

Analog-digital multimeters

METRAHit[®] 12S ... 18S, 14A

Automatic Blocking System (ABS) *

The automatic blocking system prevents incorrect connection of the test leads and incorrect selection of the measured quantity. This reduces danger to the user, the meter and the system to a remarkable extent, and eliminates it in many cases.

Interface and software METRAWin 10

The multimeters are fitted with a serial RS-232 C interface via which the measured values, the position of the operating controls and the meter type can be transmitted to a PC by means of a telegram. These values, electrically isolated, are transmitted to the attachable interface adapter with infrared light through the case *.

MIN/MAX value storage

In addition to the display of the actual measured value, the minimum or maximum value can constantly be updated and stored.

Indication of negative values on the analog scale

When measuring DC quantities, also negative values are shown on the analog scale so that variations of the measured value can be observed at the zero point.

Root-mean-square value with distorted waveform (METRAHit 16S and 18S)

The measuring principle employed permits the measurement of the root-mean-square value (TRMS) of AC quantities and mixed quantities (AC and DC) regardless of the waveform.

Automatic data hold *

The DATA HOLD function makes it possible to hold the digitally displayed measured value. According to a patented method, it is ensured that no freak value but the actual measured value is held in the case of rapid changes in measured quantities. The held measured value appears on the digital display. The actual measured value continues to be shown on the analog scale.

Autorange/manual range selection

The measured values are selected with the rotary switch. The measuring range is automatically matched to the measured value. The measuring range can also be selected manually via the AUTO/MAN push-button.

Continuity test

This permits testing for short circuit and/or interruption. In addition to the display, a sound signal is possible.

Temperature measurement

It is possible to use all meters for direct connection of temperature sensors, automatic identification of Pt 100 and Pt 1000 elements as for temperature measuring ranges.

Overload warning

A sound signal reports violation of the overload limits.

Signalling in the case of a blown fuse

The display FUSE points to a blown fuse.

Power economizing circuit

The meter disconnects automatically when the measured value remains unchanged for about 10 minutes and no operating control was operated during this time. The disconnection facility can be disabled.

Protective holster for rough duty

A holster of soft rubber with tilt stand protects the meter against damage in the case of shock and drop. The rubber material makes for the meter to stand firmly even on a vibrating surface.

* Protected by patent rights



Top model METRAHit 18S

The top model METRAHit 18S features a 4 3/4 digit display (31 000 digits) as well as the following additional functions: Event counter, measurement of the duration of the event, total time, time counter, data compare, MIN/MAX values with time recognition and wide-range capacitance measurement.

Calibration

The multimeters of the METRAHit S series can be calibrated automatically via the RS-232 data interface with the aid of the multi-function calibrator METRATop 90C and the METRAWin 91 software.

Training

We offer interesting seminars with practical training on the topic "Correct measurements in adverse environmental conditions (EMC) with multimeters and PC". The seminars are in German. These seminars also provide detailed information on the operation of the METRAHit 18S including the METRAWin 10 software and also deal with the actual measurements specified by DIN VDE.

Mark approvals



Applied rules and standards

IEC 1010-1 DIN EN 61010 part 1 VDE 0411-1	Safety requirements for electrical equipment for measurement, control and laboratory use
DIN 43 751	Digital measuring instruments
DIN EN 50081 part 1	Generic emission standard; residential, commercial and light industry
DIN EN 50082 part 1	Generic immunity standard; residential, commercial and light industry
VDI/VDE 3540	Reliability of measuring and control equipment
DIN EN 60529 DIN VDE 0470 part 1	Test equipment and test procedures – Degrees of protection provided by enclosures (IP Code)

Analog-digital multimeters

METRAHit® 12S ... 18S, 14A

Specifications METRAHit 12S ... 16S, 14A

Meas. function	Measuring range						Resolution	Input impedance			Inherent deviation of the digital display ±(...% of meas. val. + ... digits) for reference conditions					Overload capacity ⁴⁾		Measuring function		
	METRAHit	12S	13S	14A	14S	15S		16S	12S	13S/14A	14S	15S	16S	Overload value	Overload duration					
V _{DC}	30.00 mV	●	●	●	●	●	10 μV	>10 GΩ // < 40 pF	0.5 + 3 ⁵⁾					0.5 + 3 ⁵⁾	1200 V	cont.	V _{DC}			
	300.0 mV	●	●	●	●	●	100 μV	>10 GΩ // < 40 pF	0.5 + 3					0.5 + 3						
	3.000 V	●	●	●	●	●	1 mV	11 MΩ // < 40 pF	0.25 + 1					0.1 + 1						
	30.00 V	●	●	●	●	●	10 mV	10 MΩ // < 40 pF	0.25 + 1					0.1 + 1						
	300.0 V	●	●	●	●	●	100 mV	10 MΩ // < 40 pF	0.25 + 1					0.1 + 1						
	1000 V	●	●	●	●	●	1 V	10 MΩ // < 40 pF	0.35 + 1					0.1 + 1						
V _{AC}	3.000 V	●	●	●	●	● ¹⁾	1 mV	11 MΩ // < 40 pF	0.75 + 2 (10 ... 300 D) 0.75 + 1 (> 300 D)					0.75 + 3 (> 10 D)	DC AC effective sinusoidal	cont.	V _{AC}			
	30.00 V	●	●	●	●	● ¹⁾	10 mV	10 MΩ // < 40 pF												
	300.0 V	●	●	●	●	● ¹⁾	100 mV	10 MΩ // < 40 pF												
	1000 V	●	●	●	●	● ¹⁾	1 V	10 MΩ // < 40 pF												
V _{TRMS}	3.000 V					● ¹⁾	1 mV	11 MΩ // < 40 pF	—					0.75 + 3 (> 10 D)	—	—	V _{TRMS}			
	30.00 V					● ¹⁾	10 mV	10 MΩ // < 40 pF	—											
	300.0 V					● ¹⁾	100 mV	10 MΩ // < 40 pF	—											
	1000 V					● ¹⁾	1 V	10 MΩ // < 40 pF	—											
Voltage drop, approx.																				
A _{DC}	300.0 μA				●	●	100 nA	—	—	15 mV	—					1.0 + 5 (> 10 D)	0.5 + 5 (> 10 D)	0.36 A	cont.	A _{DC}
	3.000 mA	●	●	●	●	●	1 μA	15 mV	15 mV	150 mV	1.0 + 5 (> 10 D)					1.0 + 2	0.5 + 2			
	30.00 mA	●	●	●	●	●	10 μA	150 mV	150 mV	650 mV	0.25 + 2					1.0 + 5 (> 10 D)	0.5 + 5 (> 10 D)			
	300.0 mA	●	●	●	●	●	100 μA	1 V	1 V	1 V	1.0 + 2					0.5 + 2				
	3.000 A	●	●	●	●	●	1 mA	—	100 mV	100 mV	—					1.0 + 5 (> 10 D)	1.0 + 5 (> 10 D)			
	10.00 A		16A	●	●	●	10 mA	—	300/270mV	270 mV	—					1.0 + 2	1.0 + 2			
A _{AC}	3.000 mA				●	●	1 μA	—	—	150 mV	—					1.5 + 2 (> 10 D)	—	0.36 A	cont.	A _{AC}
	30.00 mA	●	●	●	●	●	10 μA	150 mV	150 mV	—					1.5 + 2 (> 10 D)	—				
	300.0 mA	●	●	●	●	●	100 μA	1 V	1 V	1 V	1.5 + 2 (> 10 D)					—				
	10.00 A		16A	●	●	●	10 mA	—	300/270mV	270 mV	—					1.5 + 2 (> 10 D)	—			
A _{TRMS}	30.00 A ²⁾	●					10 mA	150 mV	—	—	1.5 + 2 (> 10 D)					—	0.36 A	cont.	A _{TRMS}	
	300.0 A ²⁾	●					100 mA	1 V	—	—	—					—				
	10.00 A						● ¹⁾	10 mA	—	—	270 mV	—								1.75 + 4 (> 10 D)
No-load voltage																				
Ω	30.00 Ω	●	●	●	●	●	10 mΩ	max. 3.2 V			0.5 + 3 ⁵⁾					0.4 + 3 ⁵⁾	500 V	10 min	Ω	
	300.0 Ω	●	●	●	●	●	100 mΩ	max. 3.2 V			0.5 + 3					0.4 + 3				
	3.000 kΩ	●	●	●	●	●	1 Ω	max. 1.25 V			0.4 + 1					0.2 + 1				
	30.00 kΩ	●	●	●	●	●	10 Ω	max. 1.25 V			0.4 + 1					0.2 + 1				
	300.0 kΩ	●	●	●	●	●	100 Ω	max. 1.25 V			0.4 + 1					0.2 + 1				
	3.000 MΩ	●	●	●	●	●	1 kΩ	max. 1.25 V			0.6 + 1					0.4 + 1				
	30.00 MΩ	●	●	●	●	●	10 kΩ	max. 1.25 V			2.0 + 1					2.0 + 1				
→	2.000 V	●	●	●	●	●	1 mV	max. 3.2 V			0.25 + 1					0.1 + 1	→			
Discharge resistance U _{0 max}																				
F	30.00 nF					●	10 pF	250 kΩ	2.5 V	—					1.0 + 3 ⁵⁾	500 V	10 min	F		
	300.0 nF					●	100 pF	250 kΩ	2.5 V	—					1.0 + 3					
	3.000 μF					●	1 nF	25 kΩ	2.5 V	—					1.0 + 3					
	30.00 μF					●	10 nF	25 kΩ	2.5 V	—					3.0 + 3					
Sensor f _{min} V _{DC} f _{min} V _{AC}																				
Hz	300.0 Hz					●	0.1 Hz	1 Hz	45 Hz	—					0.5 + 1 ⁸⁾	≤ 3 kHz: 1200 V ≤ 30 kHz: 300 V	cont.	Hz		
	3.000 kHz					●	1 Hz	1 Hz	45 Hz	—										
	30.00 kHz					●	10 Hz	10 Hz	45 Hz	—										
	100.0 kHz					●	100 Hz	100 Hz	100 Hz	—										
%	2.0 ... 98.0 %					●	0.1 %	1 Hz	—	—					1 Hz...1 kHz: ±5 D ⁹⁾ 1 kHz...10 kHz: ±5 D/kHz ⁹⁾	≤ 100 kHz: 30 V	%			
°C	-200.0 ... +200.0 °C	●	●	●	●	●	0.1 °C	Pt 100	—	—	2 Kelvin + 5 D ¹⁰⁾					500 V	10 min	°C		
	+200.0 ... +850.0 °C	●	●	●	●	●	0.1 °C		—	—	1.0 + 5 ¹⁰⁾					DC				
	-100.0 ... +200.0 °C	●	●	●	●	●	0.1 °C	Pt 1000	—	—	2 Kelvin + 2 D ¹⁰⁾					AC effective sinusoidal				
	+200.0 ... +850.0 °C	●	●	●	●	●	0.1 °C		—	—	1.0 + 2 ¹⁰⁾									

1) TRMS measurement

2) Direct display with clip-on transformer 1000:1

4) At 0 °C ... + 40 °C

5) With zero setting; w/o zero setting + 35 digits

6) With zero setting; w/o zero setting + 50 digits

7) METRAHit 13S (w/o 16 A fuse!); 16 A cont., 20 A for 5 min;
METRAHit 14A, 14S ... 16S: 12 A for 5 min, 16 A 30 s

8) Range 3 V_{AC}: U_E = 1.5 V_{rms} ... 100 V_{rms}
30 V_{AC}: U_E = 15 V_{rms} ... 300 V_{rms}
300 V_{AC}: U_E = 150 V_{rms} ... 1000 V_{rms}

9) On the range 3V_{DC}, rectangular signal positive at one end 5 ... 15 V, f = const., not 163.84 Hz or integer multiple.

10) Without sensor

Analog-digital multimeters METRAHit®18S

Specifications METRAHit 18S

Measuring function	Measuring range METRAHit 18S	Resolution	Input impedance		Inherent deviation of the digital display ±(...% of meas. val. + ... digits) for ref. conditions		Overload capacity ²⁾		Measuring function
			—	~ ¹⁾ ≐ ¹⁾	—	~ ¹⁾ ≐ ¹⁾	Overload value	Overload duration	
V	300.00 mV	10 μV	>10 GΩ	5 MΩ // < 40 pF	0.05 + 3; 0.05 + 20 ³⁾	0.5 + 30 (> 500 D)	1200 V DC AC RMS sinusoidal	cont.	V
	3.0000 V	100 μV	11 MΩ	1 MΩ // < 40 pF	0.05 + 3	0.3 + 30 (> 300 D)			
	30.000 V	1 mV	10 MΩ	1 MΩ // < 40 pF	0.05 + 3	0.3 + 30 (> 300 D)			
	300.00 V	10 mV	10 MΩ	1 MΩ // < 40 pF	0.05 + 3	0.3 + 30 (> 300 D)			
	1000.0 V	100 mV	10 MΩ	1 MΩ // < 40 pF	0.05 + 3	0.3 + 30 (> 300 D)			
dB	See table below		—	Same as with V ~	—	± 0.5 dB ⁴⁾			dB
			Voltage drop, approx.						
			—	≐ ¹⁾	—	≐ ¹⁾			
mA	300.00 μA	10 nA	15 mV	15 mV	0.2 + 20	0.5 + 30 (> 300 D)	0.36 A	cont.	mA
	3.0000 mA	100 nA	150 mV	150 mV	0.2 + 10	0.5 + 30 (> 300 D)			
	30.000 mA	1 μA	30 mV	30 mV	0.05 + 10	0.5 + 30 (> 300 D)			
A	300.00 mA	10 μA	300 mV	300 mV	0.2 + 10	0.5 + 30 (> 300 D)	12 A ⁵⁾	5 min	A
	3.0000 A	100 μA	150 mV	150 mV	0.5 + 10	0.75 + 30 (> 300 D)			
10.000 A	1 mA	400 mV	400 mV	0.5 + 10	0.75 + 30 (> 300 D)				
			No-load voltage	Short circuit current					
Ω	300.00 Ω	10 mΩ	max. 4.00 V	max. 1 mA	0.1 + 6; 0.1 + 30 ³⁾		500 V DC AC RMS sinusoidal	10 min	Ω
	3.0000 kΩ	100 mΩ	max. 1.25 V	max. 100 μA	0.1 + 6				
	30.000 kΩ	1 Ω	max. 1.25 V	max. 10 μA	0.1 + 6				
	300.00 kΩ	10 Ω	max. 1.25 V	max. 1 μA	0.1 + 6				
	3.0000 MΩ	100 Ω	max. 1.25 V	max. 0.1 μA	0.1 + 6				
30.000 MΩ	1 kΩ	max. 1.25 V	max. 0.1 μA	1.0 + 6					
→	3.0000 V~	1 mV	max. 4.00 V	—	0.2 + 6				→
			Discharge resist.	U _{0 max}					
F	3.000 nF	1 pF	1.5 MΩ	4 V	1.0 + 8; 1.0 + 60 ³⁾		500 V DC AC RMS sinusoidal	10 min	F
	30.00 nF	10 pF	1.5 MΩ	4 V	1.0 + 8; 1.0 + 30 ³⁾				
	300.0 nF	100 pF	150 kΩ	4 V	1.0 + 3				
	3.000 μF	1 nF	150 kΩ	4 V	1.0 + 3				
	30.00 μF	10 nF	15 kΩ	2 V	1.0 + 3				
	300.0 μF	100 nF	1.5 kΩ	2 V	5.0 + 6				
	3000 μF	1 μF	1.5 kΩ	2 V	5.0 + 6				
10000 μF	10 μF	1.5 kΩ	2 V	5.0 + 6					
			f _{min} ⁶⁾						
Hz	300.00 Hz	0.01 Hz	10 Hz				≤ 3 kHz: 1200 V	cont.	Hz
	3.0000 kHz	0.1 Hz	10 Hz		0.1 + 3 ⁷⁾				
	30.000 kHz	1 Hz	10 Hz						
	100.00 kHz	10 Hz	100 Hz						
°C	Pt 100	- 200.0 ... + 100.0 °C	0.1 °C	—	—	0.5 Kelvin + 3 ⁸⁾	500 V DC AC eff sinus	10 min	°C
		+ 100.0 ... + 850.0 °C	0.1 °C	—	—	0.5 + 3 ⁸⁾			
	Pt 1000	- 100.0 ... + 100.0 °C	0.1 °C	—	—	0.5 Kelvin + 3 ⁸⁾			
		+ 100.0 ... + 850.0 °C	0.1 °C	—	—	0.5 + 3 ⁸⁾			

dB ranges

Measuring ranges	Display span at reference voltage U = 0.775 V	Display span at reference voltage U _{ref} (V)
300 mV ~	- 48 dB ... - 8 dB	- 40 dB ... + 110 dB
3 V ~	- 38 dB ... + 12 dB	- 60 dB ... + 100 dB
30 V ~	- 18 dB ... + 32 dB	- 80 dB ... + 80 dB
300 V ~	+ 2 dB ... + 52 dB	- 100 dB ... + 60 dB
1000 V ~	+ 22 dB ... + 63 dB	- 110 dB ... + 40 dB
	Display (dB) = 20 lg U _x (V) / 0.775 V	Display (dB) = 20 lg U _x (V) / U _{ref} (V)

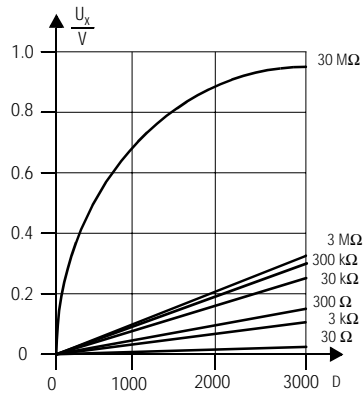
- TRMS measurement
- At -10 °C ... + 40 °C
- With zero setting; w/o zero setting
- At a resolution of 0.01 dB
- 16 A for 30 s
- Lowest measurable frequency with sinusoidal measuring signal symmetrical to zero
- Range

3 V ≐	U _E =	1 V _{rms} ...	10 V _{rms}
30 V ≐	U _E =	10 V _{rms} ...	100 V _{rms}
300 V ≐	U _E =	100 V _{rms} ...	1000 V _{rms}
- Without sensor

Analog-digital multimeters

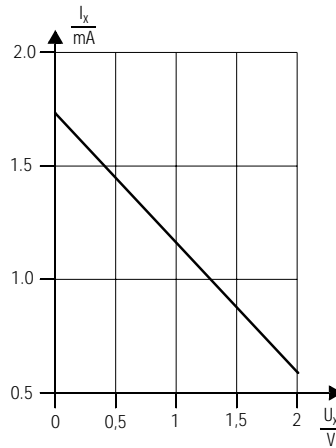
METRA Watt® 12S ... 18S, 14A

Measuring voltage with resistance measurement 12S ... 16S, 14A



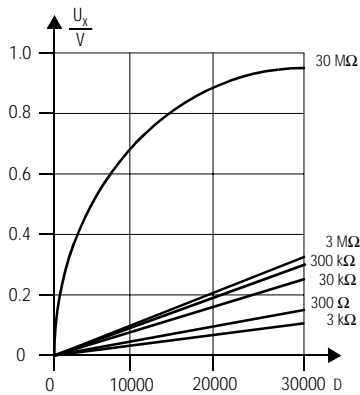
Voltage U_x across the resistance R_x to be measured as a function of measuring range and display.

Measuring current with diode test and/or continuity test 12S ... 16S, 14A



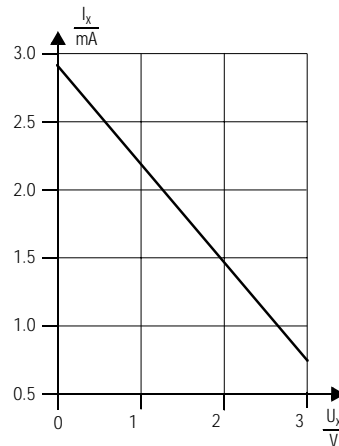
Measuring current I_x as a function of the displayed voltage U_x on the device under test.

Measuring voltage with resistance measurement 18S



Voltage U_x across the resistance R_x to be measured as a function of measuring range and display.

Measuring current with diode test and/or continuity test 18S



Measuring current I_x as a function of the displayed voltage U_x on the device under test.

Reference conditions

Ambient temperature	+ 23 °C ± 2 K
Relative humidity	45% ... 55%
Frequency of the measured quantity	45 Hz ... 65 Hz
Waveform of the measured quantity	Sinusoidal
Battery voltage	8 V ± 0.1 V

Analog-digital multimeters METRAHit[®] 12S ... 18S, 14A

Display

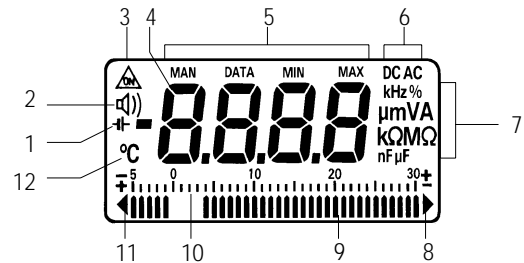
LCD field (65 mm x 30 mm) with analog indication and digital display and with annunciators for unit of measurement, function and various special functions.

Analog

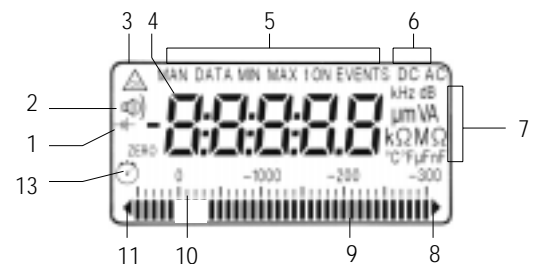
Indication	LCD scale with pointer
Scale length	55 mm on V $\overline{=}$ and A $\overline{=}$; 47 mm on all other ranges
Scaling	$\mp 5 \dots 0 \dots \pm 30$ with 35 scale divisions on $\overline{=}$, 0 ... 30 with 30 scale divisions on all other ranges
Polarity indication	With automatic reversal
Overrange indication	By triangle
Sampling rate	20 readings/s, on Ω : 10 readings/s

Digital

Display / height of numerals	METRAHit 12S ... 16S, 14A: 7-segment numerals / 15 mm METRAHit 18S: 7-segment numerals / 12 mm
Number of counts	METRAHit 12S ... 16S, 14A: 3 3/4 digit \cong 3100 steps METRAHit 18S: 4 3/4 digit \cong 31000 steps
Overrange display	"OL" is shown
Polarity display	"-" sign is shown, when positive pole to "⊥"
Sampling rate	2 readings/s, on Ω and °C: 1 reading/s



Display METRAHit 12S ... 16S, 14A



Display METRAHit 18S

- 1 Display with low battery voltage
- 2 Display with sound signal on
- 3 Symbol for "CONTINUOUSLY ON"
- 4 Digital display with indication of decimal point and polarity
- 5 Display with manual range selection as well as with data and MIN/MAX hold
- 6 Display of the selected function
- 7 Display of the unit of measurement
- 8 Display with overrange
- 9 Pointer for analog indication
- 10 Scale for analog indication
- 11 Indication that negative analog range is exceeded
- 12 Display of the unit °C when measuring temperature
- 13 Display with time counter switched on

Analog-digital multimeters METRAHit® 12S ... 18S, 14A

Influence quantities and variations for 12S ... 16S, 14A

Influence quantity	Influence range	Measured quantity/ measuring range	Variation ¹⁾		
			±(... % of meas. val. + ... digits)		
			12S ... 14S	15S	16S
Temperature	0 °C ... +21 °C and +25 °C ... +40 °C	30/300 mV $\overline{\text{---}}$	1.0 + 3		1.0 + 1
		3 ... 300 V $\overline{\text{---}}$	0.15 + 1		0.1 + 1
		1000 V $\overline{\text{---}}$	0.2 + 1		0.1 + 1
		V \sim	0.4 + 2		0.3 + 2
		300 μ A ²⁾ ... 300 mA $\overline{\text{---}}$	0.5 + 1		0.15 + 1
		3 A / 10 (16) A $\overline{\text{---}}$	0.5 + 1		
		A \sim	0.75 + 1		0.75 + 3
		30 Ω ²⁾	0.15 + 2		
		300 Ω	0.25 + 2		0.15 + 2
		3 k Ω ... 3 M Ω	0.15 + 1		0.1 + 1
		30 M Ω	1.0 + 1		0.6 + 1
		30 nF ²⁾ ... 3 μ F	—		0.5 + 2
		30 μ F	—		2.0 + 2
		Hz	—		0.5 + 1
		%	—		± 5 D
-200 ... +200 °C			0.5 K + 2		
+200 ... +850 °C			0.5 + 2		
Frequency of the measured quantity		15 Hz ... < 30 Hz	—	—	1.0 + 3
		30 Hz ... < 45 Hz	—	—	0.5 + 3
		> 65 Hz ... 400 Hz	2.0 + 3		0.5 + 3
		> 400 Hz ... 1 kHz	2.0 + 3		1.0 + 3
		> 1 kHz ... 20 kHz	—	—	2.0 + 3
		15 Hz ... < 30 Hz	—	—	1.0 + 3
		30 Hz ... < 45 Hz	—	—	0.5 + 3
		> 65 Hz ... 1 kHz	3.0 + 3		2.0 + 3
		15 Hz ... < 30 Hz	—	—	1.0 + 3
		30 Hz ... < 45 Hz	—	—	0.5 + 3
Crest factor CF	1 ... 3 > 3 ... 5	V \sim ⁴⁾ , A \sim ⁴⁾	—	—	± 1 % of rdg.
			—	—	± 3 % of rdg.
			—	—	

The permissible crest factor CF of the AC quantity to be measured is a function of the displayed value:

Waveform of the measured quantity³⁾

Waveform of the measured quantity³⁾

Influence quantity	Influence range	Measured quantity/ measuring range	Variation
			12S ... 16S, 14A
Battery voltage	$\overline{\text{---}}$ ⁵⁾ ... < 7.9 V > 8.1 V ... 10.0 V	V $\overline{\text{---}}$	± 2 D
		V \sim	± 4 D
		A $\overline{\text{---}}$	± 4 D
		A \sim	± 6 D
		30 Ω / 300 Ω / °C	± 4 D
		3 k Ω ... 30 M Ω	± 3 D
		nF, μ F	± 1 D
		Hz	± 1 D
		%	± 1 D
Relative humidity	75 % 3 days Meter off	V \approx A \approx Ω F Hz % °C	1x inherent deviation
		DATA	± 1 D
		MIN / MAX	± 2 D

- 1) With temperature: Error data is per 10 K change in temperature.
With frequency: Error data is valid from a display of 300 digits.
- 2) With zero setting
- 3) With unknown waveform (crest factor CF > 2), the measurement must be made with manual range selection.
- 4) Except for sinusoidal waveform
- 5) From the time the symbol, $\overline{\text{---}}$ appears.

Influence quantities and variations for 18S

Influence quantity	Influence range	Measured quantity/ measuring range ¹⁾	Variation ²⁾
			±(... % of meas. val. + ... digits)
Temperature	-10 °C ... +21 °C and +25 °C ... +40 °C	V $\overline{\text{---}}$	0.05 + 3
		V \sim , V $\overline{\text{---}}$	0.2 + 30
		300 μ A / 3 mA	0.2 + 3
		30 mA $\overline{\text{---}}$	0.1 + 3
		300 mA ... 10 A $\overline{\text{---}}$	0.2 + 3
		300 μ A ... 300 mA $\overline{\text{---}}$	0.3 + 30
		3 A / 10 A $\overline{\text{---}}$	0.5 + 30
		300 Ω	0.1 + 5
		3 k Ω ... 3 M Ω	0.1 + 3
		30 M Ω	0.6 + 3
		3 nF ... 3 μ F	0.5 + 3
		30 μ F	2.0 + 3
		Hz	0.1 + 3
		-200 ... +100 °C	0.5 Kelvin + 2 D
		+100 ... +850 °C	0.5 + 2
Frequency of the measured quantity		15 Hz ... < 45 Hz	1.0 + 20
		> 65 Hz ... 200 Hz	1.0 + 20
		15 Hz ... < 30 Hz	1.0 + 20
		30 Hz ... < 45 Hz	0.5 + 20
		> 65 Hz ... 400 Hz	0.5 + 20
		> 400 Hz ... 1 kHz	1.0 + 20
		> 1 kHz ... 20 kHz	2.0 + 20
		15 Hz ... < 30 Hz	1.0 + 20
		30 Hz ... < 45 Hz	0.5 + 20
		> 65 Hz ... 1 kHz	2.0 + 20
Crest factor CF	1 ... 3 > 3 ... 5	V \sim ⁴⁾ , A \sim ⁴⁾	± 1 % of rdg.
			± 3 % of rdg.

The permissible crest factor CF of the AC quantity to be measured is a function of the displayed value:

Waveform of the measured quantity³⁾

Waveform of the measured quantity³⁾

Influence quantity	Influence range	Measured quantity/ measuring range ¹⁾	Variation
Battery voltage	$\overline{\text{---}}$ ⁵⁾ ... < 7.9 V > 8.1 V ... 10.0 V	V $\overline{\text{---}}$	± 6 D
		V \sim	± 30 D
		A $\overline{\text{---}}$	± 10 D
		A \sim	± 30 D
		Ω	± 10 D
		3 nF ... 30 μ F	± 5 D
		Hz	± 6 D
		°C	± 5 D
Relative humidity	75 % 3 days Meter off	V, dB, A, Ω F, Hz °C	1x inherent deviation
		DATA	± 10 D
		MIN / MAX	± 20 D

- 1) With zero setting
- 2) With temperature: Error data is per 10 K change in temperature.
With frequency: Error data is valid from a display of 10 % of the measuring range.
- 3) With unknown waveform (crest factor CF > 2), the measurement must be made with manual range selection.
- 4) Except for sinusoidal waveform
- 5) From the time the symbol, $\overline{\text{---}}$ appears.

Analog-digital multimeters METRAHit® 12S ... 18S, 14A

Influence quantity	Influence range	Meas. ranges 12S ... 16S	Damping
Common mode voltage	Disturbance variable max. 1000 V \sim 50 Hz, 60 Hz sinusoidal	V \equiv	> 120 dB
		3 V \sim	> 80 dB
		30 V \sim	> 70 dB
		1000 V \sim	> 60 dB
Normal mode voltage	Disturbance variable V \sim , nom. value of meas. range at a time, max. 1000 V \sim , 50 Hz, 60 Hz sinusoidal	V \equiv	> 50 dB
		V \sim	> 110 dB

Influence quantity	Influence range	Meas. ranges 18S	Damping
Common mode voltage	Disturbance variable max. 1000 V \sim 50 Hz, 60 Hz sinusoidal	V \equiv	> 120 dB
		300 mV ... 30 V \sim	> 80 dB
		300 V \sim	> 70 dB
		1000 V \sim	> 60 dB
Normal mode voltage	Disturbance variable V \sim , nom. value of meas. range at a time, max. 1000 V \sim , 50 Hz, 60 Hz sinusoidal	V \equiv	> 48dB
		V \sim	> 110dB

Response time

Response time for 12S ... 16S, 14A (after manual range selection)

Measured quantity/ measuring range	Response time		Leap function of the measured quantity
	of analog indication	of digital display	
V \equiv , V \sim , A \equiv , A \sim	0.7 s	1.5 s	from 0 to 80 % of the upper range limit
30 Ω ... 3 M Ω	1.5 s	2 s	from ∞ to 50 % of the upper range limit
30 M Ω	4 s	5 s	
\rightarrow	0.7 s	1.5 s	
nF, μ F, °C		max. 1... 3 s	from 0 to 50 % of the upper range limit
300 Hz, 3 kHz		max. 2 s	
30, 100 kHz		max. 0.7 s	
% (1 Hz)		max. 9 s	
% (\geq 10 Hz)		max. 2.5 s	

Response time for 18S (after manual range selection)

Measured quantity/ measuring range	Response time		Leap function of the measured quantity
	of analog indication	of digital display	
V \equiv , V \sim , A \equiv , A \sim	0.7 s	1.5 s 300 mV \equiv : 8 s	from 0 to 80 % of the upper range limit
300 Ω ... 3 M Ω	1.5 s	2 s	from ∞ to 50 % of the upper range limit
30 M Ω	4 s	5 s	
\rightarrow	0.7 s	1.5 s	
3 nF ... 300 μ F	max. 2 s	max. 2 s	from 0 to 50 % of the upper range limit
3 000 μ F	max. 7 s	max. 7 s	
10 000 μ F	max. 14 s	max. 14 s	
>10 Hz	max. 1.5 s	max. 1.5 s	
°C		max. 3 s	

Power supply

Battery	9-V flat cell battery; manganese-dioxide cell according to IEC 6 F 22, alkaline-manganese cell according to IEC 6 LR 61 or corresponding NiCd storage battery
Operating time	With alkaline-manganese cell: METRAHit 12...16S, 14A: approx. 750 hours on V \equiv , A \equiv approx. 200 hours on V \sim , A \sim (12S...15S, 14A) approx. 150 hours on \sim , A \sim (16S) with interface operation times x 0.7 METRAHit 18S: approx. 300 hours on V \equiv approx. 150 hours on V \sim , A \sim A \equiv
Battery test	Automatic display of the " \rightarrow " symbol, when the battery voltage drops below approximately 7 V.

Electrical safety

Protection class	II according to IEC 348/DIN VDE 0411 and IEC 1010-1/EN 61010-1/VDE 0411-1	
Overvoltage category	II	III
Nominal voltage	1000 V	600 V
Degree of pollution	2	2
Nominal insulation voltage	1000 V acc. to IEC 348 / DIN VDE 0411	
Test voltage	6 kV~ acc. to IEC 348 / DIN VDE 0411	

Electromagnetic compatibility EMC

Emission	EN 50081-1:1992 / EN 55022:1987 class B
Immunity	EN 50082-1:1992 / IEC 801-2:1991 8 kV air discharge / IEC 801-3:1984 3 V/m / IEC 801-4:1988 0.5 kV

Fuses

Fuse link for the ranges up to 300 mA	FF 1.6/500 G; 6.3 mm x 32 mm; switching capacity 20 kA on 500 V \sim and ohmic load; in connection with power diodes protects all current measuring ranges up to 300 mA
Fuse link for ranges up to 10 A	Switching capacity 100 kA on 600 V \sim and ohmic load; protects the 3 A and 10 A ranges up to 600 V

Data interface

Type	RS-232C, serial, according to DIN 19 241
Data transmission	Optical, with infrared light through the case
Baud rate	8192 bit/s

Analog-digital multimeters

METRAHit® 12S ... 18S, 14A

Environmental conditions

Working temperature range	METRAHit 12S ... 16S, 14A: -10 °C ... + 50 °C METRAHit 18S: -20 °C ... + 50 °C
Storage temperature range	- 25 °C ... + 70 °C (excl. batteries)
Climatic class	METRAHit 12S ... 16S, 14A: 2z/-10/50/70/75 % with reference to VDI/VDE 3540 METRAHit 18S: 2z/-20/50/70/75 % with reference to VDI/VDE 3540
Altitude above sea level	Up to 2000 m

Mechanical configuration

Protection type	For meters: IP 50, for connection sockets: IP 20
Dimensions	84 mm x 195 mm x 35 mm
Weight	0.35 kg, approx., incl. battery

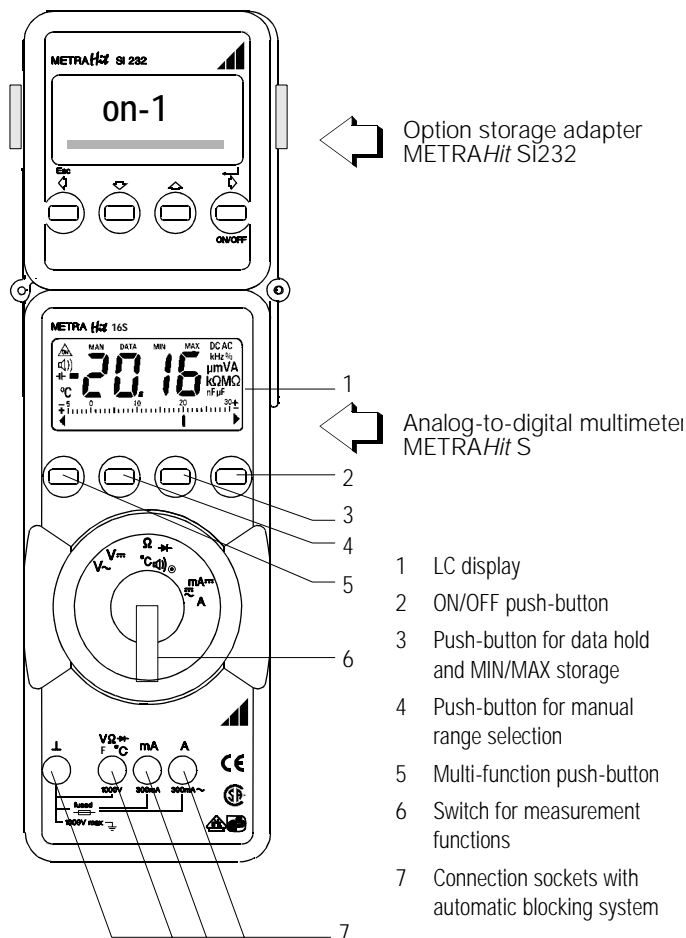
Scope of delivery

- 1 multimeter
- 1 lead set KS17-2
- 1 copy of operating instructions
- 1 test certificate
- 1 rubber holster GH18 with tilt stand and carrying strap (except for 12S)

Warranty

- 3 years against defects in materials and workmanship
- 1 year for the calibration

Operating controls 12S ... 18S, 14A

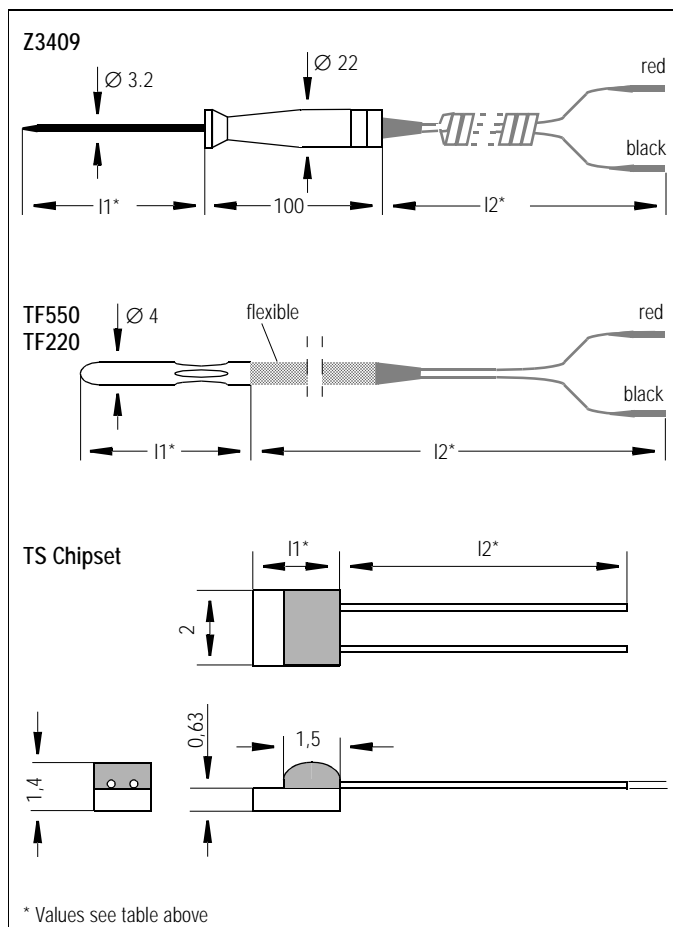


Accessories

Temperature sensor

For the measurement of temperatures on the range from $-40 \dots 600 \text{ }^\circ\text{C}$ and/or $-50 \dots 550 \text{ }^\circ\text{C}$ with METRAHit S multimeters, the following temperature sensors are particularly suited:

Temperature sensor	Z3409	TF550	TF220	TS Chipset
Sensor element	Pt100	Pt100	Pt1000	Pt100
Length sensor element I1	130 mm	40 mm	39 mm	2.3 mm
Length sensor element I2	1 m	1.5 m	1 m	10 mm
Temperature range	$-40 \dots +500 \text{ }^\circ\text{C}$	$-50 \dots +500 \text{ }^\circ\text{C}$	$-50 \dots +220 \text{ }^\circ\text{C}$	$-50 \dots +500 \text{ }^\circ\text{C}$
Accuracy acc. to DIN EN 60751 / IEC 751	Class A	Class B		
Inherent deviation	$0 \text{ }^\circ\text{C}: 0.15 \text{ K}$	$0 \text{ }^\circ\text{C}: 0.3 \text{ K}$	$0 \text{ }^\circ\text{C}: 0.3 \text{ K}$	$0 \text{ }^\circ\text{C}: 0.4 \text{ K}$
Inherent deviation	$500 \text{ }^\circ\text{C}: 1.35 \text{ K}$	$500 \text{ }^\circ\text{C}: 3.1 \text{ K}$	$220 \text{ }^\circ\text{C}: 1.4 \text{ K}$	$500 \text{ }^\circ\text{C}: 3.1 \text{ K}$
Response time T_{90} water	5 s	8 s		0.3 s
Response time T_{90} air	33 s			15 s
Cable				
Conductor	Stranded wire, $2 \times 0.35 \text{ mm}^2$			$2 \times 0.25 \text{ mm } \varnothing / \text{Ni-Pt}$
Outer insulating sleeve	PVC	V4A braided	Teflon	—
Insulation	PVC	Glass silk	Teflon	—



TF550 oven sensor and TF220 water-proof sensor

The TF550 sensor is especially suited for service applications for household appliances, i.e. for measurements in ovens to $+500 \text{ }^\circ\text{C}$.

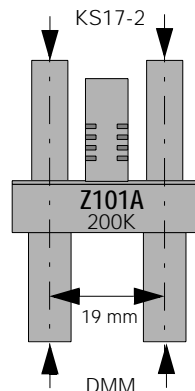
The TF220 sensor enables problem-free temperature measurements in gases and liquids such as water temperature in washing machines, transmission oil temperature and air temperatures in freezers and air conditioners.

TS Chipset

Due to its compact size, this temperature sensor is suited for measurements taken at constricted points, e.g. when the sensor is glued to a temperature sensitive component. It is delivered in sets of 10 sensor elements.

RI adapter

The RI adapter is a load resistor, which reduces the input resistance of concurrent measuring instruments from about $10 \text{ M}\Omega$ to about $200 \text{ k}\Omega$.



The RI adapter is plugged onto a measuring instrument with the help of safety sockets, and reduces the measuring point load resistance to about $198 \text{ k}\Omega$ with its integrated $200 \text{ k}\Omega$ resistor. Thus voltages, which are generated by high impedance interference (e.g. capacitive interference) are charged with a relatively low impedance. This causes a sharp drop in voltage at the measuring point. An interrupted or faulty cable at the measuring point is thus rapidly detected.

METRAHit[®] S

as multiple measurement system

Storage adapter SI232

The storage adapter METRAHit SI 232 which is attachable to the hand-held multimeters METRAHit S permits direct transmission of measured data of a single or several METRAHit S to a PC as well as on-site data storage without a PC and their later transmission to the PC. The data is synchronized by an integrated clock.

Memory: 128 kB (corresponds to approx. 100000 meas. values)

Sampling

Sampling is dependent upon the selected signal hysteresis setting. This sampling method results in an expansion of virtual memory, which is dependent upon measurement signal dynamics and the selected signal hysteresis. Thus storage capacity can be substantially increased (10 to 100-fold).

With a selected sampling rate of up to maximum 500 ms, an arithmetic mean value is ascertained for the measurement values which are received at a pulse rate of 50 ms. Within a range of 1 s to 60 s, the signal sampling rate remains at a constant 500 ms (10 measurement values). The integrated closed-circuit system causes the storage module to enter the standby mode for the remainder of the sampling cycle after signal acquisition is complete, and thus lengthens battery service life. Signal acquisition is interrupted during the rest period for this reason. Thus the functional principal can be compared to that of point recorder.

Sampling rate adjustable from: 50 ms ... 1 min

Sampling period *Operational Life* (battery service life)

0.05 ... 0.5 s	> 30 days
10 s	9 months
20 s	12 months
60 s	18 months

Configuration of a multi-measurement system (on-line and off-line)

To configure a powerful multi-measurement system, up to six METRAHit SI 232 can be interconnected and connected to a PC on-line via a standard interface cable (RS-232C) and/or up to ten devices can be operated off-line.

Each adapter can manually be provided with a specific contact address.

Interface adapter RS-232

The interface adapter which is attachable to the hand-held multimeters METRAHit S permits transmission of measured data of as many as four multimeters to a PC (single-channel pack). The interface adapter has no memory and does not permit interconnection of multimeters.

Interface packs

An interface pack can connect one or more METRAHit S with a PC. It contains all hardware and software components required to configure a PC measurement system.

Single-channel storage pack

- 1 Storage adapter METRAHit SI 232
- 1 RS-232 bus cable, 2 m long
- 1 METRAwin 10 program disk 3 1/2", 1,44 MByte
- 1 copy of installation instructions METRAwin 10

Four-channel storage pack

- 4 Storage adapters METRAHit SI 232
- 1 RS-232 bus cable, 2 m long
- 1 METRAwin 10 program disk 3 1/2", 1,44 MByte
- 1 copy of installation instructions METRAwin 10

Single-channel pack, type Z323

- 1 Interface adapter RS-232
- 1 RS-232 bus cable, 2 m long
- 1 METRAwin 10 program disk 3 1/2", 1,44 MByte
- 1 copy of installation instructions METRAwin 10

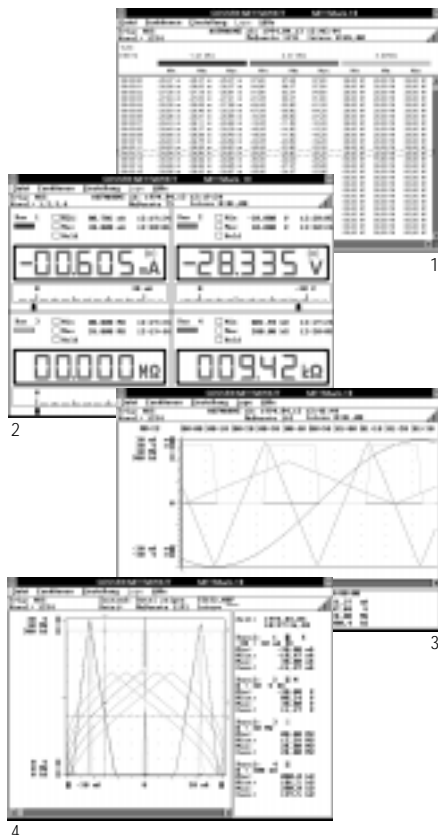


4 METRAHit S digital multimeters interconnected with the SI 232 storage adapter together with a PC and METRAwin 10 software comprise a multiple measurement system.

Each of the measurement values is transmitted via infrared light to the RS232 interface adapter, or the SI 232 storage adapter through the closed, electrically isolated METRAHit housing. A serial interface cable is used to establish the connection to the PC.

METRAWin 10 software

METRAWin 10 software (can be run with DOS or WINDOWS) is used for the processing and representation of measurement data at a PC. Sampling in the on-line mode can be performed manually with an adjustable sampling interval, or dependent upon signal dynamics (with adjustable signal hysteresis). Storage in the ASCII format is controlled with two trigger thresholds per measurement channel, as well as with the internal clock.



Data logger (1)

The acquired data is continuously shown on the screen in the form of a clear table.

Multimeter (2)

Transmitted measurement values from a maximum of 4 freely selectable channels are digitally displayed at the monitor, and represented in an analog scale during on-line operation.

Y(t) recorder (3)

The acquired measured values are shown on the screen as time diagram with horizontal time axis and measured with a cursor. Stored signals can be zoomed in amplitude and time axis and/or compressed ("zoom"). The time scale can be presented in absolute time or relative measuring time.

X-Y recorder (4)

The acquired data are shown on the screen on-line as X-Y diagram and measured with the cursor. Same as in all other forms of presentation, all scales can be freely selected.

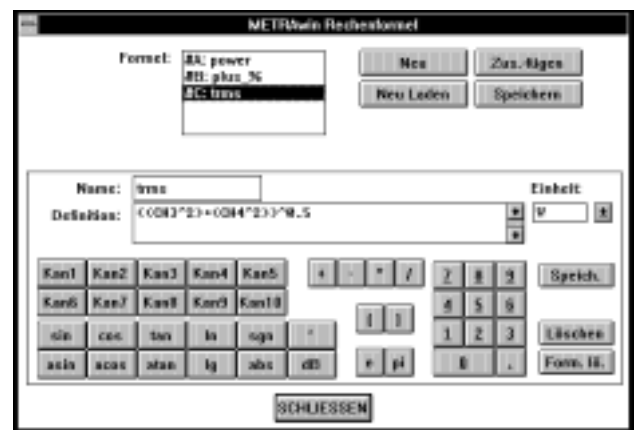
Math functions with powerful arithmetics can analyze, link and display measured data on-line and off-line.

Scanning

Scanning can optionally be performed manually (mouse click), automatically with selectable interval (50 ms ... 1 min) or signal-dependent with settable signal hysteresis (0 ... 500 digits). The data can be controlled by time and window trigger and stored automatically as multiple files.

Data processing

The measured data can further be processed by means of a powerful computer function and by linearization functions.



Thus it is possible, for example, to present mA signals from sensors or transformers directly in print values as active power, and many more.

Parameterization of the SI232 storage adapters

The storage adapters can be set manually via the front keys or via the serial interface of the PC. By transmission of the time from the computer, as many as ten memories can acquire measured values synchronous with time. Values for minimum and maximum triggering, recording time and post-trigger time can easily be set. Also the beginning of the measurement is controlled via the crystal clock of the memory, just as is scanning rate and signal hysteresis.

Analog-digital multimeters METRAHit® 12S ... 18S, 14A

Carrying bag F829



Order code

Designation	Type	Ident Number
Multimeter	METRAHit 12S	GTM 2012 100 R0003
	METRAHit 13S	GTM 2013 000 R0003
	METRAHit 14A	GTM 2014 000 R0007
	METRAHit 14S	GTM 2014 000 R0003
	METRAHit 15S	GTM 2015 000 R0003
	METRAHit 16S	GTM 2016 000 R0003
	METRAHit 18S	GTM 2018 000 R0003
Single-channel storage pack including 4 storage adapters SI 232, cable and software METRAWin 10	1-CH. Pack	GTZ 3231 020 R0001
Four-channel storage pack including storage adapter SI 232, cable and software METRAWin 10	4-CH. Pack	GTZ 3234 020 R0001
Storage adapter for METRAHit S	SI232	GTZ 3242 020 R0001
Single-channel pack including cable and software METRAWin 10	Z3231	GTZ 3231 000 R0001
Interface adapter RS-232 (contained in Z3231)	Z3242	GTZ 3242 000 R0001
Interface cable RS-232, 2 m, (contained in Z3231)	Z3241	GTZ 3241 000 R0001
METRAWin 10 software update	Z3240	GTZ 3240 000 R0001
Temperature sensor Pt100 for surface and immersion measurements, -40 ... +600 °C	Z3409	GTZ 3409 000 R0001
Temperature sensor Pt1000 for measurements in gases and liquids -50 ... +220 °C	TF220	Z102A
Oven sensor Pt100, -50 ... +550 °C	TF550	GTZ 3408 000 R0001
10 temperature sensors Pt100, affixable, up to -50 .. +550 °C	TS-Chipset	GTZ 3406 000 R0001
Measuring adapter for leakage current for METRAHit 18S	Z3450	GTZ 3450 000 R0001
Ri adapter 200 k Ω /230 V	R200K	Z101A
Carrying bag	F829	GTZ 3301 000 R0003
Ever-ready case	F836	GTZ 3302 000 R0001
Ever-ready case for 2 METRAHit S with SI232 and accessories	F840	GTZ 3302 001 R0001
Protective rubber holster and carrying strap	GH18	GTZ 3212 000 R0001
Electric set consisting of: carrying bag F829, clip-on current transformer WZ11 (15 ... 180 A-, 1 mA/1 A-) and test leads	Electric-Set	GTZ 3236 000 R0001
Fuse link (10 each)	FF1,6/500G	GTY 3578 136 P0001
Fuse link (10 each)	16 A/600 V	GTY 3578 176 P0001

Ever-ready case F836



Protective rubber holster GH18



Measuring adapter for leakage current



This measuring adapter serves as measuring device for the METRAHit 18S for the measurement of the contact potential according to DIN VDE 0107 (clause 10) and for the meas. of continuously flowing leakage currents and patient auxiliary currents acc. to DIN VDE 0750, part 1, IEC 601-1 and EN 60601-1.1990.