

# METRA MAX 12

## Analog-Digital Multimeter

3-348-831-03  
8/8.16

- Input resistance can be selected for voltage measurements
- Direct and alternating voltages from 100  $\mu$ V ... 600 V
- Direct and alternating currents from 10  $\mu$ A ... 10.00 A
- Resistances from 10 m $\Omega$  ... 40.00 M $\Omega$
- Capacitance from 1 pF ... 40.00  $\mu$ F with relative operation
- Frequencies from 10.00 Hz ... 400.0 kHz
- Diode measurement and continuity testing
- MIN, MAX and Hold measurement value storage



### Applications

The METRA MAX 12 digital multimeter is suited for universal, general applications in the electrical and electronics fields, as well as in radio and television service, training and education. It is of especially flat design, and thus fits into any bag. The protective cover with tilt stand, which is included as a standard feature, provides for easy transport, allows for convenient reading from the workbench as well as for attachment of the measuring probe to the instrument.

#### Selection of input resistance for voltage measurement

In addition to the usual voltage input with one resistance value of 10 M $\Omega$ , which is selected via V $\sim$  or V $\equiv$ , this measuring instrument provides the electrician with an additional selector switch position for V $_{400k\Omega}$  with an input resistance of approx. 400 k $\Omega$ . This allows for the avoidance of negative influences from capacitive coupling during voltage measurements in power supply systems.

#### Automatic/manual measuring range selection

The measurement quantities are chosen with the rotary selector switch. The measuring range is automatically adapted to the measurement value. The measuring range can also be manually selected with the AUTO/MAN button.

#### Overload warning

An acoustic signal occurs, if the range limit value is exceeded.

#### Hold/Min/Max

By pressing the HOLD/ON key, the currently displayed measurement value can be „frozen“ in the display. The minimum and maximum values which were present at the input of the measuring instrument after activation of the MIN/MAX mode can be selectively "retained" with the MIN/MAX function. The most important application is the determination of the minimum or maximum value during long-term observation of measurement quantities. MIN/MAX has no effect on the analog display; it continues to display the current measurement value.

#### Diode and continuity testing

This provides for the testing of the polarity of diodes, as well as inspection for short-circuits and circuit interruptions. In addition to the display, resistances of less than 40  $\Omega$  are indicated with an acoustic signal.

#### Protective cover for rough operating conditions

A protective cover of ABS with a built-in stand protects the instrument against jolts and falls. It also secures the test prod for one-hand operation, and allows for winding of the measurement cable which provides protection during transport.

#### Theft protection

Company name and name of the user can be entered into the field next to the display with an indelible etching needle for identification of the owner.

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### Characteristic Values

Measuring function	Measuring range	Resolution	Input impedance 100 pF // X Ω		Digital display intrinsic uncertainty at reference conditions ±(...% of rdg.+... digits)	Overload capacity <sup>1)</sup>		Measuring function
			V <sub>∞</sub> / ~	V <sub>400kΩ</sub>		Overload value	Overload duration	
<b>V<sub>∞</sub></b> <b>V<sub>∞400kΩ</sub></b>	400.0 mV	100 μV	> 20 MΩ	~ 400 kΩ	0.75 + 2	600 V effective	continuous	<b>V<sub>∞</sub></b> <b>V<sub>∞400kΩ</sub></b>
	4.000 V	1 mV	11 MΩ	~ 400 kΩ	0.5 + 2			
	40.00 V	10 mV	10 MΩ	~ 400 kΩ				
	400.0 V	100 mV	10 MΩ	~ 400 kΩ				
	600 V	1 V	10 MΩ	~ 400 kΩ				
<b>V<sub>~</sub></b> <b>V<sub>~400kΩ</sub></b>	400.0 mV	100 μV	> 20 MΩ	~ 400 kΩ	1.5 + 5	600 V effective	continuous	<b>V<sub>~</sub></b> <b>V<sub>~400kΩ</sub></b>
	4.000 V	1 mV	11 MΩ	~ 400 kΩ	1 + 5			
	40.00 V	10 mV	10 MΩ	~ 400 kΩ				
	400.0 V	100 mV	10 MΩ	~ 400 kΩ				
	600 V	1 V	10 MΩ	~ 400 kΩ				
			<b>Approx. voltage drop at max. meas. current</b>					
<b>A<sub>∞</sub></b>	40,00 mA	10 μA	450 mV		0.8 + 2	480 mA	continuous	<b>A<sub>∞</sub></b>
	400,0 mA	100 μA	1.5 V					
	10,00 A <sup>2)</sup>	10 mA	750 mV		1.5 + 5			
<b>A<sub>~</sub></b>	40,00 mA	10 μA	450 mV		1 + 5	480 mA	continuous	<b>A<sub>~</sub></b>
	400,0 mA	100 μA	1.5 V					
	10,00 A <sup>2)</sup>	10 mA	750 mV		2 + 5			
			<b>Open-circuit voltage</b>					
<b>Ω</b>	400.0 Ω	100 mΩ	approx. 0.5 V		0.8 + 5	600 V effective	5 min	<b>Ω</b>
	4.000 kΩ	1 Ω			0.8 + 2			
	40.00 kΩ	10 Ω						
	400.0 kΩ	100 Ω						
	4000 kΩ	1 kΩ						
40.00 MΩ	10 kΩ	2 + 5						
<b>Ω<sub>Ⓜ</sub></b>	400.0 Ω	100 mΩ			Acoustic signal for 0 ... < 40 Ω			<b>Ω<sub>Ⓜ</sub></b>
<b>→</b>	3.000 V	1 mV	approx. 3 V <sup>3)</sup>		2 + 10			<b>→</b>
<b>F</b>	4.000 nF	1 pF			3 + 40 <sup>4)</sup>	600 V effective	5 min	<b>F</b>
	40.00 nF	10 pF			3 + 10 <sup>4)</sup>			
	400.0 nF	100 pF			3 + 10			
	4.000 μF	1 nF						
	40.00 μF	10 nF						
<b>Hz<sup>5)</sup></b>	100.00 Hz	0.01 Hz	f <sub>min</sub> 10 Hz	U <sub>max</sub> ≤ 600 V	0.2 + 2	600 V effective	continuous	<b>Hz</b>
	1.0000 kHz	0.1 Hz	10 Hz	≤ 100 V				
	10.000 kHz	1 Hz	10 Hz	≤ 40 V				
	100.00 kHz	10 Hz	10 Hz					
	400.0 kHz	100 Hz	100 Hz					

Key: rdg. = measured value (reading)

- 1) At 0 °C ... + 40 °C
- 2) max. 10 A/30 min  
12 A/5 min  
16 A/30 s
- 3) Battery voltage 2.2 V ... 3.2 V
- 4) With zero adjustment „REL“;  
without zero adjustment: +300 digits in the 4 nF range,  
+30 digits in the 40 nF range
- 5) Indication of the frequency measurement expanded to up to 9999 digits

### Applicable Regulations and Standards

<b>EN 61010-1</b> <b>VDE 0411-1</b>	Safety regulations for electrical measuring, control, regulation and laboratory devices
<b>DIN 43751</b>	Digital measuring instruments
<b>EN 61326-1</b> <b>VDE 0843-02-1</b>	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
<b>EN 61326-2-1</b> <b>VDE 0843-02-2-1</b>	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-1: Particular requirements for sensitive test and measurement equipment
<b>EN 60529</b> <b>DIN VDE 0470-1</b>	Test Instruments and test procedures – Degree of protection provided by enclosures (IP code)

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### Reference Conditions

Ambient temperature	+ 23 °C ± 2 K
Relative humidity	40 % ... 60 %
Frequency of measuring quantity	sine 50 Hz
Battery voltage	3 V ± 0.1 V

### Display

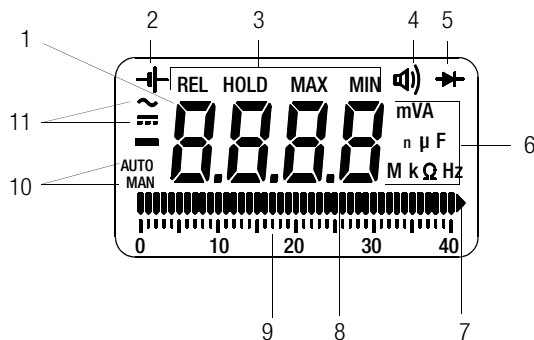
LCD display field (50 mm x 30 mm) with analog and digital display, and with display of measurement unit, type of current and various special functions.

#### Analog

Display	LCD scale with bar graph display
Scale length	40 mm
Scaling	0 ... 40 with 40 scale divisions
Polarity display	with automatic reversal
Overflow display	Bar with triangle
Measuring rate	20 measurements/s

#### Digital

Display/Character height	7 segment digits/ 10 mm
Number of digits	3¾ places $\triangleq$ 3999 steps
Overflow display	„4000“ with flashing „4“
Polarity display	„-“ sign is displayed when plus pole at „1“
Measurement rate	2 measurements/s for U, I and $\Omega$ 1 measurement/s for capacitive and frequency measurements



#### Display

- Digital display with comma and polarity display
- Display for insufficient battery voltage
- Display for REL and HOLD as well as MIN MAX storage
- Continuity test display: speaker symbol appears when acoustic signal is switched on
- Display for diode measurement
- Measurement unit display
- Display for exceeding of measuring range
- Indicator for analog display
- Scale for analog display
- Display for analog or automatic measuring range selection
- Display for selected type of current

### Influence Variables and Effects

Influence Variable	Influence Range	Meas. quantity / Meas. range	Influence Effect
Temperature	0 °C ... +21 °C and +25 °C ... +40 °C	V $\approx$	0.1 x intrinsic uncertainty/K
		V $\sim$	
		A $\approx$	
		A $\sim$	
		$\Omega$	
		F	
		Hz	

Influence Variable	Influence Range (max. resolution)	Frequency	Intrinsic uncertainty at Ref. $\pm$ (... % rdg. +... digits)
Frequency $V_{AC}$	4, 40, 400 V	20 Hz ... < 50 Hz > 50 Hz ... 500 Hz	2 + 3
	400 mV, 600 V	20 Hz ... < 50 Hz > 50 Hz ... 100 Hz	2 + 3

Influence Variable	Influence Range	Meas. quantity / Measuring range	Influence Effect
Relative humidity	55 ... 75 %	V $\approx$ A $\approx$ $\Omega$ F Hz	1 x intrinsic uncertainty

Influence Variable	Interference Magnitude	Measuring ranges	Attenuation
Common Mode Interference Voltage	600 V DC / AC 50 Hz sinusoidal	all V DC	> 100 dB
	600 V DC	all V AC	> 100 dB
	600 V AC 50 Hz sine	400 mV / 4 V AC	> 80 dB
		40 V AC	> 63 dB
		400 V AC	> 43 dB
600 V AC	> 23 dB		
Series-Mode Interference Voltage	max. 600 V AC 50/60 Hz sine	V DC	> 43 dB
	max. 600 V DC	V AC	> 55 dB

#### Aux. Voltage Influence

(without  $\rightarrow$  display) all ranges except AC:  $\pm 5$  d  
AC range:  $\pm 20$  d

### Power Supply

Battery	2 ea. 1.5 V mignon cell zinc-carbon cell per IEC R6 alkaline manganese dry cell per IEC LR 6
Service life	zinc-carbon cell: approx. 300 hours Alkaline mang. dry cell: approx. 600 hours
Battery test	Automatic display of „ $\rightarrow$ “ symbol when battery voltage falls below approx. 2.3 V

#### Power-saving circuit

The instrument switches off automatically when no operating element has been activated for approx. 30 minutes.

Key: rdg. = measured value (reading), d = digit

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### Fuses

Fuse for ranges up to 400 mA	FF(UR)1.6 A / 700 V; 6.3 mm x 32 mm; Breaking capacity 50 kA at 700 V ~ and non-reactive load, $\cos \varphi < 0,2$ ; protects all current measuring ranges up to 400 mA in connection with power diodes
Fuse for 10 A range	FF(UR)16 A / 600 V; 6.3 mm x 32 mm breaking capacity 50 kA at 600 V ~ and non-reactive load, $\cos \varphi < 0,2$

### Electrical Safety

Protection class	II per IEC 61010-1:2010/ EN 61010-1:2011/VDE 0411-1:2011	
Measuring category	II	III
Nominal voltage	600 V	300 V
Contamination degree	2	2
Operating voltage	600 V	
Test voltage	3.5 kV~ per IEC 61010-1:2011/ EN 61010-1:2011/VDE 0411-1:2011	

### Electromagnetic Compatibility (EMC)

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

### Ambient Conditions

Operating temperatures	-10 °C ... + 50 °C
Storage temperatures	- 25 °C ... + 70 °C (without batteries)
Relative humidity	45 ... 75 %, no condensation allowed
Elevation	up to 2000 m

### Mechanical Design

Protection Housing: IP 50, Connector sockets: IP 20  
Extract from table on the meaning of IP codes

IP XY (1 <sup>st</sup> digit X)	Protection against foreign object entry	IP XY (2 <sup>nd</sup> digit Y)	Protection against the penetration of water
2	$\geq 12.5$ mm dia.	0	not protected
5	dust-protected	0	not protected

Dimensions W x H x D: 92 mm x 154 mm x 25 mm  
Weight approx. 0.2 kg with batteries

### Standard Equipment

- 1 Multimeter
- 1 KS14 cable set
- 1 Operating instructions
- 1 Protective cover with tilt stand

### Order Information

Designation	Type	Ident. number
Analog-digital multimeter	METRA MAX 12	M212A
Ever-ready bag with cable compartment	F823	GTY3172097P01
Carrying case	F829	GTZ3301000R0003
Fuse set (10 ea.)	FF(UR)1.6A/700V AC	Z109E
Fuse set (10 ea.)	FF(UR)16A/600V AC	Z109A

Edited in Germany • Subject to change without notice • A pdf version is available on the internet

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