

USB Interface

The USB port is electrically isolated from the measuring circuit.

Operating voltage	5 V DC ±10% from USB Port of PC
Current consumption	50 mA max, 25 mA typ.
USB-Interface	Type Mini-B, 5-pin, USB 1.1
Transfer parameters	38400 Baud (1 Stopbit, no parity)
Pinning	1: VCC, 2: D–, 3: D+, 4: ID/not assigned, 5: GND

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Mechanical Design

Protection Housing: IP 40, connector jacks: IP 20

Table Excerpt Regarding Significance of IP Codes

IP XY (1st char. X)	Protection against penetration of solid particles	IP XY (2nd char. Y)	Protection against penetration by water
2	≥ 12.5 mm dia.	0	Not protected
4	≥ 1.0 mm dia.	0	Not protected

Dimensions 146 x 118 x 44 mm

Weight Approx. 450 g with batteries

Scope of Delivery

1 4¾-place multimeter
2 1.5 V batteries
1 KS17 safety cable set
(measuring category: 600 V CAT III,
max. rated current: 16 A)
1 Carrying strap
1 Set operating instructions
1 Abbreviated operating instructions
1 CD-ROM, contents: operation instructions in the following lanugages: D, GB, F, E, S, I, DK, CZ, PL, P, TR
1 DKD certificate

DKD Calibration Certificate

The multimeters are furnished with an internationally valid DKD calibration certificate (recognized by EA and ILAC). After the specified calibration interval has elapsed (recommended interval: 1 to 3 years), the multimeters can be recalibrated in our own DKD calibration laboratory.

Order Information

Description	Type	Article Number
4¾-place digital multimeter with USB interface	METRAport40S	M234D
Flexible AC current sensor 30/300/3000 A, 100 mV/10 mV/1 mV/A, 1%, Frequency range 10 Hz … 20 kHz, with batteries, probe length 61 cm	METRAFLEX 3000 D)	Z207E
Clip-on current sensor, 10 mA … 100 A, 0.1 mV/mA	WZ12B D)	Z219B
Clip-on current sensor, active, with battery (service life: 50 h) AC measuring ranges: 20 A/200 A DC measuring ranges: 30 A/300 A Frequency range: DC ... 10 kHz Output: 10 mV/A or 1 mV/A Clip opening: Max. cable diameter: 19 mm	Z202A	Z202A
Clip-on current sensor with switchable current measuring ranges and zeroing button, 60/600 A DC and 40/400 A DC	Z13B D)	Z213B
Pt100 temperature sensor for surface and emersion measurements, -40 to +600° C	Z3409	GTZ3409000R0001
Dip-stick oil temperature sensor, Pt1000 class B, -50 to +500 °C, sensor: 3 mm dia. x 810 mm long	TF400CAR	Z102C
Quick-response surface temperature sensor (T90 = 2 s) thermocouple K (NiCr-Ni), – 50 ... + 400 °C	TF400 SURFACE	Z102E
Carrying pouch	F822	GTY3172095P01

D) Data sheet available

Accessories flexible AC current sensor METRAFLEX 3000

Accessories current sensors

WZ12B/C

Z202A

Z13B

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