

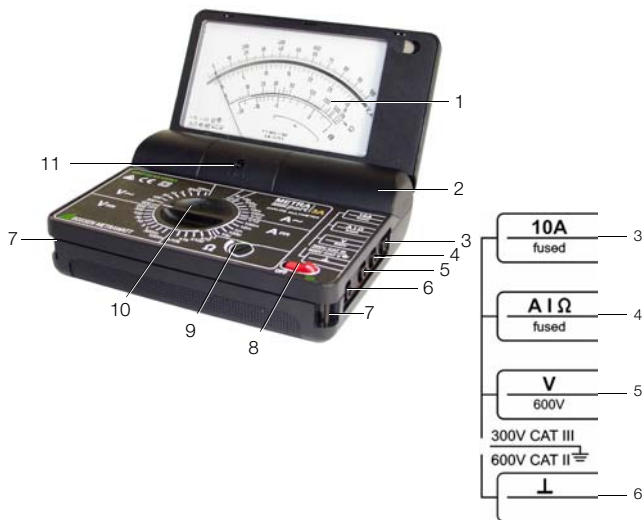
METRAport[®] 3A

Analog Multimeter

3-349-303-15

5/11.11





- 1 Scale
- 2 Cover of battery compartment
- 3 Connection socket „10 A“ for the highest current range
- 4 Connection socket for the measuring range $A|\Omega$
- 5 Connection socket for the measuring range V (high potential)
- 6 Connection socket $\perp$ for all measuring ranges
- 7 Eye for fastening of the carrying strap
- 8 OFF|ON: on/off switch (off when the instrument is closed)
- 9 Potentiometer full scale deflection setting for resistance measurement
- 10 Function switch and range switch
- 11 Setscrew for mechanical zero

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1 Safety Features and Precautions

You have selected an instrument which provides you with a high level of safety.

This instrument fulfills the requirements of the applicable European and national EC guidelines. We confirm this with the CE marking.

The relevant declaration of conformity can be obtained from GMC-I Messtechnik GmbH.

The analog/digital multimeter has been manufactured and tested in accordance with safety regulations IEC 61010–1:2001/ DIN EN 61010–1:2001/VDE 0411–1:2002. If used for its intended purpose, safety of the operator, as well as that of the instrument, is assured. However, safety cannot be guaranteed if the instrument is used improperly or handled carelessly.

In order to maintain flawless technical safety condition, and to assure safe use, it is imperative that you read the operating instructions thoroughly and carefully before placing your instrument into service, and that you follow all instructions contained therein.

Observe the following safety precautions

- The instrument may only be operated by persons who are capable of recognizing contact hazards and implementing appropriate safety precautions. Contact hazards exist anywhere, where voltages of greater than 33 V RMS may occur.
- Avoid working alone when taking measurements which involve contact hazards. Be certain that a second person is present.
- **Maximum allowable voltage between terminals (3), (4), (5), (6) and ground is equal to 600 V category II or 300 V category III.**
- **The instrument may only be used for current measurement in power systems if the electrical circuit is protected with a fuse or a circuit breaker with a rating of up to 20 A. In order to conform to the CAT requirements, two fuse links have been fitted for the ranges mA und A.**
- Be prepared for the occurrence of unexpected voltages at devices under test (e.g. defective devices). For example, capacitors may be dangerously charged.

- Make certain that the **measurement cables** are in flawless condition, e.g. no damage to insulation, no interruptions in cables or plugs etc.

For the application of measuring cables see chapter 8.2.

- No measurements may be performed with this instrument in electrical circuits with corona discharge (high voltage).
- Special care is required when measurements are made in HF electrical circuits. Dangerous pulsating voltages may be present.
- Measurements under moist ambient conditions are not permitted.
- Be absolutely certain that the measuring ranges are not overloaded beyond their allowable capacities. Limit values can be found in the “Measuring Ranges” table in chapter 5 „Technical Data“.

Meaning of symbols on the instrument



Warning concerning a point of danger
(Attention: observe documentation!)



Earth



Continuous doubled or reinforced insulation

CAT II / III

Measurement category II 600 V / III 300 V device



Indicates CE conformity



fuse



This device and the inserted (rechargeable) batteries may not be disposed of with the trash. For further details on the WEEE marking, please refer to our website www.gossenmetrawatt.de and enter search key 'WEEE'.

Repairs, Parts Replacement and Balancing

When the instrument is opened, voltage conducting parts may be exposed. The instrument must be disconnected from the measuring circuit before repair, replacement of parts or balancing. If repair or balancing of a live, open instrument is required, this may only be carried out by trained personnel who are familiar with the dangers involved.

Defects and Extraordinary Strains

If it may be assumed that the instrument can no longer be operated safely, it must be removed from service and secured against unintentional use. Safe operation can no longer be relied upon:

- If the instrument demonstrates visible damage
- If the instrument no longer functions
- After long periods of storage under unfavorable conditions, e.g. humidity, dust, excessive temperature.

2 Application

The multimeter is an analog multimeter with an electronic amplifier. It offers a great number of applications in the field of the electrotechnical practice, e.g. in research and development, manufacture, operation, test room and service as well as in the field of training and further education.

3 Description

The multimeter features 46 measuring ranges for DC and AC voltages up to 1000 V, AC voltage levels from -40 to +62 dB, DC and AC currents up to 10 A and resistances up to 20 M Ω . It has a constant input resistance of 10 M Ω on all voltage measuring ranges.

All measuring ranges are selected with a central range switch. They are clearly arranged in the turning area of the switch.

Measuring unit and indicating unit are housed in two different case halves which are connected with each other across a joint with a stepped stop device. An optimum reading angle can thus be set in all positions of use for easy reading.

Several well-tuned protection means protect the instrument against damage through improper handling and overload within the specified limit values for overload:

- Overdimensioned precision resistors
- Melting fuse in conjunction with protective power diodes
- Overvoltage arrester

The instrument operates independent of the mains on a commercially available 9 V flat cell battery. Thanks to the low power consumption of the electronic components, a long battery life is assured.

The rugged design of the multimeter assures fine protection in the case of rough mechanical duty. In closed condition, the instrument offers additional mechanical protection for the measuring unit and the indicating unit. The connection sockets are protected against accidental contact. Both the special measuring leads the connection plugs of which are protected against accidental contact (lead set KS17-2) and all measuring leads with conventional banana plugs (4 mm diameter) can be used.

4 Operation

4.1 Controls

ON/OFF switch

The toggle switch is used to turn the instrument on and off. This switch should be switched to the "OFF" position when the instrument is not operated for extended periods of time in order to avoid unnecessary load on the battery. Apart from that, even a leakproof battery may leak when the instrument remains turned on for several days with a discharged battery. Damages caused by leaking batteries are not covered by the instrument warranty.

When the instrument is closed, the battery is automatically disconnected.

Range switch

The multimeter has only one rotary switch. All measuring ranges are selected with it. Without disconnecting the measured variable, it is possible to switch from the DC voltage ranges to the corresponding AC voltage ranges or from the DC current ranges to the corresponding AC current ranges. The measuring circuit is not interrupted when

changing the current measuring ranges. When making current and voltage measurements, take care that the range switch is **first set to the highest measuring range**. Then work down to lower measuring ranges until optimum display is obtained.



Attention!

When the measuring voltage, e.g. 250 V $\sim$, is applied, do not switch to the resistance measuring ranges. From the range $\Omega \times 100$ on there is danger of damaging the contacts of the range switch.

Eye for fastening of the carrying strap

The carrying strap can be fastened at the eyes. It allows for the instrument to be carried around the neck. Both hands are free for measuring.

Setscrew

for setting of the mechanical zero.

Analog indication

Indication of the measured value is effected by a moving-coil core magnet movement with spring-loaded jewel bearings on a mirror-backed scale of a maximum length of 101 mm.

Connection sockets

The instrument has four connection sockets which are protected against accidental contact. They have the following functions:

Socket „10 A“	connector for the highest current meas. range 10 A $\sim$.
Socket „A Ω “	connector for current measuring range up to max. 1 A and for all resistance measuring ranges.
Socket „V“	connector for all voltage meas. ranges (high potential).
Socket „ $\perp$ “	common connector for all measuring ranges to which earth potential of the measured variable has to be applied. This input is connected with the shielding within the instrument.

Special measuring leads the connection plugs of which are protected against accidental contact (lead set KS17-2) as well as all leads with banana plugs (4 mm diameter) can be plugged onto the sockets.

Melting fuses

for measuring circuit (see also chapter 5).

Potentiometer

for full scale deflection ∞ setting when measuring resistance

4.2 Starting the Instrument

Installing the battery

➤ To install or replace the battery, the battery compartment must be opened.



Attention!

Remove the measuring leads from the measuring circuit prior to removing the cover of the battery compartment!

- Close the instrument.
- Put a coin or a similar object into the slot between the case and the cover of the battery compartment and press **down**.
- Open the instrument completely and remove the cover of the battery compartment.
- Install a 9 V flat cell battery into the battery compartment.



Attention!

Only use a leak-proof, 9 V flat cell battery, per IEC 6LR61, if possible!

- Reattach the cover of the battery compartment and press onto it until it engages.

Checking the mechanical zero

Put the multimeter into its position of use, turn off switch and check the mechanical zero position of the pointer. Correct with the adjustment screw, if required.

Checking the battery voltage

If the pointer is within the zone marked with the battery symbol „ + “ after the instrument has been turned on then the battery voltage is sufficient that is, it is assured that the error limits according to the data given in chapter 5 „Technical Data“ are maintained.

4.3 Voltage Measurement



Attention!

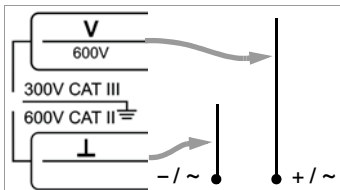
Regardless of the magnitude of the voltage being measured, for safety reasons, the sum of the voltage being measured and the voltage to earth must not exceed 600 V CAT II or 300 V CAT III when the multimeter is connected directly!

If possible, take the connection socket, marked „ $\perp$ “, immediately to earth or to the point having the lowest potential to earth when making any voltage measurements.

4.3.1 DC and AC Voltages up to 600 V (Direct Connection)

- Set the range switch to position 600 V --- or 600 V $\sim$.
- Connect the measurement cables as shown.

With DC voltage note the polarity! The „ $\perp$ “ jack must be grounded. For safety reasons, leads with connection plugs that are protected against accidental contact (KS17-2) should be used.



- Set switch to position „ON“.
- Work down to lower voltage ranges until optimum indication is obtained.
- Read the measuring voltage on the VA scale.

Note: Overload protection up to 600 V --- is provided by a PTC thermistor; cooling time of the thermistor until the start of next measurement: grant at least 2 minutes.

4.4 Current Measurement



Attention!

The multimeter should be connected into the line having the lowest voltage to earth. For safety reasons, the voltage to earth must not exceed 600 V CAT II or 300 V CAT III!

The measuring circuit must be set up mechanically solid and protected against accidental opening. The conductor cross sections and the connection points must be designed in such a way that there will be no unpermissible warm-up. The current measuring ranges 10 μ A ... 1 A are protected by a 1.6 A superquick-action melting fuse (FF 1.6A/600V AC) in conjunction with power diodes. The maximum breaking capacity of the protective means is 200 A $\overline{\sim}$ (one half wave) with a nominal voltage of 600 V and ohmic load.



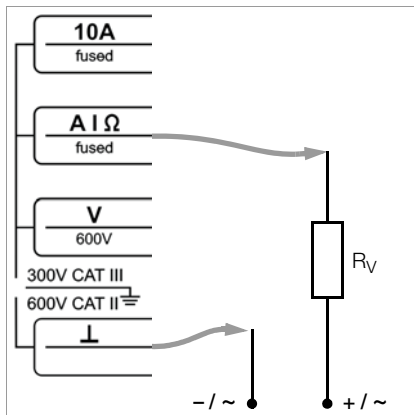
Attention!

Upon cut-out of the protective means, eliminate the cause of overload before putting the instrument back to serviceable condition!

The 10 A range is protected by a 16 A superquick-action melting fuse (FF 16A/600V AC).

4.4.1 DC and AC Currents up to 1 A (Direct Connection)

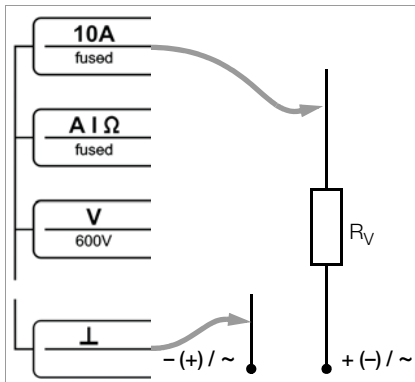
- ⇒ Disconnect the power supply to the measuring circuit and/or power consumer (R_V), and discharge all capacitors, if available.
- ⇒ Set the range switch to position $1/10 \text{ A} \text{---}$ or $1/10 \text{ A} \sim$.



- ⇒ Interrupt the measuring circuit and safely connect the measuring leads (without transient resistor!) in series with the power consumer R_V . With DC current note the polarity!
- ⇒ Set switch to position „ON“.
- ⇒ Reconnect the power supply to the measuring circuit.
- ⇒ Work down to lower current measuring ranges until optimum indication is obtained. Switching over does not interrupt the measuring circuit.
- ⇒ Read the measured value on the V, A scale.

4.4.2 DC and AC Currents up to 10 A (Direct Connection)

- Disconnect the power supply to the measuring circuit and/or power consumer (R_V), and discharge all capacitors, if available.
- Set the range switch to position $1/10 \text{ A} \text{ ---}$ or $1/10 \text{ A} \sim$.
- Interrupt the measuring circuit and safely connect the

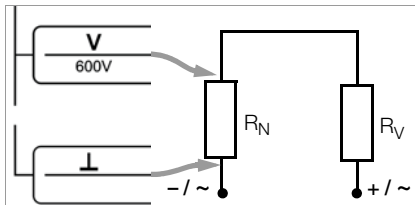


- measuring leads (without transient resistor!) in series with the power consumer R_V . With DC current note the polarity!
- Set switch to position „ON“.
 - Reconnect the power supply to the measuring circuit.
 - Read the measured value on the V, A scale 0 ... 100.

4.4.3 DC and AC Currents above 10 A with External Shunt

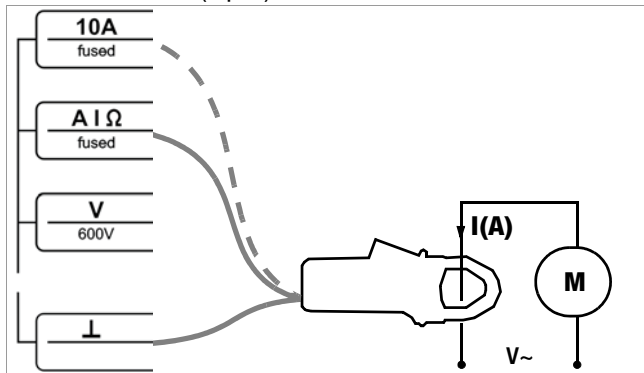
Measurements of currents above 10 A are possible with shunts (R_N), e.g. 100 A/ 100 mV.

- Set the range switch to position 100 mV, for instance, depending on the voltage drop at the shunt.



- Then proceed according to chapter 4.4.1.

4.4.4 AC Currents with (Clip-on) Current Transformers



Attention!

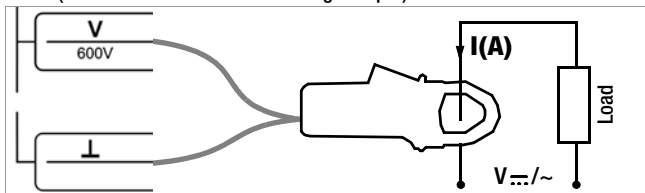
Prior to closing the primary circuit, verify that the secondary circuit is closed. If current transformers are operated in open state on the secondary side, e.g. due to defective or not connected leads, due to a blown fuse because of prior overload, or due to a wrong position of the range switch (not on the current range), dangerously high voltages can appear at the connection terminals. Therefore, first check that the current circuit of the measuring instrument and the secondary winding of the transformer which is connected to the instrument form an uninterrupted measuring circuit. This can be done for all measuring ranges by means of a resistance measurement as described in chapter 4.6.

Clip-on current transformers allow for measurements of AC currents without the need to interrupt the operating circuit. For the use of both bushing type current transformers and clip-on current transformers the maximum permissible operating voltage is the rated voltage of the current transformer. Take into account the additional error in indication.

➔ Set the range switch to position A~.

- Select the measuring range of the multimeter as a function of the measuring range and the transformation ratio of the clip-on transformer.
- Connect the measurement cables as shown.
- Set switch to position „ON“.
- Scan the electrical circuit with the clip-on transformer.
- Read the measured value by making allowances for the transformation ratio of the transformer.
- Disconnect the clip-on transformer from the electrical circuit before separating the measurement cables from the instrument!

4.4.5 DC and AC Currents with (Clip-on) Current Sensors (Current Transformers with Voltage Output)



- Set the range switch to position $V_{\text{---}}$ or $V_{\sim}$.
- Select the measuring range of the multimeter as a function of the measuring range and the transformation ratio of the clip-on sensor.
- Connect the measurement cables as shown.
- Set switch to position „ON“.
- Scan the electrical circuit with the clip-on sensor.
- Read the measured value by making allowances for the transformation ratio of the transformer.

Example Current Sensor Z13B:

Measuring range of clip-on sensor: $60 A_{\text{---}}/40 A_{\sim}$,

Output of clip-on sensor: 10 mV/A (max. 600 mV)

Measuring range of multimeter: $1 V_{\text{---}}/\sim \rightarrow 300 \text{ mV}_{\text{---}}/\sim$

Indicated value: $150 \text{ mV} \triangleq 15.0 \text{ A}$

4.5 Measurement of Composite Voltages and Composite Currents

The multimeter allows for separate measurements of DC and AC components of composite voltages and composite currents.



Attention!

The sum of the DC and AC components of the measured variable shall not exceed the permissible limit values for overload according to chapter 5, and/or the response values of the protective means!

4.5.1 Composite Voltages

Perform the measurement in accordance with chapter 4.3.

DC voltage measurement with superimposed AC voltage

The AC voltage component may be 5 times the full scale value on 50 Hz and 50 times the full scale value from 500 Hz on. The additional error is then smaller than 2.5% of the full scale value.

AC voltage measurement with superimposed DC voltage

The sum of the AC voltage and the superimposed DC voltage shall not exceed the permissible limit values for overload according to chapter 5.

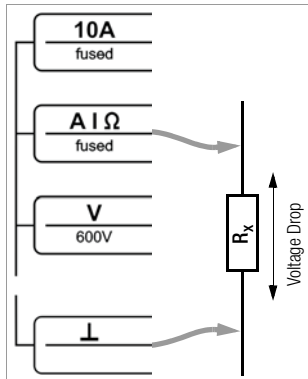
4.5.2 Composite Currents

Perform the measurements according to chapter 4.4.

On the 10 μA ... 100 mA measuring ranges, the sum of DC and AC component causes an erroneous indication from the threefold full scale value on up due to the response of the protective means.

4.6 Resistance Measurement

For resistance measurement, the resistance R_x to be measured is switched in parallel to the internal resistance. That is why with open input terminals ($R_x = \infty$) the scale value ∞ (full scale deflection) is indicated. The polarity of the voltage to be measured corresponds to the markings on the connection sockets „A| Ω “ and „ $\perp$ “. The resistance measuring ranges are protected by a superquick-action melting fuse FF 1.6A/600V AC in conjunction with power diodes. The overload limit of the protective means is 200 A $\approx$ at a maximum (one half wave) on 600 V $_{\text{eff}}$.



Attention!

Upon cut-out of the protective means:

Check the measuring electric circuit and eliminate the cause of overload prior to putting the instrument back to serviceable condition.

On the ranges $\Omega \times 1$, $\Omega \times 10$ and $\Omega \times 100$ the open-circuit voltage at the sockets is approximately 100 mV. The voltage across the device under test can be read on the 0 ... 100 graduation, whereby 100 scale parts correspond to 100 mV.

On the ranges $k\Omega \times 1$ and $k\Omega \times 10$ the open-circuit voltage at the sockets is approximately 1 V. The voltage across the device under test can be read on the 0 ... 100 graduation, whereby 100 scale parts correspond to 1 V. Because the open-circuit voltage is approximately 100 mV on the ranges $\Omega \times 1$, $\Omega \times 10$ and $\Omega \times 100$, resistance measurements are possible on circuit boards that are also equipped with semi-conductors.

- Set the range switch to position $\Omega \times 1 \dots k\Omega \times 10$.
- Set switch to position „ON“.

- With adjustment potentiometer, adjust to full scale deflection ∞ .
- Connect the measurement cables as shown.
- Read the resistance value on the Ω scale giving consideration to the multiplication factor.



Attention!

Only electrically dead items may be measured. External voltages would falsify the measured result.

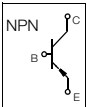
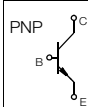
After the range switch has been switched from one resistance measuring range to another, always check the full scale deflection $\infty \Omega$ and correct with potentiometer, if required.

4.7 Test of Diodes and Transistors

The resistance measuring ranges $k\Omega \times 1$ and $k\Omega \times 10$ are also suited for coarse functional tests of diodes and transistors. A short circuit or an interruption of a diode and/or a diode path between base, collector and emitter of a transistor can be found in a simply way with a "resistance measurement". The polarity of a diode and the base connection of a transistor can also be found in this way. The device under test cannot be destroyed as the measuring voltage is 1 V at a maximum and the measuring current. 2.2 μA or 22 μA at a maximum. From this limitation of the measuring voltage and the measuring current it follows, however, that semi-conductors with relatively high reverse and/or residual current, such as power diodes and power transistors, for instance, and also rectifiers with several series-connected elements cannot be tested as, due to the small measuring current, the difference between the readings in forward and/or reverse direction are not sufficiently marked.

- Set the range switch to position $k\Omega \times 1$ or $k\Omega \times 10$.
- Set switch to position „ON“.
- With adjustment potentiometer adjust to full scale deflection ∞ .
- Connect the measuring leads to the sockets „A| Ω “ and „┴“.
- Connect diode or transistor according to the following table and measure both in forward and reverse direction.

- Read the resistance value on the Ω -scale and the voltage on the V, A scale with the 100 part graduation.

Measurement	Diode		Transistor			
						
in	on socket		on socket		on socket	
Forward direction	$1\text{ k}\Omega$	$\perp$	$1\text{ k}\Omega$	$\perp$	$\perp$	$1\text{ k}\Omega$
Reverse direction	$\perp$	$1\text{ k}\Omega$	$\perp$	$1\text{ k}\Omega$	$1\text{ k}\Omega$	$\perp$

B= Basis C= Collector E= Emitter

Valuation of a diode and/or the diode path of a transistor

A diode and/or a transistor functions when the indication on the V, A scale during a measurement in forward direction is smaller than the indication during a measurement in reverse direction. The qualitative behaviour and the technical data of the semi-conductor can, however, not be judged by the degree of deflection; mainly the current gain of a transistor is not picked up. When measuring in reverse direction, the multimeter indicates the voltage on the diode path on the $\text{k}\Omega \times 10$ range (1 V for full scale value). The reverse current flowing thereby is the difference between the full scale value (graduation 100) and the indication. One graduation corresponds to 10 mV and/or 22 nA.

A diode and/or a transistor is interrupted when ∞ or the same value close to ∞ is indicated on the Ω -scale in both directions (insulation resistance). A diode and/or a transistor has a short between the connection electrodes when 0 or the same value close to 0 is indicated on the Ω -scale in both directions.

5 Technical Data

Voltage ¹⁾	Level ²⁾		Input Resistance R _i	Overload Protection up to ³⁾
	Const.	Measuring Span		
100 mV $\approx$	-20 dB	-40 ... -18 dB	10 M Ω / /50 pF	600 V $\approx$
300 mV $\approx$	-10 dB	-30 ... -8 dB		600 V $\approx$
1 V $\approx$	0 dB	-20 ... +2 dB		600 V $\approx$
3 V $\approx$	+10 dB	-10 ... +12 dB		600 V $\approx$
10 V $\approx$	+20 dB	0 ... +22 dB		600 V $\approx$
30 V $\approx$	+30 dB	+10 ... +32 dB		600 V $\approx$
100 V $\approx$	+40 dB	+20 ... +42 dB		600 V $\approx$
300 V $\approx$	+50 dB	+30 ... +52 dB		600 V $\approx$
600 V $\approx$	+60 dB	+40 ... +62 dB		600 V $\approx$

- ¹⁾ The voltage measuring ranges 100 mV ... 10 V can also be used for current measurements as shown in the following table (e.g. reverse currents or leak currents). The accuracy of these measuring ranges then corresponds to class 5.

Frequency range on $\approx$: 15 ... 100 Hz

Overload protection same as on the voltage measuring ranges.

- ²⁾ Measuring value = indicated value + constant ; 0 dB $\triangleq$ 0.775 V, i.e. 1 mW at 600 Ω
- ³⁾ protected by PTC thermistor; cooling time of thermistor before the start of next measurement: grant at least 2 minutes.

Range	Current at Full Scale Value	R _i
100 mV $\approx$	10 nA	10 M Ω
300 mV $\approx$	30 nA $\approx$	
1 V $\approx$	100 nA $\approx$	
3 V $\approx$	300 nA $\approx$	
10 V $\approx$	1 μ A $\approx$	
30 V $\approx$	3 μ A $\approx$	

Current	Input Resistance R _i	Voltage Drop ΔU	Overload Protection up to
10 μ A $\approx$	10,0 k Ω	100 mV	600 V $\approx$ ³⁾
100 μ A $\approx$	1,0 k Ω	100 mV	600 V $\approx$ ³⁾
1 mA $\approx$	100,0 Ω	100 mV	600 V $\approx$ ³⁾
10 mA $\approx$	10,0 Ω	100 mV	600 V $\approx$ ³⁾
100 mA $\approx$	1,4 Ω	140 mV	600 V $\approx$ ³⁾
1 A $\approx$	480 m Ω	0,480 V	600 V $\approx$ ³⁾
10 A $\approx$	26 m Ω	260 mV	600 V $\approx$ ⁴⁾

Resistance Range	Read-out Range	Mid-Scale Value (R_i)	Open-Circuit Voltage U_0	Short-Circuit Current I_K	Overload Protection up to
$\Omega \times 1$	1 Ω ... 2 k Ω	45,6 Ω	100 mV	2,2 mA	600 V ³⁾
$\Omega \times 10$	10 Ω ... 20 k Ω	456,0 Ω	100 mV	0,22 mA	600 V ³⁾
$\Omega \times 100$	100 Ω ... 200 k Ω	4,56 k Ω	100 mV	22 μ A	600 V ³⁾
k $\Omega \times 1$	1 k Ω ... 2 M Ω	45,6 k Ω	1 V	22 μ A	600 V ³⁾
k $\Omega \times 10$	10 k Ω ... 20 M Ω	456,0 k Ω	1 V	2,2 μ A	600 V ³⁾

³⁾ Protected by G type melting fuse link FF 1.6A/600V AC in conjunction with protective power diodes.

⁴⁾ Fuse protection FF 16A/600V AC; 10 A: max. 10 min.

Accuracy at reference conditions per IEC 60051/EN 60051

Class 1.5 for DC variables; class 2.5 for AC variables and class 1.5 for resistance (inherent deviation with reference to the scale length of 69 mm) corresponding to maximum 10 % inherent deviation from the measured value in the range of the bolder drawn scale arc.

Reference Conditions

Ambient

temperature $+23\text{ }^{\circ}\text{C} \pm 2\text{ K}$

Relative humidity 40 ... 60 %

Position of use Device and scale horizontal $\pm 1^{\circ}$

Frequency of

measured variable 45 ... 65 Hz

Waveshape of

measured variable sinusoidal

Battery voltage $7.5\text{ V} \pm 0.1\text{ V}$

for other influencing

variables per IEC 60051/EN 60051

The multimeter is calibrated in rms values. It operates with full-wave rectification which values the arithmetic mean value.

Influencing variables and rated operating ranges

Temperature	+5 ... +23 ... +35 °C
Limit temperatures	for accuracy +5 ... +35 °C for operation 0 ... +40 °C for storage -25 ... +65 °C (without battery)
Position	additional influence effect max. $\pm 1\%$ of scale length when the scale is inclined to the horizontal between 0 and $\pm 120^\circ$
Frequency	additional influence effect max. $\pm 10\%$ of full scale value in the ranges 100 mV; 3 V ... 600 V: 15 Hz ... 1 kHz 10 μ A ... 10 A: 15 Hz ... 1 kHz 300 mV; 1 V: 15 Hz ... 200 Hz
Auxiliary voltage	No additional influence effect; the upper range value for each measuring range must be set via the potentiometer in the case of resistance measurements.
Series-mode interference	
voltage attenuation	on $V_{\text{---}}$ > 60 dB with AC 50 Hz on $V_{\sim}$ > 120 dB with DC
Common-mode	
voltage attenuation	> 120 dB with DC and 50 Hz AC
Composite voltages and composite currents	see chapter 4.5
Other influencing variables	per IEC 60051/EN 60051

Power Supply

Battery	nominal voltage 9 V—; 9 V flat cell battery per IEC 6LR61 (6F22), alkaline-manganese or NiCd/NiMH-Akku.
Service life	with alkaline-manganese cell: approx. 1000 hours with NiCd storage battery: approx. 200 hours in the $\Omega \times 1$ range: $\frac{1}{4}$ of the entire service life
Battery test	indication must be within battery test zone

Fuse

Range up to 1 A and Ω FF 1.6A/600V, 6 mm x 32 mm protects the 10 μ A ... 1 A and Ω x1 ... k Ω x10 ranges in conjunction with the power diodes

Switching capacity:

50 kA with 600 V~ (one half wave on ohmic load) overload limit of the melting fuse in conjunction with the power diodes: max. 200 A $\approx$ with 600 V (one half wave on ohmic load)

10 A range FF 16A/600V AC, 6 mm x 32 mm,
Switching capacity 50 kA at 600 V~

Electrical Safety

Protection class	II per IEC/EN 61010-1:2001/VDE 0411-1:2002	
Measuring category	II	III
Operating voltage	600 V	300 V
Pollution degree	2	
Test voltage	3.5 kV~ per IEC/EN 61010-1:2001/VDE 0411-1:2002	

Electromagnetic Compatibility (EMC)

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

Mechanical Design

Protection type	Housing: IP 40, connection sockets: IP 20
Dimensions	146 x 118 x 44 mm (in closed condition)
Weight	approx. 0.45 kg without battery

6 Maintenance



Attention!

Disconnect the instrument completely from the measuring circuit before opening the battery compartment to replace the battery!

6.1 Battery

The state of the battery should be checked from time to time. A discharged or deteriorating battery shall not be left in the battery compartment. When a check of the battery voltage according to chapter 4.2 shows that the pointer is beyond the zone for the battery check then the battery needs to be replaced as described in chapter 4.2.



Attention!

Install a leak-proof battery only. Use a 9 V flat cell battery according to IEC 6 F 22. Instead of an alkaline-manganese cell a NiCd/NiMH storage battery can be used as well.

6.2 Melting Fuse

The instrument is equipped with two fuses.



Attention!

Disconnect the instrument completely from the measuring circuit before opening the bottom part of the housing to replace the fuse!

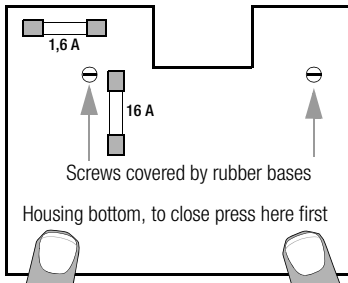
Upon tripping of the fuse, eliminate the cause of overload before putting the instrument back to serviceable condition! Make absolutely sure that only the specified fuse is used, see chapter 5 „Technical Data“!

Using a fuse with different tripping characteristics, different nominal current or different switching capacity involves hazards for the operator and for protective diodes, resistances or other components. The use of mended fuses or short-circuiting of the fuse holder is not permitted.

Melting Fuse for the mA Range (up to 1 A)

The built-in FF 1.6A/600V AC melting fuse for the measuring circuit up to 1 A/ Ω can be checked for continuity on the resistance measuring ranges, preferably on the $\Omega \times 1$ range. With the measuring sockets „A| Ω “ and „1“ shorted, the resistance of the fuse must be indicated to be approximately 0.5 Ω . If the fuse is defective, ∞ is indicated.

The melting fuse blows when one of the current measuring ranges (except for the range 10 A $\approx$) or one of the resistance measuring ranges $\Omega \times 1 \dots k\Omega \times 10$ and higher is overloaded unpermissibly high. The fuse is located immediately behind the „A| Ω “ connection terminal. Replace the fuse as follows:



- Disconnect the instrument from the measuring circuit!
- Open the bottom part with the housing in closed condition, if possible. To this end, remove the rubber bases and pull out the screws.
- Remove the defective fuse and replace it with a new one.
- Close the housing again by pressing it shut at the bottom first.
- After retightening the screws, fix the rubber bases again with a little bit of adhesive.

Melting Fuse for the 10 A Range

The built-in FF 16A/600V AC fuse for the 10 A measuring circuit can only be checked for continuity when removed from the device. Access to the fuse is described above.

- Remove the fuse from the fuse holder.
- It can be checked for continuity in the $\Omega \times 1$ range. ∞ is indicated if the fuse is defective.

6.3 Housing

No special maintenance is required for the housing. Keep outside surfaces clean. Use a slightly dampened cloth for cleaning. Avoid the use of cleansers, abrasives or solvents.

Device Return and Environmentally Compatible Disposal

The **instrument** is a category 9 product (monitoring and control instrument) in accordance with ElektroG (German Electrical and Electronic Device Law). This device is not subject to the RoHS directive.

We identify our electrical and electronic devices (as of August 2005) in accordance with WEEE 2002/96/EG and ElektroG with the symbol shown to the right per DIN EN 50419.



These devices may not be disposed of with the trash. Please contact our service department regarding the return of old devices.

If you use **batteries** or **rechargeable batteries** in your instrument or accessories which no longer function properly, they must be duly disposed of in compliance with the applicable national regulations.

Batteries or rechargeable batteries may contain harmful substances or heavy metal such as lead (Pb), cadmium (Cd) or mercury (Hg).

The symbol shown to the right indicates that batteries or rechargeable batteries may not be disposed of with the trash, but must be delivered to collection points specially provided for this purpose.



7 Recalibration

The respective measuring task and the stress to which your measuring instrument is subjected affect the ageing of the components and may result in deviations from the guaranteed accuracy.

If high measuring accuracy is required and the instrument is frequently used in field applications, combined with transport stress and great temperature fluctuations, we recommend a relatively short calibration interval of 1 year. If your measuring instrument is mainly used in the laboratory and indoors without being exposed to any major climatic or mechanical stress, a calibration interval of 2-3 years is usually sufficient.

During recalibration* in an accredited calibration laboratory (DIN EN ISO/IEC 17025) the deviations of your instrument in relation to traceable standards are measured and documented. The deviations determined in the process are used for correction of the readings during subsequent application.

We are pleased to perform DKD or factory calibrations for you in our calibration laboratory. Please visit our website at

→ FAQs → Calibration questions and answers).

By having your measuring instrument calibrated regularly, you fulfill the requirements of a quality management system per DIN EN ISO 9001.

8 Accessories

8.1 General

The extensive accessories available for our measuring instruments are checked for compliance with currently valid safety regulations at regular intervals, and are expanded as required for new applications. Currently up-to-date accessories which are suitable for your measuring instrument are listed at the following web address along with photo, order number, description and, depending upon the scope of the respective accessory, data sheet and operating instructions:

Products → Measuring Technology –
Portable → Multimeters Accessories).

* Verification of specifications or adjustment services are not part of the calibration. For products from our factory, however, any necessary adjustment is frequently performed and the observance of the relevant specification is confirmed.

8.2 Technical Data for Measurement Cables

(scope of delivery: KS17-2 safety cable set)

Electrical Safety

Maximum Rated Voltage	600 V	1000 V	1000 V
Measuring Category	CAT IV	CAT III	CAT II
Maximum Rated Current	1 A	1 A	16 A
with safety cap applied	•	•	—
without safety cap applied	—	—	•

Ambient Conditions (EN 61010-031)

Temperature	-20 °C ... + 50 °C
Relative humidity	50 to 80%
Contamination level	2

Application KS17-2



Attention!

Please observe the maximum values of the electrical safety of the device.

In conformity with standard DIN EN 61010-031, measurements in an environment according to measuring category III may only be performed with the safety cap applied to the test probe of the measurement cable.

For establishing contact in 4 mm jacks you have to remove the safety cap by levering out the snap lock of the safety cap with another sharp object (e.g. the second test probe).

9 Repair and Replacement Parts Service Calibration Center and Rental Instrument Service

When you need service, please contact:

GMC-I Service GmbH
Service-Center

This address is only valid in Germany. Please contact our representatives or subsidiaries for service in other countries.

10 Product Support

When you need support, please contact:

GMC-I Messtechnik GmbH
Product Support Hotline