Operating Instructions

GOSSEN METRAWATT

METRA HIT 1A/2A

Analog Multimeter

3-349-305-15
5/8.11

1 Common connection for all measuring ranges (instrument earth)

2 METRA HIT 2A: connection for highest current measuring range 15 A≂⎓

3 Connection for resistance measurement and capacitance measurement (negative potential)

4 Connection for all voltage and current ranges
except for METRA HIT 2A: here current measuring range up to 1.5 A

5 Catch for locking the bottom part of the instrument

6 Set screw for mechanical zero setting of the pointer

7 Potentiometer knob

8 Range switch

Contents

Page

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.

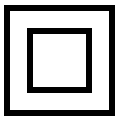
Observe the following safety precautions

- 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 (1), (2), (3), (3) and ground is equal to 500 V category II.**

- **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.
- 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 4 „Operation“.

Meaning of symbols on the instrument

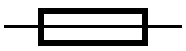
Warning concerning a point of danger
(Attention: observe documentation)



Continuous, doubled or reinforced insulation

CAT II Measuring category II instrument 500 V

Ground



Fuse

Indicates EU conformity

2 Application

The multimeter is suited for voltage, current and resistance measurements and for the rough measurement of capacitance. It is designed for universal use in electronics, radio and television technology and digital technology and can be used for many measuring tasks in the field of general electrical technology. The meter is mainly used in the DIY sector as well as in the fields of service, eductation and vocational training.

3 Description

The multimeter has measuring ranges for direct and alternating voltage, direct and alternating current and resistance. Capacitance values can be ascertained by rough measurements.
All the measuring ranges are selected by means of the central range switch. They are clearly arranged in the rotary section of the switch.
A mirror is placed behind the scale for accurate reading of the measured values. The pivots of the measuring element and the measuring range switch are located in line one above the other, so that it is also possible to provide long scales for the Ω and dB measurements. The rugged plastic case and the core-magnet moving-coil measuring element with its spring-backed jewel bearings protect the meter against damage when subjected to rough mechanical stress.
The connection sockets are protected against accidental contact. Both the special instrument leads with shock protection (KS 17) and all measuring leads with conventional banana plugs (4 mm diameter) can be plugged in.

4 Operation

4.1 Controls

Measuring range switch

The multimeter has only one rotary switch by which all the measuring ranges are selected. The meter can be switched from the direct voltage ranges to the corresponding alternating voltage ranges, or from the direct current ranges to the corresponding alternating current ranges, without switching off the measured value.

It must be ensured that the measuring range switch is **first set to the highest measuring range** when measuring voltage and current. The switch then has to be switched to lower ranges until the optimum deflection is obtained.

Connection sockets

The meter has connection sockets with shock-proof protection. Their functions are as follows:

Socket „⊥“ = common connection for all measuring ranges (instrument earth)

Socket „+15 A ≂ = METRA HIT 2A: connection for highest current measuring range 15 A ≂

Socket „Ω“ = connection for resistance measurement and capacitance measurement (negative potential)

Socket „+V,A ≂“ = connection for all voltage and current ranges except for METRA HIT 2A: here up to 1.5 A

The sockets can accommodate the instrument leads with shock-protected connection plugs as well as all measuring cables with banana plugs (diameter 4 mm).

Potentiometer knob

The rotary knob is used to set the full deflection 0 Ω when measuring resistance as described in chapter 4.5 and capacitance according to chapter 4.6.

4.2 Starting the Instrument (Ω Measurement only)

Inserting the battery

The bottom half must be removed from the instrument in order to install or exchange the battery.

Attention!
Before opening the instrument, the measuring leads must be disconnected from the measuring circuit!

- ➪ Press the catch on the rear of the instrument, using a test point, banana plug or similar object, in the direction of the arrow and remove the lower section.
- ➪ Insert the 1.5 V mignon cell in accordance with the symbol and pole sign.

Attention!
Only use a leak-proof 1.5 V mignon cell according to IEC LR6/R 6! (AA-Size)

- ➪ Place the instrument in the lower section of the housing and gently press the two halves together until they lock into place.

Mechanical zero point check

- Place the multimeter flat on the edge of a table. The lower third of the instrument should project over the edge.
- Check the mechanical zero setting of the pointer.

- If necessary, adjust the set screw on the rear of the instrument with a screwdriver to correct the setting.

Battery check

➪ Set the range switch to the „Ω x 1“ position.

➪ Short-circuit connecting sockets „⊥“ and „Ω“ using a measuring lead.

➪ Set the pointer to full deflection position 0 Ω using potentiometer knob.

If it is no longer possible to set the full deflection or if the reading does not remain constant after setting, the mignon cell is spent or the pigtail fuse is defective.

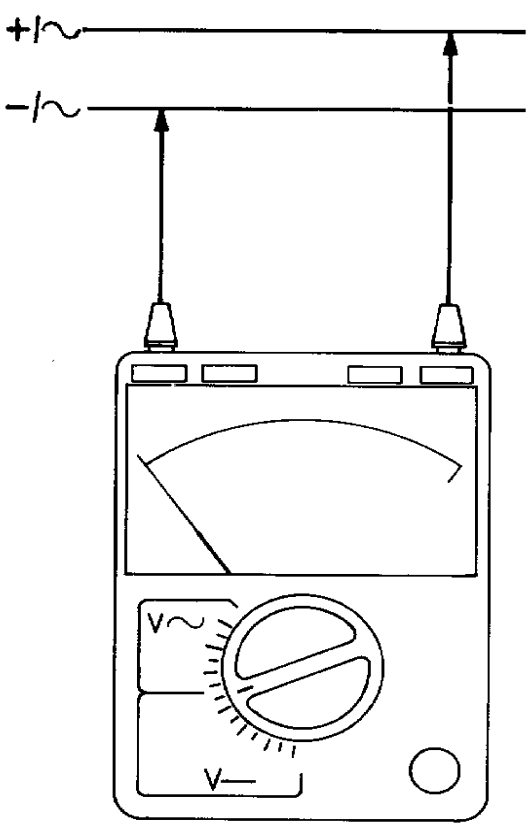
4.3 Voltage Measurement

Attention!

Regardless of the value of the measured voltage, as a safety precaution, do not exceed the sum of 500 V CAT II for measured voltage plus voltage against earth when directly connecting up the multimeter!

The left-hand connection socket marked „⊥“ should be connected whenever possible and for all voltage measurements to the point with the lowest potential against earth.

4.3.1 DC and AC Voltages up to 500 V

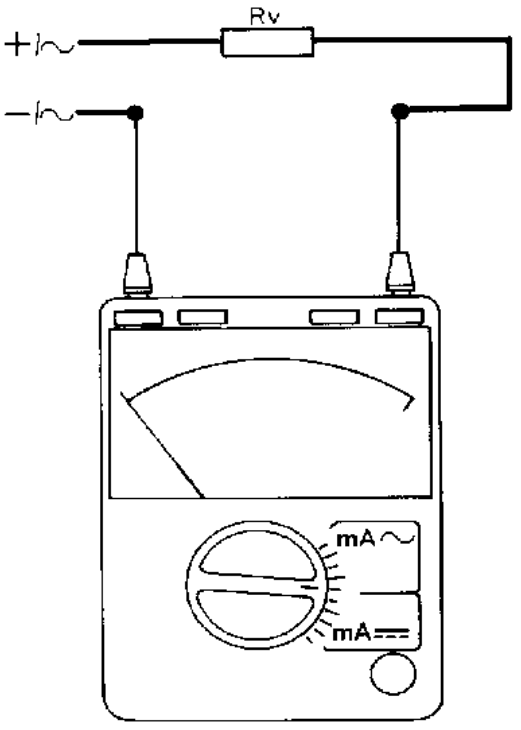


- ➪ Set range switch to the position 500 V — or 500 V ~.
- ➪ Plug test leads into the instrument; (black) test lead to socket „⊥“ and (red) lead to socket „+ V, ⎓ “.
  For safety reasons, the test leads with shock-protected connection plugs should be used.
- ➪ Apply the voltage measured to the test leads. For DC voltage, socket „⊥“ must be connected to the negative pole of the measured voltage and socket „+ V,A ⎓“ to its positive pole.
- ➪ If the measured voltage is less than 150 V, set range switch, in the case of DC voltage, to the lower DC voltage ranges and, in the case of AC voltage, to the lower AC voltage ranges, proceeding until optimum deflection is obtained.
- ➪ Read off the measured value: for DC voltage, on scales 0 ... 5 or 0 ... 15 V, A ⎓ , for AC voltage, on scales 0 ... 5 or 0 ... 15 V, A ~ .

4.4 Current Measurement

Attention!
The multimeter must always be connected into the lead the voltage of which is the lowest relative to earth. For safety reasons, the voltage relative to earth must not exceed 500 V CAT II! **Observe the overload limits, see tables on page 23.**

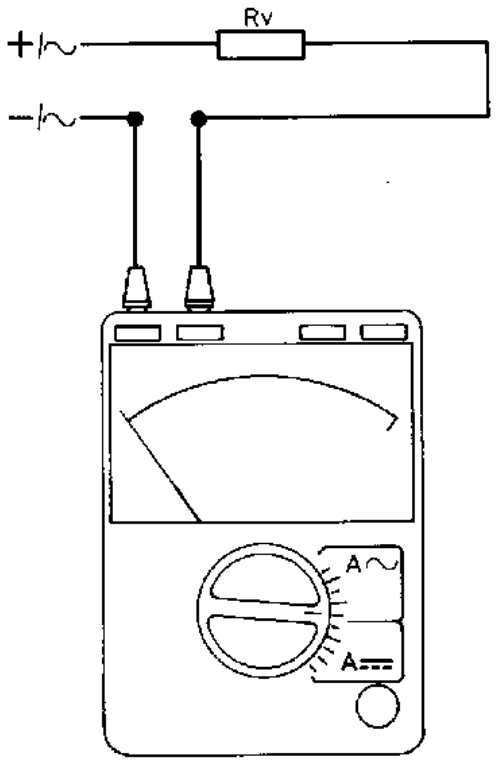
4.4.1 DC and AC Voltages (METRA HIT 2A: up to 1.5 A)



- Set range switch to the position 5 A ⎓ or 5 A ~ (METRA HIT 2A: 1.5 A ⎓ or 1.5 A ~).
- Plug test leads into the instrument; (black) test lead to socket „⊥“ and (red) lead to „+ V, A ⎓ “.
- Disconnect the power supply to the measuring circuit, and/or the power consumer (R_V) and discharge all capacitors, if available.
- Interrupt the measuring circuit and safely connect the measuring leads (without contact resistance!) in series with the power consumer R_V. Note polarity sign when measuring direct current! Negative to „⊥“ socket and positive to „+V, A ⎓ “ socket.
- Connect power supply to measuring circuit again.

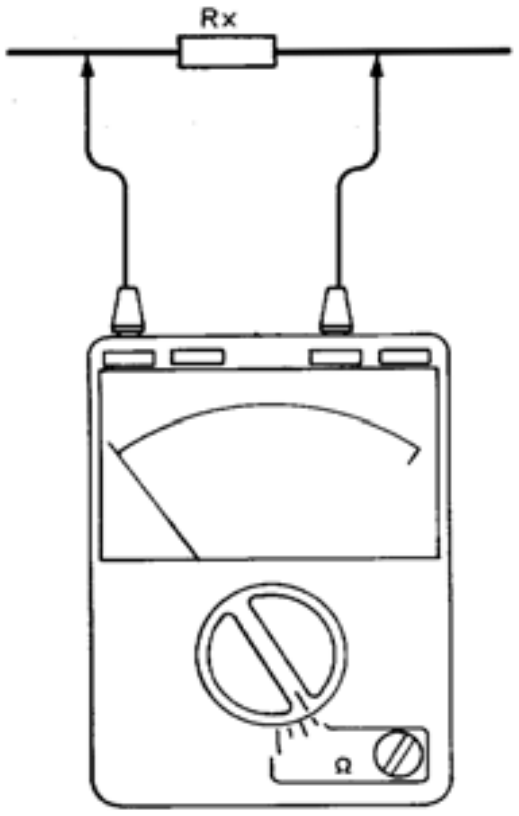
- If the measuring current is less than 500 mA. set the measuring range switch to lower direct current ranges in the case of direct current, and to lower alternating current ranges in the case of alternating current, until the optimum deflection is obtained.
- Read off the measured value: METRA HIT 1A: for DC on scale 0 ... 15 V,A⎓, for AC on scale 0 ... 15 V,A∼.
  METRA HIT 2A: for DC on scale 0 ... 15 V,A⎓, for AC on scale 0 ... 15 V,A∼.

4.4.2 METRA HIT 2A: Direct and Alternating Currents up to 15 A



- Set the range switch to the position 15 A ⎓ or 15 A ∼.
- Plug the test leads into the instrument; (black) test lead to socket „⊥“ and (red) test lead to socket „+ 15 A ⎓∼ “.
- Disconnect the power supply to the test circuit or consumer (R_V) and discharge all capacitors, if any.
- Disconnect test circuit and connect test leads safely (no contact resistance) in series to the consumer R_V. In the case of direct current, observe the correct pole signs. Negative to socket „⊥“ and positive to „+ 15 A ⎓∼ “.
- Re-connect the supply to the test circuit.
- Read off the measured value: for DC on scale 0 ... 15 V,A⎓, for AC on scale 0 ... 15 V,A∼.

4.5 Resistance Measurements



Resistance is measured with DC voltage from the 1.5 V mignon cell. The table of measuring ranges in chapter 5 gives the maximum measuring currents for full deflection and a battery voltage of 1.5 V.
Socket polarity is as follows:
Positive pole on socket „⊥“
Negative pole on socket „Ω“

- ➪ Set range switch, depending on the measured value expected, to one of the ranges Ω x 1 ... Ω x 1000.
- ➪ Plug in the test leads to sockets „⊥“ and „Ω“.
- ➪ Short-circuit the test leads.
- ➪ Using the potentiometer knob, set the pointer of the measuring mechanism to full deflection 0 Ω. If it is no longer possible to set for full deflection or if the reading does not remain constant after setting, the mignon cell is depleted or the pigtail fuse is defective.
- ➪ Connect resistance to be measured R_x to the test leads.

Attention!

Only voltage-free objects may be measured. External voltages falsify the measuring results and might also damage the instrument!

➪ Read off the value displayed on the Ω scale and multiply by the factor according to the adjusted measuring range.

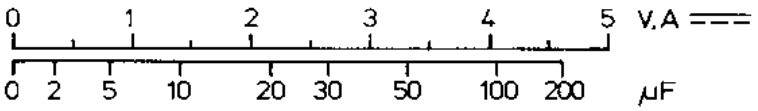
If possible, the measuring range should be selected in such a way as to obtain a reading in the range 5 ... 50 Ω. The measuring error, in relation to the actual resistance value, is smallest in the middle of the deflection range. Read off the value displayed on the Ω scale and multiply by the factor according to the adjusted measuring range. During resistance measurements of a longer duration, the full deflection 0 Ω should always be checked if possible after moving the range switch from one resistance range to another and, if necessary, it should be reset.

Note!

Contact resistances at the battery connecting terminals may, particularly in low ohmic resistance ranges, cause the setting of full deflection 0 Ω to fluctuate. Consequently, good contact should be ensured, for example by removing and refitting the battery (see chapter 4.2).

4.6 Estimated Capacitance Measurement

Capacitance values can be determined in the resistance ranges by estimated measurement. When doing so, proceed exactly as if measuring resistance in accordance with chapter 4.5. Resistance R_x is to be replaced by the capacitance to be measured, after prior discharge. When the capacitor is connected, the pointer of the instrument swings to a maximum value and then returns to its initial position (mechanical zero point). The point of return of the pointer deflection serves as a measure for capacitance. It is to be determined on scale 0 ... 5 V, A ⎓. The measured value can be determined using the following comparative scale and the factor for capacitance measurement corresponding to the measuring range selected:



Measuring Range	Factor for Capacitance Measurement	Measuring Limits
Ω x 1000	µF x 1	2 ... 200 µF
Ω x 100	µF x 10	20 ... 2000 µF
Ω x 10	µF x 100	200 ... 20000 µF
Ω x 1	µF x 1000	2000 ... 200000 µF

Before measurement is repeated, the capacitor must be recharged!

Example:

Selected measuring range: Ω x 100
Return point of pointer: 3.3 on the upper scale 0 ... 5 V, A ⎓
Capacitance determined via comparative scale: 50 µF
Multiplied by the factor for capacitance measurement: 50 µF x 10 = 500 µF

4.7 Measurement of Gain and Attenuation

In communications engineering, gain or attenuation is almost exclusively given as a logarithm of the ratio between a measured voltage and a given reference voltage in dB. In recurrent networks, it is thereby possible to determine the total gain or attenuation in a simple manner by adding or subtracting the individual values. The reference voltage is 0.775 V (1 mW for 600 Ω); attenuation at this voltage is 0 dB.

For gain and attenuation measurement, proceed exactly as described in chapter 4.3.1 for AC voltage measurement; the measured values, however, are to be read off the dB scale.

The range – 15 ... + 6 dB shown on the scale corresponds to the AC voltage range 1.5 V. In the case of the higher voltage measuring ranges 5 V ∼, 15 V ∼, 50 V ∼ ..., 10 dB, 20 dB, 30 dB ... are to be added to the value read; see the table in chapter 5 showing the voltage measuring ranges.

If a DC voltage is superposed on the AC voltage to be measured, this can be cancelled out by using a suitable capacitor, which is to be series-connected to the measuring input.

The operating voltage of the series-connected capacitor must be at least of the same magnitude as the peak value for the voltage applied. If there is an additional error of 1 % of the measured value, it can be calculated from the formula opposite.

$$C_v \approx \frac{1}{0{,}89 \cdot \frac{f}{Hz} \cdot \frac{R_i}{M\Omega}} \cdot \mu F$$

In mentionned formula, R_i is the internal resistance of the measuring instrument in the selected measuring range

Example:
For a 1 kHz superposed AC voltage, a series-connected capacitor of C_V = 0.0056 µF = 5.6 nF results for the 50 V ~ measuring range.

Attention!
The capacitor is loaded up to the value of the DC voltage component. The load can assume a magnitude that can be **lethal** and retain this load for quite some time. The capacitor must therefore be discharged after measurement!

4.8 Testing Diodes and Transistors

The resistance range Ω x 1000 is suitable for approximate functional testing of diodes and transistors. By using a resistance measurement (see chapter 4.5) it is simple to determine a short-circuit or interruption of current in a diode or a diode path between base, collector and emitter in a transistor. This test also enables the polarity of a diode and the base connection of a transistor to be determined.

Note!
The positive pole is at socket „⊥“, the negative pole is at socket „Ω“.

The DUT is not destroyed during this measurement as the voltage does not exceed 1.75 V, and the test current does not exceed 100 µA.

5 Technical Characteristics

Voltage Measuring Ranges

Voltage	Output [1]	Internal Resistance approx. —	Internal Resistance approx. ~
0.15 V —	—	3.15 kΩ	—
0.50 V —	—	10.00 kΩ	—
1.50 V ≂	–15 ... + 6 dB	31.50 kΩ	6.50 kΩ
5.00 V ≂	– 5 ... + 16 dB	100.00 kΩ	20.00 kΩ
15.00 V ≂	+ 5 ... + 26 dB	315.00 kΩ	65.00 kΩ
50.00 V ≂	+15 ... + 36 dB	1.00 MΩ	200.00 kΩ
150.00 V ≂	+25 ... + 46 dB	3.15 MΩ	650.00 kΩ
500.00 V ≂	+35 ... + 56 dB	10.00 MΩ	2.00 MΩ

[1] 0 dB ≙ 0.775 V in the range of 1.5 V ~; 0 dB ≙ 1 mW at 600 Ω

Input resistance in relation to voltage — for —: 20.0 kΩ/V; for ~: 4.0 kΩ/V

METRA HIT 1A: Current Measuring Ranges

Current	Voltage Drop approx. —	Voltage Drop approx. ~
50.00 µA —	0.158 V	—
0.50 mA ≂	1.15 V	1.00 V
5.00 mA ≂	1.25 V	1.25 V
50.00 mA ≂	1.25 V	1.25 V
500.00 mA ≂	1.85 V	1.85 V
5000.00 mA ≂	1.73 V	1.73 V

METRA HIT 2A: Current Measuring Ranges

Current	Voltage Drop approx. —	Voltage Drop approx. ~
50 µA —	0.158 V	—
1.5 mA ≂	1.16 V	1.21 V
15 mA ≂	1.25 V	1.25 V
150 mA ≂	1.25 V	1.25 V
1.5 A ≂	1.95 V	1.95 V
15 A ≂	0.43 V	0.49 V

Resistance Measuring Ranges

Resistance	Measuring Limits	Value at Mid-Scale (R_i)	Max. Meas. Current I_{max} [2] approx.
Ω x 1	1 Ω ... 1 kΩ	18.00 Ω	83 mA
Ω x 10	10 Ω ... 10 kΩ	180.00 Ω	8.3 mA
Ω x 100	100 Ω ... 100 kΩ	1.80 kΩ	0.83 mA
Ω x 1000	1 kΩ ... 1 MΩ	18.00 kΩ	0.083 mA

[2] for battery voltage 1.5 V

Capacitance Measuring Ranges

Capacitance [3]	Measuring Limits
µF x 1000	2000 ... 20000 µF
µF x 100	200 ... 20000 µF
µF x 10	20 ... 2000 µF
µF x 1	2 ... 200 µF

[3] Estimated measurement in the resistance measuring ranges; determination of measured values via comparative scale, see chapter 4.6.

Reference Conditions

Ambient temperature	+23 °C ±2 K
Position of use	horizontal
Frequency	40 ... 60 Hz
Wave shape	for ∼: sinusoidal
Relative humidity	40 ... 60 %

The instrument features half-wave rectification and is calibrated in r.m.s. values. It evaluates the arithmetical mean of a half-wave and indicates different values for undulatory voltage or current, depending on the polarity of connection.

For other influencing quantities according to IEC/EN 60 051

Ambient Conditions

Storage temperatures	–25 ... 65 °C (without battery)
Relative humidity	max. 75 %, no condensation allowed

METRA HIT 2A: Accuracy

(for reference conditions per IEC/EN 60 051),
Class 2.5 for ⎓ and ∼;
maximum permissible intrinsic error in the 15 A⎓∼: range: ±2 %;
1,5 V~: +1/–2,5 %

Class 2.5 for Ω (error in relation to a scale length of 52 mm)

METRA HIT 2A: additional accuracy class influence and nominal ranges of use

Ambient temperatures	for ⎓: 0 ... +<u>23</u> ... +40 °C
	for ∼: +13 ... +<u>23</u> ... +35 °C
Frequency	Ranges 1.5 V ... 500 V:
	35 ... <u>40 ... 60</u> ... 1000 Hz
	Ranges 1.5 mA ... 1.5 A:
	35 ... <u>40 ... 60</u> ... 1000 Hz
	Range 15 A:
	40 ... <u>45 ... 60</u> ... 1000 Hz
Other influencing quantites	according to IEC/EN 60 051

Power Supply

Battery for resistance measurement	1 mignon cell 1.5 V per IEC LR6/R6 (AA-Size), leak-proof

Elektrical Safety

Protection class	II per IEC/EN 61010-1:2001/ VDE 0411-1:2002
Measuring category	II
Nominal voltage	500 V
Test voltage	3.5 kV~
Contamination level	2
Fuses	

replaceable

<u>METRA HIT 1A:</u>

F1: FF630mA/700V AC (50 kA), 6.3 x 32 (Article number: Z109J)
F2: FF6,3A/500V AC (50 kA), 6.3 x 32 (Article number: Z109K)

<u>METRA HIT 2A:</u>

F1: FF1,6A/700V AC (50 kA), 6.3 x 32 (Article number: Z109E)
F2: FF16A/500V AC (50 kA), 6.3 x 32 (Article number: Z109A)

pigtail fuse

750 mA/600 V AC

Electromagnetic Compatibility (EMC)

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

METRA HIT 1A: Overload capacity

Range		loadable up to
0.15	V –	20 V [1]
0.5	V –	50 V [2]
1.5	V –	100 V [2]
5.0	V –	150 V [2]
15.0	V –	250 V [2]
50.0	V –	250 V [2]
150.0	V –	300 V [2]
500.0	V –	500 V [2]
50.0	µA –	1.0 mA
0.5	mA –	5.0 mA
5.0	mA –	10.0 mA
50.0	mA –	70.0 mA
500 .0	mA –	500.0 mA
5 000.0	mA –	3.0 A
		5.0 A [3]

Range		loadable up to
—		—
—		—
1.5	V ~	25 V [2]
5.0	V ~	50 V [2]
15.0	V ~	150 V [2]
50.0	V ~	250 V [2]
150.0	V ~	300 V [2]
500.0	V ~	500 V [2]
—		—
0.5	mA ~	5.0 mA
5.0	mA ~	10.0 mA
50.0	mA ~	70.0 mA
500 .0	mA ~	500.0 mA
5 000.0	mA ~	3.0 A
		5.0 A [3]

METRA HIT 2A: Overload capacity

Range		loadable up to
0.15	V –	20 V [1]
0.5	V –	50 V [2]
1.5	V –	100 V [2]
5.0	V –	150 V [2]
15.0	V –	250 V [2]
50.0	V –	250 V [2]
150.0	V –	300 V [2]
500.0	V –	500 V [2]
50	µA –	1.0 mA
1.5	mA –	5.0 mA
15	mA –	20.0 mA
150	mA –	150.0 mA
1.5	A –	1.2 A
		1.5 A [3]
15	A –	12.0 A
		15.0 A [3]

Range		loadable up to
—		—
—		—
1.5	V ~	25 V [2]
5.0	V ~	50 V [2]
15.0	V ~	150 V [2]
50.0	V ~	250 V [2]
150..0	V ~	300 V [2]
500.0	V ~	500 V [2]
—		—
1.5	mA ~	5.0 mA
15	mA ~	20.0 mA
150	mA ~	150.0 mA
1.5	A ~	1.2 A
		1.5 A [3]
15	A ~	12.0 A
		15.0 A [3]

[1] Fuse F1 blows in the event of an overload

[2] These ranges are protected against overload by a PTC thermistor

[3] max. 1 min

Mechanical Design

Scale length	A, V – 0 ... 5.0: approx. 83 mm
	A, V – 0 ...15.8: approx. 77 mm
	A, V∼0 ... 5.0: approx. 67 mm
	A, V∼0 ... 15.8: approx. 59 mm
	Ω ∞ ... 0: approx. 52 mm
	dB – 15 ... +6: approx. 42 mm
Dimensions	92 x 126 x 45 mm
Weight	approx. 0.3 kg without battery
Protection type	Housing IP 40, terminals IP 20 per EN 60529/VDE 0470 part 1 Extract from table on the significance of IP codes

IP XY (1st digit X)	Protection against the penetration of solid foreign matter	IP XY (2nd digit Y)	Protection against the penetration of water
0	no protection	0	no protection
1	≥ 50.0 mm ∅	1	vertical dripping
2	≥ 12.5 mm ∅	2	dripping (15° gradient)
3	≥ 2.5 mm ∅	3	spray-water
4	≥ 1.0 mm ∅	4	splashwater
5	protection from dust	5	hoseproof
6	dustproof	6	extremely hoseproof

6 Maintenace

6.1 Battery

The state of the battery should be checked from time to time. A discharged or decomposing battery should not be left inside the instrument. The battery should be checked and changed in the manner described in chapter 4.2.

6.2 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.

6.3 Fuses

The instrument is fitted with two replaceable fuses F1 and F2. For replacement: Open and close the housing as described in chapter 4.2 under the heading „Inserting the battery“.

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!**

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.

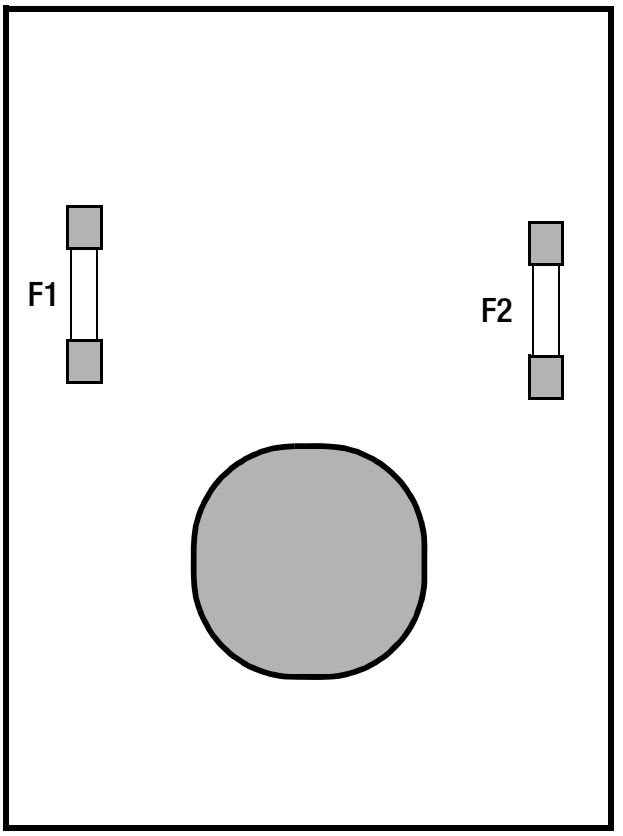
Melting Fuse F1 for the mA Range and 0.15 V Range

The inserted F1 melting fuse for the measuring circuit up to 0.5 A (for METRA HIT 1A) or 1.5 A (for METRA HIT 2A) can be checked for continuity in the resistance measuring ranges, preferrably in the Ω x 1 range when removed from the instrument. If the fuse is defective, ∞ is indicated. The melting fuse blows if one of the current measuring ranges or the 0.15 V range is unduly overloaded.

Melting Fuse F2 for the A Range

The fuse can be checked for continuity in the Ω x 1 range when removed from the instrument. If the fuse is defective, ∞ is indicated.

Location of melting fuses after removal of the bottom part of the housing



6.4 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).

They 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 Standard Equipment

Analog multimeter without battery, without cable set

8 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 www.gossenmetrawatt.com (→ Services → DKD Calibration Center *or* → 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.

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* 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.

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

When you need service, please contact:

GMC-I Service GmbH
Service Center
Thomas-Mann-Strasse 20
90471 Nürnberg • Germany
Phone +49 911 817718-0
Fax +49 911 817718-253
E-Mail service@gossenmetrawatt.com
www.gmci-service.com

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
Hotline Produktsupport
Phone +49 911 8602-0
Fax +49 911 8602-709
E-Mail support@gossenmetrawatt.com

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