GOSSEN METRAWATT

METRA**HIT** | Cal
Calibrator

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

CE

3 YEARS WARRANTY

MADE IN GERMANY

DAkkS
German
Accreditation Body
D-K-15080-01-01
DAkkS Calibration Certificate included

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's 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 always be used in calibration systems for calibrating measuring transducers, buffer amplifiers, transmitters, temperature measuring and recording instruments, controllers, signaling devices and indicators.

If a USB X-TRA interface adapter 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 the measurement data of any interconnected multimeter from a transducer output 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're 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 X-TRA**), the 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 retrieves 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 following step can be triggered automatically (time per step: 1 second to 60 minutes) or manually.

Ramp

Continuous read-out of calibration values is accomplished 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

Technical Data

Calibration Function	Simulation Range	Resolution 30,000 digits (4¾ places)		Intrinsic Uncertainty	Overload
Direct voltage source			Minimum Load Resistance	±(% S + mV)	I_{max}
V	0…±300mV	0.01 mV	1 kΩ	0.05 + 0.02	18 mA
	0 … 3 V	0.1 mV		0.05 + 0.2	
	0 …10 V	1 mV		0.05 + 2	
	0 …15 V	1 mV		0.05 + 2	
Frequency generator duty cycle (pulse-no-pulse ratio): 50%, Amplitude: 10 mV … 15 V			Minimum Load Resistance	±(% S + Hz)	I_{max}
Hz	1 Hz …1 kHz	0.1 …1 Hz	1 kΩ	0.05 + 0.2	18 mA
Current source			Max. load	±(% S + µA)	
mA	4 … 20 mA	1 µA	16 V	0.05 + 2	
	0 … 20 mA				
	0 … 24 mA				
Current Sink				±(% S + µA)	U_{max}
mA	4 … 20 mA	1 µA	V_{in} = 4 ... 27 V	0.05 + 2	27 V
	0 … 20 mA				
	0 … 24 mA				
Resistance simulation			Sensor current [mA]	±(% S + Ω)	I_{max}
Ω	5…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	Over-load
°C / °F	Resistance thermometers per IEC 751			±(% S + K)	I_{max}
	Pt100	−200 …+850	−328…+1562	0.1 + 0.5	5 mA
	Pt1000	−200 …+300	−328 …+572	0.1 + 0.2	
	Resistance thermometers per DIN 43760			±(% S + K)	I_{max}
	Ni100	−60 …+180	−76 …+356	0.1 + 0.5	5 mA
	Ni1000	−60 …+180	−76 …+356	0.1 + 0.2	
	RTD sensor current: 0.05 ... 0.1 ... 4 ... 5 mA			*	
	Thermocouples per DIN and IEC 584-1			ΔU in mV *	I_{max}
	K (NiCr/Ni)	−250…+1372	−418…+2501	±(0,05 % v.ISettingI + 0,02 mV)	18 mA
	J (Fe/CuNi)	−210…+1200	−346…+2192		
	T (Cu/CuNi)	−270…+400	−454…+ 752		
	B (Pt30Rh/Pt6Rh)	+500...+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		
	L (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: entry of -30 … 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 minute per month
Temp. influence	50 ppm/K

Display

LCD panel (65 x 36 mm) with digital display including simulation unit of measure 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 x 6 digits, 12 mm
	Auxiliary displays: 2 x 6 digits, 7 mm
Max. resolution	30000
Polarity display	"–" (minus sign) is displayed
Refresh Rate	2 times per second, every 500 ms

Power Supply

Battery	2 AA size batteries, alkaline manganese per IEC LR6 (2 ea. 1.2 V NiMH rechargeable battery also possible)
Service life	With alkaline manganese (2600 mAh)

Calibration Function	Power Consump-tion	Service life
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 with battery symbol in 4 segments: ▉▉▉. 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 is plugged in, the installed batteries are disconnected automatically.
	Rechargeable batteries can only be recharged externally.

Fuses

Fuse link	FF160mA/400V, 5 mm x 20 mm, min. 10 kA switching capacity

Electrical Safety

Protection class	II per DIN EN 61010-1:2011/VDE 0411-1:2011
Operating voltage	Max. 50 V
Measuring category	I (250 V)
Pollution degree	2
Test voltage	500 V~ per DIN EN 61010-1:2011/ VDE 0411-1:2011

Electromagnetic Compatibility (EMC)

Interference emission	EN 61326-1: 2006 class B
Interference immunity	EN 61326-1: 2006
	EN 61326-2-1: 2006

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 cal. 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 temp. range	–10 °C … +50 °C
Storage temp. range	–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 x 87 x 45 mm (without protective rubber holster)
Weight	Approx. 0.35 kg with batteries
Protection	IP 54 (pressure equalization via the housing)

Table Excerpt Regarding Significance of IP Codes

IP XY (1st char. X)	Protection against penetration by solid particles	IP XY (2nd char. Y)	Protection against penetration by water
5	Dust protected	4	Splashing water

METRA**HIT** CAL
Calibrator

Scope of delivery

1 **METRAHIT CAL** calibrator with 2 batteries per IEC LR6
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 Abbreviated operating instructions
1 CD ROM with operating instructions in English and German
1 Protective rubber holster
1 DAkkS calibration certificate

Guarantee

3 years material and workmanship
1 year for calibration

Accessories

Interface adapter for USB connection

The USB X-TRA bidirectional interface adapter includes the following functions:

- 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.
A CD ROM is included which contains current drivers for Windows operating systems.

METRAwin90-2 Calibration Software

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.

HitBag Cordura Belt Pouch
For METRAHIT multimeters (with/without protective rubber holster) and METRAport

HC20 hard case
For multimeters (with/without GH18 protective rubber holster) and accessories

Order Information

Description	Type	Article Number
Calibrator, see scope of delivery	**METRAHIT CAL**	M244A
Set consisting of METRAHIT CAL handheld calibrator and METRAHIT X-TRA handheld multimeter in HC30 hard case including cable sets, batteries and DAkkS certificates.	METRAHIT CAL Pack	M244B
Accessories		
Power pack with broad range input: 90 ... 253 V AC / 5 V DC, CAT IV	NA X-TRA	Z218G
Imitation leather carrying pouch for METRAHIT	F829	GTZ3301000R0003
Cordura belt pouch for METRAHIT multimeters	HitBag	Z115A
Soft belt pouch large for one METRAHIT or METRAport Multimeter. Made of rugged and water repellent Cordura, three separate cases for leads, clips, manual, CD, etc.	HitBag L	Z115B
Imitation leather ever-ready case with cable compartment	F836	GTZ3302000R0001
Ever-ready case for 2 METRAHITs, 2 adapters and accessories	F840	GTZ3302001R0001
Hard case for 1 METRAHIT and accessories	HC20	Z113A
Hard case for 2 METRAHITs and accessories	HC30	Z113A
Bidirectional interface adapter, IR-USB	USB X-TRA	Z216C
Calibration software for controlling the METRAHIT CAL and for analysis of calibration results	METRAwin90-2	Z211A
Fuse link	FF160mA/400V	Z109N

For additional information regarding accessories please refer to:

- *Measuring Instruments and Testers catalog*
- *www.gossenmetrawatt.com*