

# 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<br>100 pF // X Ω                  |                    | Digital display intrinsic uncertainty<br>at reference conditions<br>±(...% 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><br><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><br><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><br><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><br><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      |   |                    |  |                                 |                        |   |
| <b>Ω</b> <sup>4)</sup>                            | 400.0 Ω               | 100 mΩ     | Acoustic signal for 0 ... < 40 Ω                  |                    |  |                                 | <b>Ω</b> <sup>4)</sup> |   |
| <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</b> <sup>5)</sup>                           | 100.00 Hz             | 0.01 Hz    | f <sub>min</sub>                                  | U <sub>max</sub>   | 0.2 + 2  | 600 V effective                 | continuous             | <b>Hz</b>   |
|   | 1.0000 kHz            | 0.1 Hz     | 10 Hz   | ≤ 600 V            |  |                                 |                        |   |
|   | 10.000 kHz            | 1 Hz       | 10 Hz   | ≤ 100 V            |  |                                 |                        |   |
|   | 100.00 kHz            | 10 Hz      | 10 Hz   | ≤ 40 V             |  |                                 |                        |   |
|   | 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><br><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><br><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><br><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><br><b>DIN VDE 0470-1</b>      | Test Instruments and test procedures<br>– 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

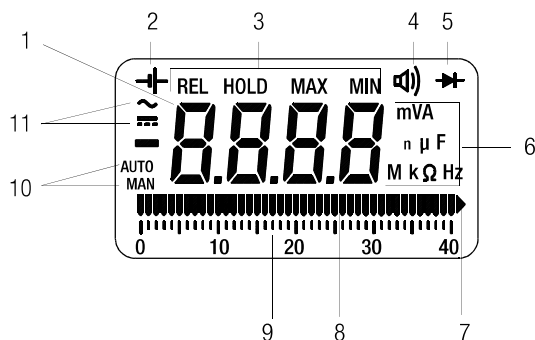
LCD display field (50 mm x 30 mm) with analog and digital display, and with display of measurement unit, type of current and various special functions.

#### 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 $\cong$ 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 $\Omega$<br>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 $\equiv$                   | 0,1 x intrinsic uncertainty/K |
|                    |                                       | V $\sim$                     |                               |
|                    |                                       | A $\equiv$                   |                               |
|                    |                                       | 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<br>> 50 Hz ... 500 Hz | 2 + 3  |
|                    | 400 mV, 600 V                     | 20 Hz ... < 50 Hz<br>> 50 Hz ... 100 Hz | 2 + 3  |

| Influence Variable | Influence Range | Meas. quantity / Measuring range              | Influence Effect          |
|--------------------|-----------------|---|---------------------------|
| Relative humidity  | 55 ... 75 %     | V $\cong$<br>A $\cong$<br>$\Omega$<br>F<br>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 +- display) all ranges except AC:  $\pm 5$  d  
AC range:  $\pm 20$  d

### Power Supply

|              |  |
|--------------|--|
| Battery      | 2 ea. 1.5 V mignon cell<br>zinc-carbon cell per IEC R6<br>alkaline manganese dry cell per IEC LR 6 |
| Service life | zinc-carbon cell: approx. 300 hours<br>Alkaline mang. dry cell: approx. 600 hours                  |
| Battery test | Automatic display of „+-“ 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/<br>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/<br>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<br>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           |

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