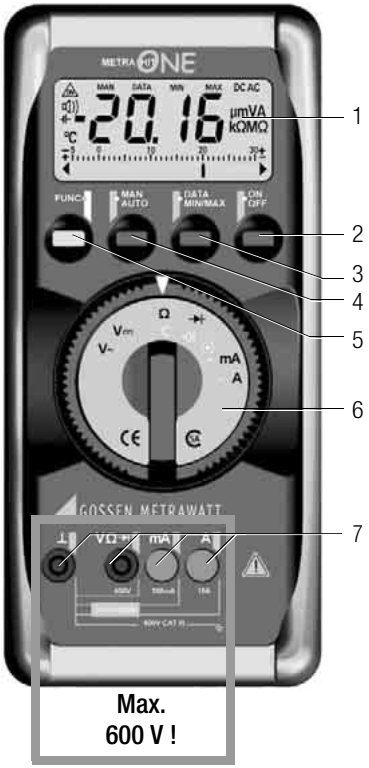
Operating Instructions

GOSSEN METRAWATT

METRA HIT ONE

Analog-Digital Multimeter

3-349-236-03
1/1.03



1 Display (LCD)

2 **ON/OFF** key

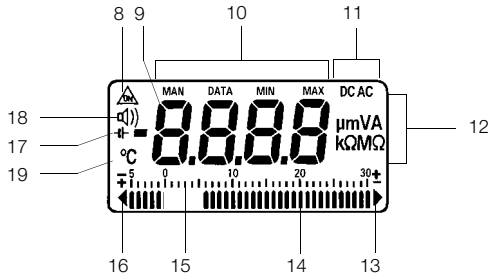
3 **DATA** key for the following functions: save measured value, delete and MIN-MAX

4 **AUTO/MAN** key for manual measuring range selection

5 **FUNC** key for selecting ranges or functions

6 Rotary selector switch for measuring function

7 Connector jacks



Symbols used in the Digital Display

8 Symbol for continuous duty

9 Digital display with decimal point and polarity display

10 Display for manual measuring range selection and for storage of measured and min-max values

11 Display for selected current type

12 Unit of measure display

13 Display in case of overranging

14 Pointer for analog display

15 Scale for analog display

16 Indicates that the negative analog display range has been exceeded

17 Low battery display

18 Indicates that the acoustic signals are active

19 Unit of measure °C for temperature measurement

Table of Contents

1 Safety Features and Precautions

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

The analog-digital multimeter is manufactured and tested in accordance with safety regulations DIN VDE 0411 and IEC 61010–1 / DIN EN 61010–1 / VDE 0411–1. When used for its intended purpose, safety of the operator, as well as that of the instrument, is assured. Their safety is however not guaranteed, if the instrument is used improperly or handled carelessly.

In order to maintain flawless technical safety conditions, 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.

In the interest of your own safety and in order to protect the instrument, the multimeter is equipped with an automatic socket blocking mechanism. This mechanism is linked to the function selector switch and only allows access to those jacks which are actually required for the selected function. It also prevents the user from turning the selector switch to impermissible functions after the measurement cables have already been plugged in.

Observe the following safety precautions:

- The instrument may only be operated by persons who are capable of recognizing contact hazards and taking the 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 any of the connector jacks (7) and earth **is 600 V, category III**. Nominal voltage at the system may not exceed 600 V. Voltage measurement may only be performed with the selector switch set to the V= or the V~ position.
- 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 made 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 13, “Characteristic Values”.

- All current measuring ranges are protected with fuses. Maximum allowable voltage for the measuring current circuit is 600 V in all “mA” and “A” ranges.
- We recommend using our **KS30 measuring adapter**, available as an accessory, for hazard-free **voltage measurement in power installations with up to 1000 V**. The included internal resistor limits measuring current in the event of excessive voltage and operator error, and assures reliable quenching of active spark gaps. For additional information refer to chapter 7.2, “Voltage Measurements at Above 600 V”.

Warning!

The instrument may not be operated in explosive atmospheres, or connected to intrinsically safe electrical circuits.

Meanings of symbols on the instrument:

Warning concerning a source of danger (attention: observe documentation)

Earth terminal

Continuous, doubled or reinforced insulation

CSA approval mark applied for

Indicates EC conformity

CAT III **Maximum allowable voltage** between the connector jacks (7) and earth is **600 V, category III**.

DKD Calibration Upon Request

Consecutive number
German Calibration Service– calibration laboratory
Registration number
Date of calibration (year – month)

Repair, 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 the performance of repairs, the replacement of parts or balancing. If balancing, maintenance or repair 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 device demonstrates visible damage
- If the instrument no longer functions
- After lengthy periods of storage under unfavorable conditions (e.g. humidity, dust, temperature), see ambient conditions on page 17

2 Initial Start-Up

Battery

Your instrument us supplied with an installed 9 V flat-cell battery in accordance with IEC 6 F22 or IEC 6 LR 61, and is ready for operation. **Be sure to refer to chapter 14.1, “Battery”, before initial start-up, or after your device has been in storage for a lengthy period of time.**

Switching the Instrument On

➪ Press the ON/OFF key (2).
Power-up is acknowledged with an acoustic signal. As long as the key is held depressed, all of the segments at the liquid crystal display (LCD) are illuminated. The LCD is shown in the diagram on page 2.
The instrument is ready for use as soon as the key is released.

Note!

Electrical discharge and high frequency interference may cause incorrect displays to appear, and may disable the measuring sequence. In such cases, switch the instrument off and back on again in order to reset. If the problem persists, briefly dislodge the battery from the connector contacts.

Disconnect the instrument from the measuring circuit before opening and refer to chapter 14, “Maintenance”!

Automatic Shutdown

The instrument switches itself off automatically if the measured value remains constant for a period of approximately 10 minutes (measured value fluctuation ≤ ± 2 digits), assuming that none of the keys or the rotary selector switch are activated during this time. However, it is not switched off if a current measuring range has been selected and a measured value of greater than 30 digits is displayed.

Disabling Automatic Shutdown

The instrument can be set to continuous duty. Press the multifunction key (5) and the ON/OFF key (2) simultaneously when switching the instrument on to this end. Continuous duty is indicated at the LCD by means of the ⚠ symbol (8).

Switching the Instrument Off

Press the ON/OFF key (2).

3 Selecting Measuring Functions and Measuring Ranges

The function selector switch (6) is linked to the automatic socket blocking mechanism, which only allows access to two connector jacks for each function. Be certain to remove the appropriate plug from its respective jack before switching to and from the “mA” or the “A” function. The socket blocking mechanism prevents the user from inadvertently turning the selector switch to impermissible functions after the measurement cables have been plugged in to the instrument.

3.1 Activating the DC Measuring Ranges ⊙

The DC measuring ranges are not activated automatically when the instrument is switched on. They must be activated separately if they are required for the measurement to be performed.

- ➪ Set the rotary selector switch (6) to ⊙.
- ➪ Briefly press the multifunction key (5).
  The multimeter acknowledges initialization of offset balancing for the DC measuring ranges with an acoustic signal. “CAL” appears at the digital display (9) during internal balancing.
- ➪ Wait until the “CAL” display is cleared from the LCD. The DC measuring ranges are now active. They remain active until the instrument is switched off, either automatically or manually.
  Note:
  Automatic shutdown is disabled in all current measuring ranges if the measured value display exceeds 30 digits.
- ➪ Set the rotary selector switch (6) to the desired position.

3.2 Automatic Measuring Range Selection

The multimeter is equipped with automatic measuring range selection for all ranges except the 30 mV ⎓, 300 mV ⎓ and 10 A ∼ ranges. Auto-ranging is active as soon as the instrument is switched on. The instrument automatically selects the measuring range which allows for highest possible resolution of the applied quantity. If the instrument is switched to frequency measurement and continues to perform proportional measurement, the previously selected voltage measuring range remains active.

The instrument is automatically switched to:

– The next highest range	at	± (3099 digits + 1 digit)
– The next lowest range	at	± (240 / 280 digits – 1 digit)
From the 300 mA ⎓ to the 3 mA ⎓ range if the DC ranges are not activated in accordance with chapter 3.1.	at	± (24 digits – 1 digit)

3.3 Manual Measuring Range Selection

Auto-ranging can be deactivated and measuring ranges can be selected manually in accordance with the following table. Manual operation is deactivated by pressing and holding the AUTO/MAN key (4) (approx. 1 s), by activating the rotary selector switch (6), or by switching the instrument off and then back on again.

If the instrument is switched back to auto-ranging in the 30 mV ⎓ or the 300 mV ⎓ range, the 3 V ⎓ range is selected automatically.

⇓ AUTO/ MAN (4)	Function	Acknowledgement	
		Display	Acoustic Signal
brief	Manual mode active: utilized measuring range is fixed	MAN (10)	1 x
brief	Range switching sequence for: V ⎓ : 3 V → 30 V → 300 V → 600 V → 30 mV → 300 mV → 3 V → ... V ∼/≂: 3 V → 30 V → 300 V → 600 V → 3 V → ... mA ⎓ : 300 µA [1] → 3 mA → 30 mA [1] → 300 mA → 300 µA ... mA ∼/≂:3 mA → 300 mA → 3 mA ... A ⎓ : 3 A [1] → 10A → 3 A [1] ... Ω : 30 MΩ → 30 Ω → 300 Ω → 3 kΩ → 30 kΩ → 300kΩ → 3 MΩ → 30 MΩ ...	MAN (10)	1 x
long	Return to automatic range selection	—	2 x

1) If the respective measuring ranges are active

3.4 Quick Measurements

Measurements performed using a suitable fixed measuring range are executed more quickly than those which utilize automatic range selection. Quick measurement is made possible with the following two functions:

- **Manual measuring range selection**, i.e. selection of the measuring range with best resolution (see chapter 3.3)

or

- With the **DATA function** (see chapter 5). In this way, the correct measuring range is selected automatically after the first measurement and the second measurement is executed more quickly.

The selected measuring range remains active for the subsequent series of measurements with these two functions.

4 LCD

4.1 Digital Display

The measured value with decimal and plus or minus sign appears at the digital display (9). The selected unit of measure (12) and the current type (11) are displayed as well. A minus sign appears to the left of the value during the measurement of zero-frequency quantities, if the plus pole of the measured quantity is applied to the “⊥” input. “OL” is displayed if the upper range limit of 3099 is exceeded (or 1999 in the ⇥ range).

The digital display is refreshed twice per second during V, A and Ω measurements.

4.2 Analog Display

The analog display with simulated pointer and the same dynamic performance as a moving-coil mechanism is refreshed 20 times per second during V, A and Ω

measurements. This display is especially advantageous for observing measured value fluctuation, and for balancing procedures.

The analog display has its own polarity indicator. The analog scale (15) has a negative range of 5 scale divisions for the measurement of zero-frequency quantities, allowing for precise observation of measured value fluctuation around zero. If the measured value exceeds the display range, the triangle at the left (16) is displayed first, and polarity at the analog display is then switched after approximately 0.7 seconds. Overranging is indicated by the triangle at the right (13) (> 3099 digits, or > 1999 in the ⇥ range).

5 Measured Value Memory – DATA Function.

Measured values can be automatically "frozen" with the DATA function. This is useful, for example, when contacting the measuring points with the test probes requires your full attention. After the measured value has been applied and the corresponding "condition" from the table below has been fulfilled, the measured value is frozen at the digital display and an acoustic signal is generated. The test probes can now be removed from the measuring points, and the measured value can be read from the digital display. If the measured value is less than the value specified in the table, the instrument is reactivated for storage of the next value.

The DATA function has no effect on the analog display, at which the current measured value continues to appear. However, when the digital display if "frozen", the decimal point is fixed as well. If automatic range selection is activated, you are thus no longer able to determine which range the analog display is using. Manual range selection is not possible as long as the DATA function is active.

DATA Function	⇓ DATA MIN/MAX (3)	Condition		Response from Instrument		
				Display		Acoust. Signal
		Measuring Ranges	Measured Value Limits (digits)	Digital Meas. Value	DATA	
Activate	brief				blinks	1 x
Save		V ≃ [2] A ≃ Ω	>280 >24 [3] <0L	is displayed	is displayed	1 x
Reactivate [1]		V ≃ [2] A ≃ Ω	<280 <24 [3] 0L	stored meas. value	blinks	
Stop	long			is cleared	is cleared	2 x

1) Reactivation results from falling short of specified measured value limits.
2) Except 30 mV and 300 mV ranges
3) 240/280 digits, if the 300 µA, 30 mA, and 3 A ranges have been activated in accordance with chapter 3.1.

The DATA function is deactivated by pressing and holding the DATA key (3) (approx. 1 s), by activating the rotary selector switch (6), or by switching the instrument off and then back on again.

6 Saving Minimum and Maximum Values – MIN/MAX Function

Minimum and maximum measured values applied to the measuring instrument's input after the min-max function has been activated can be "frozen" at the display. The most important use of this function is the determination of minimum and maximum values during long-term measured value observation.

The min-max function has no effect on the analog display, at which the current measured value continues to appear.

Connect the measured quantity to the instrument and select the appropriate measuring range before activating the min-max function.

Measuring ranges can only be selected manually after the min-max function has been activated. However, saved minimum and maximum values are cleared if the measuring range is switched.

The min-max function is deactivated by pressing and holding the DATA key (3) (approx. 1 s), by activating the rotary selector switch (6), or by switching the instrument off and then back on again.

Function MIN/MAX	⇓ DATA MIN/ MAX (3)	Meas. Range	Min. and Max. Measured Values	Response from Instrument		
				Display		Acoustic Signal
				Digital Meas. Value	MIN MAX	
1. Activate and save	2 x brief 30 mV/ 300 mV and °C : 1 x brief	V ≃ A ≃ Ω, °C	are saved	Current meas. value	MIN and MAX blink	1 x
2. Save and display	brief	V ≃ A ≃ Ω, °C	Storage continues in background, new min. and max. values are displayed.	Saved min. value	MIN	1 x
	brief			Saved max. value	MAX	1 x
3. Return to 1	brief	Same as 1	Same as 1, stored values are not deleted	Same as 1	Same as 1	1 x
Stop	long		are deleted	is deleted	is deleted	2 x

7 Voltage Measurement

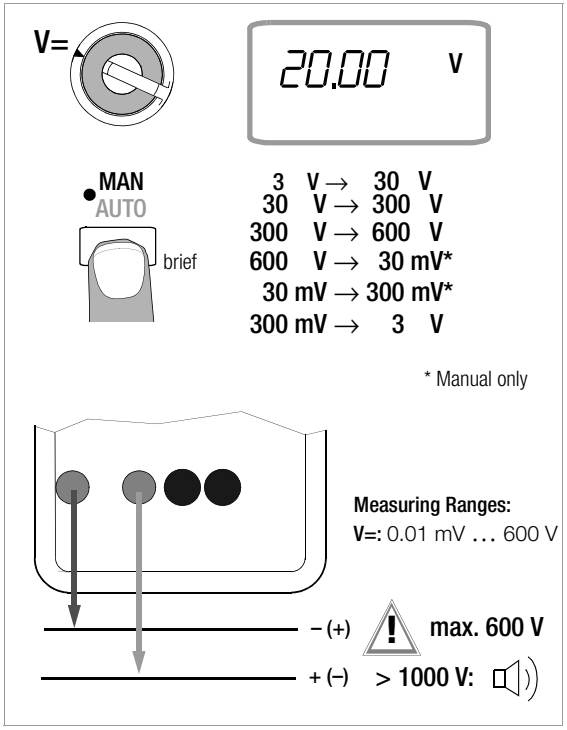
- Depending upon the voltage to be measured, set the rotary selector switch (6) to V ~ or V ⎓.
- Connect the measurement cables as shown. The "⊥" connector jack should be grounded.

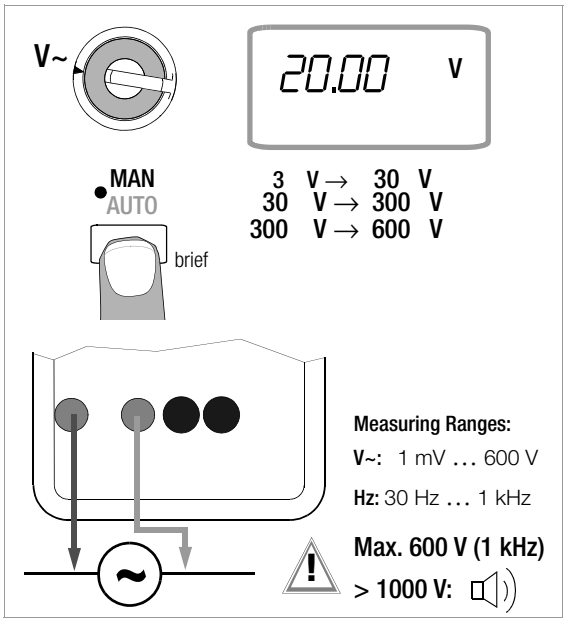
Note!

The 30 mV ⎓ and 300 mV ⎓ measuring ranges can only be selected manually with the MAN/AUTO key (4)! An intermittent acoustic signal warns the operator if the measured value exceeds 1000 V in the 600 V range.

Attention!

Make sure than none of the current measuring ranges (neither "mA" nor "A") **are activated** when connecting the multimeter for the performance of voltage measurements! If fuse trip limits are exceeded as a result of operator error, both the operator and the instrument are in danger!





Zero Balancing in the 30 mV ⎓ Measuring Range

Zero balancing is possible in the 30 mV ⎓ measuring range:

- Plug the measuring cables into the instrument and connect the free ends to each other.
- After selecting the measuring range, briefly press the multifunction key (5).

The instrument acknowledges zero balancing with an acoustic signal, and "*00.00*" (+ 1 digit) appears at the LCD with blinking decimal point. The voltage displayed at the moment the key is pressed serves as a reference value (max. ± 200 digits). It is automatically subtracted from all subsequent measured values.

Zero balancing can be deleted:

– By pressing and holding the multifunction key (5), which is acknowledged with two acoustic signals

– By switching the instrument off

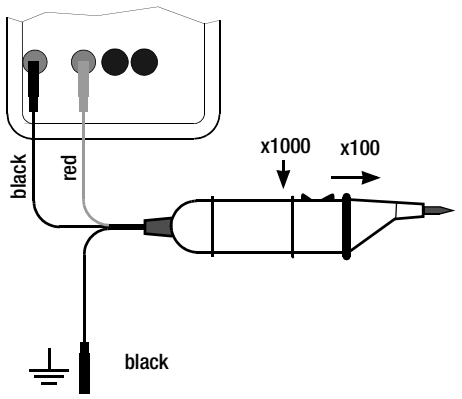
7.1 Transient Overvoltages

The multimeter is protected against transient overvoltages of up to 6 kV with rise times of 1.2, and halftimes of 50 µs. For measurements at transformers or motors with long pulse durations etc., we recommend the use of our KS30 measuring adapter. It provides protection against transient overvoltages of up to 6 kV with rise times of 10, and halftimes of 1000 µs. It has a continuous load capacity of 1200 V_{RMS}. Additional influence error caused by the KS30 measuring adapter amounts to approximately –2 %.

7.2 Voltage Measurements at Above 600 V

Voltages of greater than 600 V can be measured with a high-voltage probe, e.g. the HV3[1] of the HV30[2] from GOSSEN METRAWATT GMBH. It is absolutely essential to ground the bonding terminal. Observe all applicable safety precautions!

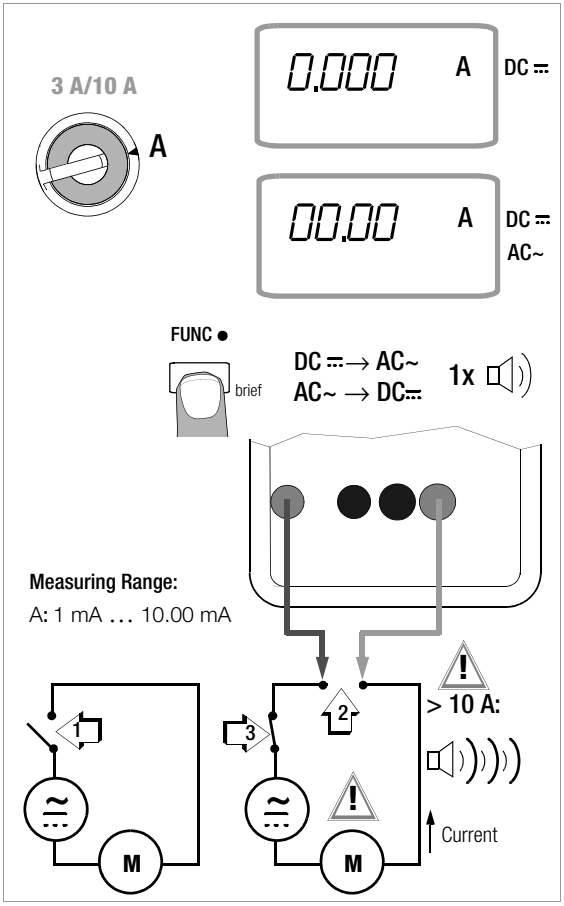
Voltage Measurements at Above 600 V with the HV3 High-Voltage Probe

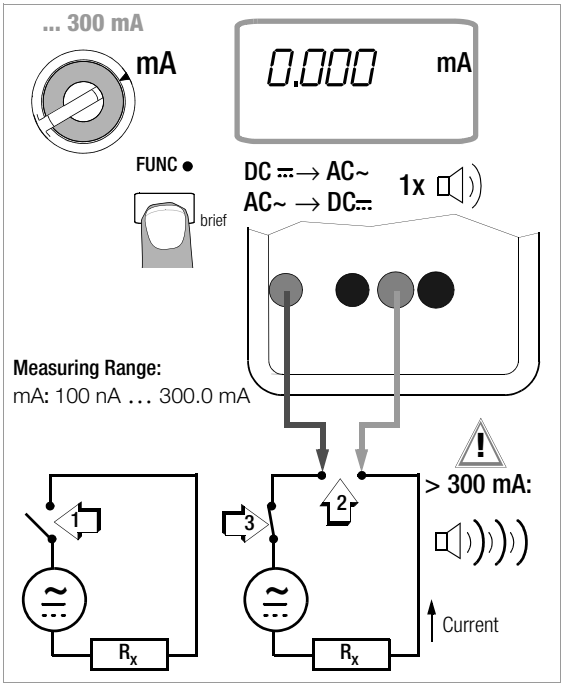


[1] HV3: 3 kV
[2] HV30: 30 kV, for direct voltage only: ⎓

8 Current Measurement

- ➪ First disconnect supply power from the measuring circuit or the consuming device, and discharge any included capacitors.
- ➪ Activate the DC measuring ranges as described in chapter 3.1.
- ➪ Select the A ⎓ range with the rotary selector switch (6) for current greater than 300 mA, or the mA ⎓ range for current less than 300 mA. Activate the **highest measuring range first** when measuring current of an unknown magnitude.
- ➪ Select the current type appropriate for the measured quantity by briefly pressing the multifunction key (5). Each time the key is pressed, DC and AC are alternately selected, and switching is acknowledged with an acoustic signal. The selected current type is indicated at the LCD by means of the DC and AC symbols (11). DC current is always active immediately after range selection with the rotary switch (6). The instrument can always be switched to DC by pressing and holding the multifunction key (5), which is acknowledged with two acoustic signals.
- ➪ Securely connect the measuring instrument to the consuming device in series as shown (without transfer resistor).





Notes Regarding Current Measurement:

- The instrument may only be used in power installations if the electrical circuit is protected with a 20 A fuse or circuit breaker, and the nominal voltage of the installation does not exceed 600 V.
- The measuring circuit must be mechanically stable, and must be secured against accidental interruption. Select conductor cross-sections and connectors such that no overheating occurs.
- An intermittent acoustic signal warns the operator if the measured value exceeds the upper range limit in the 300 mA and 10 A measuring ranges.
- Measuring ranges up to 300 mA are protected against short-circuit current of up to 25 A with an FF 1.6 / 700 V fuse link in combination with power diodes. The fuse has a breaking capacity of 50 kA at a nominal voltage of 700 V ~ and ohmic load.
- The 3 A and 10 A current measuring ranges are protected with a 16 A / 600 V fuse link. The fuse has a breaking capacity of 100 kA at a nominal voltage of 600 V ~ and ohmic load.
- If one of the fuses blows, this condition is indicated at the LCD as soon as a measured quantity with a voltage of greater than 4 V is applied to the corresponding connector jacks. FUSE appears at the digital display (9) in this case.
- If a fuse blows, eliminate the cause of overload before placing the instrument back into service!
- Refer to chapter 14, “Maintenance”, regarding fuse replacement.

8.1 Measuring Alternating Current with (Clip-On) Current Transformers

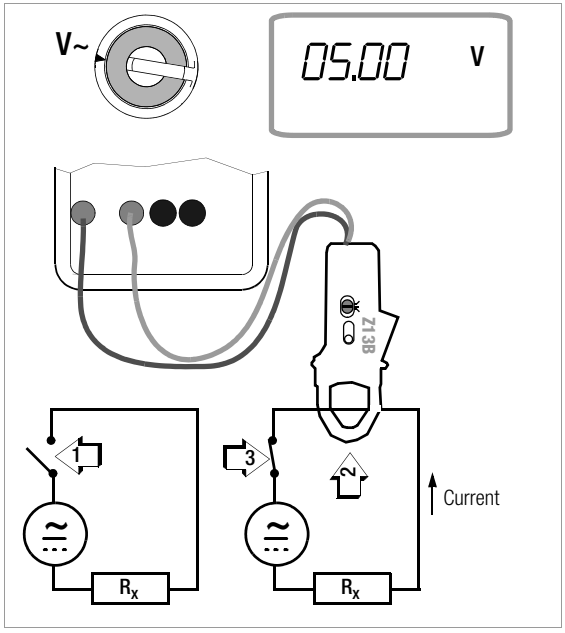
8.1.1 Transformer Output: mA / A

Attention!
If current transformers are operated without being connected at the secondary side (e.g. as a result of defective or missing cables, a blown device fuse or incorrect connection), dangerously high voltages may occur at the connector jacks. For this reason, make sure that the measuring instrument’s current path and the transformer’s secondary coil connected to the instrument complete an uninterrupted circuit, and connect this circuit to the ⊥ and mA or A jacks.

Maximum allowable operating voltage is equal to the current transformer’s nominal voltage. Do not forget to consider the transformer’s transformation ratio and additional display error when reading measured values.

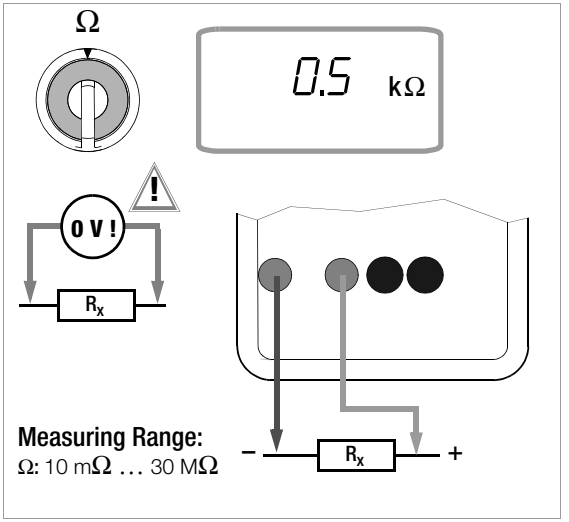
8.1.2 Transformer Output: V

Some transformers are equipped with a voltage output (designation: mV/A). The secondary terminals must thus be connected to ⊥ and V.



9 Resistance Measurement

- ➪ Make sure that the device under test is voltage-free. Interference voltages distort measurement results!
- ➪ Set the rotary selector switch (6) to Ω.
- ➪ Connect the device under test as shown.



Zero Balancing in the 30 Ω Measuring Range

Cable and contact resistances can be eliminated for the measurement of small resistance values in the 30 Ω range by means of zero balancing:

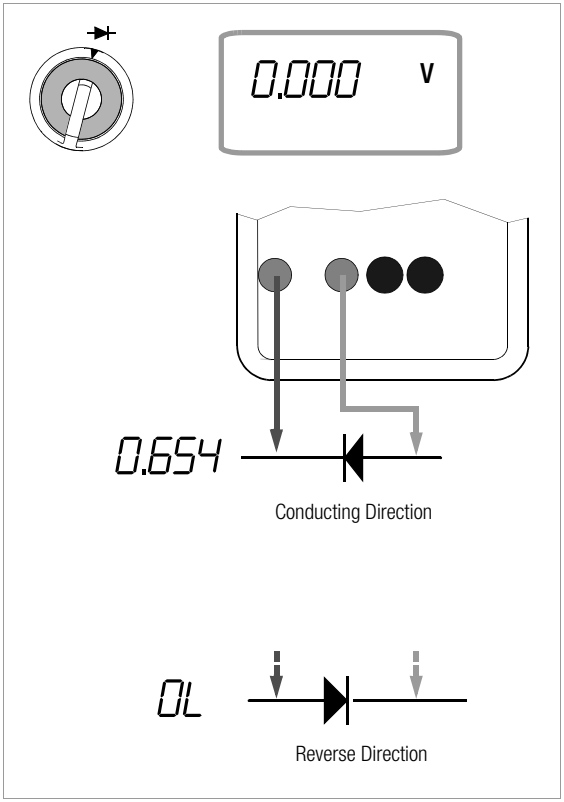
- ➪ Plug the measuring cables into the instrument and connect the free ends to each other.
- ➪ Briefly press the multifunction key (5). The instrument acknowledges zero balancing with an acoustic signal, and "00.00" (+1 digit) appears at the LCD with blinking decimal point. The resistance value measured at the moment the key is pressed serves as a reference value (max. 200 digits). It is automatically subtracted from all subsequent measured values.

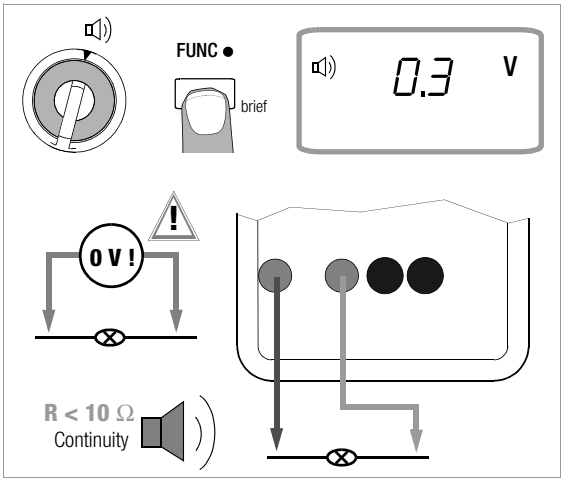
Zero balancing can be deleted:

- – By pressing and holding the multifunction key (5), which is acknowledged with two acoustic signals
- – By switching the instrument off

10 Continuity and Diode Testing

- ➪ Make sure that the device under test is voltage-free. Interference voltages distort measurement results!
- ➪ Set the rotary selector switch (6) to ⇻.
- ➪ Connect the device under test as shown.





Conducting Direction and Short-Circuit:

The instrument displays conducting-state voltage in volts. As long as voltage drop does not exceed the maximum display value of 1999 V, several series connected components or reference diodes can be tested with a small reference voltage.

Reverse Direction or Interruption:

The measuring instrument indicates overflow: “OL”.

Note!

Resistors and semiconductors which are connected in parallel to the diode distort measurement results!

Continuity and Diode Testing with Acoustic Signal

If the “acoustic signal” function is activated, a continuous acoustic signal is generated by the instrument within a display range of 0 to approximately 1 V.

Acoustic Signal ON:

- Briefly press the multifunction key (5).
  Activation is acknowledged with an acoustic signal. The symbol (18) appears at the display as well.

Acoustic Signal OFF:

- Briefly press the multifunction key (5) once again.
  Deactivation is acknowledged with an acoustic signal. The symbol (18) is cleared from the display.

The acoustic signal function is always inactive immediately after the “continuity and diode testing” function has been selected with the rotary selector switch (6). The acoustic signal can be activated and deactivated by repeatedly pressing the multifunction key (5). If the key is pressed and held the acoustic signal is deactivated, which is acknowledged with two acoustic signals.

11 Temperature Measurement

The multimeter provides for the measurement of temperature within a range of – 200 (– 100) °C to + 850 °C with the help of Pt100 and Pt1000 temperature sensors.

- ➪ Set the rotary selector switch (6) to Ω.
- ➪ Connect the sensor to the two accessible jacks.
- ➪ Briefly press the multifunction key (5).
  The device is switched to temperature measurement, automatically recognizes the utilized type of sensor (Pt100 or Pt1000) and displays the measured temperature in °C at the digital display.

☞ **Note!**

Cable resistances of temperature sensors available as accessories are compensated for automatically during temperature measurement. Switching to temperature measurement is not possible if the 30 Ω resistance measuring range has been selected!

Compensation of Sensor Cable Resistances of up to 50 Ω

Sensor cables with resistance values other than 100 mΩ can be compensated for as follows up to a value of 50 Ω:

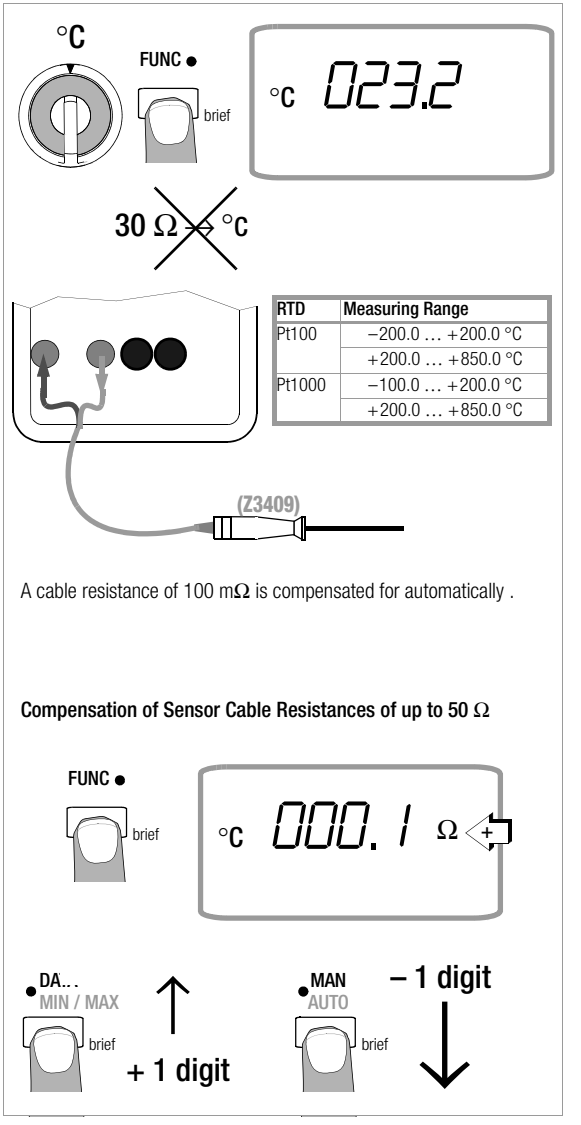
- ➪ Briefly press the multifunction key (5) once again.
  The resistance value which will automatically be taken into consideration by the instrument after the temperature measuring range has been selected is now displayed at the LCD. The "°C" symbol is displayed at the same time in order to assure that the user recognizes the displayed value as the resistance correction for the temperature measuring range.
- ➪ The resistance correction value can be set as follows: Press the DATA MIN/MAX key (3) in order to increase the value, or the AUTO/MAN (4) key in order to reduce the value. The value is changed by one digit each time the respective key is pressed. Pressing and holding the respective key results in rapid scrolling.
- ➪ Briefly press the multifunction key (5) once again.
  Measured temperature is displayed at the LCD. The blinking decimal point indicates that a cable resistance correction value has been entered. The correction value is retained until the instrument is switched off.
- ➪ Each time the multifunction key (5) is pressed, the display alternates between the measured temperature value and the cable resistance correction value.

The temperature measurement function can be exited:

– By pressing and holding the multifunction key (5), which is acknowledged with two acoustic signals
– By switching the instrument off

☞ **Note!**

The multimeter which will actually be utilized to perform temperature measurement must also be used to determine cable resistance. This is the only way to assure that measuring error lies within the guaranteed range.



RTD	Measuring Range
Pt100	–200.0 … +200.0 °C
	+200.0 … +850.0 °C
Pt1000	–100.0 … +200.0 °C
	+200.0 … +850.0 °C

A cable resistance of 100 mΩ is compensated for automatically .

Compensation of Sensor Cable Resistances of up to 50 Ω

12 RS 232C Interface (with METRAHit ONE Plus only)

The multimeter is equipped with an RS 232C serial interface for the transmission of measurement data to electronic data processing systems. Measured data are transferred optically through the instrument housing by means of infrared light to an interface adapter (accessory), which is attached to the multimeter. Data are then transferred to the computer via a cable.

Activating the Interface

➪ While switching the instrument on, simultaneously press the ON/OFF (2) and DATA-MIN/MAX (3) keys. Automatic instrument shutdown is disabled after the interface has been activated. The ⚠ symbol (8) blinks at the LCD (1) in order to indicate this condition. The DATA function cannot be activated.

➪ Setup in METRAwin®10:
... device type / METRAHit12S-18S

Accessory Interface Packs

Interface adapters without memory allow for the transmission of measurement data to a PC (single-channel pack).

Memory adapters also allow for on-site storage of measurement data without a PC, and subsequent downloading to a PC. Up to ten multimeters can be interconnected off-line for the creation of a high performance measuring system. Up to six multimeters can be connected to a PC for online operation via memory adapters (single-channel or 4-channel memory pack).

All interface packs include adapters, all necessary connector cables and METRAwin®10/METRA*Hit*® data logging and analysis software with operating instructions.

METRAwin®10 Software

METRAwin®10 software is used to process and display measurement data at a PC. Sampling can be triggered manually with an adjustable sampling interval, or in a signal dependent fashion. Storage of data in ASCII format can be controlled with two trigger thresholds per measuring channel, as well as by means of system time.

Hardware Requirements

- IBM compatible Windows PC, Pentium CPU or better with at least 64 MB RAM
- VGA monitor
- Hard disk with at least 40 MB available memory
- 3½" floppy disk drive for 1.4 MB floppies and a CD drive
- Microsoft compatible mouse
- If print-outs are required: a Windows supported printer
- 1 serial interface: COM1 or COM2

Software Requirements

- MS Windows 95, 98, ME, NT, 2000* or XP*
  * With memory adapter only

13 Characteristic Values

Meas. Function	Measuring Range		Resolution	Input Impedance		Intrinsic Error at Max. Resolution under Reference Conditions		Overload Capacity [1]		Meas. Function
						±(... % rdg. + ... d)	±(... % rdg. + ... d)			
			3000	⎓	~	⎓	~	Value	Time	
V	30	mV	10 µV	>10 GΩ // < 40 pF	10 MΩ // < 40 pF	0.5 + 3	—	600 V DC AC eff sine	Cont.	V
	300	mV	100 µV	>10 GΩ // < 40 pF	10 MΩ // < 40 pF	0.5 + 3	—			
	3	V	1 mV	11 MΩ // < 40 pF	11 MΩ // < 40 pF	0.5 + 3	1 + 3			
	30	V	10 mV	10 MΩ // < 40 pF	10 MΩ // < 40 pF	0.5 + 3				
	300	V	100 mV	10 MΩ // < 40 pF	10 MΩ // < 40 pF	0.5 + 3				
	600	V	1 V	10 MΩ // < 40 pF	10 MΩ // < 40 pF	0.5 + 3				
				Voltage drop at approx. range limit						
				⎓	~	⎓	~			
A	300	µA	100 nA	15 mV	—	1.0 + 5 (> 10 d)		0.36 A	Cont.	A
	3	mA	1 µA	150 mV	150 mV	1.0 + 2	1.5 + 2 (> 10 d)			
	30	mA	10 µA	650 mV	—	1.0 + 5 (> 10 d)	—			
	300	mA	100 µA	1 V	1 V	1.0 + 2	1.5 + 2 (> 10 d)			
	3	A	1 mA	100 mV	—	1.0 + 5 (> 10 d)	—	10 A [4]	Cont.	
	10	A	10 mA	270 mV	270 mV	1.0 + 2	1.5 + 2 (> 10 d)			
				Open-circuit voltage	Meas. current at range limit	±(... % rdg. + ... d)				
Ω	30	Ω	10 mΩ	max. 3.2 V	max. 250 µA	0.7 + 3 [2]		600 V DC AC eff sine	max. 10 s	Ω
	300	Ω	100 mΩ	max. 3.2 V	max. 250 µA	0.7 + 3				
	3	kΩ	1 Ω	max. 1.25 V	max. 45 µA	0.7 + 3				
	30	kΩ	10 Ω	max. 1.25 V	max. 4.5 µA	0.7 + 3				
	300	kΩ	100 Ω	max. 1.25 V	max. 1.5 µA	0.7 + 3				
	3	MΩ	1 kΩ	max. 1.25 V	max. 150 nA	0.7 + 3				
	30	MΩ	10 kΩ	max. 1.25 V	max. 15 nA	2.0 + 3				
⧫	2	V	1 mV	max. 3.2 V		0.5 + 3				⧫
°C	Pt100	−200.0 ... +200.0°C	0.1 °C			2 K + 5 D [3]		600 V DC / AC eff sine	max. 10 s	°C
		+200.0 ... +850.0 °C				1.0 + 5 [3]				
	Pt1000	−100.0 ... +200.0°C				2 K +2 D [3]				
		+200.0 ... +850.0 °C				1.0 + 2 [3]				

1) At 0 °C ... + 40 °C
2) With zero balancing, + 35 digits without zero balancing
3) Without sensor
4) 12 A 5 minutes, 16 A 30 seconds

Key

rdg. = reading (measured value)
d = digit

Influencing Quantities and Influence Error

Influencing Quantity	Sphere of Influence	Measured Quantity / Measuring Range	Influence Error [1] ±(... % rdg. + ... digits)
Temperature	0 °C ... +21 °C and +25 °C ... +40 °C	30/300 mV ⎓	1.0 + 3
		3 ... 300 V ⎓	0.15 + 1
		600 V ⎓	0.2 + 1
		V ∼	0.4 + 2
		300 µA ... 300 mA ⎓	0.5 + 1
		3 A/10 A ⎓	0.5 + 1
		A ∼	0.75 + 1
		30 Ω [2]	0.15 + 2
		300 Ω	0.25 + 2
		3 kΩ ... 3 MΩ	0.15 + 1
		30 MΩ	1.0 + 1
		– 200 ... + 200 °C	0.5 K + 2
		+ 200 ... + 850 °C	0.5 + 2
Measured Quantity Frequency	> 65 Hz ... 400 Hz	3 ... 600 V ∼	2.0 + 3
	> 400 Hz ... 1 kHz		2.0 + 3
	> 65 Hz ... 1 kHz	A ∼	2.0 + 3

Influencing Quantity	Sphere of Influence	Measured Quantity / Measuring Range	Influence Error
Battery Voltage	⊣⊢ [3] ... < 7.9 V > 8.1 V ... 10.0 V	V ⎓	± 2 digits
		V ∼	± 4 digits
		A ⎓	± 4 digits
		A ∼	± 6 digits
		30 Ω / 300 Ω / °C	± 4 digits
		3 kΩ ... 30 MΩ	± 3 digits
Relative Humidity	75% 3 days instrument off	V ≃ A ≃ Ω °C	1 x intrinsic error
DATA	—		± 1 digits
MIN / MAX	—	V ≃, A ≃	± 2 digits

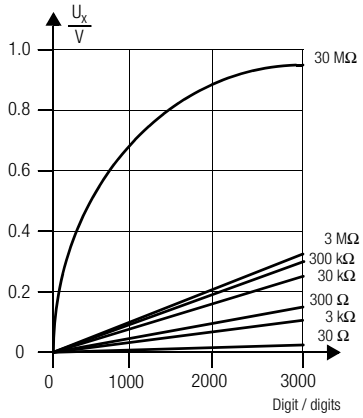
1) For temperature: specified error valid starting with temperature changes as of 10 K.
For frequency: specified error valid starting with display values as of 300 digits.
2) With zero balancing
3) After the ⊣⊢ symbol appears at the display

Influencing Quantity	Sphere of Influence	Measuring Range	Damping
Common Mode Interference Voltage	Interference quantity max. 600 V ∼ 50 Hz, 60 Hz sine	V ⎓	> 120 dB
		3 V ∼, 30 V ∼	> 80 dB
		300 V ∼	> 70 dB
		600 V ∼	> 60 dB
Series Mode Interference Voltage	Interference quantity: V ∼, respective nominal value of the measuring range, max. 600 V ∼, 50 Hz, 60 Hz sine	V ⎓	> 50 dB
	Interference quantity max. 600 V —	V ∼	> 110 dB

Response Time (after manual range selection)

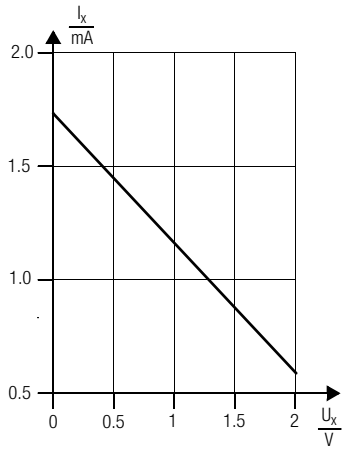
Measured Quantity / Measuring Range	Response Time		Measured Quantity Step Function
	Analog Display	Digital Display	
V ⎓, V ∼, A ⎓, A ∼	0.7 s	1.5 s	from 0 to 80% of the upper range limit
30 Ω..3 MΩ	1.5 s	2 s	from ∞ to 50% of the upper range limit
30 MΩ	4 s	5 s	
⊣◀	0.7 s	1.5 s	
°C		max. 1 ... 3 s	from 0 to 50% of the upper range limit

Measuring Voltage During Resistance Measurement



Voltage U_x at measured resistance Rx relative to measuring range and display

Measuring Current During Diode and Continuity Testing



Measuring current I_x relative to displayed voltage value U_x for the device under test

Reference Conditions

Ambient temperature	+ 23 °C ± 2 K
Relative humidity	40 % ... 60 %
Measured quantity frequency	45 Hz ... 65 Hz
Measured quantity waveshape	sinusoidal
Battery voltage	8 V ± 0.1 V

Display

LCD panel (65 mm x 30 mm) with analog and digital display including unit of measure, type of current and various special functions

Analog:

Display	LCD scale with pointer
Scale length	55 mm for V ⎓ and A ⎓, 47 mm in for other ranges
Scaling	∓ 5 ... 0 ... ± 30 with 35 scale divisions for ⎓, 0 ... 30 with 30 scale divisions in all other ranges
Polarity display	With automatic switching
Overflow display	Triangle (13)
Measuring rate	20 measurements per second, 10 measurements per second for Ω

Digital:

Display / char. height	7-segment characters / 15 mm
Number of places	3¾-place ≙ 3100 steps
Overflow display	"OL" appears
Polarity display	"–" sign is displayed if plus pole is connected to "⊥"
Measuring rate	2 measurements per second, 1 measurement per second for Ω and °C

Power Supply

Battery	9 V flat-cell battery, zinc carbon battery per IEC6F22, alkaline manganese per IECLR6 or equivalent rechargeable NiCd battery
Service life	With alkaline manganese: approx. 750 hours for V ⎓, A ⎓ approx. 200 hours for V ∼, A ∼ Times 0.7 for interface operation
Battery test	⊣⊢ is displayed automatically if battery voltage drops to below approx. 7 V.

Electrical Safety

Safety class	II per IEC 61010-1/EN 61010-1/ VDE 0411-1
Overvoltage category	CAT III
Nominal voltage	600 V
Fouling factor	2
Test voltage	5.2 kV~ per IEC 61010-1/ EN 61010-1

Electromagnetic Compatibility (EMC)

Interference emission	EN 61326:2002 class B
Interference immunity	EN 61326:2002 IEC 61000-4-2: 1995/A1:1998 Feature A: 8 kV atmospheric discharge 4 kV contact discharge IEC 61000-4-3:1995/A1:1998 Feature B: 3 V/m

Fuses

Fuse links for all ranges up to 300 mA	FF(UR) 1.6 A/700 V; 6.3 mm x 32 mm, switching capacity: 50 kA at 700 V~ with ohmic load, protects all current measuring ranges up to 300 mA in combination with power diodes
Fuse links for all ranges up to 10 A	FF(UR) 16 A/600 V; 10 mm x 38 mm, switching capacity: 100 kA at 600 V with ohmic load, protects 3 A and 10 A ranges to 600 V Refer to chapter 14, “Maintenance”, regarding fuse manufacturers and types.

Interface

Type	RS 232C, serial
Data transmission	Optical via infrared light through the housing
Baud rate	8192 bits per second

Ambient Conditions

Accuracy range	0 °C ... + 40 °C
Operating temperature	–10 °C ... + 50 °C
Storage temperature	– 25 °C ... + 70 °C without batteries
Relative humidity	45 ... 75%, no condensation allowed
Elevation	to 2000 m
Deployment	Indoors only, except within specified ambient conditions

Mechanical Design

Protection	IP 40, IP 20 at the connector jacks per DIN VDE 0470 part 1 / EN 60529
Dimensions	84 mm x 195 mm x 35 mm
Weight	approx. 350 gr. with battery

Attention!
Disconnect the instrument from the measuring circuit before opening to replace batteries or fuses!

14.1 Battery

Make sure that no battery leakage has occurred before initial start-up, and after long periods of storage. Continue to inspect the batteries for leakage at short, regular intervals.

If battery leakage has occurred, carefully and completely clean the electrolyte from the instrument with a damp cloth, and replace the batteries before using the instrument.

If the ⊣⊢ symbol (17) appears at the display (1), the batteries should be replaced as soon as possible. You can continue working with the instrument, but reduced measuring accuracy may result.

The instrument requires one 9 V flat-cell battery in accordance with IEC 6 F 22 or IEC 6 LR 61, or equivalent rechargeable battery.

Replacing the Battery

- ➪ Set the instrument face down onto a flat working surface, loosen the two screws at the back and lift off the housing base, starting at the bottom. The housing top and housing base are held together with the help of snap hooks at the top front.
- ➪ Remove the batteries from the battery compartment and carefully disconnect the snap contacts from the battery.
- ➪ Snap the contacts onto a new 9 V battery and insert it into the battery compartment.
- ➪ Important for reassembly: First set the housing base onto the housing top and align accurately (see photo below). Then press the two housing halves together, first at the bottom front (a), and then at the top front (b).

- ➪ Secure the housing base with the two screws.
- ➪ Please dispose of depleted batteries in accordance with environmental protection regulations!

14.2 Fuses

If one of the fuses blows, this condition is displayed at the LCD as soon as a measured quantity with a voltage of greater than 4 V is applied to the corresponding connector jacks. FUSE appears at the digital display (9) in this case.

The 16 A fuse interrupts the 3 A and 10 A ranges, and the 1.6 A fuse interrupts all other current measuring ranges. All other measuring ranges remain functional.

If a fuse should blow, eliminate the cause of overload before placing the instrument back into service!

Replacing the Fuse

- ➪ Open the instrument as described under “Replacing the Battery”.
- ➪ Remove the blown fuse with the help of an abject such as a test probe, and replace it with a new fuse.

The following fuses are approved for use:

– For current measuring ranges up to 300 mA:
Type FF(UR) 1.6 A / 700 V AC (50 kA),
6.3 mm x 32 mm

– For 3 A and 10 A current measuring ranges:

Manufacturer	Type	Dimensions
Siba	FF Ultrarapid 16 A / 600 V ~ 100 kA	10 mm x 38 mm

Attention!
Use specified fuses only! If fuses with other blowing characteristics, other current ratings or other breaking capacities are used, the operator is placed in danger, and protective diodes, resistors and other components may be damaged.

The use of repaired fuses or short-circuiting the fuse holder is prohibited.

14.3 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 and solvents.

15 Repair and Replacement Parts Service, DKD Calibration Lab* and Rental Instrument Service

If required please contact:

GOSSEN METRAWATT GMBH
Service Center
Thomas-Mann-Str. 20
90471 Nürnberg, Germany
Phone +49-(0)-911-8602-0
Fax +49-(0)-911-8602-253
e-mail service@gmc-instruments.com

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

*** DKD Calibration Laboratory for Electrical Quantities DKD – K – 19701 accredited per DIN EN ISO/IEC 17025**

Accredited quantities: direct voltage, direct current value, direct current resistance, alternating voltage, alternating current value, alternating current active power, alternating current apparent power, DC power, capacitance, frequency

Competent Partner

GOSSEN METRAWATT GMBH is certified in accordance with DIN EN ISO 9001:2000.

Our DKD calibration lab is accredited by the Physikalisch-Technischen Bundesanstalt (German Federal Institute of Physics and Metrology) and the Deutscher Kalibrierdienst (German Calibration Service) in accordance with DIN EN ISO/IEC 17025 under registration number DKD–K–19701.

We offer a complete range of expertise in the field of metrology: from **test reports** and **factory calibration certificates**, right on up to **DKD calibration certificates**.

Our spectrum of offerings is rounded out with free **test equipment management**.

Our **DKD calibration laboratory** is part of our service department. If errors are discovered during calibration, our specialized personnel are capable of completing repairs using original replacement parts.

As a full service calibration lab, we can calibrate instruments from other manufacturers as well.

DKD Calibration Certificate Reprints (upon request)

If you order a DKD calibration certificate reprint for your instrument, please provide us with the reference numbers indicated in the upper and lower most fields of the calibration seal. We do not need the instrument's serial number.

16 Guarantee

All METRA*Hit*® measuring and calibration instruments are guaranteed for a period of 3 years after date of shipment.

Calibration is guaranteed for a period of 12 months. The guarantee covers materials and workmanship. Damages resulting from use for any other than the intended purpose or operating errors, as well as any and all consequential damages, are excluded.

17 Product Support

If required please contact:

GOSSEN METRAWATT GMBH
Product Support Hotline
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Fax +49-(0)-911-8602-709
e-mail support@gmc-instruments.com

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