

# METRAmax 2

Analog multimeter

3-348-734-02

3/3.97





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# 1 Safety features and safety precautions

The analog multimeter METRAMax 2 is constructed in compliance with the safety rules of IEC 1010-1/EN 61010-1/VDE 0411-1.

When properly used, the safety of both the user and the meter is assured. Their safety is not assured, however, if the meter is mis-used or carelessly handled. That is why it is absolutely necessary to carefully and completely read these operating instructions before using the METRAMax 2 and to follow them in all respects.

Please note the following safety precautions:

- The meter must only be operated by persons who understand the danger of shock hazards and know how to apply safety precautions.
- Shock hazards exist wherever voltages of more than 30 V (RMS value) to ground can appear.
- It must be taken into account that unexpected voltages can appear on devices under test (e.g. defective devices).  
Capacitors may be charged dangerously, for instance!
- Case and test leads must be in good condition, e.g. no cracks or broken spots.
- The METRAMax 2 must not be used for measurements on circuits with corona discharge (high voltage!).
- Be particularly careful when measuring on HF circuits.  
Dangerous composite voltages may exist there.
- Measurements under moist environmental conditions are not permitted. Hands, shoes, floor and working site must be dry.
- Absolutely verify that overloading of the measuring ranges does not exceed the permissible limits.

## 2 Description

On the METRAmax 2, the measuring ranges are selected with a sliding function switch and a rotary range selector switch. The scale is mirror-backed.

The rugged plastic case and the spring-loaded jewel bearings of the stray-field-insensitive moving-coil movement with core magnet protect the meter against damages in the case of severe mechanical stress.

The electrical zero of the pointer can be positioned at mid-scale. This allows for bipolar DC voltage and DC current measurements regardless of the polarity.

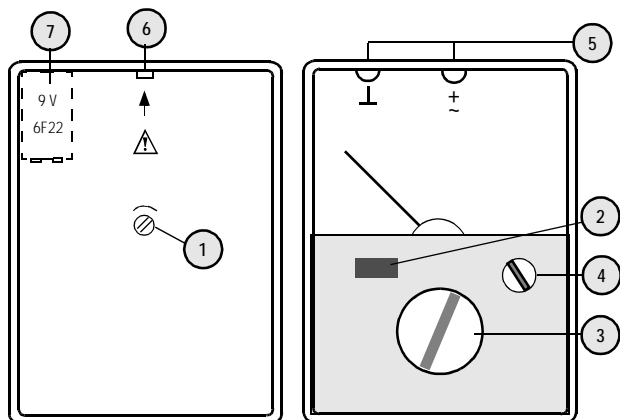
The connection sockets are protected against accidental contact. Both the special test leads with contact-protected connection plugs and all test leads with commercial banana plugs (4 mm diameter) can be used.

The DC current measuring ranges can be expanded by means of a shunt (e.g. 10 A/100 mV).

The meter is of service-friendly design.

## 3 Operation

### 3.1 Operating controls



- 1 Adjustment screw for the mechanical zero (  $\rightarrow$  OFF on scale)
- 2 Sliding function switch
- 3 Rotary range selector switch
- 4 Rotary knob for mid-scale setting of the electrical zero
- 5 Safety connection sockets
- 6 Nose to open the meter
- 7 Battery compartment

### 3.2 Getting started

#### 3.2.1 Connecting the battery

The battery compartment 7 contains a 9-V battery (IEC 6F22) which is not connected. To connect the battery, it is required to remove the lower part of the case. For this purpose, press the nose 6 on the front of the meter inwards, using an adequate tool. Securely connect the battery contacts to the battery clip located in the battery compartment. Ensure reliable contact making. Replace the lower part of the case and press the two parts together until they engage.



### Caution!

Both test leads must be disconnected from the measuring circuit before opening the meter!

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### Note

Automatic battery switch-off after 45 min. Switching off and on again of the sliding function switch activates the power supply.

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## 3.2.2 Checking the mechanical zero

The METRMax 2 must not be connected when checking the mechanical zero.

- Set the sliding function switch 2 to the "0" position
- Place the METRMax 2 in a horizontal position
- The pointer must be located exactly above the line marked " →| OFF"
- Correct the deviation by means of the adjustment screw 1 on the bottom of the case using a screwdriver, if required

## 3.2.3 Checking the electrical zero

- Set the sliding function switch 2 to the ↗ position, select the measuring range
- The pointer must rest exactly above the line for the zero at mid-scale
- Correct deviations by means of the rotary knob 4, if required

## 3.2.4 Battery test

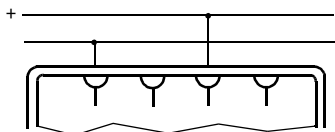
- Set the sliding function switch 2 to the " ↖ " position
- Set the rotary range selector switch 3 to the " →| " position
- The pointer must travel into the battery test section marked " →| "

If the pointer no longer travels into the battery test section, or if there is an instable indication, the battery is exhausted. It must be replaced with a new one (see section 5 Maintenance, battery replacement).

## 3.3 Voltage measurement

### 3.3.1 DC voltage measurement

Operating mode: Electrical zero at left

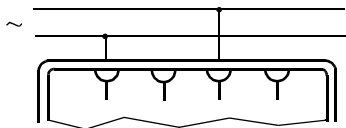


- Set the sliding function switch 2 to the  $\curvearrowright$  position
- Set the rotary range selector switch 3 to the corresponding measuring range:  $V_{\text{DC}}$  300 V ... 100 mV
- Connect the METRAMax 2
- Read the measured value: black scale  $\overline{\text{=}}$

Operating mode: Electrical zero at mid-scale


- Set the sliding function switch 2 to the  $\uparrow$  position
- Set the rotary range selector switch 3 to the corresponding measuring range:  $V_{\text{DC}}$  300 V ... 100 mV
- Check that the pointer rests at mid-scale, see section 3.2.3 on page 7
- Connect the METRAMax 2
- Read the measured value: red scale +/-


### 3.3.2 Direct AC voltage measurement up to 300 V



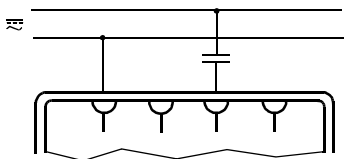
- Set the sliding function switch 2 to the  $\curvearrowright$  position
- Set the rotary range selector switch 3 to the corresponding measuring range:  $V_{\sim}$  300 V ... 3 V



- Connect the METRAMax 2
- Read the measured value: black scale 

To keep the influence of the frequency as low as possible, the connection socket "  " should be connected to the ground potential as directly as possible or to lowest point with respect to ground.

### 3.3.3 AC voltage measurement with superimposed DC voltage component



The DC voltage component, such as occurs with an amplifier output stage, for example, can be cut off by means of a capacitor (recommended value:  $4.7 \mu\text{F}/630 \text{ V}$ ). In this case, the additional service error is smaller than 0.2% at a measuring frequency of 50 Hz. The measuring procedure corresponds to the one described above.

The DC component can be determined same as with DC voltage measurement.

To protect the meter against overload, the selected measuring range must always be higher than the DC voltage component determined at first.



#### Caution!

Both voltage components must be tested before switching to a lower measuring range.

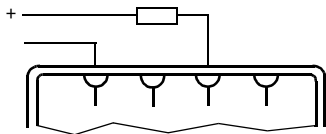
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### 3.4 Current measurement

For all current measurements, connect the METRAMax 2 in series with the consumer in the line having the lower potential to ground.

#### 3.4.1 Direct DC current measurement

Operating mode: Electrical zero at left



- Set the sliding function switch 2 to the  $\curvearrowright$  position
- Set the rotary range selector switch 3 to the corresponding measuring range: A  $\equiv$  3 A...100  $\mu$ A
- Connect the METRAMax 2
- Read the measured value: black scale  $\equiv$

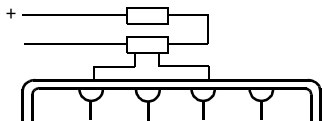
Operating mode: Electrical zero at mid-scale

- Set the sliding function switch 2 to the  $\uparrow$  position
- Set the rotary range selector switch 3 to the corresponding measuring range: A  $\equiv$  3 A...100  $\mu$ A
- Check that the pointer rests at mid-scale, see section 3.2.3 on page 7
- Connect the METRAMax 2 according to the wiring diagram
- Read the measured value: red scale +/-

#### 3.4.2 DC current measurement via shunts

The accuracy of the measurement is influenced by the measuring error of the shunt.

Operating mode: Electrical zero at left

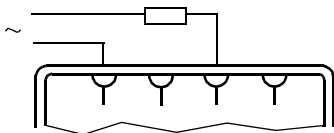


- Set the sliding function switch 2 to the  $\curvearrowright$  position
- Set the rotary range selector switch 3 to the following position:  
V $\equiv$  100 V
- Connect the METRAMax 2
- Read the measured value: back scale  $\equiv$

Operating mode: Electrical zero at mid-scale

- Set the sliding function switch 2 to the  $\uparrow$  position
- Set the rotary range selector switch 3 to the following position:  
V $\equiv$  100 mV
- Check that the pointer rests at mid-scale, see section 3.2.3 on page 7
- Connect the METRAMax 2
- Read the measured value: red scale +/-

### 3.4.3 AC current measurement



- Set the sliding function switch 2 to the  $\curvearrowright$  position
- Set the rotary range selector switch 3 to the corresponding measuring range: A $\sim$  3 A...100  $\mu$ A
- Connect the METRAMax 2
- Read the measured value: black scale  $\equiv$

### 3.5 End of measurement

When no measurements are made, the sliding function switch 2 should always be set to "0" to conserve the battery life.

## 4 Specifications

### Measuring ranges

DC and AC voltage	Internal resistance		DC and AC voltage	Voltage drop
	$\equiv$	$\sim$		
100 mV $\equiv$	10 M $\Omega$		100 $\mu$ A $\equiv/\sim$	55 mV
300 mV $\equiv$	10 M $\Omega$		1 mA $\equiv/\sim$	55 mV
1 V $\equiv$	10 M $\Omega$		10 mA $\equiv/\sim$	55 mV
			100 mA $\equiv/\sim$	55 mV
3 V $\equiv/\sim$	10 M $\Omega$	1 M $\Omega$	1 A $\equiv/\sim$	53 mV
10 V $\equiv/\sim$	10 M $\Omega$	1 M $\Omega$	3 A $\equiv/\sim$	51 mV
30 V $\equiv/\sim$	10 M $\Omega$	1 M $\Omega$		
100 V $\equiv/\sim$	10 M $\Omega$	1 M $\Omega$		
300 V $\equiv/\sim$	10 M $\Omega$	1 M $\Omega$		

### Influence quantities and nominal ranges of use

Temperature

on the range 0 ... +40 °C  $\pm 2\%/10$  K on  $\equiv$

Frequency

for all measuring ranges  $\pm 2.5\%$  on the 30 Hz...1.5 kHz range  
 $\pm 5\%$  on the 1.5 kHz ... 3 kHz range

### Accuracy

Under reference conditions Class 2 for  $\equiv$   
 Class 3 for  $\sim$

### Reference conditions

Ambient temperature +23 °C  $\pm 2$  K

Position of use Horizontal

Frequency 50 ... 60 Hz

Waveform Sinusoidal

## Power supply

Battery

9-V flat cell battery, IEC 6F22,  
automatic battery switch-off  
after 45 min.

## Overload protection

Fuse F3,15 H/250 V acc. to  
DIN VDE 0820 part 22/EN 60127-2  
protects the circuits against over-  
load. The movement is protected by  
2 diodes in inverse-parallel connec-  
tion.

## Electrical safety

Protection class

II acc. to IEC 1010-1/EN 61010-1/  
VDE 0411-1

Oversvoltage category

CAT III

Nominal voltage

300 V

Pollution degree

2

Test voltage

3,7 kV~

## EMC

Emission

Electromagnetic compatibility

EN 50081-1: 1992

Immunity

EN 50082-1: 1992

## Mechanical configuration

Dimensions


100 mm x 140 mm x 35 mm

Weight

approx. 300 g with battery

## 5 Maintenance

### 5.1 Battery replacement

When a battery test reveals that the pointer no longer travels into the battery test section marked "  ", the battery must be replaced. Replace the exhausted battery with a new 9-V flat cell battery according to IEC 6F 22. Remove the lower part of the case as described in section 3.2.1 on page 6.

### 5.2 Fuse replacement

Remove the case as described in section 3.2.1 on page 6. The fuse holders are soldered to the circuit board.

### 5.3 Cleaning

The meter must only be cleaned with a soft cloth or brush. Eventually existing static charges of the window can be eliminated by means of an antistatic agent or a moist cloth.

## 6 Repair and replacement parts service

When you need service, please contact:

GOSSEN-METRAWATT GMBH  
Service  
Thomas-Mann-Straße 16 - 20  
D - 90471 Nürnberg  
Telefon (09 11) 86 02 - 4 10 / 4 11  
Telefax (09 11) 86 02 - 2 53

This address is for Germany only. Abroad, our representatives or establishments are at your disposal.

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