METRA*Hit*®28C
Calibrator, Multimeter and Milliohmmeter

3-349-098-03
2/8.01

- **Universal calibrator, simulator and multimeter**
  mA / mV … V / °C (Pt100/1000, Ni100/1000, type J, L, T, U, K, E, S, R, B and N thermocouples) / 30 … 2000 Ω
- Dual mode – simultaneous simulation and measurement (U/I)
- Simulation and sensing in absolute terms, and as percentages (scaled)
- Memory for calibration procedures and results
- Frequency and pulse run generator
- Ramp and step functions
- Interface and METRAwin®90 calibration software
- Transmitter simulator (sink: 0 … 24 mA)
- DKD calibration certificate included
- Rugged, EMC compliant design
- **Precision multimeter** (V, A, Ω, F, Hz, °C/°F)
  300,000 digits and triple display
- True RMS Measurement up to 1 kHz
- **Milliohmmeter**
  4-wire measurement with 0.01 mΩ resolution

CE

QUALITY MANAGEMENT SYSTEM

DQS Certified per
DIN EN ISO 9001 reg. no. 1262

Deutscher Kalibrierdienst DKD-K-19701 **DKD** Calibration Certificate

Applications

Process engineers can use the METRA*Hit*®28C as a calibrator and a multimeter simultaneously, for example in order to simulate sensor conditions at the input of a transmitter while measuring and saving the output signal.
If the METRA*Hit*®BD232 plug-in infrared interface adapter (accessory) is attached to the instrument, measurement and calibration results can be uploaded to a PC, where they can be recorded and printed as a calibration report. The multimeter can also be used as a data logger. METRAwin®10/METRA*Hit*® PC software (accessory) allows for convenient evaluation and display of measurement data, and METRAwin®90 (accessory) can be used to create, upload and download calibration procedures, as well as for the generation of calibration certificates.

Calibrator and Measuring Instrument

Universal Calibration Source

Integrated electronics generate mV, V and mA signals. Beyond this, the electronics are capable of simulating thermovoltages for various types of thermocouples for predefined temperatures (°C or °F), as well as for Pt and Ni temperature sensors.

Frequency and Pulse Generator

Continuous frequency signals can be generated by the METRA*Hit*®28C for testing PLCs, energy metering devices, flow rates and more. Amplitude is adjustable for the generated square-wave pulses, which are used to simulate sensor pulses. Predefined pulse runs are also generated at a chosen frequency.

Calibration and Simulation

Measuring transducers with a wide variety of input signals (voltage, thermovoltage, RTD and 2-wire resistance sensors etc.) can be directly connected and calibrated. If a multimeter is used (e.g. METRA*Hit*®26S), respective values can be measured at the measuring transducer's output, transmitted to a PC via an adapter if desired, displayed with the help of METRAwin®90 software and compared with the appropriate calibration specifications. Setpoint values and actual values are displayed, or printed as a certificate. When operated in the "mA sink" mode, the METRA*Hit*®28C simulates a 2-wire transmitter and pulls the selected current value from the device under test.

Data Storage

Individual values which have been manually saved (10 values per measuring range or sensor type), as well as complete calibration procedures are transferred to the integrated memory and can be queried one by one by pressing a key (forward or back).
The calibrator is connected to a PC with the attached METRA*Hit*®BD232 interface adapter (accessory). Individual values, intervals and ramps which have been created with the help of METRAwin®90 software can be saved as data files, uploaded to the calibrator and saved to non-volatile memory.

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Read-Out Modes for Source and Sink Functions

Calibration signals can be read out either manually (numerically with key entries), or automatically by means of intervals with intermediate steps, or as a ramp signal.
The METRA*Hit*®28C can thus be used as a precision pulse generator for dynamic testing.
Depending upon individual needs, desired dynamic response can be based upon full-scale value and the number of intermediate steps (intervals), or rise and dwell periods (ramp). This is especially helpful for long-term testing of laboratory and panel recorders, as well as measuring transducers, and for “one-man” control rooms.

Numeric Read-Out

Calibration values are set and read out manually with the help of the instrument’s keypad immediately after the calibration function has been selected.

Interval

Continuous read-out of calibration values is triggered in steps between the minimum and maximum values selected at the device to be calibrated in this read-out mode. The following step can be triggered automatically (time per step: 1 s … 60 minutes), or manually.

Ramp

Continuous read-out of calibration values is triggered in a stepless fashion between the minimum and maximum values selected at the device to be calibrated in this read-out mode. Ramp duration for rising and falling ramps can be set within a range of 1 second to 60 minutes.

Temperature Simulation

The ten most common sensor types are available for the simulation of thermovoltages. Thermovoltages can be generated with reference to an internal (0 °C), or an external reference junction.
Temperature for the external reference junction can be set at the calibrator or with a PC. This eliminates the need to connect the device to be calibrated with the calibrator via the respectively required compensating lead. A copper conductor between the calibrator and the device to be calibrated is sufficient in this case.

Characteristic Values

Calibrator

Calibration Function	Simulation Range	Resolution 30,000 Digits (4¾ places)	Maximum Load Impedance	Intrinsic Error	Overload
Direct Voltage Simulator				±(% rdg. + mV)	I_{max}
V	0…±300 mV	0.01 mV	700 Ω	0.05 + 0.02	18 mA
	0 … 3 V	0.1 mV	1000 Ω	0.05 + 0.2	
	0 … 10 V	1 mV	1000 Ω	0.05 + 2	
	0 … 15 V	1 mV	1000 Ω	0.05 + 2	
Output Impedance: 3.5 Ω					
Pulse / Frequency Generator Keying Ratio: 50% Amplitude: 10 mV ...15 V				±(% rdg. + Hz)	I_{max}
Hz	1 Hz … 1 kHz	0.1Hz [1]	1000 Ω	0.05 + 0.2	18 mA
Current Source				±(% rdg. + µA)	U_{max}
mA	4 … 20 mA	1 µA	700 Ω	0.05 + 2	18 V
	0 … 20 mA				
	0 … 24 mA				
Current Sink				±(% rdg. + µA)	U_{max}
mA	4 … 20 mA	1 µA		0.05 + 2	30 V
	0 … 20 mA				
	0 … 24 mA				
V_{in}: 4 … 27 V, I_{in}: 0 … 24 mA, $P_{in} = V_{in} \times I_{in} < 0.6$ W					
Resistance-Type Sensors Ω_2 and Ω_4			Sensor Current [mA]	±(% rdg. + Ω)	U_{max}/I_{max}
Ω	5…2000 Ω_2	0.1 Ω	0.05...0.1..5...6	0.05 + 0.2	18 V 18 mA
	0…2000 Ω_4				
Maximum Short-Circuit Current: 6 mA					

[1] Frequencies from 29 Hz onwards are set with a resolution of 0,2 to 8 Hz

Simulator for Temperature Sensors (Resolution: 0.1 °K)

	Temperature Sensor Type	Simulation Range in °C	Simulation Range in °F	Intrinsic Error *	U_{max}/I_{max} Overload
°C / °F	**Resistance Thermometer per IEC 751**			±(% of s. + K)	
	Pt100	−180 …+850	−292…+1562	0.1 + 0.5	18 V / 18 mA
	Pt1000	−180 …+300	−292 …+572	0.1 + 0.2	
	Resistance Thermometer per DIN 43760			±(% of s. + K)	
	Ni100	−60 …+180	−76 …+356	0.1 + 0.5	18 V / 18 mA
	Ni1000	−60 …+180	−76 …+356	0.1 + 0.2	
	RTD Sensor Current: 0.05 ... 0.1 ... 5 ... 6 mA, Resolution: 0.1 °C/°F				
	Thermocouples per DIN and IEC 584-1			±(% of s. + K) **	I_{max}
	K (NiCr/Ni)	−250…+1250	−418…+2282	0.1 + 0.5	18 mA
	J (Fe/CuNi)	−200…+1200	−328…+2192		
	T (Cu/CuNi)	−250…+400	−418…+ 752		
	B (Pt30Rh/Pt6Rh)	+500…+1800	+122…+3272		
	E NiCr/CuNi)	−250…+1000	−418…+1832		
	R (Pt13Rh/Pt)	−50…+1750	−58…+3182		
	N (CU/Cu10)	−240…+1300	−400…+2372		
	S (Pt10Rh/Pt)	−50…+1750	−58…+3182		
	L (Fe/CuNi)	−200…+900	−328…+1652		
	U (Cu/CuNi)	−200…+600	−328…+1112		

* Without internal reference junction
** Relative to fixed reference temperature °C and thermovoltage of the thermocouple
Reference junction, internal: 2 °K intrinsic error
Reference junction, external: entry of −30 … 40 °C

Key

rdg. = reading (measured value)
s. = setting
d = digit

Multimeter

Meas. Function	Measuring Range	Resolution at Upper Range Limit		Input Impedance		Intrinsic Error for Max. Resolution under Reference Conditions ±(...% rdg. + ... d)	±(...% rdg. . + ... d)	Overload Capacity [3]	
		300 000 [1]	30 000 [1] / 3 000 [1]	DC	AC [6]	DC	AC [6]	Value	Duration
V	300 mV	1 µV	10 µV	> 20 MΩ	11 MΩ // < 50 pF	0.05 + 15	0.5 + 30 (>500d)	600 V DC AC eff sine	continuous
	3 V	10 µV	100 µV	11 MΩ	11 MΩ // < 50 pF	0.05 + 15	0.2 + 30 (>100d)		
	30 V	100 µV	1 mV	10 MΩ	10 MΩ // < 50 pF	0.05 + 15	0.2 + 30 (>100d)		
	300 V	1 mV	10 mV	10 MΩ	10 MΩ // < 50 pF	0.05 + 15	0.2 + 30 (>100d)		
	600 V	10 mV	100 mV	10 MΩ	10 MΩ // < 50 pF	0.05 + 15	0.2 + 30 (>100d)		
				Voltage drop at approx. range limit					
				DC	AC [6]	DC	AC [6]		
A	3 mA	10 nA	100 nA	160 mV	160 mV	0.05 + 15	0.5 + 30 (>100d)	0.36 A	continuous
	30 mA	100 nA	1 µA	200 mV	200 mV	0.05 + 15	0.5 + 30 (>100d)		
	300 mA	1 µA	10 µA	300 mV	300 mV	0.05 + 15	0.5 + 30 (>100d)		
				Open-circuit voltage	Meas. current at upper range limit	±(...% rdg. + ... d)			
Ω_4	30 mΩ		0.01 mΩ	0.6 V	100 mA	0.5 + 5		±0.6 V	continuous
	300 mΩ		0.1 mΩ	0.6 V	100 mA	0.5 + 5			
	3 Ω		1 mΩ	0.6 V	10 mA	0.5 + 5			
	30 Ω		1 mΩ	0.6 V	10 mA	0.5 + 5			
Ω_2	300 Ω	1 mΩ		0.6 V	250 µA	0.07 + 20 [4]		600 V DC AC eff sine	5 min.
	3 kΩ	10 mΩ		0.6 V	45 µA	0.07 + 15 [4]			
	30 kΩ	100 mΩ		0.6 V	4.5 µA	0.07 + 15			
	300 kΩ	1 Ω		0.6 V	1.5 µA	0.07 + 15			
	3 MΩ	10 Ω		0.6 V	150 nA	0.07 + 15			
	30 MΩ	100 Ω		0.6 V	15 nA	1.5 + 15			
Ω 🔊	300 Ω		0.1 Ω	3 V	1 mA	0.5 + 5		Umax	5 min.
⊣▶⊢	3 V		0.1 mV	6 V	1 mA	0.5 + 5			
Zener ⊣▶⊢	15 V		1 mV	22 V	1 mA	1 + 5 (> 10 d)			
				Discharge resistance	$U_{0\,max}$	±(...% rdg. + ... d)			
F	3 nF		1 pF	10 MΩ	3 V	1 + 5 [4]		600 V DC AC eff sine	5 min.
	30 nF		10 pF	10 MΩ	3 V	1 + 5 [4]			
	300 nF		100 pF	1 MΩ	3 V	1 + 5			
	3 µF		1 nF	100 kΩ	3 V	1 + 5			
	30 µF		10 nF	11 kΩ	3 V	1 + 5			
				f_{min} [2]		±(...% rdg. + ... d)			
Hz	300 Hz		0.01 Hz	1 Hz		0.05 + 5 [5]		600 V	continuous
	3 kHz		0.1 Hz					600 V	
	100 kHz < 30 kHz > 30 kHz		10 Hz					100 V 30 V	

1) Display: 5¾ places for DC and 4¾ places for AC, a different resolution and sampling rate can be selected in the rAtE menu for saving and transmitting measured values.
2) Lowest measurable frequency for sinusoidal measuring signals symmetrical to the zero point
3) At 0 ° ... + 40 °C
4) ZERO is displayed for “zero adjustment” function.
5) Range 300 mV~: U_E = 100 $mV_{eff/rms}$ . . . 300 $mV_{eff/rms}$
3 V~: U_E = 0,3 $V_{eff/rms}$ . . . 3 $V_{eff/rms}$
30 V~: U_E = 3 $V_{eff/rms}$ . . . 30 $V_{eff/rms}$
300 V~: U_E = 30 $V_{eff/rms}$ . . . 300 $V_{eff/rms}$
600 V~: U_E = 300 $V_{eff/rms}$ . . . 600 $V_{eff/rms}$
for voltages > 100 V: power limiting of $3 \cdot 10^6$ V · Hz
6) 20 … 45 … 65 Hz … 1 kHz sine, for alternating voltage $TRMS_{AC}$, influences see page 4

Key

rdg. = reading (measured value)
d = digit

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Meas. Function	Temperature Sensor	Measuring Range	Resolution	Intrinsic Error for Max. Resolution under Reference Conditions ±(...% rdg. + ... d) [1]	Overload Capacity [3] Value	Overload Capacity [3] Duration
°C/°F	Pt 100	−200.0 … −100.0 °C	0.1 K	1 K	600 V DC eff sine	5 min.
		−100.0 … +100.0 °C		0.8 K		
		+100.0 … +850.0 °C		0.5 + 3		
	Pt 1000	−200.0 … +100.0 °C		0.8 K		
		+100.0 … +850.0 °C		0.5 + 3		
	Ni 100	−60.0 … +180.0 °C		0.5 + 3		
	Ni 1000	−60.0 … +180.0 °C		0.5 + 3		
	K (NiCr-Ni)	−270.0… +1372.0 °C		0.7 + 3 [2]		
	J (Fe-CuNi)	−210.0… +1200.0 °C		0.8 + 3 [2]		
	T (Cu-CuNi)	−270.0… +400.0 °C		0.2 + 3 [2]		
	B	−0… +1820.0 °C		0.5 + 3 [2]		
	E	−270.0… +1000.0 °C		0.5 + 3 [2]		
	R	−50.0… +1768.0 °C		0.5 + 3 [2]		
	N	−270.0… +1300.0 °C		0.5 + 3 [2]		
	S	−50.0… +1768.0 °C		0.5 + 3 [2]		
	L	−200.0… +900.0 °C		0.5 + 3 [2]		
	U	−200.0… +600.0 °C		0.5 + 3 [2]		

[1] Plus sensor deviation
[2] Without integrated reference junction, with internal reference temperature plus error ±2 K
[3] at 0 ° ... + 40 °C

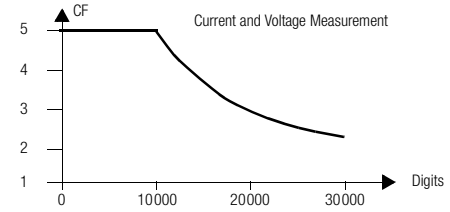
Influence Error

Influencing Quantity	Sphere of Influence	Measured Quantity / Measuring Range [1]	Influence Error ± (... % rdg. + d)/10 K
Temperature	0 … +21 °C and +25 … +40 °C	V DC, °C (TC)	0.1 + 10
		V AC	0.5 + 10
		3/30 mA DC	0.1 + 10
		3/30 mA AC	0.5 + 10
		300 mA DC, AC	0.5 + 10
		300Ω/3/30/300 kΩ 2L	0.2 + 10
		3 MΩ 2L	0.5 + 10
		30 MΩ 2L	1 + 10
		Ω 4L	1 + 10
		3/30/300 nF/3/30 µF	0.5 + 10
		Hz	0.1 + 10
		°C (RTD)	0.2 + 10
		Source quantity [1]	
		mV/V, °C (TC)	0.1 + 10
		Ω, °C (RTD)	0.2 + 10
		mA source	0.1 + 10
		mA sink	0.1 + 10

Influencing Quantity	Frequency	Meas. Qty. / Meas. Range	Influence Error [2] ± (... % rdg. + d)
Frequency V_{AC}	> 20Hz ... 45Hz	300.00 mV … 600.0 V	2 + 30
	> 65Hz ... 1kHz		

Influencing Quantity	Frequency	Meas. Qty. / Meas. Range	Influence Error [2] ±(...% rdg. + ... d)
Frequency I_{AC}	> 20Hz ... 45Hz	3 mA 30 mA 300 mA	1 + 30
	> 65Hz ... 1kHz		

[1] With zero adjustment
[2] Specified error valid as of display values of 10% of the measuring range

Influencing Quantity	Sphere of Influence		Measured Quantity / Measuring Range [1]	Influence Error [2]
Measured Quantity Waveshape	Crest Factor CF	1 … 2	V AC, A AC	±1 % rdg.
		2 … 4		±5 % rdg.
		4 … 5		±7 % rdg.
	Allowable crest factor CF of the periodic quantity to be measured is dependent upon the displayed value: 			

Influencing Quantity	Sphere of Influence	Measured Quantity / Measuring Range [1]	Influence Error
Relative Humidity	75% 3 days instrument off	V, A, Ω F, Hz °C	1 x intrinsic error

Influencing Quantity	Sphere of Influence	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 sine	300 mV ... 30 V ~	> 80 dB
		300 V ~	> 70 dB
		1000 V ~	> 60 dB
Series Mode Interference Voltage	Interference quantity: V ~ , respective nominal value of the measuring range, max. 1000 V ~ , 50 Hz, 60 Hz sine	V ⎓	> 60 dB
	Interference quantity max. 1000 V ⎓	V ~	> 60 dB

Real-Time Clock

Accuracy	±1 minute per month
Temperature Influence	50 ppm/K

Reference Conditions

Ambient Temperature	+23 °C ±2 K
Relative Humidity	45 … 55 %
Measured Quantity Frequency	45 … 65 Hz
Measured Quantity Waveshape	sine, deviation between RMS and rectified value < 0.1 %
Battery Voltage	4.5 V ±0.1 V

Response Time (multimeter functions)

Response Time (after manual range selection)

Measured Quantity / Measuring Range	Response Time for Digital Display	Measured Quantity Step Function
V DC, V AC A DC, A AC	1.5 s	from 0 to 80 % of upper range limit value
300 Ω ... 3 MΩ	2 s	from ∞ to 50 % of upper range limit value
30 MΩ	5 s	
Continuity	< 50 ms	
⇻	1.5 s	
°C Pt100	max. 3 s	
3 nF ... 30 µF	max. 2 s	from 0 to 50 % of upper range limit value
>10 Hz	max. 1.5 s	

Display

LCD panel (65 mm x 30 mm) with display of up to 3 measured values, unit of measure, type of current and various special functions

Display / Char. Height	7-segment characters Main display: 12 mm Auxiliary display: 7 mm
Resolution	5¾ digit ≙ 309,999 counts
Overflow Display	"OL" appears
Polarity Display	"–" sign is displayed if positive pole is connected to "⊥"
LCD Test	All display segments available during operation of the 28C are activated after the instrument is switched on.

Power Supply

Battery	3 ea. 1.5 V AA-Size alkaline batteries per IEC LR6, or equivalent rechargeable battery
Service Life	With alkaline batteries (2200 mAh)

Measuring Function	Current	Service Life
V, Hz, mA, Ω_2, F, °C	25 mA	70 h
Standby (MEM + clock)	350 µA	approx. 1 year
Calibration Function		**Service Life**
mV, thermocouple	48 mA	40 h
15 V	85 mA	20 h
Ω, RTD	95 mA	18 h
Sink, 20 mA	175 mA	10 h
Source, 20 mA	140 mA	12 h

If voltage drops below 2.7 V, the instrument is switched off automatically.

Battery Test	"⊣⊢" is displayed automatically if battery voltage drops to below approx. 3.5 V.
Mains Power	with NA4/500 power line adapter

Power Saving Circuit

The device is switched off automatically if none of the controls are activated for a period of approximately 10 minutes. The simulator is switched off after a period of only 5 minutes (sockets are current and voltage-free). Automatic shutdown can be deactivated.

Fuses

Fusible links for all mA measuring ranges	FF (UR) 1.6 A/1000 V AC/DC, 6.3 mm x 32 mm, 10 kA switching capacity at 1000 V AC/DC and ohmic load
Indication of over-ranging	300 mA range: Acoustic signal for displayed value > 310 mA (250 ms on, 250 ms off)

Multimeter Electrical Safety

Safety Class	II per IEC 61010-1/EN 61010-1	
Overvoltage Category	II	III
Operating Voltage	600 V	300 V
Test Voltage	3.7 kV~ per IEC 61010-1/EN 61010-1	

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Electromagnetic Compatibility (EMC)

Interference Emission	EN 61326: 1997 class B
Interference Immunity	EN 61326: 1997/A1: 1998 appendix C
	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

Data Interface

Data Transmission	optical via infrared light through the housing
with interface adapter as accessory	
Type	RS 232C, serial
Bidirectional baud rate (read and write)	
(DMM ↔ PC)	BD232: 9600 baud

Ambient Conditions

Accuracy Range	0 °C … +40 °C
Operating Temperature	–10 °C … +50 °C
Storage Temperature	–25 °C … +70 °C (without batteries)
Relative Humidity	45% … 75%, no condensation allowed

Mechanical Design

Protection	Instrument: IP 50, Connector sockets: IP 20
Dimensions	84 mm x 195 mm x 35 mm
Weight	approx. 420 gr. with batteries

Applicable Regulations and Standards

IEC 61010-1/EN 61010-1/	Safety requirements for electrical equipment for measurement, control and laboratory use
EN 60529	Test instruments and test procedures Protection provided by enclosures (IP code)
IEC 61326/EN 61326	Electromagnetic compatibility (EMC)

Standard Equipment

1 METRA*Hit*®28C calibrator with 3 AA-Size batteries
1 KS17 cable set (yellow) including two measurement cables (1 black, 1 yellow) with angle plugs and test probes
1 KS17 cable set (red and black)
1 operating instructions
1 GH18 protective rubber holster
1 DKD calibration certificate

Warranty

3 years material and workmanship
1 year for calibration

METRAwin®90 Calibration Software (optional accessory)

This software allows for paperless documentation and management of calibration results, the creation of calibration procedures and remote control of the calibrator.
METRA*Hit*®28C sequence controls can be implemented online, or off-line after downloading complete calibration procedures.

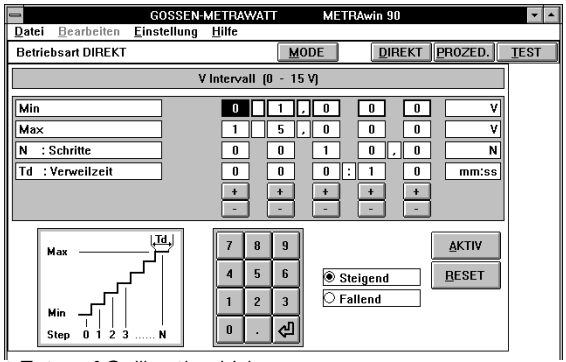
METRA*Hit*®BD232 Interface Adapter

The METRA*Hit*®28C calibrator can be set up, its parameters can be configured and measurement data can be uploaded to a PC with the help of the METRA*Hit*®BD232 bidirectional adapter. The adapter has no memory of its own. It can be used to read out data from the memory integrated into the METRA*Hit*®28C. It supports all measuring functions and data formats included in the METRA*Hit*®20 series, and is included in the user-friendly BD-Pack 1.

Direct Entry at the Calibrator

The calibrator is controlled by the PC, and preset values are uploaded from the PC directly to the calibrator.
The following operating modes are provided with the indicated calibration ranges:

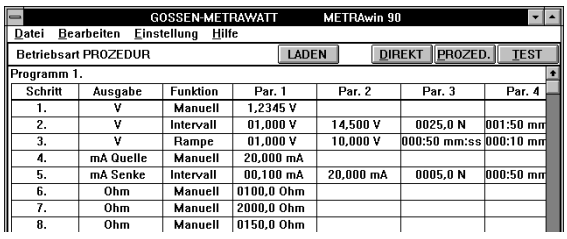
- DIRECT — A freely selectable, fixed numeric calibration value can be entered.
- INTERVAL — Continuous read-out of calibration values from a calibration interval which can be subdivided into intermediate steps as desired.
- RAMP — Continuous, stepless read-out of calibration values from a calibration ramp with definable rise and dwell periods. The ramp function may also be operated continuously.



Direct Entry of Calibration Values

Calibrator Program (sequence operation)

A calibrator test program is created at the PC (e.g. with several test steps for a complex instrument or a group of systems components), stored to a data file and uploaded to memory at the METRA*Hit*®28C. Each calibration step can then be queried via the keypad at the METRA*Hit*®28C.



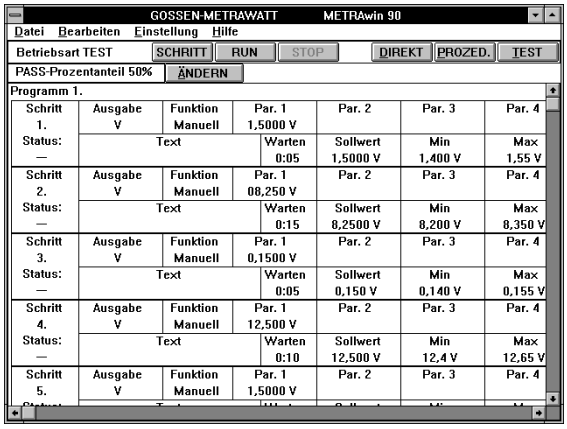
Schritt	Ausgabe	Funktion	Par. 1	Par. 2	Par. 3	Par. 4
1.	V	Manuell	1,2345 V			
2.	V	Intervall	01,000 V	14,500 V	0025,0 N	001:50 mm
3.	V	Rampe	01,000 V	10,000 V	000:50 mm:ss	000:10 mm
4.	mA Quelle	Manuell	20,000 mA			
5.	mA Senke	Intervall	00,100 mA	20,000 mA	0005,0 N	000:50 mm
6.	Ohm	Manuell	0100,0 Ohm			
7.	Ohm	Manuell	2000,0 Ohm			
8.	Ohm	Manuell	0150,0 Ohm			

Creation of a Test Program

Calibration "Test" Program in Accordance with ISO9001, 4.11

A calibration sequence can be pre-programmed in the TEST mode which can be run in selectable, individual steps, or fully automatically.

The calibration values and a freely definable comment are read out after each calibration step. After the output parameters of the device to be calibrated (e.g. a transducer) have been logged and evaluated with the multimeter, the measurement results are displayed in tabular form. Test sequence results can be saved to a data file or printed out as a calibration certificate. All requirements in accordance with ISO9001 Abs.11.4 are fulfilled.



Schritt 1.	Ausgabe V	Funktion Manuell	Par. 1 1,5000 V	Par. 2	Par. 3	Par. 4
Status: —	Text		Warten 0:05	Sollwert 1,5000 V	Min 1,400 V	Max 1,55 V
Schritt 2.	Ausgabe V	Funktion Manuell	Par. 1 08,250 V	Par. 2	Par. 3	Par. 4
Status: —	Text		Warten 0:15	Sollwert 8,2500 V	Min 8,200 V	Max 8,350 V
Schritt 3.	Ausgabe V	Funktion Manuell	Par. 1 0,1500 V	Par. 2	Par. 3	Par. 4
Status: —	Text		Warten 0:05	Sollwert 0,150 V	Min 0,140 V	Max 0,155 V
Schritt 4.	Ausgabe V	Funktion Manuell	Par. 1 12,500 V	Par. 2	Par. 3	Par. 4
Status: —	Text		Warten 0:10	Sollwert 12,500 V	Min 12,4 V	Max 12,65 V
Schritt 5.	Ausgabe V	Funktion Manuell	Par. 1 1,5000 V	Par. 2	Par. 3	Par. 4

Calibration Sequence for Measuring Transducer ("TEST" function)

Ausfertigendes Labor: MUSTER KG
Kalibriert von: MUSTERMANN
Kalibrierdatum:
Prüfling Fabrikat: MUSTER
Typ: MULTIMETER
Nummer: 328-45-3334
Umgebung
Temperatur: 23 °C
Luftfeuchtigkeit: 65 %

Zertifikat Nr.:
Kalibriergeräte
METRAHit 28S S-Nr.: XXXXX-YYYYYY-ZZZZZ
Kalibrierzertifikat:
METRAHit 28C S-Nr.: WWWW-ZZ-YYYYY
Kalibrierzertifikat:
Hersteller: GOSSEN-METRAWATT
Art der Messung: Multimetertest
Unterschrift:

Angelegter Wert	Sollwert	Grenzwert Unten	Grenzwert Oben	Prüfling Istwert	Prüfling Abweichung	% Fehler der Spezifikation	PASS/Grenze/FAIL
1,5000 V	1,5000 V	1,400 V	1,55 V	1,481 V	-0.0190 V	19%	PASSED
08,250 V	8,2300 V	8,200 V	8,350 V	8,28 V	0.0800 V	30%	PASSED
0,1500 V	0,150 V	0,140 V	0,155 V	0,148 V	-0.0020 V	20%	PASSED
12,500 V	12,300 V	12,4 V	12,65 V	12,39 V	0.0900 V	60%	GRENZWERT
1,5000 V	1,500 V	1,45 V	1,65 V	1,482 V	-0.0180 V	36%	PASSED
1,4444 V	1,4444 V	1,400 V	1,4788 V	1,426 V	-0.0184 V	41%	PASSED
1,2500 V	1,25 V	1,2 V	1,3 V	1,288 V	-0.0170 V	34%	PASSED

Zusammenfassung: Messungen = 7
PASS (0...50%) = 6 Grenzfall (50...100%) = 1 FAIL (>100%) = 0

Printout of a calibration certificate in accordance with ISO9001 including traceability (4.11b), calibration process (4.11c), measurement deviation (4.11d), pass/fail results (4.11g) and ambient conditions (4.11h)

METRA*Hit*®28C
Calibrator, Multimeter and Milliohmmeter

KC2 / KC3 Kelvin Clip Sets

These sets consist of two clips for rapid, reliable connection to low resistance devices under test like shunts, cables, contact points etc. The fine-toothed contacts are gold plated and are distinguished by consistently low contact resistance.
The clips are connected to contact protected banana plugs by means of a 120 cm (4 ft.) cable (conductor cross-section: 1 square mm).

KC2 Kelvinclips allow for the connection of larger devices under test such as screw terminals, busbars, shunts etc. (jaw opening 10mm).

KC3 Kelvinclips are suitable for small devices under test such as electronic components, coil terminals etc. (jaw opening 5mm).

Order Information

Description	Type	Article Number
Calibrator, see standard equipment for METRA*Hit*®28C	METRA*Hit*®28C	M231A
Hardware Accessories		
Power pack, 230 V~/4.5 V, 600 mA	NA4/500	Z218A
Probe for voltage measurement in power installations to 1000 V	KS30	GTZ 3204 000 R0001
Pt100 temperature sensor for surface and immersion measurements, −40 … +600 °C	Z3409	GTZ 3409 000 R0001
Pt1000 temperature sensor for measurement in gases and liquids, −50 … +220 °C	TF220	Z102A
Pt100 oven sensor, −50 … +550 °C	TF550	GTZ 3408 000 R0001
Ten adhesive Pt100 temperature sensors, −50 … +550 °C	TS Chipset	GTZ 3406 000 R0001
Carrying pouch	F829	GTZ 3301 000 R0003
Ever-ready case	F836	GTZ 3302 000 R0001
Ever-ready case for 1 METRA*Hit*®28C and an additional multimeter with accessories	F840	GTZ 3302 001 R0001
Hard case (with room for 1 METRA*Hit*®28C including GH18, 1 KS17-2 and 1 clip-on current transformer / sensor)	HC20	Z113A
Hard case (with room for 1 METRA*Hit*®28C including GH18, 1 KS17 and extensive accessories)	HC30	Z113A
Fuse link (shipped in package of 10)	FF(UR) 1.6 A / 1000 V AC/DC	Z109C
Kelvinclips for DUTs (1 pair) to 10 mm diameter to 4 mm diameter	 KC2 KC3	 Z217A Z217B
Software Accessory		
1-channel pack consisting of: METRA*Hit*®BD232, bidirectional interface adapter, RS 232 interface cable, METRAwin®10/METRA*Hit*® analysis software and installation instructions	BD-Pack 1	Z215A
Calibrator pack consisting of: METRA*Hit*®BD232, bidirectional interface adapter, RS 232 interface cable, METRAwin®90 calibration software and installation instructions	CP1	GTZ 3231 100 R0001
Calibrator pack consisting of METRA*Hit*®28C, METRAwin®10/ METRA*Hit*®, METRAwin®90-2, RS 232 interface cable, BD232, KC2, HC30 and 1ASi battery set	CP28	M231B
Bidirectional interface adapter	METRA*Hit*®BD232	GTZ 3242 100 R0001
RS 232 interface cable, 2 m	Z3241	GTZ 3241 000 R0001
METRAwin®10/METRA*Hit*® software update and installation instructions	Z3240	GTZ 3240 000 R0001
Calibration software for controlling the METRA*Hit*®28C and for analysis of calibration results	METRAwin®90-2	Z211A
Accessory Clip-On Current Transformers and Current Sensors *		
Clip-on current transformer 1 … 200 A~, 1000:1, 48…65…400 Hz	WZ11A [D]	Z208A
WZ12A ... Clip-On Current Transformers / Sensors D [D] frequency range: 45…65 …500 Hz, clip opening: ∅ 15 mm max. cable dia.		
Clip-on current transformer 15 A … 180 A, 1000:1	WZ12A	Z219A
Clip-on current sensor 10 mA … 100 A; 100 mV/A	WZ12B	Z219B
Clip-on current sensor selectable, 1 mA … 15 A; 1 mV/mA und 1 A … 150 A; 1 mV/A	WZ12C	Z219C
Clip-on current transformer 30 mA … 150 A, 1000:1	WZ12D	Z219D

[D] Data sheet available

* Please refer to the Test and Measurement Catalog for further information on clip-on current transformers and current sensors

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