GOSSEN METRAWATT
GMC-INSTRUMENTS GROUP

METRAHIT | CAL
Calibrator

3-349-440-03
15/8.24

- **Universal calibrator, simulator**
  mA /
  mV … V /
  °C/°F (Pt100/1000, Ni100/1000,
  Thermocouple J, L, T, U, K, E, S, R, B, N) /
  5 Ω … 2000 Ω
- Frequency generator: 1 Hz … 1000 Hz
- Ramp and staircase functions
- Easy operation
- Interface and optional calibration software METRAwin90-2
- Transmitter simulator (sink: 0 mA … 24 mA)
- DAkkS calibration certificate included in scope of supply
- Rugged, EMC compliant design

3 YEARS WARRANTY

MADE IN GERMANY

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-K-15080-01-01

System Components and Range of Applications

The METRAHIT CAL calibrator functions as a highly accurate calibration and simulation instrument for electrical quantities. As a handheld instrument, it is suitable for precise, on-site calibration and inspection tasks, as well as for test department and laboratory work.
Thanks to its diverse functions, the highly flexible instrument can be used in process engineering, control room and equipment fabrication, general measuring technology and many other applications. As a system component it can be always used in calibration systems for calibrating measuring transducers, buffer amplifiers, transmitters, temperature measuring instruments and recording instruments, controllers, signaling devices and indicators.

If a USB X-TRA interface adapted is plugged on to the instrument (accessory, see page 4), complete calibration procedures and measuring-point oriented calibration cycles can be transferred from a PC, saved to memory and accessed by simply pressing a key. The calibrator setup procedure can thus be significantly shortened, and erroneous settings can be avoided.

Optional METRAwin90-2 software simplifies programming, controls data transfer to the calibrator, receives measurement data of any interconnected multimeter from the output of a transducer and executes a comparison of the targeted and the actual situation. Acquired values can be printed out as a calibration report by the PC.

Universal Calibration Standard

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

Frequency and pulse run generator

Continuous frequency signals can be transmitted by the METRAHIT CAL for testing SPCs, energy metering devices, flow rates and more. Amplitude is adjustable for the generated square-wave pulses, which are used to simulate sensor pulses.

Calibration and Simulation

Measuring transducers with a wide variety of input signals (voltage, thermo-voltage, RTD and 2-wire resistance sensors etc.) can be directly connected and calibrated. If a multimeter is used (e.g. METRAHIT AM XTRA), 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 optional METRAwin90-2 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 METRAHIT CAL simulates a 2-wire transmitter and pulls the selected current value from the measuring sequence.

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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 in a stepless fashion.
The METRAHIT CAL can thus be used as a precision pulse generator for dynamic testing.
Depending upon individual needs, desired dynamic response can be derived from, for example, the 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.

Fixed value

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 accomplished in steps between the minimum and maximum values selected at the device to be calibrated in this read-out mode. The subsequent step can be triggered automatically (time per step: 1 sec. … 60 min.) or manually.

Ramp

Calibration values are read out 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, as well as dwell time at min. and max. values, 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 thermo-voltages. Thermo-voltages can be read out with reference to an internal (terminal temperature) 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.

Applicable Regulations and Standards

IEC 61010-1/ DIN EN 61010-1/ VDE 0411-1	Safety requirements for electrical equipment for measurement, control and laboratory use
EN 60529 VDE 0470, part 1	Test instruments and test procedures Degrees of protection provided by enclosures (IP code)
DIN EN 61326-1 VDE 0843-20-1	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements

Characteristic Values

Calibration Function	Simulation Range	Resolution 30,000 Digits (4¾ places)		Intrinsic Uncertainty	Overload
Direct voltage source			Minimum load resistance	±(I% SI + mV)	I_{max}
V	0 mV … ±300mV	0.01 mV	1 kΩ	0.05 + 0.02	18 mA
	0 V … 3 V	0.1 mV		0.05 + 0.2	
	0 V … 10 V	1 mV		0.05 + 2	
	0 V … 15V	1 mV		0.05 + 2	
Frequency generator duty cycle (pulse-no-pulse ratio): 50%, amplitude: 10 mV … 15 V			Minimum load resistance	±(I% SI + mV)	I_{max}
Hz	1 Hz … 1 kHz	0.1 … 1 Hz	1 kΩ	0.05 + 0.2	18 mA
Current Source			mac. load	±(% S + µA)	
mA	4 mA … 20 mA	1 µA	16 V	0.05 + 2	
	0 mA … 20 mA				
	0 mA … 24 mA				
Current Sink				±(% S + µA)	U_{max}
mA	4 mA … 20 mA	1 µA	V_{in} = 4 V … 27 V	0.05 + 2	27 V
	0 mA … 20 mA				
	0 mA … 24 mA				
Resistance simulation			Sensor current [mA]	±(% S + Ω)	I_{max}
Ω	5 Ω … 2000 Ω	0.1 Ω	0.05…0.1…4…5	0.05 + 0.2	5 mA

Simulator for Temperature Sensors (resolution: 0.1 K)

	Sensor Type	Simulation Range in °C	Simulation Range in °F	Intrinsic Uncertainty	Overload
°C / °F	**Resistance Thermometer per IEC 751**				I_{max}
	Pt100	–200 … +850	–328 … +1562	±(0.1 % of resistance + 0.2 Ω)	5 mA
	Pt1000	–200 …+300	-328 to +572		
	Resistance Thermometer per DIN 43760				I_{max}
	Ni100	–60 … +180	–76 … +356	±(0.1 % of resistance + 0.2 Ω)	5 mA
	Ni1000	–60 … +180	–76 … +356		
	RTD-sensor current 0.05 mA … 0.1 mA … 4 mA… 5 mA			*	
	Thermocouples per DIN and IEC 584-1				I_{max}
	K (NiCr/Ni)	–250 … +1372	–418 … +2501	±(0.1 % of voltage + 40 µV) *	18 mA
	J (Fe/CuNi)	–210 … +1200	–346 … +2192		
	T (Cu/CuNi)	–270 … +400	–454 … + 752		
	B (Pt30Rh/Pt6Rh)	+500 to +1820	+932 … +3308		
	E (NiCr/CuNi)	–270 … +1000	–454 … +1832		
	R (Pt13Rh/Pt)	–50 … +1768	–58 … +3214		
	N (NiCrSi-NiSi)	–270 … +1300	–454 … +2372		
	S (Pt10Rh/Pt)	–50 … +1768	–58 … +3214		
	J (Fe/CuNi)	–200 … +900	–328 … +1652		
	U (Cu/CuNi)	–200 … +600	–328 … +1112		

* Without internal reference junction;
Relative to fixed external reference temperature and thermovoltage of the thermocouple
Internal reference junction: 2 K intrinsic error
External reference junction: Input –30 °C … 60 °C

Key
S = setting value

Reference Conditions

Ambient temperature	+23° C ±2 K
Relative humidity	40 … 75%
Battery voltage	3.0 V ±0.1 V

Internal Clock

Time format	DD.MM.YYYY hh:mm:ss
Resolution	0.1 s
Accuracy	±1 min./month
Temperature influence	50 ppm/K

Display

LCD panel (65 x 36 mm) with digital display including display of simulator unit and various special functions.

Background Illumination

Background illumination is switched off approximately 1 minute after it has been activated.

Display / char. height	7-segment characters Main display: 1 × 6 digits, 12 mm Auxiliary displays: 2 × 6 digits, 7 mm
max. resolution	30,000
Polarity display	"–" (minus sign) is displayed
Display refresh	2 times per second, every 500 ms

Power Supply

Battery	2 × 1.5 V mignon cell (size AA) alkaline manganese per IEC LR6 (1.2 V NiMH rechargeable batteries are also possible)
Operating time	with alkaline manganese (2600 mAh)

Calibration function	Current consumption	Operating time
mV, thermocouple	55 mA	45 h
15 V	240 mA	10 h
Ω, RTD	85 mA	30 h
Sink, 20 mA	310 mA	8 h
Source, 20 mA	310 mA	8 h

If voltage drops below 1.8 V, the instrument is switched off automatically.

Battery indicator	Battery capacity display via battery symbol . Querying of momentary battery voltage via menu function

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.

Power pack socket	If the NA X-TRA power pack has been plugged into the instrument, the installed batteries are disconnected automatically. Rechargeable batteries can only be recharged externally.

Fuse

Fuse link	FF 160 mA / 400 V, 5 mm × 20 mm Breaking capacity min. 10 kA (Replacement part see page 5)

Electrical Safety

Protection class	II
Operating voltage	Max. 50 V
Measuring category	I (250 V)
Pollution degree	2
Test voltage	500 V~ per DIN EN 61010-1 / VDE 0411-1

Electromagnetic Compatibility (EMC)

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

Data Interface

Type	Optical via infrared light through the housing
Data transmission	Serial, bidirectional (not IrDa compatible)
Protocol	Device specific
Baud rate	38,400 baud
Functions	Set/query calibration functions and parameters

The USB X-TRA plug-in interface adapter (see accessories) is used for adaptation to the PC's USB port.

Ambient Conditions

Accuracy range	0° C … +40° C
Operating temperature	–10° C … +50° C
Storage temperature	–25° C … +70° C (without batteries)
Relative humidity	40% … 75%, no condensation allowed
Elevation	To 2000 m

Mechanical Design

Housing	Impact resistant plastic (ABS)
Dimensions	200 × 87 × 45 mm (without rubber holster)
Weight	approx. 0.35 kg with batteries
Protection	IP54 per DIN EN 60529 / IEC 60529 (protection against ingress of solid foreign objects: protected against dust in harmful quantities, protection against water ingress: protection against ingress of splashing water from all sides; pressure equalization via the housing)

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Scope of Delivery

1 Calibrator METRAHIT CAL
2 Batteries
1 KS17-2 safety cable set
(1 pair of safety measurement cables (yellow and black)
(1.5 m) with 4 mm test probes, 1000 V CAT III / 600 V CAT IV)
1 Condensed operating instructions*
1 Protective rubber cover
1 DAkkS calibration certificate

* Complete operating instructions are available for download from the Internet at www.gossenmetrawatt.com.

Guarantee

3 years material and workmanship
1 year for calibration

Accessories

Interface adapter for USB connection

The bidirectional interface adapter USB X-TRA permits data transmission between the multimeter and the PC:

- Configure the METRAHIT CAL from a PC.
- Read data out of memory from the METRAHIT CAL.

The adapter does not require a separate power supply.
Its baud rate is 38,400 baud.

Calibration SoftwareMETRAwin90-2

This software allows for paperless documentation and management of calibration results, the creation of calibration procedures and remote control of the calibrator.
METRAHIT CAL sequence controls can be implemented online, or offline after downloading complete calibration procedures.

Belt pouch HitBag / HitBag +

for multimeters of the METRAHIT and METRAport series

Hard case HC20 / HC30

for multimeters and accessories

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Order Information

Instrument

Type	Description	Article Number
METRAHIT CAL	Instrument with standard scope of supply	M244A

Sets

Type	Description	Article Number
METRAHIT CAL Pack	Set consisting of METRAHIT CAL and METRAHIT AM XTRA multimeter in HC30 hard case including cable sets, batteries and DAkkS calibration certificate	M244B

Accessories

Type	Description	Article Number
NA X-TRA	Power pack 90 V_{AC} … 253 V_{AC} / 5 V_{DC}, 600 V CAT IV	Z218G
FF160mA/400V	Fuse link	Z109N
METRAwin90-2	Calibration software for controlling process calibrators	Z211A
USB X-TRA	Infrared USB interface adapter for METRAHIT series multimeters AM XTRA, PM, E and S	Z216C
HC20	Hard case for 1 METRAHIT and accessories	Z113A
HC30	Hard case for 2 METRAHITs and accessories	Z113A
HitBag	Belt pouch for METRAHIT and METRAport	Z115A
HitBag +	Large belt pouch for METRAHIT and METRAport	Z115B
F836	Ever-ready case for METRAHit with cable compartment	GTZ3302000R0001
F829	Carrying pouch for 1 METRAHIT with protective rubber cover and sensor or for 1 METRAmax	GTZ3301000R0003

For additional information regarding accessories please refer to:

- our Measuring Instruments and Testers catalog
- our website www.gossenmetrawatt.com

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