

# METRACAL | MC

## Multimeter, Calibrator

3-349-564-03  
5/10.12

- **Universal calibrator, simulator and multimeter**  
mA / mV ... V / °C (Pt100/1000, Ni100/1000, thermocouples: J, L, T, U, K, E, S, R, B, N) / 30 ... 2000  $\Omega$
- Dual mode – simultaneous calibration and measurement (U/I)
- Measuring and encoding in absolute terms and as percentage (scaled)
- Memory for measurement results: 16 MBit
- Frequency and pulse run generators: 1 Hz to 2 kHz
- Ramp and staircase functions
- METRAWin®90-2 interface and calibration software
- Transmitter simulator (sink: 0 ... 24 mA)
- DAkkS calibration certificate included
- Rugged, EMC compliant design
- **Precision multimeter** (V, A,  $\Omega$ , F, Hz, °C/°F)  
30,000 (60,000) digits and triple display
- TRMS AC measurement to 1 kHz



## Applications

Process engineers can use the **METRACAL MC** as a calibrator and a multimeter simultaneously, e.g. in order to simulate sensor conditions at the input of a transmitter while measuring and saving the output signal.

If the USB X-TRA 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 out as a calibration report. The multimeter can also be used as a data logger. METRAWin®10/METRAHit® PC software (accessory) allows for convenient evaluation and display of measurement data, and METRAWin®90-2 (accessory) can be used to create, upload and download calibration procedures, as well as for the generation of calibration certificates.

## Calibrator with Loop Current Measuring Instrument

### Universal Calibration Standard

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

### Frequency and Pulse Run Generator

Continuous frequency signals can be transmitted by the **METRACAL MC** 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, thermovoltage, RTD and 2-wire resistance sensors etc.) can be directly connected and calibrated. If a multimeter is used (e.g. **METRAHIT 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 METRAWin®90-2 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 **METRACAL MC** simulates a 2-wire transmitter and retrieves the selected current value from the measuring sequence.

### Data Storage (16 MBit / 46,000 measured values)

The calibrator is connected to a PC with the attached USB X-TRA interface adapter (accessory). Individual values, intervals and ramps which have been created with the help of METRAWin®90-2 software (accessory) can be saved as data files, uploaded to the calibrator and saved to non-volatile memory.

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### Read-Out Modes for Encoding 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 **METRACAL MC** 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.

#### 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

Calibration values are read out continuously 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 minimum and maximum 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 thermovoltages. Thermovoltages can be read out with reference to an internal (socket 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

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

### Guarantee

3 years material and workmanship

1 year for calibration

### Characteristic Values

#### Calibrator Section

| Calibration Function                                                                               | Simulation Range | Resolution: 30,000 Digits (4½ places) | With a Load of               | Intrinsic Uncertainty | Overload         |
|----------------------------------------------------------------------------------------------------|------------------|---------------------------------------|------------------------------|-----------------------|------------------|
| Direct Voltage Source                                                                              |                  |                                       |                              | ±(% S + mV)           | I <sub>max</sub> |
| V                                                                                                  | 0...±60mV        | 1 μV                                  | 15 mA                        | 0.1 + 0.01            | 18 mA            |
|                                                                                                    | 0...±300mV       | 0.01 mV                               |                              | 0.05 + 0.02           |                  |
|                                                                                                    | 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              |                  |
| Pulse / Frequency Generator<br>Duty cycle (pulse-no-pulse ratio): 50%,<br>amplitude: 10 mV... 15 V |                  |                                       |                              | ±(% S + Hz)           | I <sub>max</sub> |
| Hz                                                                                                 | 1 Hz ...2 kHz    | 0.1 ...1 Hz                           | 15 mA                        | 0.05 + 0.2            | 18 mA            |
| Current Source                                                                                     |                  |                                       | Max. load                    | ±(% S + μA)           |                  |
| mA                                                                                                 | 4 ... 20 mA      | 1 μA                                  | 17 V                         | 0.05 + 2              |                  |
|                                                                                                    | 0 ... 20 mA      |                                       |                              |                       |                  |
|                                                                                                    | 0 ... 24 mA      |                                       |                              |                       |                  |
| Current Sink                                                                                       |                  |                                       |                              | ±(% S + μA)           | U <sub>max</sub> |
| mA                                                                                                 | 4 ... 20 mA      | 1 μA                                  | V <sub>in</sub> = 4 ... 27 V | 0.05 + 2              | 27 V             |
|                                                                                                    | 0 ... 20 mA      |                                       |                              |                       |                  |
|                                                                                                    | 0 ... 24 mA      |                                       |                              |                       |                  |
| Resistance Simulation                                                                              |                  |                                       | Sensor Current [mA]          | ±(% S + Ω)            | I <sub>max</sub> |
| 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                             | Overload         |
|---------|------------------------------------------------------|------------------------|------------------------|---------------------------------------------------|------------------|
| °C / °F | <b>Resistance Thermometer per IEC 751</b>            |                        |                        | $\pm(\% S + \text{K})$                            | $I_{\text{max}}$ |
|         | Pt100                                                | -200 ... +850          | -328 ... +1562         | 0.1 + 0.5                                         | 5 mA             |
|         | Pt1000                                               | -200 ... +300          | -328 ... +572          | 0.1 + 0.2                                         |                  |
|         | <b>Resistance Thermometer per DIN 43760</b>          |                        |                        | $\pm(\% S + \text{K})$                            | $I_{\text{max}}$ |
|         | 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 ... <u>0.1</u> ...4 ... 5 mA |                        |                        |                                                   |                  |
|         | <b>Thermocouples per DIN and IEC 584-1</b>           |                        |                        | $\Delta U$ in mV <sup>1</sup>                     | $I_{\text{max}}$ |
|         | K (NiCr/Ni)                                          | -250...+1372           | -418...+2501           | $\pm(0.05\% \text{ r }   \text{Setting}  + 0.02)$ | 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 (CU/Cu10)                                          | -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           |                                                   |                  |

<sup>1</sup> Without internal reference junction, relative to fixed external reference temperature and thermovoltage of the thermocouple, internal reference junction: intrinsic error of 2 K, external reference junction: entry of -30 ... 60 °C

Key

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### Multimeter Section

| Meas.<br>Function | Measuring Range     | Resolution at<br>Upper Range<br>Limit |                    | Input impedance                     |                                     | Intrinsic Uncertainty<br>at Highest Resolution<br>under Reference Conditions |                      | Overload<br>Capacity <sup>3)</sup> |           |
|-------------------|---------------------|---------------------------------------|--------------------|-------------------------------------|-------------------------------------|------------------------------------------------------------------------------|----------------------|------------------------------------|-----------|
|                   |                     | 30,000 <sup>1)</sup><br>(60,000)      | 3000 <sup>1)</sup> | DC                                  | AC                                  | ±(...% rdg. + ... d)                                                         | ±(...% rdg. + ... d) | Value                              | Time      |
|                   |                     |                                       |                    |                                     |                                     | DC                                                                           | AC <sup>4) 10)</sup> |                                    |           |
| V                 | 60 mV <sup>2)</sup> | 1 μV                                  |                    | > 20 MΩ                             | —                                   | 0.1 + 10                                                                     | —                    | 300 V<br>DC<br>AC<br>TRMS<br>sine  | Cont.     |
|                   | 300 mV              | 10 μV                                 |                    | > 20 MΩ                             | 9 MΩ // < 50 pF                     | 0.08 + 10                                                                    | 0.5 + 30 (> 500 d)   |                                    |           |
|                   | 3 V                 | 100 μV                                |                    | 11 MΩ                               | 9 MΩ // < 50 pF                     | 0.05 + 10                                                                    | 0.2 + 30 (> 100 d)   |                                    |           |
|                   | 30 V                | 1 mV                                  |                    | 10 MΩ                               | 9 MΩ // < 50 pF                     | 0.05 + 10                                                                    | 0.2 + 30 (> 100 d)   |                                    |           |
|                   | 300 V               | 10 mV                                 |                    | 10 MΩ                               | 9 MΩ // < 50 pF                     | 0.05 + 10                                                                    | 0.2 + 30 (> 100 d)   |                                    |           |
|                   |                     |                                       |                    | Voltage drop at approx. range limit |                                     |                                                                              |                      |                                    |           |
|                   |                     |                                       |                    | DC                                  | AC                                  | DC                                                                           | AC <sup>4) 10)</sup> |                                    |           |
| mA                | 300 μA              | 10 nA                                 |                    | 150 mV                              | 150 mV                              | 0.1 + 15                                                                     | 0.8 + 30 (> 100 d)   | 0.36 A                             | Cont.     |
|                   | 3 mA                | 100 nA                                |                    | 150 mV                              | 150 mV                              | 0.05 + 15                                                                    | 0.5 + 30 (> 100 d)   |                                    |           |
|                   | 30 mA               | 1 μA                                  |                    | 150 mV                              | 150 mV                              | 0.05 + 15                                                                    | 0.5 + 30 (> 100 d)   |                                    |           |
|                   | 300 mA              | 10 μA                                 |                    | 150 mV                              | 150 mV                              | 0.05 + 15                                                                    | 0.5 + 30 (> 100 d)   |                                    |           |
|                   |                     |                                       |                    | Open-circuit voltage                | Measuring current<br>at range limit | ±(...% rdg. + ... d)                                                         |                      |                                    |           |
| Ω                 | 300 Ω               | 10 mΩ                                 |                    | 0.6 V                               | 250 μA                              | 0.1 + 5 <sup>5)</sup>                                                        |                      | 300 V<br>DC<br>AC<br>TRMS<br>sine  | 5 minutes |
|                   | 3 kΩ                | 0.1 Ω                                 |                    | 0.6 V                               | 150 μA                              | 0.1 + 5 <sup>5)</sup>                                                        |                      |                                    |           |
|                   | 30 kΩ               | 1 Ω                                   |                    | 0.6 V                               | 30 μA                               | 0.1 + 5                                                                      |                      |                                    |           |
|                   | 300 kΩ              | 10 Ω                                  |                    | 0.6 V                               | 3 μA                                | 0.2 + 5                                                                      |                      |                                    |           |
|                   | 3 MΩ                | 100 Ω                                 |                    | 0.6 V                               | 360 nA                              | 0.5 + 5                                                                      |                      |                                    |           |
|                   | 30 MΩ               | 1 Ω                                   |                    | 0.6 V                               | 100 nA                              | 2 + 10                                                                       |                      |                                    |           |
| Ω <sup>10)</sup>  | 300 Ω               |                                       | 0.1 Ω              | 3.2 V                               | 1 mA                                | 2 + 5                                                                        |                      |                                    | Max. 10 s |
| →                 | 6 V                 | 1 mV                                  |                    | 7 V                                 | Approx. 1 mA                        | 0.5 + 3                                                                      |                      | 300 V                              | Max. 10 s |
|                   |                     |                                       |                    | Discharge<br>resistance             | U <sub>0</sub> max                  | ±(...% rdg. + ... d)                                                         |                      |                                    |           |
| F                 | 30 nF               |                                       | 10 pF              | 1 MΩ                                | 3 V                                 | 1 + 10 <sup>5) 10)</sup>                                                     |                      | 300 V<br>DC<br>AC<br>TRMS<br>sine  | 5 minutes |
|                   | 300 nF              |                                       | 100 pF             | 100 kΩ                              | 3 V                                 | 1 + 6 <sup>5) 10)</sup>                                                      |                      |                                    |           |
|                   | 3 μF                |                                       | 1 nF               | 12 kΩ                               | 3 V                                 | 1 + 6 <sup>10)</sup>                                                         |                      |                                    |           |
|                   | 30 μF               |                                       | 10 nF              | 12 kΩ                               | 3 V                                 | 1 + 6 <sup>10)</sup>                                                         |                      |                                    |           |
|                   | 300 μF              |                                       | 100 nF             | 3 kΩ                                | 3 V                                 | 5 + 6 <sup>10)</sup>                                                         |                      |                                    |           |
|                   |                     |                                       |                    | f <sub>min</sub> <sup>6)</sup>      |                                     | ±(...% rdg. + ... d)                                                         |                      |                                    |           |
| Hz                | 300 Hz              | 0.01 Hz                               |                    | 1 Hz                                |                                     | 0.05 + 5 <sup>7) 10)</sup>                                                   |                      | 300 V                              | Cont.     |
|                   | 3 kHz               | 0.1 Hz                                | 300 V              |                                     |                                     |                                                                              |                      |                                    |           |
|                   | 30 kHz              | 1 Hz                                  | 200 V              |                                     |                                     |                                                                              |                      |                                    |           |
|                   | 300 kHz             | 10 Hz                                 | 10 Hz              | 20 V                                |                                     |                                                                              |                      |                                    |           |

| Meas. Function | Temperature Sensor | Measuring Range                                                      | Resolution | Intrinsic Uncertainty at highest Resolution under Ref. Conditions | OL Capacity <sup>3)</sup>  |       |
|----------------|--------------------|----------------------------------------------------------------------|------------|-------------------------------------------------------------------|----------------------------|-------|
|                |                    |                                                                      |            | $\pm(\dots\% \text{ rdg.} + \dots \text{ d})$ <sup>8)</sup>       | Value                      | Time  |
| °C/°F          | Pt100              | -200.0 ... -100.0 °C<br>-100.0 ... +100.0° C<br>+100.0 ... +850.0° C | 0.1 K      | 0.3 + 10                                                          | 300 V<br>DC<br>RMS<br>sine | 5 min |
|                | Pt1000             | -200.0 ... +100.0° C<br>+100.0 ... +850.0° C                         |            |                                                                   |                            |       |
|                | Ni 100             | -60.0 ... +180.0° C                                                  |            |                                                                   |                            |       |
|                | Ni 1000            | -60.0 ... +180.0 °C                                                  |            |                                                                   |                            |       |
|                | K (NiCr-Ni)        | -250.0... +1372.0° C                                                 |            | 0.2 + 10 <sup>9)</sup>                                            |                            |       |
|                | J (Fe-CuNi)        | -210.0... +1200.0° C                                                 |            |                                                                   |                            |       |
|                | T (Cu-CuNi)        | -270.0... +400.0° C                                                  |            |                                                                   |                            |       |
|                | B (Pt30Rh/ Pt6Rh)  | +0... +1820.0 °C                                                     |            |                                                                   |                            |       |
|                | E (NiCr/CuNi)      | -270.0... +1000.0 °C                                                 |            |                                                                   |                            |       |
|                | R (Pt13Rh/Pt)      | -50.0... +1768.0 °C                                                  |            |                                                                   |                            |       |
|                | N (Cu/Cu10)        | -270.0... +1300.0 °C                                                 |            |                                                                   |                            |       |
|                | S (Pt10Rh/Pt)      | -50.0... +1768.0 °C                                                  |            |                                                                   |                            |       |
|                | J (Fe/CuNi)        | -200.0... +900.0 °C                                                  |            |                                                                   |                            |       |
|                | U (Cu/CuNi)        | -200.0... +600.0 °C                                                  |            |                                                                   |                            |       |

1) Display: 3¼ places for capacitance measurement; a different sampling rate can be selected in the rAtE menu for saving and transmitting measured values.

2) Only manually adjustable

3) At 0° ... + 40° C

4) 20 ... 45 ... 65 Hz ... 1 kHz sine, for alternating voltage TRMS<sub>AC</sub>, see page 4 for influences

5) ZERO is displayed for active "zero balancing" function, maximum correction: 50% rdg.

6) Lowest measurable frequency for sinusoidal measuring signals symmetrical to the zero point

7) Range 60/300 mV~: U<sub>E</sub> ≥ 30% of upper range limit  
3/30/300 V~: U<sub>E</sub> ≥ 10% of upper range limit

8) Plus sensor deviation

9) Without integrated reference junction; with internal reference temperature plus error of ±2 K

10) The limits only apply for battery operation (mains adapter Z218K for multimeter operation in preparation)

### Key

d = digit(s)

MR = measuring range

rdg. = reading (measured value)

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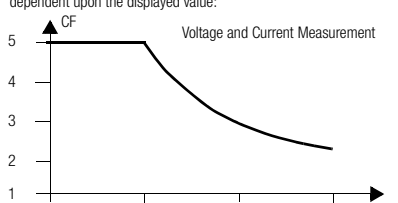
### Influencing Quantities and Influence Error

| Influencing Quantity | Sphere of Influence                 | Measured Quantity / Measuring Range <sup>1)</sup> | Influence Error<br>$\pm (... \% \text{ rdg.} + d)/10 \text{ K}$ |
|----------------------|-------------------------------------|---------------------------------------------------|-----------------------------------------------------------------|
| Temperature          | 0 ... +21 °C<br>and<br>+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                                                          |
|                      |                                     | 30/300 nF/3/30/300 μF                             | 0.5 + 10                                                        |
|                      |                                     | Hz                                                | 0.1 + 10                                                        |
|                      |                                     | °C (RTD)                                          | 0.2 + 10                                                        |
|                      |                                     | <b>Simulator quantity</b>                         |                                                                 |
|                      |                                     | mV/V, °C (TC)                                     | 0.1 + 10                                                        |
|                      |                                     | Ω, °C (RTD)                                       | 0.2 + 10                                                        |
|                      |                                     | mA source                                         | 0.1 + 10                                                        |
|                      |                                     | mA sink                                           | 0.1 + 10                                                        |

<sup>1)</sup> With zero balancing

| Influencing Quantity  | Frequency          | Measured Qty. / Meas. Range | Influence Error <sup>2)</sup><br>$\pm (... \% \text{ rdg.} + d)$ |
|-----------------------|--------------------|-----------------------------|------------------------------------------------------------------|
| Frequency<br>$V_{AC}$ | > 20 Hz ... 45 Hz  | 300.00 mV                   | 2 + 30                                                           |
|                       | > 65 Hz ... 1 kHz  | ...                         |                                                                  |
|                       | > 1 kHz ... 20 kHz | 300.0 V                     | 3 + 30                                                           |

| Influencing Quantity  | Frequency          | Measured Qty. / Meas. Range | Influence Error <sup>2)</sup><br>$\pm (... \% \text{ rdg.} + ... d)$ |
|-----------------------|--------------------|-----------------------------|----------------------------------------------------------------------|
| Frequency<br>$I_{AC}$ | > 20 Hz ... 45 Hz  | 300 μA                      | 2 + 30                                                               |
|                       |                    | 3 mA                        |                                                                      |
|                       | > 65 Hz ... 10 kHz | 30 mA                       | 3 + 30                                                               |
|                       |                    | 300 mA                      |                                                                      |

| Influencing Quantity       | Sphere of Influence                                                                                                                                                                             | Measured Quantity / Measuring Range | Influence Error <sup>2)</sup> |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------|
| Measured Quantity Waveform | Crest Factor CF                                                                                                                                                                                 | 1 ... 2                             | $\pm 1 \% \text{ rdg.}$       |
|                            |                                                                                                                                                                                                 | 2 ... 4                             | $\pm 5 \% \text{ rdg.}$       |
|                            |                                                                                                                                                                                                 | 4 ... 5                             | $\pm 7 \% \text{ rdg.}$       |
|                            | Allowable crest factor CF of the periodic quantity to be measured is dependent upon the displayed value:<br> |                                     |                               |

<sup>2)</sup> Specified error valid as of display values of 10% of the measuring range

| Influencing Quantity | Sphere of Influence | Measured Quantity / Measuring Range | Influence Error           |
|----------------------|---------------------|-------------------------------------|---------------------------|
| Relative Humidity    | 75%                 | V, A, Ω                             | 1 x intrinsic uncertainty |
|                      | 3 days              | F, Hz                               |                           |
|                      | Instrument off      | °C                                  |                           |

| Influencing Quantity             | Sphere of Influence                                                                                         | Measuring Range   | Attenuation<br>$\pm \text{dB}$ |
|----------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------|
| Common mode interference voltage | Interference quantity max. 250 V ~<br>50 Hz, 60 Hz sine                                                     | V $\equiv$        | > 90 dB                        |
|                                  |                                                                                                             | 300 mV ... 30 V ~ | > 80 dB                        |
|                                  |                                                                                                             | 300 V ~           | > 70 dB                        |
| Series-mode interference voltage | Interference quantity V ~, respective nominal value of the measuring range max. 250 V ~, 50 Hz, 60 Hz, sine | V $\equiv$        | > 60 dB                        |
|                                  |                                                                                                             | V ~               | > 60 dB                        |

### Real-Time Clock

|                 |                            |
|-----------------|----------------------------|
| Time format     | DD.MM.YYYY hh:mm:ss        |
| Resolution      | 0.1 s                      |
| Accuracy        | $\pm 1 \text{ min./month}$ |
| Temp. Influence | 50 ppm/K                   |

### Reference Conditions

|                                    |                                                              |
|------------------------------------|--------------------------------------------------------------|
| Ambient temp.                      | +23° C $\pm$ 2 K                                             |
| Relative humidity                  | 40 ... 60%                                                   |
| Measured quantity frequency for AC | 45 ... 65 Hz                                                 |
| Measured quantity waveform for AC  | Sinusoidal, deviation between RMS and rectified value < 0.1% |
| Battery Voltage                    | 3.0 V $\pm$ 0.1 V                                            |

### Response Time (multimeter functions)

Response Time (after manual range selection)

| Measured Quantity / Measuring Range                                                       | Digital Display Response Time | Measured Quantity Jump Function                 |
|-------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------|
| V DC, V AC<br>A DC, A AC                                                                  | 1.5 s                         | From 0 to 80% of upper range limit value        |
| 300 Ω ... 3 MΩ                                                                            | 2 s                           | From $\infty$ to 50% of upper range limit value |
| 30 MΩ                                                                                     | 5 s                           |                                                 |
| Continuity                                                                                | < 50 ms                       |                                                 |
|  1.5 s |                               |                                                 |
| °C Pt100                                                                                  | Max. 3 s                      | From 0 to 50% of upper range limit value        |
| 3 nF ... 30 μF                                                                            | Max. 2 s                      |                                                 |
| > 10 Hz                                                                                   | Max. 1.5 s                    |                                                 |

### Display

LCD panel (65 x 35 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<br>Main display: 12 mm<br>Auxiliary displays: 7 mm |
| Number of places       | 4 $\frac{3}{4}$ places $\triangleq$ 30,999 steps                        |
| Overflow display       | "OL" or "-OL" appears                                                   |
| Polarity display       | "-" sign is displayed if plus pole is connected to "1"                  |

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## Multimeter, Calibrator

LCD Test All display segments available during operation of the **METRACAL MC** are activated after the instrument is switched on.

### Power Supply

Battery 2 ea. 1.5 V mignon cell (AA), alkaline manganese per IEC LR6 or equivalent rechargeable battery

Service life With alkaline manganese (2600 mAh)

| Measuring Function           | Current     | Service Life   |
|------------------------------|-------------|----------------|
| V, Hz, mA, $\Omega$ , F, °C  | 25 mA       | 70 h           |
| Standby (MEM + clock)        | 350 $\mu$ A | Approx. 1 year |
| Calibration Function         |             | Service Life   |
| mV, thermocouple             | 80 mA       | 25 h           |
| 15 V                         | 200 mA      | 10 h           |
| $\Omega$ RTD                 | 130 mA      | 15 h           |
| Sink, 20 mA (25 V)           | 300 mA      | 5 h            |
| Source, 20 mA max. load < 5V | 200 mA      | 10 h           |

Battery test If voltage drops below 1.8 V, the instrument is switched off automatically. Battery capacity display with battery symbol in 4 segments: "▢▢▢▢". Querying of momentary battery voltage via menu function.

Mains Power With NA X-TRA power pack

### Power Saving Circuit

The device is switched off automatically if the measured value remains unchanged for a long period of time, and if none of the controls are activated before a selected period of time in minutes elapses. In the case of the simulator, the output is switched off first, followed by the display one minute later, if no controls have been activated.

Automatic shutdown can be deactivated (**APoFF = ON**).

### Fuses

Fuse links **DMM** (mA current measuring ranges): FF0.63A/400V, 5 mm x 20 mm  
Breaking capacity  $\geq 1.5$  kA at 380 V AC with ohmic load  
**Calibrator:** FF0.63A/400V, 5 mm x 20 mm  
Breaking capacity  $\geq 1.5$  kA at 380 V AC with ohmic load

### Multimeter Electrical Safety

Protection Class II per EN 61010-1:2001/VDE 0411-1:2002  
Measuring category II  
Operating voltage 300 V  
Pollution degree 2  
Test Voltage 2.2 kV~ per EN 61010-1:2001/VDE 0411-1:2002

### Electromagnetic Compatibility (EMC)

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

### 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 meters

### Mechanical Design

Protection IP 65,

Table Excerpt Regarding Significance of IP Codes

| IP XY<br>(1 <sup>st</sup> digit X) | Protection against foreign<br>object entry | IP XY<br>(2 <sup>nd</sup> digit Y) | Protection against the<br>penetration of water |
|------------------------------------|--------------------------------------------|------------------------------------|------------------------------------------------|
| 6                                  | Dust-proof                                 | 5                                  | Jet-water                                      |

Dimensions 200 x 87 x 45 mm  
Weight Approx. 430 g with batteries

### 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 **DMM:** read data  
**Calibrator:** 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.

### Scope of Delivery

- 1 **METRACAL MC** calibrator with 2 batteries per IEC LR6
- 1 KS29 cable set, consisting of 3 measurement cables (1 black, 1 blue, 1 red) with angle plugs / safety plug, test probes and 3 safety caps
- 1 Abbreviated instructions
- 1 CD ROM with operating instructions in English and German, as well as other available languages
- 1 GH-XTRA rubber holster
- 1 DAkkS calibration certificate

# METRACAL | MC

## Multimeter, Calibrator

### Accessories

#### HitBag Cordura Belt Pouch

for **METRAHIT** multimeters (with/without rubber holster) and METRAport



#### HC20 hard case

for multimeter (with/without GH18 rubber holster) and accessories



#### Interface Adapter for USB Connection

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

- Configure the **METRACAL MC** from a PC.
- Read data out of memory from the **METRACAL MC**.

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.



### Order Information

| Description                                                                                                 | Type                   | Article Number |
|-------------------------------------------------------------------------------------------------------------|------------------------|----------------|
| Calibrator, see standard equipment for <b>METRACAL MC</b>                                                   | <b>METRACAL MC</b>     | M245A          |
| <b>Hardware Accessories</b>                                                                                 |                        |                |
| Power pack with broad range input:<br>AC 90 ... 253 V / DC 5 V, 600 V CAT IV                                | NA X-TRA               | Z218G          |
| Power pack with broad range input:<br>AC 90 ... 264 V / DC 5,1 V, 1000 V CAT III<br>low capacitive coupling | NA MULTI <sup>1)</sup> | Z218K          |

| Description                                                                                                                                     | Type                       | Article Number  |
|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------|
| Battery set (4 ea. rechargeable NiMH batteries, 1600 mAh) and charger                                                                           | 1ASi battery set           | Z206B           |
| Probe for voltage measurement in power installations to 1000 V                                                                                  | KS30                       | GTZ3204000R0001 |
| Pt100 temperature sensor for surface and immersion measurements,<br>-40 ... +600° C                                                             | Z3409                      | GTZ3409000R0001 |
| Pt1000 temperature sensor for measurement in gases and liquids,<br>-50 ... +220° C                                                              | TF220                      | Z102A           |
| Pt100 oven sensor, -50 ... +550° C                                                                                                              | TF550                      | GTZ3408000R0001 |
| Ten adhesive Pt100 temperature sensors,<br>-50 ... +550° C                                                                                      | TS Chipset                 | GTZ3406000R0001 |
| Imitation leather carrying pouch for <b>METRAHIT</b>                                                                                            | F829                       | GTZ3301000R0003 |
| Cordura belt pouch for <b>METRAHIT</b> multimeters                                                                                              | HitBag                     | Z115A           |
| Imitation leather ever-ready case with cable compartment                                                                                        | F836                       | GTZ3302000R0001 |
| Ever-ready case for 2 <b>METRAHIT</b> instruments, 2 adapters and accessories                                                                   | F840                       | GTZ3302001R0001 |
| Hard case for one <b>METRAHIT</b> and accessories                                                                                               | HC20                       | Z113A           |
| Hard case for two <b>METRAHIT</b> instruments and accessories                                                                                   | HC30                       | Z113A           |
| Fuse link for mA current measuring ranges                                                                                                       | FF0,63A/400V               | Z109M           |
| Fuse link for calibrator                                                                                                                        | FF0,63A/400V               | Z109M           |
| <b>Software Accessories</b>                                                                                                                     |                            |                 |
| Bidirectional interface adapter, IR-USB                                                                                                         | USB X-TRA                  | Z216C           |
| Calibration software for controlling the <b>METRACAL MC</b> and for analysis of calibration results                                             | METRAwin90-2 <sup>1)</sup> | Z211A           |
| <b>Current Clamp Transformers and Sensors as Accessories <sup>2)</sup></b>                                                                      |                            |                 |
| Current clamp transformer, 1 ... 200 A~, 1000:1, 48...65...400 Hz                                                                               | WZ11A <sup>D)</sup>        | Z208A           |
| WZ12A current clamp transformers and sensors ... <sup>D)</sup><br>Frequency range: 45...65...500 Hz, clamp opening: max cable diameter of 15 mm |                            |                 |
| Current clamp transformer<br>15 A ... 180 A, 1000:1                                                                                             | WZ12A                      | Z219A           |
| Current clamp sensor<br>10 mA ... 100 A; 100 mV/A                                                                                               | WZ12B                      | Z219B           |
| Switchable current clamp sensor,<br>1 mA ... 15 A; 1 mV/mA<br>and 1 A ... 150 A; 1 mV/A                                                         | WZ12C                      | Z219C           |
| Current clamp transformer<br>30 mA ... 150 A, 1000:1                                                                                            | WZ12D                      | Z219D           |

<sup>D)</sup> Data sheet available

<sup>1)</sup> in preparation

<sup>2)</sup> Refer to our Measuring Instruments and Testers catalog for more current clamp transformers and sensors.

For additional information regarding accessories please refer to

- *Measuring Instruments and Testers catalog*
- [www.gossenmetrawatt.com](http://www.gossenmetrawatt.com)

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 GOSSEN METRAWATT

Phone: +49 911 8602-111

Find Quality Products Online at: [www.GlobalTestSupply.com](http://www.GlobalTestSupply.com)

[sales@GlobalTestSupply.com](mailto:sales@GlobalTestSupply.com)