GOSSEN METRAWATT

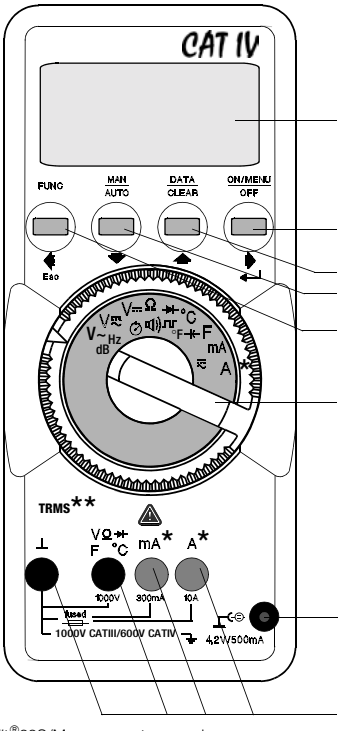
Operating Instructions

METRAHit®

22S/M, 23S, 24S, 25S, 26S/M

Analog Digital Multimeter with Signal Generator

3-348-984-03
8/4.03



* METRA*Hit*®22S/M: no current measuring range
** RMS value measurement with METRA*Hit*®26S/M and 25S only

1 LC Display

2 **ON/MENU/OFF** ON / OFF key
Operating Mode Menu : Entry acknowledgment (ENTER or ↵)

3 **DATA/CLEAR** function key for measurement value storage, delete and MIN/MAX
Operating Mode Menu: Individual menu item selection reverse flux direction, increase values

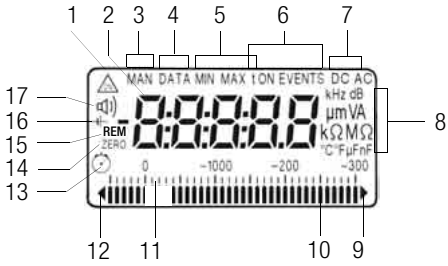
4 **MAN/AUTO** Manual measuring range selection key
Operating Mode Menu: Individual menu item selection forward flux direction, reduce values

5 **FUNC** Multifunction key (yellow)
Operating Mode Menu: Exit menu level and return to next highest level, exit parameter entry mode without storage of values

6 Rotary switch for measurement functions

7 Power pack connection (METRA*Hit*®22M/26M only)

8 Connection jacks with automatic blocking



Digital Display Symbols

1 Continuous operation
2 Digital display with display of decimal point and polarity
3 Manual measuring range selection
4 Memory display, “hold measurement value”
5 MIN-MAX storage
6 Event marking
7 Selected current type
8 Unit of measure
9 Measuring range exceeded
10 Pointer for analog display
11 Analog display scale
12 Violation of negative analog display range
13 Stopwatch activated
14 Zero balancing
15 Memory mode
16 Low battery
17 Acoustic signal on

Contents

Contents

Page

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 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.

For your safety, as well as for the protection of your instrument, the multimeter is equipped with an automatic socket blocking device. This is coupled to the rotary switch, and only allows connection to the socket required for the selected function. It also prevents the switching of the rotary selector to disallowed functions when a measurement cable is plugged into a socket.

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 30 V may occur (effective value).
- Avoid working alone when taking measurements which involve contact hazards. Be certain that a second person is present.
- **The maximum allowable voltage between the jacks (7) and earth is 1000 V for category III and 600 V for category IV.**
- **Nominal line voltage may not exceed** the following values:
  – Between conductor and neutral: **600 V**
  – 690 V between phase conductors in 4-wire 3-phase systems
  – 1000 V between phase conductors in 3-wire 3-phase systems.
- Be prepared for the occurrence of unexpected voltages at devices under test (e.g. defective devices). For example, capacitors can 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 allowable.
- Be absolutely certain that the measuring ranges are not overloaded beyond their allowable capacities. Limit values can be found in the table “Measuring Ranges” in chapter 24 “Characteristic Values”.
- All current ranges are equipped with fuses, except for METRA*Hit*®23S (which has no 16 A fuse in the 3 und 16 A measuring ranges).The maximum permissible voltage of the measuring circuit (= nominal voltage of the fuse) is 1000 V AC/DC in the „mA“ and „A“ ranges.
- **METRA*Hit*®**23S has been optimized for measurements in secondary current transformer circuits and has **no integrated fuse in the 16 A current circuit** for reducing hazards in the event of short circuits on the primary side.
  In circuits with voltages involving contact hazards **METRA*Hit*®**23S may only be used if the current circuit is protected by a fuse or a circuit breaker with 20 A.
  METRA*Hit*®23S **must not** be used for current measurements in the 16 A current circuit (rotary swith „A“) in application category IV.

Meaning of symbols on the instrument

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

Earth

Continuous, doubled or
reinforced insulation

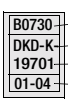
CAT III / IV Instrument for the overvoltage category III or IV

Seal of approval from VDE testing authority

Seal of approval from CSA

Indicates EU conformity

DKD calibration symbol (red label):



Serial number
DKD (German Calibration Service) – calibration lab
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 for 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.

Errors 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 a long period of storage under unfavorable conditions, (e.g. high humidity, dust or excessive temperature), see "Ambient Conditions", page 53.

2 Initial Start-Up

Batteries

Please refer to chapter 25.1 regarding correct batteries installation!

Attention!

Before opening the instrument, disconnect it from the measuring circuit.

Switching the Instrument On Manually

➲ Press the ON/OFF key until the display disappears. Activation is acknowledged with a brief acoustic signal. As long as the key remains pressed, all segments of the liquid crystal display (LCD) are active. The LCD is shown on page 3.
After the key is released, the instrument is ready for operation.
METRA*Hit*®22S: Press key until LCD appears.

Switching the Instrument On via PC (except for METRA*Hit*®22S)

After transmission of the first data block from the PC, the multimeter is switched on. See also chapter 22, page 43.

Automatic Start-Up

The multimeter is switched on automatically in the transmit or data storage mode.

☞ **Note!**
Electrical discharge and high frequency interference can cause incorrect displays, and may block the measuring sequence. To reset, switch the instrument off, and then back on. If this procedure is unsuccessful, briefly disconnect the battery from the contact terminals.

Setting Time and Date

See chapter 21.1.3, page 40.

Switching the Instrument Off Manually

➪ Press and hold the ON/OFF key, until the display is deactivated.

Deactivation of the instrument is acknowledged by two brief acoustic signals.

Automatic Shut-Off

Your instrument shuts itself off automatically, if the measurement value remains constant for a long period of time (maximum measurement value fluctuation: approx. 0.8% of the measuring range per minute or 1 °C or 1 °F per minute), and if none of the keys or the rotary switch are activated for a period of 10 minutes. Deactivation of the instrument is acknowledged by a brief acoustic signal. Exceptions are as follows:
Event counting, stopwatch, transmit or memory mode and continuous operation.

Disabling Automatic Shut-Off

The instrument can also be switched to "CONTINUOUS ON".

➪ Simultaneously press the ON/OFF key and the yellow multifunction key when switching the instrument on. The "CONTINUOUS ON" function is indicated at the LCD with the ⚠ symbol.

3 Selection of Measurement Functions and Measuring Ranges

The rotary switch is coupled to the automatic socket blocking device, which makes two jacks available for each function. Before switching to the “mA” or “A” functions, or out off the “mA” or “A” functions, be certain that the plug has been removed from the corresponding jack. The socket blocking device prevents inadvertent switching to disallowed functions when a plug connection exists.

3.1 Automatic Measuring Range Selection

The multimeter is equipped with automatic measuring range selection for all measuring ranges, except for temperature measurement, as well as diode and continuity testing. This automatic feature is active as soon as the instrument is switched on. The instrument automatically selects the measuring range which provides optimum resolution for the measured quantity.

The previously selected voltage measuring range remains active after switching the instrument to frequency measurement or events counting.

The instrument is automatically switched to the next highest or next lowest measuring range for the following measured quantities:

Measuring Range	Resolution	Switching to the Next Highest Range at ±(... D + 1 D)	Switching to the Next Lowest Range [1] at ±(... D –1 D)
V ∼, V ⎓, A ⎓, mA ∼, A ∼, Ω, 30 mF, Hz	4 ¾	31 000	2 800
3 nF ... 3 mF	3 ¾	3 100	280

[1] 280 digits apply when switching from 100 kHz to 3 kHz

3.2 Manual Measuring Range Selection

The automatic measuring range feature can be deactivated and the ranges can be manually selected and prescribed according to the following table.

The manual mode is deactivated by pressing and holding the MAN/AUTO key (approx. 1s), by activating the rotary switch or by switching the instrument off and back on again.

⇓ MAN/ AUTO	Function	Acknowledge: Display	Acknowledge: Acoust. Signal
Brief	Manual Mode Active: selected measuring range is fixed	MAN	1 x
Brief	Switching Sequence for: **V:** 300 mV → 3 V → 30 V → 300 V → 1000 V → 300 mV → ... **dB:** same switching sequence as for V ∼ **mA** : 300 µA → 3 mA → 30 mA → 300 mA → 300 µA ... **A:** 3 A → 10 A → 3 A ... **Ω:** 30 MΩ → 300 Ω → 3 kΩ → 30 kΩ → 300kΩ → 3 MΩ → 30 MΩ ... **F:** 3 nF → 30 nF → 300 nF → 3 µF → 30 µF → 300 µF → 3000 µF → 30 000 µF → 3 nF ... **Hz:** 300 Hz → 3 kHz → 100 kHz → 300 Hz ...	MAN	1 x
Long	Return to Automatic Range Selection	—	2 x

3.3 Quick Measurements

If you wish to perform quicker measurements than those possible with the automatic measuring range selection function, make sure to establish the appropriate measuring range:

- by **manual measuring range selection**, i. e. by selecting the measuring range with the best resolution, see chapter 3.2.

or

- via **DATA function**, see chapter 5. After the first measurement, the proper measuring range will be automatically determined so that measurements are performed more rapidly from the second measured value onwards.

With both functions, the established measuring range is maintained for the subsequent series mode measurments.

4 LC Display

4.1 Digital Display

The measurement value appears at the digital display with correct decimal place and plus or minus sign. The selected unit of measure and the type of current are displayed as well. A minus sign appears in front of the numeric value for the measurement of zero-frequency quantities if the positive pole of the measured quantity has been connected to the "⊥" input. If the measuring range upper limit is exceeded for the following measured quantities, "OL" (overload) appears at the display:

V DC, I DC, Ω, Hz, F,	
V (AC, AC+DC), I (AC+DC), dB (V), 30 mF:	30999 digits
3 nF ... 3 mF	3099 digits

The digital display is refreshed at various intervals depending upon the measured quantity (see Display Update on page 51).

4.2 Analog Display

The analog display with simulated pointer demonstrates the dynamic characteristics of a moving coil mechanism and is refreshed 20 times per second. The analog display is especially advantageous for the observation of measurement value fluctuation, as well as during balancing.

The analog display includes its own polarity indicator. The analog scale has a negative range including 5 scale markings which allows for the precise observation of measurement value fluctuations which drop below zero. If the measurement value exceeds the display range, the triangle appears at the left hand side of the display and polarity is reversed at the analog display after approx. 0.7 s. If the measuring range is exceeded (> 30999 digits, within a range of F : > 3099), the triangle appears at the right hand side of the display.

Scaling for the analog display is adjusted automatically, which is quite helpful for manual measuring range selection.

5 Measurement Value Storage, “DATA Function” (Hold & Compare)

Measurement values can be automatically “frozen” with the DATA (hold) function. This can be especially useful when your full attention is required for contacting the measuring point with the test probes. After the measurement value has been acquired and the appropriate “condition” as shown in the table below has been fulfilled, the measurement value is frozen at the digital display and an acoustic signal is generated. The test probes can now be removed from the measuring point and the measurement value can be read from the digital display. If the measurement value is less than the lower limit value shown in the table, the instrument is reactivated and stores a new value.

If the newly stored value deviates less than 100 digits from the previous value, the acoustic signal sounds twice (DATA Compare).

Function DATA	⇓ DATA/ CLEAR	Condition		Reaction at Instrument		
				Display		
		Measuring Range	Meas. Value Limits (digits)	Meas. Value Digital	DATA	Acoustic Signal
Switch on	brief				blinks	1 x
Store		V, dB [2], A Ω F, Hz	> 3.3% of range OL [4] > 3.3% [4] of range	is displayed	is displayed	1 x 2 x [3]
Reactivate [1]		V, dB [2], A Ω F, Hz	<3.3% of range OL [4] < 3.3 % [4] of range	stored meas. value	blinks	
Cancel	long			is deleted	is deleted	2 x

1) Reactivation if actual value falls below prescribed limit value
2) Relative to alternating voltage values
3) Acoustic signal sounds twice when measurement value is first stored. Only sounds twice for subsequent hold function if the current hold value deviates less than 100 digits from the **first** hold value.
4) Exception: 10% at 300 Ω or 3 nF

The DATA function has no effect on the analog display, which continues to indicate the current measurement value. However, as long the digital display remains “frozen”, the decimal place can not be shifted.

Manual measuring range selection is not possible as long as the DATA function is active.

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

6 Minimum and Maximum Value Storage “MIN-MAX” with Time Stamp

Minimum and maximum measurement values which occur at the measuring instrument’s input after activation of the MIN/MAX function can be “frozen”. The most important application for this function is the determination of minimum and maximum values during long-term observation of measurement values.

The “MIN/MAX” function can be activated for all measuring ranges except for counter, events and stopwatch, nor is time stamping available for frequency and capacitance measurements.

The MIN/MAX function has no effect on the analog display, which continues to indicate the current measurement value.

Apply the measured quantity to the instrument’s measurement input and select the measuring range before activating the MIN/MAX function.

After the function has been activated, measuring ranges can only be selected manually which causes deletion of the stored MIN-MAX values.

MIN and MAX values are deleted by pressing and holding the CLEAR key (approx. 1 s), by activating the rotary switch or by switching the instrument off and back on again.

Function MIN/MAX	⇓ DATA/ CLEAR	MIN and MAX Measurement Values/ Time of Measurement	Reaction at Instrument		
			Display		Acoust Signal
			Display Digital	MIN MAX	
1. Switch on and Store	2 x brief	are stored	Current Measurement Value	MIN and MAX blink	2 x
2. Store and display	brief	Storage continues in background, new MIN and MAX values and integration periods are displayed.	Stored MIN Value	MIN	1 x
	brief		Elapsed Time to MIN Value Storage	MIN and t	1 x
	brief			MIN and t	1 x
	brief		Stored MAX Value	MAX	1 x
	brief		Elapsed Time to MAX Value Storage	MAX and t	1 x
	brief			MAX and t	1 x
3. Return to 1.	brief	same as 1., stored values are not deleted	same as 1.	same as 1.	1 x
Cancel	long	are deleted	is deleted	is deleted	2 x

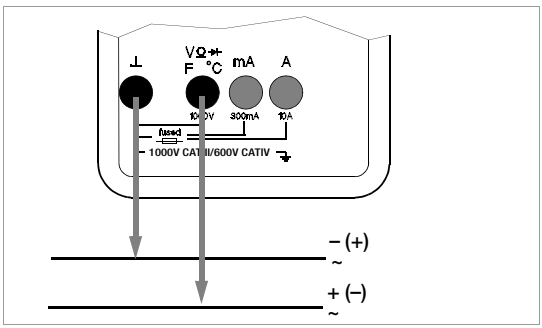
7 Voltage Measurement

METRA*Hit*®26S/M **V AC_{TRMS} + V$(AC+DC)_{TRMS}$**
METRA*Hit*®25S **V AC_{TRMS}**
METRA*Hit*®22S/M, 23S, 24S **V AC mean value rectification**

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

Note!
In the 1000 V range, an intermittent acoustic signal sounds alarm if the measurement value exceeds the measuring range upper limit value.

Attention!
Make absolutely certain that neither of the current ranges ("mA" or "A") is active when the multimeter is connected for voltage measurements! If the fuse trip limits are exceeded due to operator error, both the operator and the instrument are in danger!



Zero Balancing in the 300 mV ⎓ Measuring Range

- ➪ Select the 300 mV ⎓ measuring range.
- ➪ Connect the measurement cables to the instrument, and connect the free cable ends to one another.
- ➪ Briefly press the multifunction key.

The instrument acknowledges zero balancing with an acoustic signal and "000.00" (± 1 digit) and the "ZERO" symbol appears at the LCD. The voltage which was displayed at the moment the key was activated serves as a reference value (max. ±2000 digits). It is automatically subtracted from subsequently measured values.

- ➪ Zero balancing can be deleted:
  - – by pressing and holding the multifunction key, after which deletion is acknowledged with a twice repeated acoustic signal,
  - – by switching the instrument off.

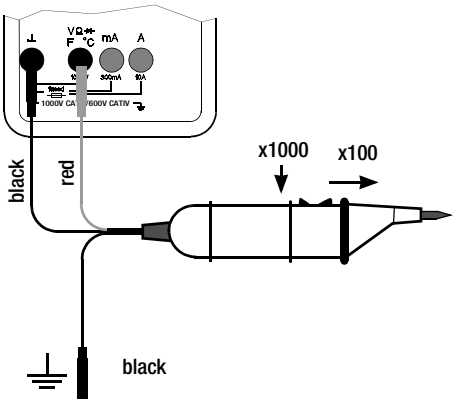
7.1 Transient Overvoltages

METRA*Hit*®22/23/24/25/26 multimeters are protected against transient overvoltages of up to 6 kV with a halftime value for front time of 1.2/50 µs. Due to the fact that overvoltages of greater duration can be expected when performing measurements, for example at transformers or motors,we recommend our KS30 measuring adapter for such cases. It provides for protection against transient overvoltages of up to 6 kV with a halftime value for front time of 10/1000 µs. Continuous loading capability is equal to 1200 V_{eff}. Additional influence error due to use of the KS30 measuring adapter amounts to approximately –2 %.

7.2 Voltage Measurements for Greater than 1000 V

Voltages of greater than 1000 V can be measured with a high-voltage probe, for example the HV3[1)] or the HV30[2)] from GOSSEN METRAWATT GMBH. The earthing terminal must be connected to ground for measurements of this type. Observe all required safety precautions!

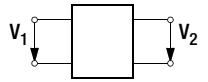
Voltage Measurements for Greater than 1000 V with the HV3 High-Voltage Probe



1) HV3: 3 kV
2) HV30: 30 kV, for (DC) voltages only

8 Alternating Voltage Level Measurement (dB)

The voltage level measurement is used for determining the overall damping or gain of a transmission system (shown here as a two-port network).



$$\text{Voltage level [dB]} = 20 \cdot \log \frac{V_2}{V_1}$$

with $V_1 = V_{REF}$ (reference level rEF_{vALUE})
result > 1: gain; result < 1: damping

➪ Set the rotary switch to V ∼.
➪ Briefly press the multifunction key.

The level measurement function is now active. The measurement value is calculated from the effective value of the alternating voltage component dependent upon the measuring range (300 mV ... 1000 V), and appears at the digital display. The present alternating voltage value (U_2) is indicated at the analog scale.

The default setting for the reference level corresponds to a value of 0 dB = 0.775 V (1 mW at 600 Ω). This value (U_{REF}) can be changed in the "Setup" menu:
SEt ↵ ↓ rEF^{dB} ↵ XXXXX ^{dB} ↓↑↵.

➪ Frequency measurement can be activated by briefly pressing the multifunction key once again.
➪ If the mutlifunction key is pressed and held (approx. 1 s), the instrument returns to voltage measurement.

Note!
No matching resistors have been installed into the instrument. It takes measurements with a high input resistance of 5 MΩ.
Input resistance for voltage measurement is listed under technical data. In order to perform correct measurements at non-terminated devices under test, a matching resistor must be connected to the terminals. Observe power dissipation at the matching resistor!

dB Ranges

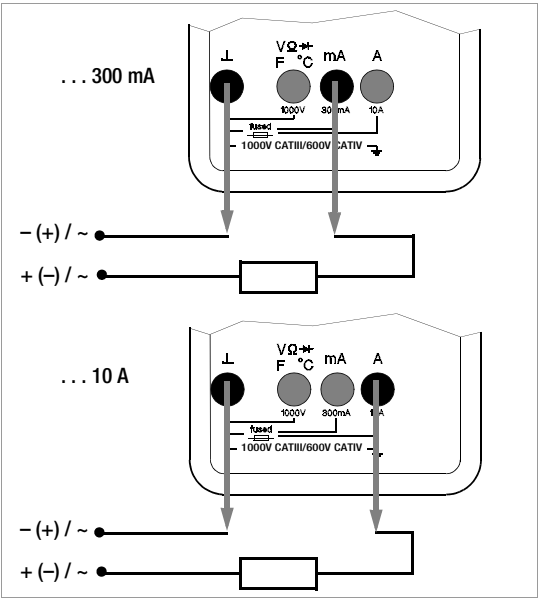
Measuring Ranges	Display Range at Reference Voltage, U_{REF} = 0,775 V	Resolution
300mV ∼	– 48 dB ... – 8 dB	0.01 dB
3V ∼	– 28 dB ... + 12dB	0.01 dB
30V ∼	– 8 dB ... + 32 dB	0.01 dB
300V ∼	+ 2 dB ... + 52 dB	0.01 dB
1000V ∼	+ 22 dB ... + 63 dB	0.01 dB
	Display (dB) = 20 lg U_x (V) /U_{REF}	

For inherent deviations (details on errors and/or tolerances) the values of the voltage measurement ranges apply (see page 48), whereas these data are only valid as from 10% of the respective measuring range.

METRA*Hit*®25S/26S/M **A $(AC+DC)_{TRMS}$**
METRA*Hit*®23S/24S **A AC mean value rectification**

Attention!
METRA*Hit*®23S: The instrument is intended for performing measurements in the transducer sector of energy measuring technology. The 3 A and 16 A measuring ranges covered by METRA*Hit*®23S are not fuse-protected!

- First switch off the power supply to the measuring circuit or the load component and discharge any capacitors which might be present.
- Select range A ⎓ with the rotary switch for currents > 300 mA, or range mA ⎓ for currents < 300 mA. Switch to the **measuring range A first**, for the measurement of currents of an unknown quantity.
- Select the respective current type which corresponds to the measured quantity by briefly pressing the yellow multifunction key. Each activation of the key causes alternate switching between DC and AC or (DC + AC), as well as acknowledgement by means of an acoustic signal. The symbols DC, AC or (DC+AC) indicate the selected voltage type at the LC display.
  After the range has been selected with the rotary switch, the DC current mode is always active.
- Securely connect the instrument to the load component in series as shown (without matching resistor).



Current Measurement Tips:

- The measuring circuit must be mechanically stable and protected against unintentional interruption. Conductor cross sections and connection points must be substantial enough to avoid excessive overheating.
- In the 300 mA and 10 A measuring ranges an intermittent acoustic signal warns you, if the measurement value has exceeded the measuring range upper limit value.
- Current ranges up to 300 mA are protected with a FF (UR) 1.6 A/1000 V AC/DC fuse in combination with power diodes up to a short-circuit current of 25 A. The breaking capacity of the fuse is equal to 10 kA at a nominal voltage of 1000 V AC/DC with resistive load.
- Measuring ranges up to 10 A are protected with a FF (UR) 16 A/1000 V AC/DC fuse. The breaking capacity of the fuse is equal to 30 kA at a nominal voltage of 1000 V AC/DC with resistive load.
- If the fuse for the active current measuring range is defective, "FUSE" appears at the digital display and an acoustic signal sounds simultaneously.
- If a fuse blows, eliminate the cause of the overload before placing the instrument back into operation!
- Fuse replacement is described in chapter 25.3, page 56.

9.1 AC Measurement with Current Transformers

9.1.1 mA or A Transformer Output (METRA*Hit*®23/24/25/26)

If a (clip-on) current transformer is connected to the multimeter (mA or A input), all current indicators are displayed in accordance with the selected transformation ratio. However, the current transformer must have a transformation ratio of either 1000:1 or 10000:1, and the transformation ratio must be selected in the following menu.

Current Clip Setup Menu:

SEt ↵ ↓ CLIP ↵ oFF ↓ 1000 ↓ 10000 ↵.

If you have selected 1000 or 10000 in the menu, you can switch back and forth between two different current displays with the help of the FUNC key:
The selected transformation ratio is only taken into consideration if a preceding **c:** is entered (c for clip).

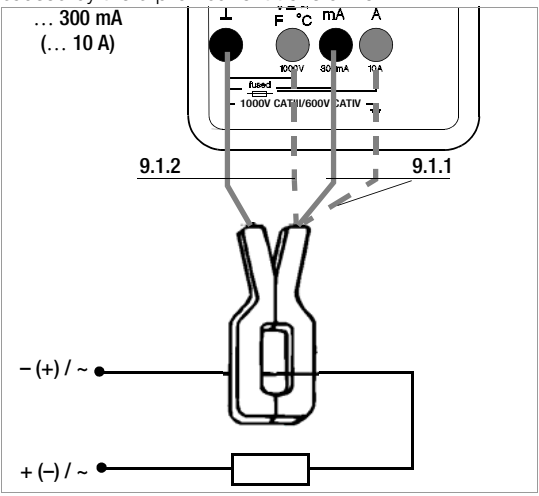
Attention!

If current transformers are used at the secondary side in an open condition, e.g. due to defective or non-connected power cables, a blown device fuse or incorrect connection, dangerously high voltages can occur at the terminals. For this reason, check to see if the measuring instrument's current path and transformer's secondary wind-

ing, which is connected to the instrument, complete a closed current circuit, and connect the transformer to the ⊥ and mA or A jacks.

Note!
After **measurement with the current clip has been completed**, **"oFF"** should be selected in the setup menu. Without taking into consideration the transformation ratio you can only take measurements in the (mA/A) DC range.

The maximum allowable operating voltage is equal to the rated voltage of the current transformer. When reading the measurement value, consider any additional display error caused by the clip-on current transformer.



9.1.2 Transformer Output mV/A)

METRA*Hit*®22...26

The secondary terminal at transformers with voltage outputs must be connected to the ⊥ and V~ jacks. .

METRA*Hit*®22S/M

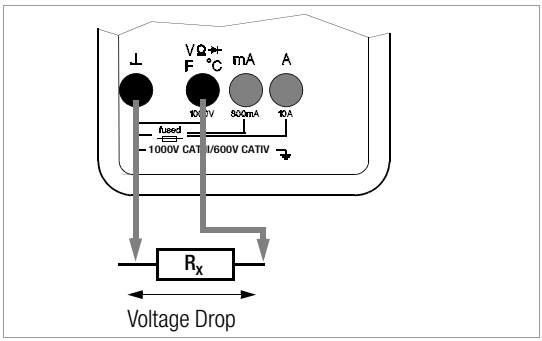
Transformers of the type WZ12B/C are connected to the **A** ⌁ jack. After pressing the FUNC button the measuring results are displayed with the exact decimal places provided the transformation ratio (CLIP) has been properly set.

Current clip setup menue:

SEt ↵ ↓ CLIP ↵ 1 (mV) : 1 mA/10 mA/1 A ↓ ↵.

10 Resistance Measurement

➪ Be certain that the device under test is voltage-free. Extraneous voltages distort the measurement results!
➪ Set the rotary switch to „Ω“.
➪ Connect the DUT as shown.



Zero Balancing in the 300 Ω and 3 kΩ Measuring Ranges

Cable and transition resistance can be eliminated with zero balancing for measurements of small resistance values in the in 300 Ω and 3 kΩ ranges :

➪ Connect the measurement cables to the instrument, and connect the free cable ends to one another.
➪ Briefly press the multifunction key.
The instrument acknowledges zero balancing with an acoustic signal and “000.00 Ω” and the “ZERO” symbol appears at the LCD. The resistance which was measured at the moment the key was activated serves as a reference value (max. 2000 digits). It is automatically subtracted from subsequently measured values.
➪ Zero balancing can be deleted:
– by pressing and holding the multifunction key, after which deletion is acknowledged with a twice repeated acoustic signal,
– by switching the instrument off.

See chapter 11 for continuity testing.

11 Continuity Testing for Resistance Measurement

The instrument generates a continuous tone in a range from 0 to approx. 10 Ω if the “acoustic signal” function is active, however only in the 0 to 310 Ω measuring range. The limit value can be adjusted in the “Setup” menu: SEt ↵ ↓ trig ↵ ↓ cont i ↵ cont i Ω ↵ XXX Ω ↓↑↵.

Activate continuity testing (acoustic signal ON):

☞ **Note!**
The two measurement cables may not come into contact with one another when the multimeter is switched on, or prior to measurement function selection, as this would lead to zero point adjustment.
OL is displayed if the DUT is not connected.

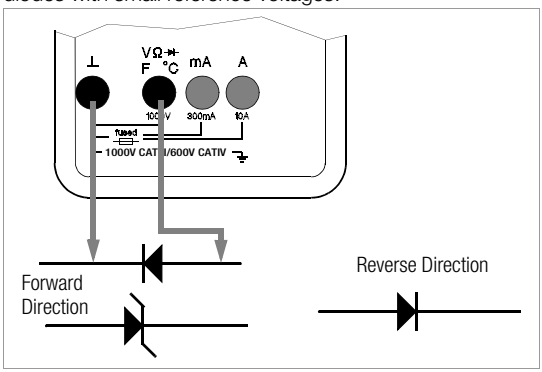
➪ Briefly press the multifunction key.
Activation is acknowledged with an acoustic signal.
The 🔊 symbol is simultaneously displayed at the LCD.
➪ Connect the measurement cables to the DUT.

Deactivate continuity testing (acoustic signal OFF):
➪ Briefly press the multifunction key a second time.
Deactivation is acknowledged with an acoustic signal.
The 🔊 symbol disappears from the LCD.

12 Diode Testing

➪ Be certain that the device under test is voltage-free.
Extraneous voltages distort the measurement results!
➪ Set the rotary switch to" ⇻ ".
➪ Connect the DUT as shown.

Conducting Direction and Short-Circuit
The measuring instrument displays the forward voltage in volts (display: 4¾ places). As long as the voltage drop does not exceed the maximum display value of 1.8 V, you can test several elements connected in series, or reference diodes with small reference voltages.



Reverse Direction or Interruption
The measuring instrument indicates overflow "OL".

☞ **Note!**
Resistors and semiconductor paths connected in parallel to the diode distort measurement results!

13 Continuity Testing for Diode Tests

If the “acoustic signal” function has been activated, the instrument generates a continuous acoustic signal exclusively in the measuring range 0 ... 1.8 V (3¾ place display) within a measurement value range of 0 to approx. 0.1 V. The limit value can be selected in the “SEt” menu mode:
SEt ↵ ↓ triG ↵ ↓ cont i ↵ ↓ cont i V ↵ XXX mV ↓↑↵.

Activate continuity testing (acoustic signal ON):

- ➪ Briefly press the multifunction key.
  Activation is acknowledged with an acoustic signal.
  The 🔊 symbol is simultaneously displayed at the LCD.
  OL is displayed if the DUT is not connected.
- ➪ Connect the measurement cables to the DUT.

The signal generator function is activated by pressing the multifunction key once again.

14 Signal Generator

Individual pulses or pulse packets with an amplitude of approx. 3 V and a frequency of 1 to 1000 Hz can be generated with the help of the signal generator function.

- ➪ Activate the signal generator parameter (see below).
- ➪ Turn the function selector switch to the “⏭” position.
- ➪ Connect the DUT to the “⊥” and “V” sockets with measurement cables.
- ➪ Press the multifunction key twice.
  “Hz” appears at the display, as well as the pulse frequency entered to the “Setup” menu.
- ➪ Select the desired frequency with the help of the “DATA” key. The following values are available:
  1, 2 , 5, 10, 20, 50, 100, 200, 500, 1000 [Hz] or USEr
- ➪ Start the signal generator.
  Continuous operation: If rEPEt has been selected, the signal generator is started automatically
  Single sequence: If onCE has been selected, press the AUTO key to start each individual sequence.

Setting Parameters

- ➪ Enter the “SEt” menu mode (see flow chart on following page as well as chapter 21).

USEr Frequency

SEt ↵ ↓ GEnEr ↵ USEr or xxxx Hz ↓↑ ↵
USEr = 1 ... 999 Hz, step size 1 Hz
xxxx = 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 [Hz]

count – Number of Pulses per Pulse Packet

count: number of pulses: 1...99999

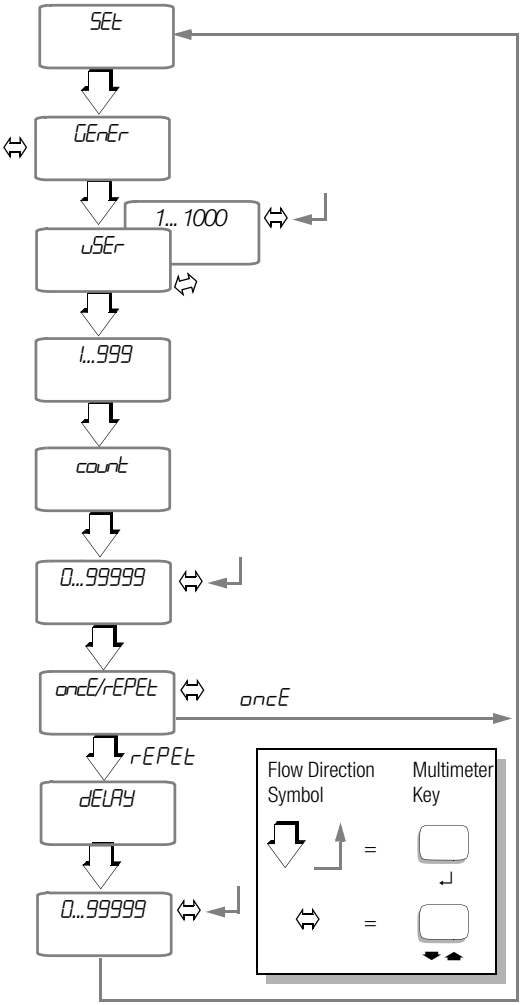
onCE/rEPEt – Single Sequence/Continuous Operation

onCE: single sequence
rEPEt: continuous operation

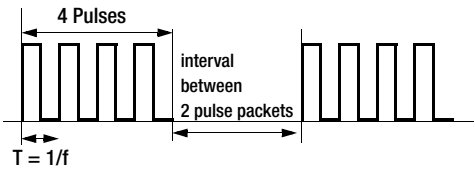
dELAY – Interval Between 2 Pulse Packets

dELAY: pause of 1 to 99 999 ms
dELAY: no function if onCE has been selected
Duty cycle: approx. 50%

Signal Generator Menu



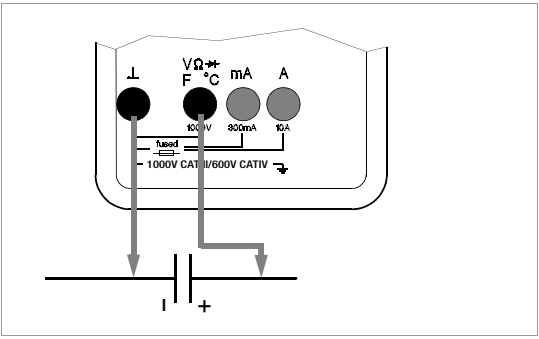
Continuous Operation



15 Capacitance Measurement

- ➪ Be certain that the device under test is voltage-free. Extraneous voltages distort the measurement results!
- ➪ Set the rotary switch to “F”.
- ➪ Connect the (discharged!) DUT to the “⊥” and “F” jacks with measurement cables.

☞ **Note!**
For polarized capacitors, the “–” pole must be connected to the “⊥” jack.
Resistors and semiconductor paths connected in parallel to the capacitor distort measurement results!



Zero Balancing in the 3 nF and 30 nF Measuring Ranges

The inherent capacitance of the instrument and the capacitance of the cables can be eliminated with zero balancing for the measurement of small capacitive values in the 3 nF and 30 nF ranges:

- ➪ Connect the measurement cables to the instrument without a DUT.
- ➪ Briefly press the multifunction key.
  The instrument acknowledges zero balancing with an acoustic signal, and “0.000” and the “ZERO” symbol appear at the LCD. The capacitance which was measured at the moment the key was activated serves as a reference value (max. 200 digits). It is automatically subtracted from subsequently measured values.

- ➪ Zero balancing can be deleted:
  – by pressing and holding the multifunction key, after which deletion is acknowledged with a twice repeated acoustic signal,
  – by switching the instrument off.

16 Frequency Measurement

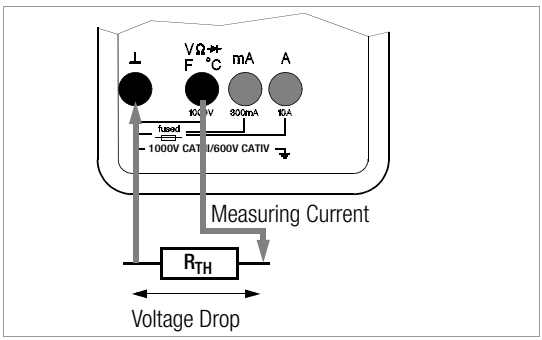
The frequency measurement function can only be activated for voltage measurement in the V~ and in the V ⎓ mode with METRA*Hit*®26S/M.

Note!
If at all possible, measure frequency in the V~ selector switch position. Frequency measurements may be distorted by superimposed DC components in the V ⎓ selector switch position.

- ➪ Set the rotary switch to V~ or V ⎓ .
- ➪ Apply the measured quantity in the same fashion as for voltage measurement.
- ➪ Select the measuring range for the voltage amplitude.
- ➪ Briefly press the multifunction key until Hz appears in the display (twice for V~ and once for V ⎓). The instrument switches to frequency measurement.
  The lowest measurable frequencies and maximum allowable voltages can be found in chapter 24 “Characteristic Values”.
- ➪ From the frequency measurement mode, you can switch directly back to voltage measurement by pressing and holding the multifunction key, which is acknowledged with a twice repeated acoustic signal. The last selected voltage measuring range remains active.

17 Temperature Measurement

- ➪ Enter the sensor type (Pt100 or Pt1000), the cable resistance and the desired temperature unit of measure in the “Setup” menu:
  SEt ↵ ↓ SEnSr ↵ ↓ Pt 100 ↵
  XX.X Ω ↓↑ ↵
  tunit °C ↓ tunit °F ↵
- ➪ Set the rotary switch to “°C”.
- ➪ Connect the sensor to the two open connector jacks. The instrument displays the measured temperature in the desired unit of measure.



Note!
The cable resistance entered in the Setup menu is automatically taken into consideration for this measurement.
The default setting is Pt100 and the cable resistance is equal to 0.1 Ω.

18 Event Counting and Zero Crossings

18.1 Event Counting

The following can be measured and displayed:

- Number of events
  An event is counted if the measurement value lies below the lower threshold L-trig for at least 1 second, ***and*** *subsequently for at least 1 second above the upper threshold H-trig. Voltage signals with a repetition frequency of maximum 0.5 Hz are recorded (minimum period: 2 seconds).*
- Total time of all events
  Time, during which the measured voltage was above the upper threshold.
- Overall time since start of event counting.

⇨ First enter the upper and lower thresholds as digits (see examples in the table below, as well as chapter 21 “Setting the Measurement Parameters”):
SEt ↵ ↓ triG ↵ ↓↑ EVENTS ↵
H.triG ↵ 01000 ↓↑↵
L.triG ↵ 00800 ↓↑↵.

⇨ Set the rotary switch to V~ or V ⎓ .

⇨ Manually select the measuring range for “event” counting.

⇨ Apply the signal in the same fashion as for voltage measurement.

⇨ Repeatedly press the multifunction key until EVENTS appears at the display. See table on next page for further operating instructions.

☞ **Note!**
Automatic instrument shut-down is *disabled* in this function.

Sample Entries for Trigger Thresholds

	Value: trigger threshold H-trig or L-trig in digits		
	20000 [1]	02000	00200
Measuring Range	**Effective Trigger Threshold**		
300 mV	200 mV	20 mV	2 mV
3 V	2 V	200 mV	20 mV
30 V	20 V	2 V	200 mV
300 V	200 V	20 V	2 V
1000 V	[2]	200 V	20 V

1) Values of up to 30000 digits (for H-trig) are reasonable for measuring ranges from 300 mV to 300 V.
2) Values of up to 10000 digits (for H-trig) are reasonable for the 1000 V measuring range, because a trigger threshold of 1000 V results from this maximum value, which corresponds with the measuring range upper limit.

⇓ FUNC Key	Function	Reaction at Instrument	
		Display	Acoust. Signal
3 or 4x brief [1]	**1.** EVENTS function is activated, events are counted	Current voltage, "**EVENTS**" blinks	1 x
brief	**2.** Number of events since initial activation, events counting continues in background	Number of events "**EVENTS**" (to 99999)	1 x
brief	**3.** Overall time for all events, max. 9 hours 59 minutes	**t ON EVENTS**	1 x
brief	**4.** Elapsed time since initial activation max. 9 hours 59 minutes	**t**	1 x
2 x brief	Return to **1.** Number of stored events remains in memory, events counting continues in background	Current voltage, "**EVENTS**" blinks	1 x
long	Cancel	Current voltage	2 x

[1] METRA*Hit*®26S/M: 3x, METRA*Hit*®22/23/24/25: 4x

18.2 Count Zero Crossings

This function counts the number of times the input signal crosses zero and displays this number together with the time.

Counting can be stopped or restarted with the help of the MAN/AUTO key. These conditions are indicated as follows:

MAN and **ON**: counting, **MAN**: counting stopped.

19 Stopwatch

Time periods of up to one hour can be measured with this function.

Activating the Stopwatch Function:

Selector switch position ⏱ for METRA*Hit*®22/23/24/25
With the following sequence for METRA*Hit*®26S/M:

- ⇨ Set the rotary switch to "V ⎓ "
- ⇨ Select a measuring range between 3 V and 1000 V with the MAN/AUTO key. This function cannot be activated in the 300 mV ⎓ measuring range!
- ⇨ Press and hold the FUNC key. The clock is reset, and "00:00.0" and the ⏱ clock symbol are displayed at the LCD.

Operating the Stopwatch

- ⇨ The clock can be started and stopped by pressing the MAN/AUTO key. Minutes, seconds and tenths of seconds are displayed in digital form.
- ⇨ Press the DATA/CLEAR key in order to reset the stopwatch.
- ⇨ Briefly press the FUNC key in order to return to voltage measurement.

Exiting the Stopwatch Function

- ⇨ METRA*Hit*®22/23/24/25: Alter selector switch position.
- ⇨ METRA*Hit*®26S/M: Press the FUNC key.

20 Storing Measurement Values with the METRA*Hit*®22M/26M

The instrument is equipped with a quartz-movement synchronized measurement-value memory (128 kB), which has sufficient capacity for an average of 50,000 measurement values. Minimum capacity is 20,000 measurement values (large signal fluctuation or time period between measurement values). Maximum capacity is 100,000 measurement values (minimal signal fluctuation, rate ≥ 0.5 s, hysteresis = "all"). Data can be stored to intermediate memory, or transmitted directly to a PC. Data are acquired relative to real-time. Thus the instrument may also be used as a real-time data logger.

The measurement data are stored as so-called data blocks. Measurement values from the same measuring function are stored in the same block.

Only absolute values and absolute time records can be stored (no relative or Δ values, and no relative time records.)

Memory content can only be read out with the help of a PC, an infrared adapter and METRAwin®10/METRA*Hit*® analysis software.

Preparations for Memory Mode Operation

Note!
First set **hysteresis**, **sampling rate** and **triggering parameters** for memory mode operation, and then activate the memory mode. These parameters cannot be changed during operation in the memory mode, or the transmission mode.

- ➪ Select the desired measuring function, as well as an appropriate measuring range.
- ➪ Check the charging level of the battery before starting long-term measurement value recording (see chapter 25.1, page 54).
  Connect the AC power pack if necessary.

Starting Memory Mode Operation via Menu Functions

- ➪ Enter the "Menu Mode" (see chapter 21, page 38).
- ➪ Select the main menu: StorE.
- ➪ The memory mode is started by activating the ↵ key. Current memory position is displayed in %. It may range from 00.00 to 99.99%.
- ➪ In order to return to the measuring function, press the Esc key twice. REM appears at the display.

Starting Memory Mode Operation via Shortcut

The multimeter must be switched on.

- ➪ Simultaneously activate the FUNC and ON keys. REM appears at the display.

☞ **Note!**
If another measuring function is selected with the rotary switch or the FUNC key, this has no influence on memory mode operation.
If the sampling rate is equal to or greater than 10 s, the display is deactivated in order to extend battery service life.

REM Display

The REM symbol indicates that the memory mode has been activated. Individual storage events such as the storage of measurement values are indicated by a brief disappearance of the REM display. As long as the storage rate is less than 1 s, REM blinks once per second.

SAMPLE Operating Mode

If the sampling rate has been set to “SAMPLE” (see chapter 21.1.1), individual measurement values can be stored manually from within the selected measuring function.

➪ Simultaneously press the FUNC and ON keys in order to store each individual measurement value. REM blinks briefly for each stored value.

DATA Operating Mode

Proceed as follows in order to store measurement values with the “DATA” function:

➪ Set the sampling rate to “DATA” (see chapter 21.1.1, page 40).

➪ Activate the memory mode.

➪ Press the DATA key in order to store measurement values with the “DATA” function, i.e. after the measuring signal has been applied and the display has settled to a stable value (see chapter 5, page 12).

High Speed Storage Rate – Rapid Sampling

The following conditions prevail (for V DC) as long as the storage rate is less than 0.05 s:

- *buSY* is still displayed at the LCD
- the decimal point is fixed:
  automatic measuring range selection is disabled,
- all measurement values are stored to memory
- hysteresis is not active,
- the following are not utilized:
  pre-trigger, st-in and st-ou (but rather trig off),
  and cycle on

Memory Occupancy Query *OCCUP*

Memory occupancy can be queried from the INFO menu. Occupancy is read out to the main display in % from 00.00% to 99.99%.

SEt ↓ inFo ↵ ↓ OCCUP ↵ XX.XX

Exiting the Memory Mode via Menu Functions

- ➲ Select the main menu: StorE.
- ➲ Activate the ↵ key. Memory occupancy is displayed.
- ➲ Activate the ↵ key again, and StOP appears at the display.
- ➲ Activate the ↵ key once again, and the setup display returns. REM disappears.
  The memory mode is deactivated.
- ➲ The Set display returns if the Esc key is activated.

Exiting the Memory Mode via Shortcut

- ➲ Simultaneously activate the FUNC and ON keys.

***CLEAr* – Delete Memory**

Attention!
This function deletes all measurement values which have been saved to memory.

The entire RAM can be cleared:
SEt ↓ rAM ↵ no ↓ YES ↵

20.1 General Parameters

***durA* – Memory Duration**

This parameter allows for a determination as to whether or not measurement values should only be stored for a limited amount of time.
If this duration needs to be limited (on), a time period can be entered in days and hours.
SEt ↵ ↓ durA ↵ OFF ↓ on ↵
0–9 (dAYS) ↓↑↵ 00:00 ↓↑↵ 00:00:00 ↓↑ ↵

***CYCLE* – Cyclic Memory Mode**

If the cyclic memory mode has been selected – ***CYCLE*** "on" – the oldest value is deleted and overwritten with the new value when memory overflow occurs.
If ***CYCLE*** is set to "OFF", the memory mode is deactivated as soon as the memory is full.
The cyclic memory mode cannot be activated if rapid sampling has been selected (1 ms to 20 ms). The selected setting is always perceived as "OFF".
SEt ↵ ↓ durA ↵ ↓ OFF ↵ CYCLE ↵ OFF ↓ on ↵

***HYSt* – Hysteresis**

The hysteresis setting allows for efficient memory utilization.
In the memory mode, new measurement data are only stored as a data block if they deviate from the previously stored value by an amount which is greater than the selected hysteresis.
Hysteresis can be set in steps of 1, 2 or 5 digits.

These digits make reference to the measuring range as follows: The positions of the digits in the pre-selected hysteresis correspond to the same positions within the measuring range, but are counted starting at the left.

Example: A pre-selected hysteresis of 001000 for the 300.000 V measuring range means that only those measurement values which deviate from the previous measurement value by at least 001.000 V are stored.

All measurement values are stored to memory if hysteresis is set to “all”. This may be required, for example, for real-time analysis at a PC with simultaneous display at the monitor.

➪ Enter the “SEt” menu mode (see chapter 21).

➪ Enter hysteresis as follows:
SEt ↵ ↓ HYSt ↵ 00500 ↑↓ ↵

20.2 Trigger Functions

With the help of the trigger functions (except for events and cont i), you can determine which measurement values are stored to memory. In addition to this, storage to memory can be started with various trigger types. A trigger event occurs when high level is exceeded, or if low level is fallen short of. Recording can take place either before or after the trigger event. The duration of recording depends upon the sampling rate, the hysteresis setting, available memory capacity and the desired recording duration (durA). Recording is activated with the shortcut key combination ESC and ↵ , or via the StorE menu (after all settings have been completed).

In the following examples for the selection of parameters, V represents trigger variables V, A, Ω, °C, µF, Hz and dB. Furthermore, the trigger function **in** represents **in**, **out**, **St-ou** and **St-in**. An overview (flow chart) of the complete trigger menu can be found on page 36.

☞ **Note!**
Changing the measuring function has no influence on the trigger functions.
The following trigger parameters are not active if the sampling rate is less than (faster than) 50 ms.

triG = OFF

If the triG function is set to OFF, measurement values can be stored to memory independent of the measured quantity (independent of parameters H.triG, L.triG, prEtr and rEtriG). However, storage is dependent upon date and time trigger parameters.

SEt ↵ ↓ triG ↵ V ↵ ↓↑ 0FF ↵ t.triG ...

triG = out

Measurement values are stored to memory if the following prerequisite has been fulfilled: At least one measurement value occurs within the limits defined by H.triG and L.triG, and one of the subsequent measurement values must violate these limits.

SEt ↵ ↓ triG ↵ V ↵ ↓↑ out ↵ H.triG ...

triG = in

Measurement values are stored to memory if the following prerequisite has been fulfilled: At least one measurement value occurs which violates the limits defined by H.triG and L.triG, and one of the subsequent measurement values is within these limits.

SEt ↵ ↓ triG ↵ V ↵ ↓↑ in ↵ H.triG ...

triG = St-ou

Only those measurement values are stored to memory, which do not lie within the limits for H.triG and L.triG.

SEt ↵ ↓ triG ↵ V ↵ ↓↑ **St-ou** ↵ H.triG ...

triG = St-in

Only those measurement values are stored to memory, which do lie within the limits for H.triG and L.triG.

SEt ↵ ↓ triG ↵ V ↵ ↓↑ **St-in** ↵ H.triG ...

20.2.1 Trigger Function Parameters

***H.triG/L.triG* – Upper Limit/Lower Limit**

Each trigger function is assigned its own upper and lower limits as trigger parameters. The upper limit should be greater than the respective lower limit.

The predetermined trigger threshold is evaluated according to the selected measuring range, independent of whether or not automatic measuring range selection is activated.

Entering upper and lower trigger thresholds in digits:

SEt ↵ ↓ triG ↵ V ↵ in

H.triG ↵ XXXXX ↓↑↵

L.triG XXXXX ↓↑↵.

Note!

Values for H.triG and L.triG are also used as trigger parameters for *cont i or EVENTS*. The table in chapter 18.1 contains examples for the entry of trigger thresholds in digits.

***PrEtr* – Pre-Trigger**

The pre-trigger function is activated when ***PrEtr = on:***
The following conditions must be fulfilled in order to store measurement values to memory:

- The memory mode must be active.
- The start time which has been defined with the timer (t.triG and d.triG) must agree with current actual time.

Storage is carried out independent of any other trigger conditions.

The pre-trigger function is deactivated when ***PrEtr = oFF:***
The following conditions must be fulfilled in order to store measurement values to memory:

- The memory mode must be active.
- Trigger conditions for the functions out, in, St-ou and St-in must be fulfilled.

Storage to memory is carried out independent of the timer.

Note!
The pre-trigger can only be activated, if trig=in or trig=out has been selected.
We recommend the entry of a defined memory duration prior to activation of the pre-trigger, (see "durA – Memory Duration", page 30).

***rEtrG* – Re-Trigger**

After a trigger signal and storage to memory have occurred – memory duration durA has expired – the trigger is reset. The re-trigger function remains disabled as long as the pre-trigger function is active.
See the trigger menu flow chart on page 36 regarding activation and deactivation of these trigger conditions.

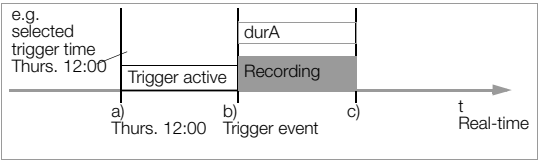
Note!
We recommend the entry of a defined memory duration prior to activation of the re-trigger (see "durA – Memory Duration", page 30).

***t.triG, d.trig* – Timer**

If this function has been activated, and if the memory mode is on, measurement values are only stored as of the specific point in time, after which current date and time agree with the values selected for t.triG (tiME triG) and d.trig (dAtE triG).
See the trigger menu flow chart on page 36 regarding activation and deactivation of the timer.

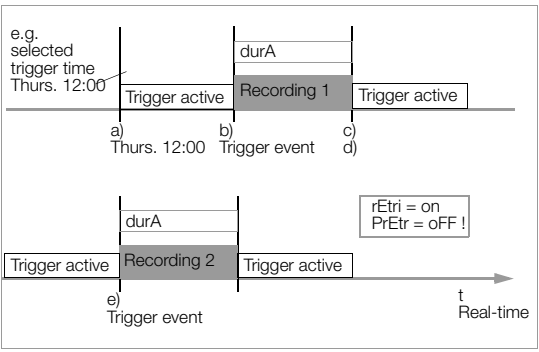
Note!
Current date and time should be checked and corrected if necessary, before the time trigger is activated, and before trigger date and time are selected.

Example: Recording as of a Trigger Event (without re-trigger or pre-trigger)



a) The predefined trigger start time is reached. The trigger is active as of this point in time.
b) The trigger event occurs, the recording duration starts (durA) and recording begins.
c) The recording duration (durA) transpires and recording is stopped – it may also be stopped earlier if memory capacity is insufficient, or if the cyclical memory mode has been selected (CYCLE).

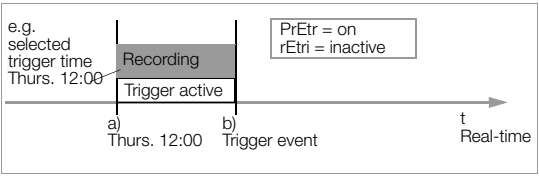
Example: Multiple Recording as of Trigger Event (with re-trigger)



Only possible for trigger types triG = in and triG = out. The pre-trigger must be deactivated in this mode (PrEtr = oFF)!

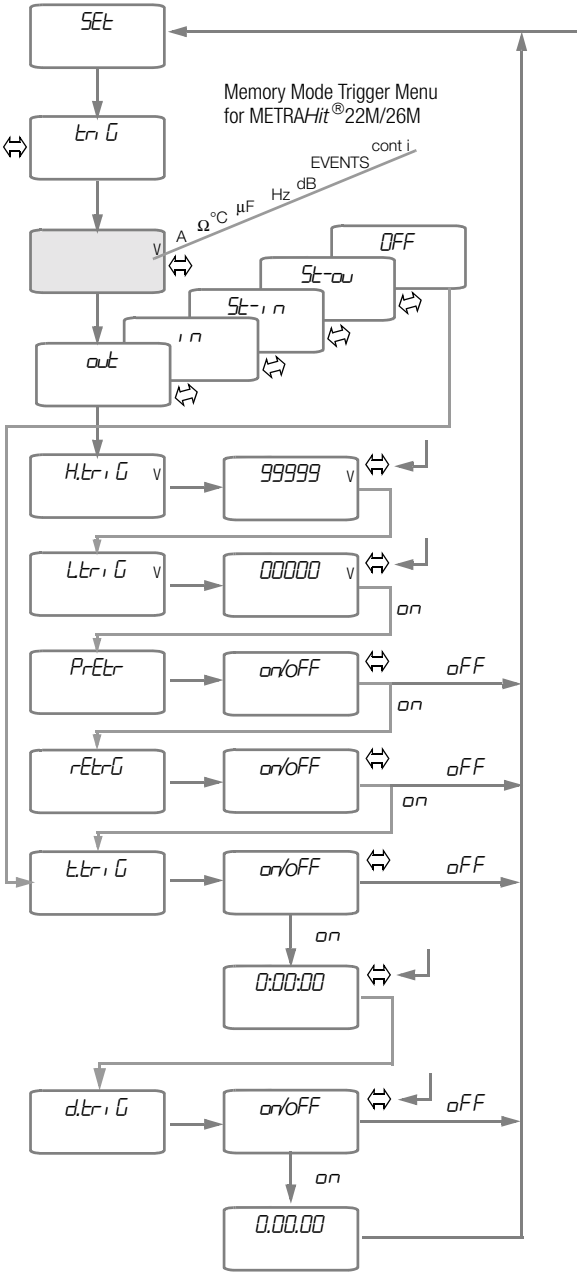
a) b), c) Same as in above example without re-trigger or pre-trigger.
d) Immediately after the end of recording the trigger is once again active.

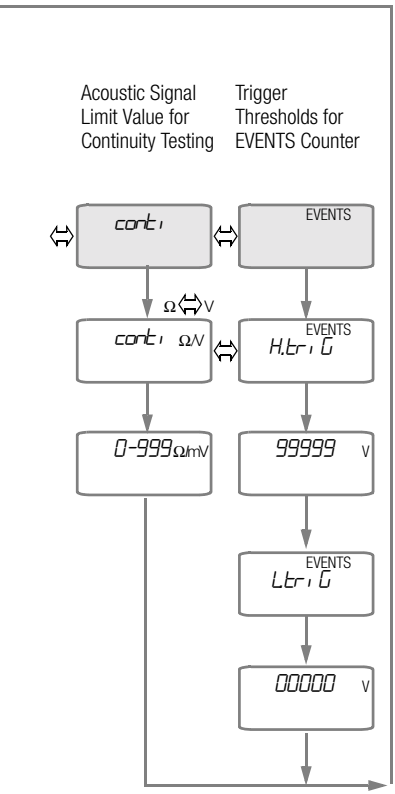
Example: Recording Prior to the Trigger Event or Immediate Recording (with pre-trigger)

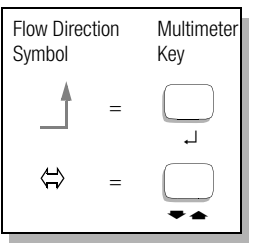


a) The predefined trigger start time is reached. The trigger is active as of this point in time. Recording begins (because PrEtr = on). A recording duration (durA) can be selected in this case as well in order to end recording.
b) The trigger event occurs and recording is stopped.

Trigger Menu




Acoustic Signal
Limit Value for
Continuity Testing
Trigger
Thresholds for
EVENTS Counter
cont1
EVENTS
Ω⇔V
cont1 Ω/V
EVENTS
H.tri G
0-999Ω/mV
99999 V
EVENTS
L.tri G
00000 V


Flow Direction
Symbol
Multimeter
Key
=
=

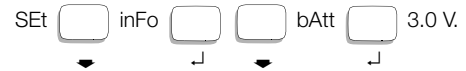
21 Setting the Measurement Parameters

The menu mode allows for the setting of operating parameters, data queries and activation of the interface.

- ➪ The menu mode is entered by pressing the ↵ key twice if the instrument is switched off, or only once if the instrument is switched on and in the measuring mode. “SEt” appears at the display.
- ➪ Repeated activation of the ↓↑ key causes alternate opening of the main menus „SEnd“ , „inFo“ (as well as “StorE” and “CLEAr” for the METRA*Hit*®22M/26M) and finally once again “SEt”.
- ➪ After the desired main menu has been selected, the sub-menus can be opened with the ↵ key.
- ➪ The desired sub-menu can be selected by repeatedly activating the ↓↑ key.
- ➪ Activate the ↵ key, in order to change the corresponding parameter in the sub-menu.
- ➪ After the parameter has been changed or the unit of measure has been selected, the display returns to the menu mode (SEt).
- ➪ Return to the measuring mode by pressing and holding the Esc key until the measuring display appears.
- ➪ In order to switch the multimeter off, press and hold the ON/OFF key until the display goes blank.

Examples

Battery Voltage Query



or in abbreviated form:

SEt ↓ inFo ↵ ↓ bAtt ↵ 3.0 V.

Setting Time

SEt ↵ ↓ tiME ↵ 10:24 ↵ 10:24:42

Setting hours minutes and seconds:

- ↓↑ Select characters, cursor position blinks. Press and hold key for rapid change of characters.
- ↵ After entry acknowledgement, the next entry position (to the right) blinks.
- ← This key sends the cursor back to the previous entry position.
- ↵ After acknowledgement for the last entry position (extreme right) – in this case seconds – the instrument returns to the menu mode.

Main menu SEt is active, menu mode

Main Menu

SEt **StorE** SEnd **CLEAr** inFo

SEt	SEnd	**CLEAr**	inFo
Sub Menu			
rAtE	on	**no**	tiME
HYSt	OFF	**YES**	**OCCUP**
triG			**t.rAM**
durA (→ CYCLE)			bAtt
tiME			
CLIP			
SEnSr (→ tunit)			
rEF ^{dB}			
GEnEr			
Addr			
MEnu			

Parameters in Bold Typeface:
METRA*Hit*®22M/26M only

21.1 Description of Items in the *SEt* Menu

21.1.1 *rAtE* – Sampling Rate

The sampling rate determines the interval, after which the respective measurement values are transmitted to the data interface or the measurement value memory.

The following sampling rates are possible:

METRA*Hit*®22M/26M:

0.001, 0.002, 0.005, 0.01, 0.02 [s:zht]

METRA*Hit*®22/23/24/25/26:

0.05, 0.1, 0.2, 0.5 [s:zht]; 00:01, 00:02, 00:05, 00:10, 00:20, 00:30, 01:00, 02:00, 05:00, 10:00 [mm:ss], SAMPL, dAtA.

Certain limit values apply to the various measured quantities for the given sampling rates. Actual values may not fall below these limits (see table below).

Measured Quantity	Sampling Rage
V ⎓	0.001 s for memory mode with METRA*Hit*®22M/26M
V ⎓, A ⎓,	0.05 s
V ≂, A ≂, EVENTS V ≂, →|| 🔊	0.5 s
Ω, Ω 🔊, Count, °C (Pt100, Pt1000)	0.5 s
V ∼, Hz, dB, EVENTS V ∼	1 s
°C	2 s
F	0.5 ... 10 s

SAMPLE (METRA*Hit*®22M/26M only)

If the sampling rate ("Rate" menu) is set to "SAMPLE", one measurement value is stored after the memory mode has been activated, and one upon activation of the ↵ key.

dAtA

This setting provides for transmission of the measurement values from the multimeter to the interface, or storage of these values, which have been generated in the measurement value storage function, "DATA".

Setting the Sampling Rate

SEt ↵ ↓ rAtE ↵ s.zht / mm:ss ↓↑ ↵

t: thousandths of a second, h: hundredths of a second, z: tenths of a second, s: seconds, mm: minutes

21.1.2 *Menu* – Rapid Query

After this function has been activated – Parameters MEnu set to CYCLE – the last accessed sub-menu is displayed after the main SET menu is opened.

SEt ↵ ↓ MEnu ↵ bASIC ↓ CYCLE ↵

21.1.3 *tiME* – Time and Date

The correct time allows for the acquisition of measurement values in the real-time mode.

SEt ↵ ↓ tiME ↵ hh:mm ↓↑ ↵ hh:mm:ss ↓↑ ↵
(hh ↓↑ ↵ mm ↓↑ ↵ ss ↓↑ ↵)

hh: hours, mm: minutes, ss: seconds

TT.MM ↓↑ ↵ TT.MM.JJ ↓↑
(TT ↓↑ ↵ MM ↓↑ ↵ JJ ↓↑ ↵)

TT: day, MM: month, YY: year

METRA*Hit*®22S: no buffer for time and date

21.2 Description o Parameters in the *inFo* Menu

***tiME* – Time Setting**

SEt ↓ inFo ↵ tiME ↵ 10:24 ↵ 10:24:42 (hh:mm:ss) ↵ 21.01 ↵ 21.01.99 (TT.MM.JJ)

***OCCUP* – Memory Occupancy (METRA*Hit*®22M/26M only)**

See description: chapter 20, page 28.

***t.rAM* (RAM Test) – Testing RAM (METRA*Hit*®22M/26M only)**

Attention!
Activating this function deletes all stored measurement values from memory.
Do not perform the RAM test while any of the following functions are active:
events counter or memory mode.

Starting the RAM test:
SEt ↓ info ↵ ↓↑ t.rAM ↵ no ↓ YES ↵

No other functions may be activated during the RAM test (the "bUSY" message is displayed). The test lasts approximately 1 minute. Two test samples are written to memory, and are subsequently read out.
If the test is completed successfully, "PASSE" appears at the display.

Significance of possible messages:

bUSY	RAM test is running
PASS	Test successfully completed
Err1	Test sample for this test is faulty
Err2	Test sample for a previous test is faulty

If Err1 and/or Err2 occur, a hardware problem may exist. Send the multimeter to our Repair and Replacement Parts Service Department.

***bAtt* – Battery Voltage**

SEt ↓ inFo ↵ ↓↑ bAtt ↵ 3.0 V.

21.3 Default Settings

Previously selected settings can be deleted, and default settings can be restored. This may be helpful in the following situations:

- After the occurrence of hardware or software problems
- If you feel that the multimeter is not functioning properly

➲ Briefly disconnect the batteries.
➲ Simultaneously press and hold the FUNC, MAN/AUTO and DATA keys, and connect the batteries before releasing the keys.

21.4 List of All Parameters

Parameter	METRA *Hit*®S	METRA *Hit*®M	Page: Heading
Addr	•	•	44: Selecting Interface Parameters
bAtt	•	•	41: bAtt – Battery Voltage 54: Batteries
bd232	•	•	44: Selecting Interface Parameters
CLIP	•	•	18: AC Measurement with Current Transformers
cont in Ω	•	•	20: Continuity Testing for Resistance Measurement
cont in V	•	•	22: Continuity Testing for Diode Tests
$CYCLE_{rAM}$	–	•	30: CYCLE – Cyclic Memory Mode
dAtA	•	•	40: rAtE – Sampling Rate
dAtE	•	•	40: tiME – Time and Date
d.trig	–	•	33: t.triG, d.trig – Timer
durA	–	•	30: durA – Memory Duration
EVENTS	•	•	26: Event Counting
H-triG	•	•	26: Event Counting
H-triG	–	•	32: Trigger Function Parameters
HYSt	–	•	30: HYSt – Hysteresis
L-triG	•	•	26: Event Counting
L-triG	–	•	32: Trigger Function Parameters
MEnu	•	•	40: Menu – Rapid Query
ModEM	•	•	44: Selecting Interface Parameters
PrEtr	–	•	33: PrEtr – Pre-Trigger
OCCUP	–	•	29: Memory Occupancy Query OCCUP
rAM_{CLEAR}	–	•	30: CLEAr – Delete Memory
rAtE	•	•	40: rAtE – Sampling Rate
rEF_{vALUE}	•	•	16: Alternating Voltage Level Measurement (dB)
rEtriG	–	•	33: rEtrG – Re-Trigger
rs232	•	•	44: Selecting Interface Parameters
SAMPLE	•	•	40: rAtE – Sampling Rate
SEnd	•	•	43: Activating the Interface
si232	•	•	44: Selecting Interface Parameters
Sto¯ou	–	•	32: triG = St-ou
Sto¯in	–	•	32: triG = St-in
SEnSr	•	•	25: Temperature Measurement
t_{unit}	•	•	25: Temperature Measurement
$tESt_{rAM}$	–	•	41: t.rAM (RAM Test) – Testing RAM (METRAHit·22M/26M only)
tiME	•	•	40: tiME – Time and Date
t.triG	–	•	33: t.triG, d.trig – Timer

22 Data Transmission via RS232 Interface

The multimeter is equipped with an infrared interface for the transmission of measurement data to the PC. Measurement values are optically transmitted via infrared light through the housing to an interface adapter, which is plugged into the multimeter. The RS232 interface at the adapter (accessory) allows for connection to the PC. The measurement data are transmitted to the PC with an interface cable.
Furthermore, commands and parameters can be uploaded from the PC to the multimeter. For example:

- Select and read our measuring parameters
- Select measuring function and range
- Start measurement
- Read out measurement values

22.1 Activating the Interface

The interface is manually activated for data transmission as described below. This operating mode provides for continuous uploading of measurement data from the instrument to the PC via the interface adapter.
The interface is activated automatically for the receipt of data (downloading from the PC to the instrument) as soon as transmission is started at the PC (except for METRA*Hit*®22S).

Starting Transmission Mode Operation via Menu Functions

SEt ↓ SEnd ↵ OFF ↓ on ↵

Starting Transmission Mode Operation via Shortcut

➪ With the instrument switched off, press and hold the DATA/CLEAR key and then activate the ON/OFF key.

The blinking ⩓ symbol at the display indicates that the interface has been activated.

☞ **Note!**
The “onlin(e)” operating mode must be selected for transmission via the SI232 interface adapter (not StorE). Other adapters are automatically activated as soon as an event occurs.

Automatic Activation and Deactivation in the Transmission Mode

If a sampling rate of 10 s or greater has been selected, the display is automatically deactivated between samples in order to extend battery service life.
The following exceptions apply:
Events counting mode, stopwatch mode and continuous operation.

22.2 Selecting Interface Parameters

Addr – Address

If several multimeters, interfaces or memory adapters are connected to the PC, each device requires its own address. Address number 1 should be assigned to the first device, 2 to the second device etc. If only one multimeter is connected to the PC, address number 1 should be used.

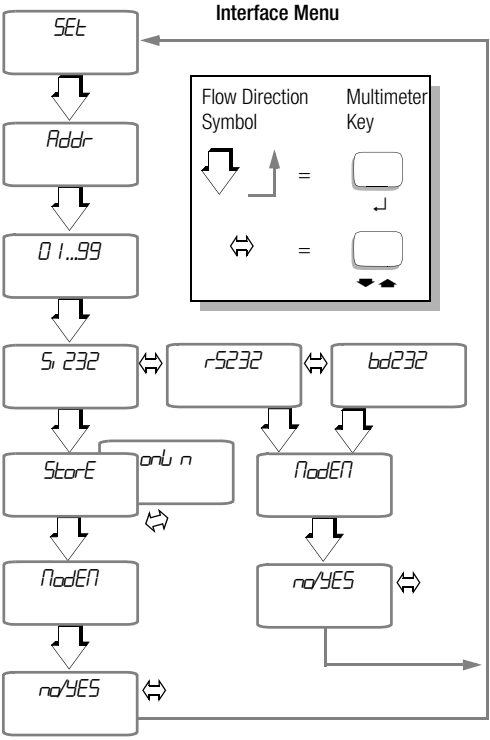
SI232/rS232/bd232 – Interface Adapters

The type of interface adapter in use must be selected for this parameter.

The SI232-II allows for on-site storage of measurement values for METRA*Hit*®22/23/24/25/26S measuring instruments. The “StorE” operating mode must be selected. “online - transmission” must be selected for the uploading of data to the PC (without memory).

ModEM

Indication must be made here as to whether or not a modem has been connected between the adapter and the PC.



23 Accessories

Interface adapter BD232 without memory allows remote control of the multimeter, as well as the transmission of measurement data from up to six multimeters to the PC.

SI232-II memory adapters make it possible to store measurement values on-site when using multimeters which are not equipped with internal memory, for example the METRA*Hit*®S series. They also allow for multimeter remote control (parameters configuration), or the transmission of measurement data from up to three multimeters to the PC.

METRAwin®10/METRA*Hit*® Software

The METRAwin®10/METRA*Hit*® software package includes a WINDOWS full version and is compatible with WINDOWS 95, 98 and NT.
The METRAwin®10/METRA*Hit*® allows for simultaneous logging, storage, display and documentation of measurement data from several METRA*Hit*®S or METRA*Hit*®M multimeters.
Measurement values can be displayed in the following formats:

- Digital display, similar to multimeter display (up to four multimeters)
- As a characteristic curve (XY and Yt), similar to a four channel recorder
- In tabular form (data logger: up to ten channels).

Measurement data are stored in ASCII format for further processing.

The following prerequisites must be fulfilled for the implementation of METRAwin®10/METRA*Hit*® software:

Software: You need

– WINDOWS 95, 98, ME, NT, 2000 or XP.

Hardware: You need

– a WINDOWS and IBM compatible PC with at least a Pentium CPU and 32 MB main memory
– a VGA monitor
– a hard disc with at least 20 MB free memory
– a 3.5” floppy disc drive for 1.4 MB floppy discs
– a MICROSOFT compatible mouse
– if you want to print your data: a WINDOWS compatible printer.

24 Characteristic Values

Meas. Function	Measuring Range		Resol. at Meas. Range Upper Limit 30 000 [1]	3 000 [1]	300 [1]
V [4]	300 mV		10 µV	100 µV	
	3 V		100 µV	1 mV	
	30 V		1 mV	10 mV	
	300 V		10 mV	100 mV	
	1000 V		100 mV	1 V	
A [4]	300 µA	function depends upon type, see table below	10 nA	100 nA	
	3 mA		100 nA	1 µA	
	30 mA		1 µA	10 µA	
	300 mA		10 µA	100 µA	
	3 A		100 µA	1 mA	
	10 A		1 mA	10 mA	
Ω	300 Ω		10 mΩ		
	3 kΩ		100 mΩ		
	30 kΩ		1 Ω		
	300 kΩ		10 Ω		
	3MΩ *		100 Ω		
	30MΩ *		1 kΩ		
Ω 🔊	300 Ω			0.1 Ω	
→+ 🔊	3 V [6]			1 mV	
→+	3 V [6]		100 µV		
F	3 nF*			1 pF	
	30 nF			10 pF	
	300 nF			100 pF	
	3 µF			1 nF	
	30 µF			10 nF	
	300 µF			100 nF	
	3000 µF			1 µF	
	30000 µF			1 µF	
Hz	300.00 Hz		0.01 Hz		
	3.0000 kHz		0.1 Hz		
	100.00 kHz		10 Hz		
⏱	100 min [2]		100 ms (1/10 s)		
°C/°F	Pt 100/ Pt1000	– 200.0 ... +100.0 °C	0.1 °C		
		+ 100.0 ... +850.0 °C			

Meas. Function	Measuring Range	22S/M	23S	24S	25S [4]	26S/M [4]
A	300 µA	—	•	•	•	•
	3 mA	—	•	•	•	•
	30 mA	—	•	•	•	•
	300 mA	—	•	•	•	•
	3 A	—	•	•	•	•
	10 A	—	16 A [5]	•	•	•
A ~ ✂	mA/A	—	•	•	•	•
Ā ~ ✂	mV/A	•	—	—	—	—

* METRA*Hit*®22M/26M: The instrument must be operated with the batteries for measurements within this range with the power pack disconnected. Measurement results may otherwise be distorted by the100 Hz hum. Use short and screened measurement cables in the case of high-resistance measurements.

Meas. Function	Measuring Range	Input Impedance —	Input Impedance ⎓
V	300 mV	> 20MΩ	5 MΩ // < 50 pF
	3 V	11MΩ	5 MΩ // < 50 pF
	30 V	10MΩ	5 MΩ // < 50 pF
	300 V	10MΩ	5 MΩ // < 50 pF
	1000 V	10MΩ	5 MΩ // < 50 pF
		Approx. Voltage Drop at Meas. Range Upper Limit —	Approx. Voltage Drop at Meas. Range Upper Limit ⎓
A	300 µA	160 mV	160 mV
	3 mA	160 mV	160 mV
	30 mA	200 mV	200 mV
	300 mA	300 mV	300 mV
	3 A	110 mV	110 mV
	10 A	350 mV	350 mV
		Open-Circuit Voltage	Meas. Current at Meas. Range Upper Limit
Ω	300 Ω	0.6 V	max. 250 µA
	3 kΩ	0.6 V	max. 45 µA
	30 kΩ	0.6 V	max. 4.5 µA
	300 kΩ	0.6 V	max. 1.5 µA
	3MΩ	0.6 V	max. 150 nA
	30MΩ	0.6 V	max. 15 nA
Ω 🔊	300 Ω	max. 3 V	max. 1.2 mA
⭲ 🔊	3 V [6]	max. 3 V	max. 1.2 mA
⭲	3 V [6]	max. 3 V	max. 1.2 mA
		Discharge Resistance	$U_{0\ max}$
F	3 nF	10MΩ	3 V
	30 nF	10MΩ	3 V
	300 nF	1MΩ	3 V
	3 µF	100 kΩ	3 V
	30 µF	11 kΩ	3 V
	300 µF	2 kΩ	3 V
	3000 µF	2 kΩ	3 V
	30000 µF	2 kΩ	3 V
		f_{min} [3]	
Hz	300.00 Hz	1 Hz	
	3.0000 kHz	1 Hz	
	100.00 kHz	1 Hz	

dB Ranges (inherent deviation: ±0.1 dB from 10% of meas.range)

Measuring Ranges	Display Range at Reference Voltage U_{REF} = 0.775 V	Resolution
300mV ∼	– 48 dB ... – 8 dB	0.01 dB
3V ∼	– 38 dB ... + 12dB	0.01 dB
30V ∼	– 18 dB ... + 32 dB	0.01 dB
300V ∼	+ 2 dB ... + 52 dB	0.01 dB
1000V ∼	+ 22 dB ... + 63 dB	0.01 dB
	Display (dB) = 20 lg U_x (V) /U_{REF}	

1) Display: 4¾ places
A separate resolution and sampling rate can be selected in the rAtE menu for the storage and transmission of measurement values.
2) Stopwatch; format: **mm:ss:hh** where m=minute, s=second and h=hundredth second, max.: 99:59.9; key-controlled only
3) Smallest meas. frequency for sinusoidal meas. signals symmetric to zero point
4) METRA*Hit*®26S/M und 25S: TRMS measurement
5) Without fuse
6) Up to max. 1.8 V, when > 1.8 V, display „OL“.

Meas. Function	Inherent Deviation at max. Resolution at Reference Conditions [2] ±(...% of rdg. + ... d) —	±(...% of rdg. + ... d) ⎓ [8]	Overload Capacity [7] Value	Duration
300 mV	0.05 + 3 [10]	0.5 + 30 (> 300 d)	1000 V DC AC eff. sine	continuous
3 V	0.05 + 3	0.2 + 30 (> 300 d)		
30 V	0.05 + 3	0.2 + 30 (> 300 d)		
300 V	0.05 + 3	0.2 + 30 (> 300 d)		
1000 V	0.05 + 3	0.2 + 30 (> 300 d)		
	—	⎓ [8]		
300 µA	0.1 + 5	0.5 + 30	0.36 A	continuous
3 mA	0.1 + 5	0.5 + 30		
30 mA	0.05 + 5	0.5 + 30		
300 mA	0.5 + 5	0.5 + 30		
3 A	0.5 + 5	0,75 + 30	10 A [9]	continuous
10 A	0.5 + 5	0,75 + 30		
300 Ω	0.1 + 5 [10]		1000 V DC AC eff. Sinus	5 min
3 kΩ	0.1 + 5 [10]			
30 kΩ	0.1 + 5			
300 kΩ	0.1 + 5			
3MΩ	0.1 + 5			
30MΩ	2 + 5			
Ω 🔊	1 + 3			
⊣⊢ 3 V	0.2 + 3			
3 nF	1 + 6 [10]		1000 V DC AC eff Sine	5 min
30 nF	1 + 6 [10]			
300 nF	1 + 6			
3 µF	1 + 6			
30 µF	1 + 6			
300 µF	5 + 6			
3 mF	5 + 6			
30 mF	5 + 60			
		max. Measuring Voltage		
300,00 Hz	0.1 + 1 [11]	1000 V	1000 V	continuous
3,0000 kHz		1000 V		
< 30 kHz		300 V		
> 30 kHz		30 V		
⏱	±15 D			
Pt 100/ Pt 1000	−200.0 ... −100.0 °C	1 K [12]	1000 V DC/AC eff sine	5 min
	−100.0 ... +100.0 °C	0,8 K [12]		
	+100,0 ... +850,0 °C	0.5 + 3 [12]		

[7] at 0 ° ... + 40 °C

[8] Values of less than 100 digits are suppressed,
15 (20) ... 45 ... 65 Hz ... 20 (1) kHz sine. See page 49 for influences.

[9] 12 A – 5 min, 16 A – 30 s, METRA*Hit*®23S: 16 A continuous

[10] When "zero balancing" function is active, ZERO display

[11] The min. amplitude of input voltage may not fall below the following values:

Frequency	Min. Voltage Amplitude
≤ 1 kHz	10% of meas. range
1 kHz … 10 kHz	15% of meas. range
10 kHz … 100 kHz	20% of meas. range

[12] Plus sensor deviation

Influence Variables and Effects

Influence Variable	Influence Range	Meas. Quantity/ Measuring Range [1]	Influence Effect (... % + ... d) / 10 K
Temperature	0 °C ... +21 °C and +25 °C ... +40 °C	V ⎓	0.2 + 10
		V ∼	0.4 + 10
		300 µA ... 30 mA ⎓ / ≂	0.5 + 10
		300 mA ⎓ / ≂	0.5 + 10
		3 A / 10 A ⎓ / ≂	0.75 + 10
		300 Ω ... 300 kΩ	0.2 + 10
		3 MΩ	0.2 + 10
		30 MΩ	1 + 10
		3 nF ... 30 µF	0.5 + 10
		Hz	0.5 + 10
		°C (Pt100)	0.5 + 10

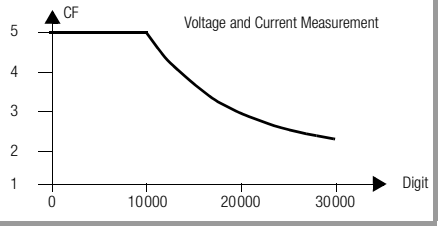
METRA*Hit*®26S/M: TRMS AC and (AC+DC) ..... 15 Hz to 20 kHz
METRA*Hit*®25S: TRMS AC ..... 20 Hz to 1 kHz
METRA*Hit*®22/23/24: AC mean value rectification ... 20 Hz to 1 kHz

Influence Variable	Influence Range (max. Resol.)	Frequency	Inherent Deviation [2] ± (... % of rdg. + ... d)
Frequency V_{AC}	300.00 mV	> 15 Hz ... 45 Hz	2.5 + 40 (> 300 d)
		> 65 Hz ... 1 kHz	1.0 + 30 (> 300 d) [3]
		> 1 kHz ... 20 kHz	3.0 + 50 (> 300 d)
	3.0000 V ... 300.00 V [4]	> 15 Hz ... 45 Hz	2.2 + 40 (> 300 d)
		> 65 Hz ... 1 kHz	0.7 + 30 (> 300 d) [3]
		> 1 kHz ... 20 kHz	2.2 + 50 (> 300 d)
	1000.0 V [4]	> 15 Hz ... 45 Hz	2.2 + 40 (> 300 d)
		> 65 Hz ... 1 kHz	2 + 30 (> 300 d)
		> 1 kHz ... 10 kHz	10 + 50 (> 300 d)

Influence Variable	Influence Range (max. Resol.)	Frequency	Inherent Deviation [2] ±(... % of rdg. +... d)
Frequency I_{AC}	300.00 µA ... 300.00 mA	> 15 Hz ... 45 Hz	1 + 30
		> 65 Hz ... 1 kHz	
	3.0000 A 10.000 A	> 15 Hz ... 45 Hz	1 + 30
		> 65 Hz ... 1 kHz	3 + 30

1) With zero balancing
2) Indicated errors valid as of a display of 10% of the measuring range
3) for METRA*Hit*®22 … 25: 2% + 30 d
4) Power limitation: frequency x voltage max. 3,000,000 V x Hz

Key: rdg. = measurement value, d = digit(s)

Influence Variable	Influence Range		Meas. Quantity/ Measuring Range	Influence Effect [2]
Measurement Quantity Waveform [3]	Crest factor CF	1 ... 3	V ∼, A ∼	± 1 % of rdg.
		> 3 ... 5		± 3 % of rdg.
	The allowable crest factor CF for the periodic quantity to be measured is dependent upon the displayed value:  Voltage and Current Measurement			

Influence Variable	Influence Range	Meas. Quantity/ Measuring Range	Influence Effect
Relative Humidity	75 % 3 days device off	V, A, Ω F, Hz °C	1 x inherent deviation

Influence Variable	Influence Range	Measuring Range	Damping ±dB
Common Mode Interference Voltage	Interference quantity max. 1000 V ∼	V ⎓	> 90 dB
	Interference quantity max. 1000 V ∼ 50 Hz, 60 Hz Sinus	300 mV ... 30 V ∼	> 60 dB
		300 V ∼	> 60 dB
		1000 V ∼	> 60 dB
Series-Mode Interference Voltage	Interference quantity V ∼ , respective measuring range nominal value, max. 1000 V ∼ , 50 Hz, 60 Hz sine	V ⎓ [4]	> 40 dB
	Interference quantity max. 1000 V ⎓	V ∼	> 60 dB

[2] Except for sinusoidal waves
[3] METRA*Hit*®26S/M und 25S only
[4] Except for mV range with METRA*Hit*®22/23/24

Real-Time Clock

Accuracy	±1 min/month (except for METRA*Hit*®22S)
Temp. Influence	50 ppm/K

Reference Conditions

Ambient Temp.	+23 °C ±2 K
Relative Humidity	40 … 60 %
Measurement Quantity Frequency	45 ... 65 Hz
Measurement Quantity Waveform	Sinus
Battery Voltage	3 V ±0.1 V
Adapter Voltage	4.5 V ±0.2 V

Response Time

Response Time (after manual range selection)

Meas. Quantity/ Measuring Range	Digital Display Response Time	Measured Quantity Step Function
V ⎓ , V ∼, A ⎓ , A ∼	1.5 s	from 0 to 80% of measuring range upper limit
300 Ω ... 3 MΩ	2 s	from • to 50% of measuring range upper limit
30 MΩ	5 s	
Continuity	< 50 ms	
⇻	1.5 s	
3 nF ... 300 µF	max. 2 s	from 0 to 50% of measuring range upper limit
3 000 µF	max. 7 s	
30 000 µF	max. 14 s	
>10 Hz	max. 1.5 s	
°C	max. 3 s	

Display

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

analog:

Display	LCD scale with pointer
Scale Length	55 mm for V ⎓ and A ⎓ ; 47 mm in all 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 pole reversal
Overflow Display	triangle is displayed
Sampling Rate	20 measurement per second

digital:

Display / Char. Height	7 segment characters / 12 mm
Number of Places	4¾ places ≙ 31000 steps
Overflow Display	„OL" is displayed
Polarity Display	„–" sign appears when plus pole is connected to „⊥"
Sampling Rate	2 measurements per second

Display Update

V (DC, AC+DC), V AC A, Ω, ⇻, EVENTS AC+DC °C (Pt100, Pt1000)	2 times per second
Hz, EVENTS AC	1 time per second

Power Supply

Battery	2 x 1.5 V mignon cell alkali manganese cell per IEC LR6 zinc carbon battery per IEC R6
Service Life	with alkali manganese cell: approx. 100 hours with zinc carbon battery: approx. 50 hours
Battery Test	automatic display of " ⊣⊢ " symbol when battery voltage falls below approx. 2.3 V, or if the mains power pack provides less than approx. 3 V.

Battery Saver Circuit

The instrument switches itself off automatically if the measurement value remains unchanged for about 10 minutes, and if none of the operating elements are activated during this time. Automatic shut-off can be disabled. This does not apply to the following functions: events, stopwatch, transmit and menu mode, continuous operation.

Fusing

Fuse for Ranges up to 300 mA	FF (UR) 1,6 A/1000 V AC/DC; 6.3 mm x 32 mm; breaking capacity 10 kA at 1000 V AC/DC with resistive load; protects all current measuring ranges up to 300 mA in combination with power diodes
Fuse for Ranges up to 10 A (not 23S)	FF (UR) 16 A/1000 V AC/DC; 10 mm x 38 mm; breaking capacity 30 kA at 1000 V AC/DC with resistive load; protects 3 A and 10 A ranges up to 1000 V

Electrical Safety

Protection Class	II per IEC 61010-1/EN 61010-1 /VDE 0411-1	
Overvoltage Category	III	IV (not 23S)
Operating Voltage	1000 V	600 V
Pollution Degree	2	2
Test Voltage	7,4 kV~ per IEC 61010-1/ EN 61010-1/VDE 0411-1	

Electromagnetic Compatibility EMC

Interference Emission	EN 61326: 2002 class B
Interference Immunity	EN 61326: 2002 IEC 61000-4-2: 1995 IEC 61000-4-2: 1995/A1: 1998 8 kV atmosph. discharge 4 kV contact discharge IEC 61000-4-3: 1995+A1: 1998 3 V/m IEC 61000-4-4: 1995 0.5 kV

Data Interface

Data Transmission	optical with infrared light, through housing
With accessory interface adapter	
Type	RS232C, serial, per DIN 19241
Baud Rate, Bidirectional	BD232: 9600 bauds, SI232-II: all baud rates

Ambient Conditions

Operating Temperature	–20 °C ... +50 °C
Storage Temperature	–25 °C ... +70 °C (without batteries)
Relative Humidity	max. 75%, no condensation
Elevation	to 2000 m
Deployment	indoors, outdoors: only in the specified ambient conditions

Mechanical Design

Protection	Housing: IP 50 Connector jacks: IP 20
Dimensions	84 mm x 195 mm x 35 mm
Weight	approx. 350 g with batteries

25 Maintenance

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

25.1 Batteries

Note!
Removal of Batteries for Long Periods on Non-Use
The integrated quartz movement requires auxiliary power even when the instrument is switched off (except for METRA*Hit*®22S), and thus drains the batteries. We recommend removal of the batteries for lengthy periods of non-use (e.g. vacation). This prevents excessive batteries discharge and leakage, which may result in damage to the instrument.

Attention!
Battery Replacement for METRA*Hit*®22M/26M
Stored measurement values are deleted when the battery is replaced. We recommend connecting the AC power pack, or uploading data to a PC with the help of METRAwin®10/ METRA*Hit*® software before replacing the battery, in order to prevent data loss.
Operating parameters remain in memory, although date and time must be reset.

You can check current battery condition in the “Info” menu: SEt ↓ inFo ↵ ↓ bAtt ↵ X.X V.

Before initial start-up, or after storage of your instrument, make sure that no leakage has occurred at the instrument battery. Repeat this inspection at regular intervals.

If battery leakage has occurred, electrolyte from the battery must be carefully and completely removed with a damp cloth, and a new battery must be installed before the instrument can be placed back into operation.
If the “⊣⊢” symbol appears at the LC display, you should change the battery as soon as possible. You can continue to take measurements, but reduced measuring accuracy may result.
The instrument works with two 1.5 V batteries per IEC R6 or IEC LR6, or with corresponding NiCd storage batteries.

Battery Replacement

- ➪ Lay the instrument onto a flat surface with the front panel facing down, loosen the two screws at the back and lift out the housing base starting at the bottom. The housing base and top are held together at the upper front side with the help of snap hooks.
- ➪ Remove the battery from the battery compartment.
- ➪ Insert two 1.5 V mignon cells into the battery compartment in the direction indicated by the polarity symbols.
- ➪ 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).

- ➪ Replace the housing base. Start at the upper front side and make certain that the snap hooks properly snap into place.
- ➪ Retighten the housing base with the two screws.
- ➪ Please dispose of used batteries properly!

25.2 Power Pack for METRA*Hit*®22M/26M

Use only the N4/500 power pack from GOSSEN METRAWATT GMBH for power supply to your instrument. The highly insulated cable assures safety for the operator, and the power pack provides for reliable electrical isolation (secondary rating: 4.5 V/600 mA). When a mains power pack is used, the batteries are switched off electronically and thus can be left inside the instrument. Please observe the footnote on page 46.

Country	Type / ID No.
Germany	Z218A
North America	Z218C
Great Britain	Z218D

25.3 Fuses

If one of the fuses for the active current range blows, “FUSE” appears at the digital display while voltage is applied, and an acoustic signal sounds at the same time.

The 16 A fuse interrupts the 3 A and 10 A ranges, and the 1.6 A fuse all other current measuring ranges. All other measuring ranges continue to function.

If a fuse blows, eliminate the cause of the overload before placing the instrument back into operation!

Fuse Replacement

- ➲ Open the instrument as described under battery replacement.
- ➲ Remove the blown fuse with the help of an object, such as a test probe, and replace it with a new fuse.

Table of allowable fuses:

Type	Dimensions	Article Number
For current measuring ranges to 300 mA		
FF (UR) 1.6 A/1000 V AC/DC (10 kA)	6.3 mm x 32 mm	Z109C *
For 3 A and 10 A current measuring ranges		
FF (UR) 16 A/1000 V AC/DC (30 kA)	10 mm x 38 mm	Z109B *

* All of these fuses are available in packages of ten from our sales organizations and distributors.

Attention!

Be absolutely certain that only the specified fuses are used!

The use of a fuse with different triggering characteristics, a different nominal current or a different breaking capacity places the operator, damping diodes, resistors and other components in danger. The use of repaired fuses or short-circuiting of the fuse holder is prohibited.

25.4 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.

26 Multimeter Messages

Message	Function	Significance
bUSY	RAM test	see chapter 21.2
CAnn	memory or transmit mode	the following functions cannot be activated: set time/date, clear RAM, RAM test
Err1, Err2	RAM test	see chapter 21.2
FUSE	current measuring	blown fuse
⊣⊢	all operating modes	battery voltage has dropped to below 2.3 V
OL	measuring	indicates overflow
PASS	RAM test	see chapter 21.2

27 Repair and Replacement Parts Service DKD Calibration Lab* and Rental Instrument Service

When you need service, please contact:

GOSSEN METRAWATT GMBH
Service Center
Thomas-Mann-Strasse 20
90471 Nürnberg, Germany
Phone +49 911 86 02 - 410 / 256
Fax +49 911 86 02 - 2 53
e-mail service@gmc-instruments.com

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

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

Accredited measured quantities: direct voltage, direct current values, DC resistance, alternating voltage, alternating current values, AC active power, AC apparent power, DC power, capacitance and frequency

Competent Partner

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

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

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

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

An **on-site DKD calibration station** is an integral 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 laboratory, we can calibrate instruments from other manufacturers as well.

28 Guarantee

The guarantee period for all METRA*Hit*® measuring and calibration instruments is 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.

29 Product Support

When you need support, please contact:

GOSSEN METRAWATT GMBH
Product Support Hotline
Phone +49 911 86 02 - 112
Fax +49 911 86 02 - 709
e-mail support@gmc-instruments.com

DKD Calibration Certificate Reprints

If you need to order an reprint of the DKD calibration certificate for your instrument, please include the ID number shown in the uppermost and lowermost fields of the calibration certificate. We do not need the instrument's serial number.

Printed in Germany • Subject to change without notice.

GOSSEN METRAWATT GMBH
Thomas-Mann-Str. 16-20
90471 Nürnberg • Germany
Phone +49-(0)-911-8602-0
Fax +49-(0)-911-8602-669
E-Mail info@gmc-instruments.com
www.gmc-instruments.com

Member of GMC Instruments Group

GOSSEN METRAWATT