

METRA^{max} 12 and 14 Analog-Digital Multimeters

3-348-831-03
3/5.98

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



Applications

METRA^{max} digital multimeters are suited for universal, general applications in the electrical and electronics fields, as well as in radio and television service, training and education. They are of especially flat design, and thus fit into any bag. The protective cover, which is provided as standard equipment, can be opened at an angle for convenient reading from the workbench, and provides for easy transport.

Selection of input resistance for voltage measurement

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

Effective value for distorted waveform (METRA^{max} 14)

The built-in effective value transducer allows for effective value measurement (TRMS) independent of waveform for alternating magnitudes (AC).

Hold

By pressing the HOLD/ON key, the currently displayed measurement value can be „held“ and „Hold“ is simultaneously displayed.

Min/Max

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.

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.

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 Ω are indicated with an acoustic signal.

Overload warning

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

Energy saving circuit

The instrument is switched off automatically, if none of the operating elements have been activated for about 30 minutes.

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.

Calibration

The multimeter can be calibrated with the help of the METRAtop 90C multi-function calibrator.

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.

METRAmax 12 and 14

Analog-Digital Multimeters

Characteristic values METRAmax 12 and 14

Meas. function	Measuring range			Resolution	Input impedance 100 pF // X Ω		Digital display inherent deviation at reference conditions ±(...% of rdg. + ... digits)	Overload capacity ¹⁾		Meas. function
	METRAmax	12	14		V _∞ / ~	V _{400kΩ}		Overload value	Overload duration	
V _∞ V _{∞400kΩ}	400.0 mV	●	●	100 μV	> 20 MΩ	~ 400 kΩ	0.75 + 2	720 V _∞	Continuous	V _∞ V _{∞400kΩ}
	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				
V _~ V _{~400kΩ}	400.0 mV	●	● ²⁾	100 μV	> 20 MΩ	~ 400 kΩ	1.5 + 5 ³⁾	720 V _~ effective sine	Continuous	V _~ V _{~400kΩ}
	4.000 V	●	● ²⁾	1 mV	11 MΩ	~ 400 kΩ	1 + 5 ³⁾			
	40.00 V	●	● ²⁾	10 mV	10 MΩ	~ 400 kΩ				
	400.0 V	●	● ²⁾	100 mV	10 MΩ	~ 400 kΩ				
	600 V	●	● ²⁾	1 V	10 MΩ	~ 400 kΩ				
				Approx. voltage drop at max. meas. current						
A _∞	40,00 mA	●	●	10 μA	450 mV		0.8 + 2	480 mA	Continuous	A _∞
	400,0 mA	●	●	100 μA	1.5 V					
	10,00 A ⁶⁾	●	●	10 mA	750 mV					
A _~	40,00 mA	●	● ²⁾	10 μA	450 mV		1 + 5 ³⁾	480 mA	Continuous	A _~
	400,0 mA	●	● ²⁾	100 μA	1.5 V					
	10,00 A ⁶⁾	●	● ²⁾	10 mA	750 mV					
				Open-circuit voltage						
Ω	400.0 Ω	●	●	100 mΩ	approx. 0.5 V		0.8 + 5	420 V DC AC effective sine	10 min	Ω
	4.000 kΩ	●	●	1 Ω			0.8 + 2			
	40.00 kΩ	●	●	10 Ω			1 + 5			
	400.0 kΩ	●	●	100 Ω			2 + 5			
	4000 kΩ	●	●	1 kΩ						
	40.00 MΩ	●	●	10 kΩ						
Ω _⚡)	400.0 Ω	●	●	100 mΩ						Ω _⚡)
↔	3.000 V	●	●	1 mV	approx. 3 V		2 + 10			↔
F	4.000 nF	●	●	1 pF	f _{min}		3 + 40 ⁴⁾	420 V DC / AC effective sine	10 min	F
	40.00 nF	●	●	10 pF			3 + 10 ⁴⁾			
	400.0 nF	●	●	100 pF			3 + 10			
	4.000 μF	●	●	1 nF			5 + 10			
	40.00 μF	●	●	10 nF						
Hz	100.00 Hz	●	●	0.01 Hz	10 Hz		0.2 + 2	≤ 1 kHz: 600 V ≤ 10 kHz: 400 V ≤ 400 kHz: 40 V	Continuous	Hz
	1.0000 kHz	●	●	0.1 Hz	10 Hz					
	10.000 kHz	●	●	1 Hz	10 Hz					
	100.00 kHz	●	●	10 Hz	10 Hz					
	400.0 kHz	●	●	100 Hz	100 Hz					

- 1) At 0 °C ... + 40 °C
- 2) Effective value measurement (TRMS) for METRAmax 14
- 3) The specified inherent deviation is valid for the METRAmax 14 from an indication of „0200“
- 4) With zero adjustment „REL“; without zero adjustment
+300 digits in 4 nF range
+30 digits in 40 nF range
- 5) Indication of the frequency measurement expanded to up to 9999 digits
- 6) max. 10 A/30 min
12 A/5 min
16 A/30 s

Applicable regulations and standards

IEC 1010-1 DIN EN 61010 part 1 VDE 0411-1	Safety regulations for electric measuring, control, regulation and lab devices
DIN 43751	Digital measuring instruments
DIN EN 50081 part 1	Generic emission standard residential, commercial and light industry
DIN EN 50082 part 1	Generic immunity standard residential, commercial and light industry
VDI/VDE 3540	Reliability of measuring, control and regulation instruments
DIN EN 60529 DIN VDE 0470 part 1	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	45 % ... 55 %
Frequency of meas. quantity	Sine 50 Hz
Operating voltage	METRAmax 12: 3 V ± 0.1 V METRAmax 14: 8 V ± 0.1 V

Display

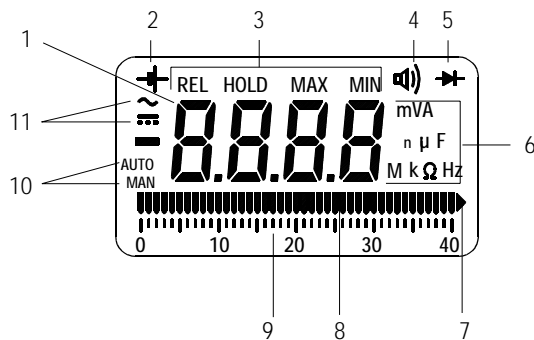
LCD display field (50 mm x 30 mm) with analog and digital display, and with display of measurement unit, type of current and various special functions.

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	7 segment
Character height	10 mm
Number of digits	3 3/4 digit \cong 3999 steps
Overflow display	„4000“ with blinking „4“
Polarity display	„-“ sign is displayed when plus pole at „1“
Measurement rate	2 measurements/s for U, I and Ω 1 measurement/s for capacitive and frequency measurements



METRAmax 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 \equiv	0.1 x intrinsic error/K
		V \sim	
		A \equiv	
		A \sim	
		Ω	
		F	
Hz			
Waveform METRAmax 14	Crest factor CF	1 ... 1.4 > 1.4 ... 5	4, 40, 40 V, mA, A ²⁾ $\pm 1\%$ of rdg. $\pm 5\%$ of rdg.
Measuring Magnitude Waveform 1)	The allowable crest factor CF of the alternating magnitude to be measured is dependent upon the displayed value: 		

- For unknown waveform (crest factor CF > 2) measurement to be made with manual range selection
- Except for sine waveform

Influence Variable	Influence Range (max. resolution)	Frequency	Inherent Error 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 Ω F Hz	1 x Inherent Error

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 sinus	400 mV / 4 V AC	> 80 dB
		40 V AC	> 63 dB
		400 V AC	> 43 dB
Series-Mode Interference Voltage	AC 50/60 Hz	V DC	> 43 dB
	max. 600 V DC	V AC	> 55 dB

Aux. Voltage Influence (without \rightarrow display) all ranges except AC: ± 5 D
AC range: ± 20 D

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Power supply

Battery METRAmax 12:
2 ea. 1.5 V mignon cell
Zinc-carbon cell per IEC R6
Alkaline manganese dry cell per IEC LR 6
METRAmax 14:
9 V flat cell battery;
Zinc-carbon cell per IEC 6 F 22,
Alkaline mang. dry cell per IEC 6 LR 61

Service life METRAmax 12:
Zinc-carbon cell: approx. 300 hours
Alkaline mang. dry cell: approx. 600 hours
METRAmax 14:
Zinc-carbon cell: approx. 150 hours
Alkaline mang. dry cell: approx. 300 hours

Battery test Automatic display of „+“ symbol when
battery voltage falls below following values:
METRAmax 12: approx. 2.3 V
METRAmax 14: approx. 7 V

Fusing

Fuse for ranges up to 400 mA FF 1.6 A / 500 V; 6.3 mm x 32 mm;
Breaking capacity 50 kA at 500 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 16 A / 500 V; 6.3 mm x 32 mm
breaking capacity 50 kA at 500 V ~ and
non-reactive load, $\cos \varphi < 0.2$

Electrical safety

Protection class II per IEC 1010-1/EN 61010-1/VDE 0411-1
Overvoltage classification II III
Nominal voltage 600 V 300 V
Contamination level 2 2
Test voltage 3.7 kV~ per IEC 1010-1/EN 61010-1/
VDE 0411-1

Electromagnetic compatibility

Interference emission EN 50081-1: 1992
EN 55022: 1987 class B
Interference immunity EN 50082-1: 1992
EN 61000-4-2: 8 kV air discharge
EN 61000-4-3: 3 V/m
EN 61000-4-4: 0,5 kV

Ambient conditions

Operating temperature range $-10^{\circ}\text{C} \dots +50^{\circ}\text{C}$
Storage temperature range $-25^{\circ}\text{C} \dots +70^{\circ}\text{C}$ (without batteries)
Climate classification 2z/-10/50/70/75 %
in correspondence with VDI/VDE 3540
Relative humidity 45 ... 75 %
Elevation up to 2000 m

Mechanical design

Protection Instruments: IP 50
Connector sockets: IP 20
Dimensions W x H x D: 92 mm x 154 mm x 25 mm
Weight Approx. 0.2 kg with battery

Included equipment

- 1 multimeter
- 1 KS14 cable set
- 1 copy operating instructions
- 1 protective case with tilt stand

Order information

Designation	Type	Ident. number
Analog-digital multimeter	METRAmax 12	M212A
Analog-digital multimeter with TRMS	METRAmax 14	M214A
Ever-ready bag with cable pouch	F823	GTY 3172 097 P01
Carrying case	F829	GTZ 3301 000 R0003
Fuse link (10 ea.)	FF1.6A/700V AC	GTY 3578 136 P0001
Fuse link (10 ea.)	FF16A/500V AC	

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