Operating instructions

GOSSEN METRAWATT CAMILLE BAUER

METRAmax 6

Analog multimeter

3-348-602-02
2/3.97

Caution!

The analog multimeter METRAmax 6 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 misused or carelessly handled. That is why it is absolutely necessary to carefully and completely read these operating instructions before using the METRAmax 4 and to follow them in all respects.

Contents

1 Applications

The METRAmax 6 is a battery-powered ohmmeter. It excels by its handy size, ease of use, and a large measuring span. It is meant for measurement of resistances between 0.05 Ω and 1 MΩ, for rough capacitance measurements between 1 µF and 30,000 µF, and for continuity tests with beeper

2 Description

The METRAmax 6 offers 9 measuring ranges for resistance and capacitance measurements. The measuring ranges are selected with a range switch.

The meter has a rugged movement with spring-loaded jewels. It is widely insensitive to vibrations and shocks.

The scale is mirror-backed for exact reading of the measured values.

The measuring range Ω x 1, marked in red, and the scale marked in red are provided for measurements of small resistance values (0.05 Ω bis 50 Ω). To measure higher resistance values, there are 4 measuring ranges which have a common black scale.

A part of the two scale arcs is boldly marked. The measuring error, referred to the actual resistance value, is smallest on these marked indicating ranges.

For rough capacitance measurements, there are 4 measuring ranges with a common scale.

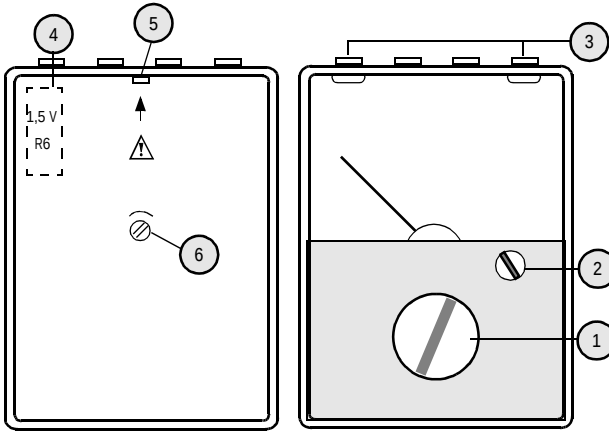
A beeper is incorporated for audible continuity tests.

The connectors are protected against accidental contact. It is recommended to use measuring leads with shockproof connection plugs (4 mm diameter).

3 Operation

Caution!
Only electrically dead devices under test must be measured!
Prior to each measurement, check mechanical zero and full-scale deflection.

3.1 Operating controls



1 Range selector switch
2 Rotary knob to adjust the full-scale deflection
3 Connection sockets
4 Battery compartment
5 Nose to open the meter
6 Adjustment screwer for the mechanical zero
(∞ on black scale)

3.2 Inserting the battery

Prior to starting the METRAmax 6, insert a 1.5 V mignon cell into the battery compartment. This requires removal of the lower part of the case

Caution!
Disconnect the test leads from the measuring circuit before opening the meter!

- Press the nose (5) on the rear of the meter inwards, using an adequate tool, and remove the lower part.
- Insert a leakproof 1.5 V mignon cell according to IEC R6 into the battery compartment (4), paying attention to the polarity markings. Verify that reliable contact is made.
- Replace the lower part of the case and press the two parts together until they engage.

3.3 Checking the mechanical zero

- Place the METRAmax 6 into a horizontal position.
- Set the range selector switch (1) to the "O" position (OFF).
- The pointer has to be exactly over the bar code of the full-scale deflection (∞ on the black scale).
- Correct deviations with the adjusting screw (6) on the rear of the meter with a screwdriver, if required.

3.4 Battery test

- Set the range selector switch (1) to the "Ω x 1" position (red marking).
- With the rotary knob (2), adjust the movement pointer on the red scale to full-scale deflection (∞).

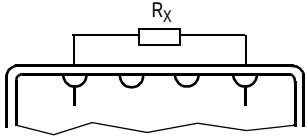
If the pointer can no longer be adjusted to full-scale deflection, or if the indication is instable after the adjustment, the battery is exhausted and has to be replaced with a new one, see Section 3.2.

4 Measurement

4.1 Resistance measurement

Resistance is measured with DC voltage from the inserted 1.5 V mignon cell. The maximum measuring currents at full-scale deflection, with a battery voltage of 1.5 V, are listed in the range table (see Section 6. Specifications).
If possible, select the measuring range in such a way that indication is in the range of the boldly drawn scale arc. The measuring error, referred to the actual resistance value, is smallest in this range.
During prolonged resistance measurements, occasionally check for full-scale deflection (0 Ω or ∞).
When switching the range selector switch (1) to another resistance range, always check for full-scale deflection and adjust with the rotary knob (2), if required.

4.1.1 Measuring on the range up to 50 Ω (Ω x 1, red)

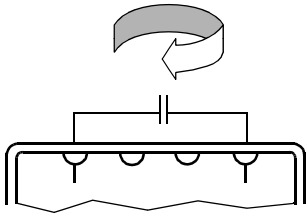


- Set the range selector switch (1) to Ω x 1 (red marking).
- With the rotary knob (2), adjust the pointer to full-scale deflection (∞) on the red scale.
- Connect the unknown resistance R_x to be measured and read the resistance value on the red scale.

4.1.2 Measuring on the ranges up to 1 MΩ
(Ω x 1/10/100/1000, black)

- Set the range selector switch (1) to one of the measuring ranges Ω x 1 ... Ω x 1000, depending upon the resistance value to be measured.
- Short the measuring leads.
- With the rotary knob (2), set the pointer to full-scale deflection (0 Ω) on the black scale.
- Connect the resistance R_X to be measured to the measuring leads and read the resistance value on the black scale. The indicated value must be multiplied by the specified factor in line with the selected measuring range

4.2 Rough capacitance measurement



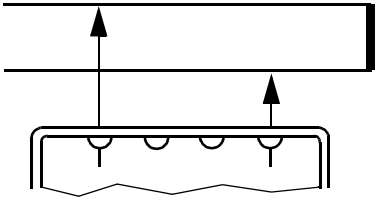
- Set the range selector switch (1) to one of the measuring ranges µF x 1 ... µF x 1000, depending upon the capacitance value to be measured.
- Capacitance is measured according to the ballistic method. Connect the capacitor a few times to the measuring leads with changing polarity and read the largest pointer deflection on the µF scale.

With this method, the capacitance of the capacitor to be measured can only roughly be determined. The measured value can deviate from the actual value by up to ±25 %.

4.3 Diode and transistor test

The resistance range Ω x 1000 is suited for a rough functional check on semiconductor elements. A resistance measurement is an easy way to find a short circuit or an interruption on a diode and/or a diode junction between base, collector and emitter. The polarity of a diode and the base connection of a transistor can also be determined by this test.
This measurement does not destroy semiconductor elements to be tested as the 1.75 V voltage and the 100 µA current are not exceeded.

4.4 Continuity test with sound signal



The continuity test (range selector switch (1) set to position ♪ is suitable for testing low-ohmic connections with a resistance value of ≤1.5 Ω.
No external voltage must be applied during the measurement!
The forward direction of semiconductor elements should not be tested by the audible continuity test but only according to the deflection method (see Section 4.3). When using the audible continuity test, inductive voltage spikes appear at the meter connectors which could damage the semiconductors.

5 End of measurement

After the measurement, the range selector switch (1) should be set to "O" to conserve the battery life.

6 Specifications

Measuring ranges

Resistance	Measuring span	Mid-scale value (R_i)	Max. measuring current I_{max} [1)]
Ω x 1 (red scale)	0.05 Ω ... 50 Ω	1 Ω	75 mA
Ω x 1	1 Ω ... 1 kΩ	20 Ω	75 mA
Ω x 10	10 Ω ... 10 kΩ	200 Ω	7.5 mA
Ω x 100	100 Ω ... 100 kΩ	2 kΩ	0.75 mA
Ω x 1000	1 kΩ ... 1MΩ	20 kΩ	0.075 mA

Capacitance measuring range	Measuring span	Max. measuring current $I_{max.}$ [1)]
µF x 1	0 ... 30 µF	0.075 mA
µF x 10	0 ... 300 µF	0.75 mA
µF x 100	0 ... 3 000 µF	7.5 mA
µF x 1 000	0 ... 30 000 µF	75 mA

[1)] With a battery voltage of 1.5 V

Continuity test with beeper

Response range	0 ... 1.5 Ω (beeper built-in)
Response current	365 mA
Operating current	170 mA

Accuracy

Error limit	±1.5 %	of scale length
	± 8.2 %	referred to the actual resistance value on the indicating range with boldly marked scale arc.

Display

Scale	Mirror-backed
Scale length	approx. 90 mm
Pointer deflection	∠ 0° ... 100°

Reference conditions	
Ambient temperature	+20 °C
Position of use	Horizontal
Power supply	
Fuse	1 mignon cell 1.5 V acc. to IEC R6, leakproof
Overload protection	
Fuse link	F 6.3 H/250 V acc. to DIN VDE 0820 part 22/EN 60127-2, fixedly installed
Electrical safety	
Protection class	II acc. to IEC 1010-1/EN 61010-1/ VDE 0411-1
Overvoltage category	CAT III
Nominal voltage	300 V
Pollution degree	2
Text voltage	3.7 kV~
EMC	Electromagnetic compatibility
Emission	EN 50081-1: 1992
Immunity	EN 50082-1: 1992
Mecanical configuration	
Dimensions	100 mm x 140 mm x 35 mm
Weight	approx. 0.3 kg (without battery)

7 Maintenance

7.1 Battery

The state of the battery should be ckecked from time to time. An exhausted or deteriorating battery must not remain in the battery compartment. Check and replace the battery as described in Section 3.2.

7.2 Fuse link

The holder for the fuse link is soldered to the circuit board. See section 6, overload protection, for the specified fuse.

7.2.1 Fuse replacement

- Disconnect the meter from the measuring circuit!
- Remove the lower part of the case, see section 3.2 on page 7.
- Changing the fuse it is possible to put the holder carefully to side or to desolder it.

Caution!
Absolutely verify that only the specified fuse is inserted! The use of a fuse with other cut-out characteristics, other nominal user and also there is danger of damaging protective diodes and other components.

The use of mended fuses or shorting of the fuse holder is not permitted.

7.3 Case

The meter must only be cleaned with a soft cloth or brush. Eventual static charges of the glass pane can be removed with an antistatic agent or a moist cloth.

8 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 if for Germany only. Abroad, our representatives or establishments are at your disposal.

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