

# METRA HIT 27M and 27I

## Milliohm Resistance Meter and Digital Multimeter, Insulation Tester and Data Logger

3-349-206-03  
3/5.04

- The **METRA HIT 27M** is a compact milliohm resistance meter plus multimeter and thermometer for the measurement of low-value contact resistance on aircraft outer skins (lightning protection, wick test), and for general low-resistance measurements.
- The **METRA HIT 27I** is used additionally for service and repair work performed on airplane and helicopter electrical systems (voltage, insulation, milliohm and temperature measurement). In addition to its own multimeter functions for electrical quantities, the instrument also includes a mega-ohm measuring function with insulation test voltages of 50, 100, 250 and 500 V, as well as temperature measurement with Pt100 and Pt1000 sensors.



### METRA HIT 27M Features

- **All-in-one: milliohm resistance meter, multimeter, insulation tester \* and data logger**  
Compact and rugged for service under harsh conditions and laboratory use, a single device for many applications
- **Kelvin connection (4-wire measurement)**  
Suppresses influence from conductor and contact resistances on measuring results
- **Measuring current can be selected according to the measuring task:**  
Adaptation to various resistance measuring requirements and optimized battery service life
- **DATA Hold**  
For quick, reliable measurement and storage of individual measured values, e.g. voltages at discrete cells in batteries and emergency power supplies
- **Overload protection**  
Protects the instrument in the event of inadvertent connection to mains power
- **DKD calibration certificate as standard feature**  
Reduced operating costs for use within ISO 9000 quality systems, documented traceability
- Battery operation
- The instrument can be operated with optional rechargeable NiMH batteries and charger.

\* With METRA HIT 27I only

### METRA HIT 27I Features

Includes all METRA HIT 27M functions plus:

- **Insulation resistance tester \***  
Testing with 50 to 500 V for components, cables and conductors, for example in aircraft and in on-board electrical systems
- **LCD panel with background illumination \***  
High contrast, even under adverse ambient light conditions
- **Compact and multifunctional**  
Can be used advantageously in aircraft cockpits as well as in other constricted spaces, which would otherwise require the use of several individual instruments.
- **Mains power or battery operation \***  
Furnished with 3 rechargeable NiMH batteries and a charger as standard equipment for optimized instrument availability and low operating costs
- **DKD calibration certificate as standard feature**  
Reduced operating costs for use within ISO 9000 quality systems, documented traceability

# METRA HIT 27M and 27I

## Milliohm Resistance Meter and Digital Multimeter, Insulation Tester and Data Logger

### Applications

The METRA HIT 27 is a compact, rugged and reliable instrument, which is equally suitable for precision measuring and recording tasks in the factory, for on-site service and in the laboratory:

- Adjustment of shunts in instrumentation
- Testing of electrical connections at conductor bars for open-pit mining, in potential bonding systems, and for industrial and household applications
- Testing of cable resistance, wiring, shunt resistors in PCBs and thick-film circuits
- Measurement of contact resistance in relays, contactors and power interrupters
- Testing of resistance in fuses, as well as conductor resistance in heavy current circuits
- Testing of winding resistance in transformers, coils, small motors etc.
- Testing of discharge resistance on aircraft, and at aircraft outer skin components
- Contact resistance testing in uninterruptible power supplies
- Measurement of cell voltages, for example in on-board batteries and emergency power supplies
- Contact resistance testing at welding seams

### General

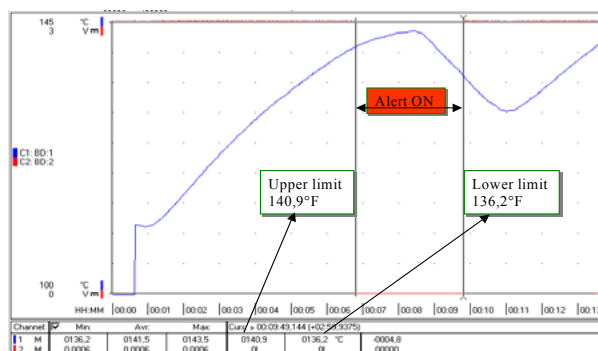
The METRA HIT 27 milliohm resistance meters are the modern alternative for the well known TH2 (Thomson) and Wh2 (Wheatstone) measuring bridges. They provide an expanded measuring range, greater accuracy and easier reading. As universal measuring and test instruments, they acquire and record values to an integrated memory module including resistance in the milliohm and micro-ohm ranges, as well as "normal multimeter resistance values" in the ohm to mega-ohm ranges by feeding a measuring current to the resistor, conductor or contact under test. The respective measuring current is determined by the rotary selector switch setting and lies within a range of 1 to 0.02 A in the milliohm ranges. The instrument also measures and records insulation resistance (METRA HIT 27I only) with test voltage selectable in steps, for example in order to test resistance in on-board electrical systems for aircraft, ocean going vessels etc., and for testing overvoltage arresters and much more.

### Easy Operation

Operation is very easy. Simply connect the low-resistance device under test to the instrument with the included measurement cables, Kelvin clips or 4-pole probes (KC27), and select the ideal measuring range.

### Integrated Measured Value Memory and Interface

Each METRAHit®27 is equipped with a measured value memory module and can thus be utilized as a data logger or a recording instrument for all measuring functions. Measurement results can be transmitted to a PC either off-line via the optical interface which is furnished as standard equipment, or online with an optional bidirectional adapter. In this way, for example, characteristic voltage and temperature curves (see figure below) can be displayed and analyzed in line recorder format relative to real-time, or individual measured values, e.g. voltages for each of the cells in a rechargeable battery, can be saved with the DATA Hold function and analyzed at a PC in tabular form.



METRAWin®10/METRAHit® (software option):

Recorded characteristic temperature curve and triggering characteristics (2-channel recording with 2 METRA HIT instruments) plus evaluation at a PC

### METRAWin®10/METRAHit® Software Option

Measurement data recorded to the measured value memory module can be evaluated at a PC if required with the help of the IR interface supplied as standard equipment and a bidirectional IR adapter (BD adapter) with conversion to the RS 232 protocol. METRAWin®10/METRAHit® software (see above figure) is recommended to this end, and is suitable for display, analysis and documentation of measurement results using Windows® 98, NT, 2000 or XP. The software is available as an accessory. User-friendly complete packages (e.g. the BD Pack or the complete METRA HIT 27AS case) are easy to connect and install and include everything required for high performance measurement data processing.

### Offset Balancing

Automatic offset balancing is provided for the lower measuring ranges. Manual offset balancing, as required with the METRA HIT17 predecessor model, is thus no longer necessary.

### Protection Against Operator Error

The METRA HIT 27 is safeguarded against erroneous short-term connection to devices under test with fault voltages of up to 600 V by means of protective devices.

### Test Functions and Automatic Functions

All METRA HIT 27 instruments are equipped with diode and continuity test functions, as well as automatic and manual measuring range selection and battery shutdown.

### Protective Cover for Harsh Conditions

The device features a very compact, rugged design. Beyond this, it is protected against damage in the event of impacts or dropping by means of a soft rubber cover with tilt stand. The rubber material also assures that the instrument does not wander if it is set up on a vibrating surface.

### Applicable Regulations and Standards

|  |  |
|--|--|
| IEC/EN 61010-1:2001<br>VDE 0411-1:2002 | Safety requirements for electrical equipment for measurement, control and laboratory use |
| EN 60529<br>VDE 0470, Part 1           | Test instruments and test procedures<br>Protecti on provided by enclosures (IP code)     |
| DIN EN 61326<br>VDE 0843 Part 20       | Electrical equipment for measurement, control and laboratory use – EMC requirements      |

# METRA HIT 27M and 27I

## Milliohm Resistance Meter and Digital Multimeter, Insulation Tester and Data Logger

### Characteristic Values

| Measuring Function  | Measuring Range       | Resolution at Upper Range Limit<br>4¾ 30000 / 3¾ 3000 <sup>1)</sup> | Input Impedance         |   | Intrinsic Error at Max. Resolution under Reference Conditions<br>±(... % rdg. + ... d) |                                  | Overload Capacity <sup>3)</sup>  |           |
|---------------------|-----------------------|---|-------------------------|---|--|----------------------------------|----------------------------------|-----------|
|                     |                       |   | DC                      | AC <sup>6)</sup>  | DC   | AC <sup>6)</sup>                 | Value                            | Time      |
| <b>V</b>            | 3 V                   | 100 µV  | 2.1 MΩ                  | 2.1 MΩ // < 50 pF   | 0.1 + 10 <sup>4)</sup>   | 0.2 + 10 (>500 d)                | 600 V<br>DC<br>AC<br>eff<br>sine | Cont.     |
|                     | 30 V                  | 1 mV  | 2.1 MΩ                  | 2.1 MΩ // < 50 pF   | 0.1 + 5  | 0.2 + 10 (>500 d)                |                                  |           |
|                     | 300 V                 | 10 mV   | 2.1 MΩ                  | 2.1 MΩ // < 50 pF   | 0.1 + 5  | 0.2 + 10 (>500 d)                |                                  |           |
|                     | 600 V                 | 100 mV  | 2.1 MΩ                  | 2.1 MΩ // < 50 pF   | 0.1 + 5  | 0.2 + 10 (>500 d)                |                                  |           |
|                     |                       |   | Open-Circuit Voltage    | Measuring Current, Approx.  | ±(... % rdg. + ... d)  |                                  |                                  |           |
| <b>mΩ @1A (4 L)</b> | 3 mΩ                  | 0.001 mΩ  | 3.5 ... 4 V             | 1 A <sup>7)</sup>   | 1 + 10   |                                  | ±0.6 V <sup>11)</sup>            | Cont.     |
|                     | 30 mΩ                 | 0.001 mΩ  | 3.5 ... 4 V             | 1 A <sup>7)</sup>   | 0.5 + 10   |                                  |                                  |           |
|                     | 300 mΩ                | 0.01 mΩ   | 3.5 ... 4 V             | 1 A <sup>7)</sup>   | 0.5 + 10   |                                  |                                  |           |
| <b>mΩ (4 L)</b>     | 30 mΩ                 | 0.01 mΩ   | 3.5 ... 4 V             | 200 mA  | 0.25 + 10  |                                  | ±0.6 V <sup>11)</sup>            | Cont.     |
|                     | 300 mΩ                | 0.01 mΩ   | 3.5 ... 4 V             | 200 mA  |  |                                  |                                  |           |
|                     | 3 Ω                   | 0.1 mΩ  | 3.5 ... 4 V             | 20 mA   |  |                                  |                                  |           |
|                     | 30 Ω                  | 1 mΩ  | 3.5 ... 4 V             | 20 mA   |  |                                  |                                  |           |
| <b>Ω (2 L)</b>      | 300 Ω                 | 10 mΩ   | 3.5 ... 4 V             | 1 mA  | 0.1 + 10 <sup>4)</sup>   |                                  | 600 V<br>DC<br>AC<br>eff<br>sine | max. 10 s |
|                     | 3 kΩ                  | 100 mΩ  | 3.5 ... 4 V             | 100 µA  | 0.1 + 5 <sup>4)</sup>  |                                  |                                  |           |
|                     | 30 kΩ                 | 1 Ω   | 3.5 ... 4 V             | 20 µA   | 0.1 + 5  |                                  |                                  |           |
|                     | 300 kΩ                | 10 Ω  | 3.5 ... 4 V             | 20 µA   | 0.1 + 5  |                                  |                                  |           |
|                     | 3 MΩ                  | 100 Ω   | 3.5 ... 4 V             | 10 µA   | 0.1 + 5  |                                  |                                  |           |
|                     | 30 MΩ                 | 1 kΩ  | 3.5 ... 4 V             | 10 µA   | 1.5 + 10   |                                  |                                  |           |
| <b>Ω)</b>           | 300 Ω                 | 0.1 Ω   | 3 V                     | 1 mA  | 1 + 5  |                                  |                                  |           |
| <b>→+</b>           | 3 V                   | 0.1 mV  | 3 V                     | 1 mA  | 1 + 5  |                                  |                                  |           |
|                     |                       |   | Test Voltage            | Measuring Current   |  |                                  |                                  |           |
| <b>MΩ @ ... V</b>   | 30 MΩ                 | 0.01 MΩ   | 50/100/250/500 V        | < 1.5 mA  | 2 + 10   |                                  | 600 V<br>DC/AC                   | max. 10 s |
|                     | 300 MΩ                | 0.1 MΩ  | 50/100/250/500 V        |   | 2 + 10   |                                  |                                  |           |
|                     | 3000MΩ <sup>10)</sup> | 1 MΩ  | 50/100/250/500 V        |   | 3 + 10   |                                  |                                  |           |
|                     |                       |   | $f_{min}$ <sup>2)</sup> |   | ±(... % rdg. + ... d)  |                                  |                                  |           |
| <b>Hz</b>           | 300 Hz                | 0.01 Hz   | 1 Hz                    |   | 0.05 + 5 <sup>5)</sup>   |                                  | 600 V AC                         | Cont.     |
|                     | 3 kHz                 | 0.1 Hz  |                         |   |  |                                  |                                  |           |
|                     | Temperature Sensor    | Measuring Range   | Resolution              | Intrinsic Error at Max. Resolution under Reference Conditions ±(... % rdg. + ... d) <sup>8)</sup> |  |                                  |                                  |           |
| <b>°C / °F</b>      | Pt 100 <sup>9)</sup>  | -200.0 ... +100.0 °C  | 0.1 °K                  | 1 K + 5   |  | 600 V<br>DC<br>AC<br>eff<br>sine | max. 10 s                        |           |
|                     |                       | +100.0 ... +600.0 °C  |                         | 0.5 + 5   |  |                                  |                                  |           |
|                     | Pt 1000               | -200.0 ... +100.0 °C  |                         | 1 K + 5   |  |                                  |                                  |           |
|                     |                       | +100.0 ... +600.0 °C  |                         | 0.5 + 5   |  |                                  |                                  |           |
|                     | Ni 100                | -60.0 ... +180.0 °C   |                         | 0.5 + 5   |  |                                  |                                  |           |
|                     | Ni 1000               | -60.0 ... +180.0 °C   |                         | 0.5 + 5   |  |                                  |                                  |           |

- 1) Display: 3¾ places in following ranges: 3 mΩ @ 1A, 30 mΩ, Ω), MΩ@...V, a different sampling rate can also 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° to + 40° C
- 4) ZERO is displayed for "zero balancing" function.
- 5) Range 3 V~:  $U_E = 0.15V_{eff/rms} \dots 3 V_{eff/rms}$   
30 V~:  $U_E = 1.5V_{eff/rms} \dots 30 V_{eff/rms}$   
300 V~:  $U_E = 15 V_{eff/rms} \dots 300 V_{eff/rms}$   
600 V~:  $U_E = 300 V_{eff/rms} \dots 600 V_{eff/rms}$   
For voltages > 100 V: power limiting of  $1.8 \cdot 10^6 V \cdot Hz$
- 6) 20 ... 45 ... 65 Hz ... 1 kHz sine, see influences on page 4.
- 7) Pulsating measuring current with interval of T = 1 s
- 8) Plus sensor deviation
- 9) Temperature value is based upon the characteristic curve per EN 60751.
- 10) In the case of high resistance values of greater than 300 MΩ, the capacitive influence of the person performing the measurement or the measurement cable may distort the measured value. Use short or shielded measurement cables for this reason.
- 11) In the event of an overcharge, the integrated FF 1.6 A/1000 V fuse blows.

### Key

rdg. = reading (measured value), R = measuring range, D = digit(s),  
2/4 L = 2/4-wire measurement

# METRA HIT 27M and 27I

## Milliohm Resistance Meter and Digital Multimeter, Insulation Tester and Data Logger

### Influencing Quantities and Influence Error

| Influencing Quantity | Sphere of Influence                  | Measured Quantity / Measuring Range <sup>1</sup> | Influence Error ± (... % rdg. + d) / 10 K |
|----------------------|--------------------------------------|--|---|
| Temperature          | 0 ... +21 °C<br>and<br>+25... +40 °C | V DC   | 0.1 + 5                                   |
|                      |                                      | V AC   | 0.5 + 5                                   |
|                      |                                      | mΩ @ 1 A 4L                                      | 1 + 5                                     |
|                      |                                      | mΩ @ 200 mA 4L                                   | 1 + 5                                     |
|                      |                                      | 300 Ω ... 300 kΩ 2L                              | 0.2 + 5                                   |
|                      |                                      | 3 MΩ 2L  | 0.5 + 5                                   |
|                      |                                      | 30 MΩ 2L   | 1 + 5                                     |
|                      |                                      | Insulation, 30 MΩ ... 3 GΩ                       | 2 + 5                                     |
|                      |                                      | Hz   | 0.1 + 5                                   |
|                      |                                      | °C (RTD)   | 0.5 + 10                                  |

<sup>1</sup> With zero balancing

| Influencing Quantity         | Frequency         | Measured Quantity / Measuring Range | Influence Error <sup>1</sup> ± (... % rdg. + d) |
|------------------------------|-------------------|-------------------------------------|---|
| Frequency<br>V <sub>AC</sub> | > 20 Hz ... 45 Hz | 3 V<br>to<br>600.0 V                | 2 + 10  |
|                              | > 65 Hz ... 1 kHz |                                     |   |

<sup>1</sup> Specified error valid as of display values of 10% of the measuring range

| Influencing Quantity | Sphere of Influence             | Measured Quantity / Measuring Range <sup>1</sup> | Influence Error     |
|----------------------|---------------------------------|--|---------------------|
| Relative Humidity    | 75%<br>3 days<br>instrument off | all measured quantities                          | 1 x intrinsic error |

<sup>1</sup> With zero balancing

| Influencing Quantity             | Sphere of Influence  | Measuring Range | Damping ±dB |
|----------------------------------|--|-----------------|-------------|
| Common Mode Interference Voltage | Interference quantity max. 600 V ~<br>50 Hz, 60 Hz sine  | V DC            | > 90 dB     |
|                                  |  | 30 V ~          | > 80 dB     |
|                                  |  | 300 V ~         | > 70 dB     |
|                                  |  | 600 V ~         | > 60 dB     |
| Series Mode Interference Voltage | Interference quantity: V~,<br>respective nominal value<br>of the measuring range,<br>max. 600 V ~, 50 Hz, 60 Hz sine | V =             | > 60 dB     |
|                                  |  | 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,           | 40 ... 60%   |
| Measured quantity frequency  | 45 ... 65 Hz   |
| Measured quantity wave shape | Sinusoidal, deviation between RMS and rectified value < 0.1% |
| Battery voltage              | 3.6 V ± 0.2 V  |

### Response Time (after manual range selection)

| Measured Quantity / Measuring Range | Response Time for Digital Display | Measured Quantity Step Function          |
|-------------------------------------|-----------------------------------|--|
| V DC, V AC                          | 1.5 s                             | from 0 to 80% of upper range limit value |
| mΩ @ 1 A 4L                         | 2 s                               | from ∞ to 50% of upper range limit value |
| mΩ                                  | 1.5 s                             |  |
| 300 Ω ... 3 MΩ                      | 2 s                               |  |
| 3 GΩ*                               | 5 s                               |  |
| ↔ Continuity                        | < 50 ms                           |  |
| ↔                                   | 1.5 s                             |  |
| °C Pt100                            | max. 3 s                          | from 0 to 50% of upper range limit value |
| >10 Hz                              | 1.5 s                             |  |

\* Without parallel connected capacitance

### 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 displays: 7 mm  
Number of places 4¾ places, ≧ 30999 steps  
Overflow display "OL" appears  
Polarity display "-" sign is displayed if plus pole is connected to ⊥

LCD Test All display segments available during operation of the METRA HIT 27 are activated after the instrument is switched on.

Background illumination METRA HIT 27I only

### Power Supply

Rechargeable batteries METRA HIT 27I (standard):  
3 ea. 1.2 V/1600 mAh NiMH (AA)  
METRA HIT 27M:  
3 ea. 1.5 V mignon, IEC LR6 (AA)

Service life with 1600 mAh NiMH battery set

| Measuring Function    | Current [mA] / 3.6 V | Operating Hours [h] |
|-----------------------|----------------------|---------------------|
| V, Hz, Ω, ↔, °C       | 70                   | 20                  |
| mΩ @ 1A               | 700                  | 2                   |
| mΩ @ 200mA            | 260                  | 5.4                 |
| mΩ @ 20mA             | 85                   | 16.5                |
| MΩ @ ... V / 1 MΩ     | 100                  | 15                  |
| Standby (MEM + clock) | 0.15                 | 6 months            |

Additional consumption for:

Interface operation: 0.5 mA  
LCD illumination: 25 mA at 3.6 V. 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. 3.3 V.  
Battery charging With NA5/600 charging unit (1600 mAh rechargeable battery set: 14 h charging time)

# METRA HIT 27M and 27I Milliohm Resistance Meter and Digital Multimeter, Insulation Tester and Data Logger

## Fuses

|  |  |
|--|--|
| Fuse links for all m $\Omega$ 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 |
| Acoustic Signal                                | For display > 610 V in 600 V range (intermittent tone, 250 ms on/off)                                |

## Electrical Safety

|                      |  |
|----------------------|--|
| Safety class         | II per IEC/EN 61010-1:2001 /VDE 0411-1:2002      |
| Overvoltage category | II   |
| Operating voltage    | 600 V  |
| Fouling factor       | 2  |
| Test voltage         | 3.5 kV~ per IEC/EN 61010-1:2001/ VDE 0411-1:2002 |

## Electromagnetic Compatibility (EMC)

|                       |  |
|-----------------------|--|
| Interference emission | EN 61326: 2002 class B                               |
| Interference immunity | EN 61326: 2002                                       |
|                       | EN 61000-4-2: 1995/A1: 1998                          |
| Feature A:            | 8 kV atmospheric discharge<br>4 kV contact discharge |
|                       | EN 61000-4-3: 1995/A1: 1998                          |
| Feature B:            | 3 V/m  |

## Data Interface

With BD232 interface adapter as accessory:

|                         |  |
|-------------------------|--|
| Data transmission       | Optical via infrared light through the housing                   |
| Type                    | RS 232 C, serial, per DIN 19241                                  |
| Bidirectional baud rate | (read and write)<br>SI232-II: all baud rates<br>BD232: 9600 baud |

## Ambient Conditions

|                     |  |
|---------------------|--|
| Accuracy range      | 0 °C ... +40 °C  |
| Operating temp.     | -10 °C ... +50 °C  |
| Storage temperature | -25 °C ... +70 °C (without batteries)                    |
| Relative humidity   | 40% ... 60%,<br>no condensation allowed                  |
| Elevation           | to 2000 m  |
| Deployment          | Indoors only, except within specified ambient conditions |

## Mechanical Design

|            |  |
|------------|--|
| Protection | Housing: IP 54,<br>Connector jacks: IP 20                                |
| Dimensions | 84 mm x 195 mm x 35 mm   |
| Weight     | Approx. 420 gr. with batteries<br>(without GH18 protective rubber cover) |

## Standard Equipment

### METRA HIT 27M including

- 1 GH18 protective rubber cover with carrying strap
- 3 size AA alkaline manganese batteries
- 1 KS17S measurement cable set
- 1 operating instructions
- 1 abbreviated operating instructions
- 1 DKD calibration certificate

### METRA HIT 27I including

- 1 GH18 protective rubber cover with carrying strap
- 3 size AA rechargeable NiMH batteries
- 1 NA5/600 charging unit
- 1 KS17S measurement cable set
- 1 set of Kelvin clips KC4 (1 set = 2 each)
- 1 abbreviated operating instructions
- 1 operating instructions
- 1 DKD calibration certificate

### METRA HIT 27AS (avionics set) including

- 1 METRA HIT 27I
- 1 GH18 protective rubber cover with carrying strap
- 3 size AA rechargeable NiMH batteries
- 1 NA5/600 charging unit
- 1 KS17S measurement cable set
- 1 set of Kelvin clips KC4 (1 set = 2 each)
- 1 set of Kelvin probes KC27 (1 set = 2 each)
- 1 HC30 hard case
- 1 abbreviated operating instructions
- 1 operating instructions
- 1 BD pack 1 including adapter, cable and METRAWin<sup>®</sup>10/ METRAHit<sup>®</sup> software on floppy disk
- 1 software METRAWin90 on floppy disk
- 1 DKD calibration certificate

## Accessories

### NA5/6000 Charging Unit

Output:

5 V-, max. 600 mA linear controlled, with low residual ripple and coupling capacity for mains input; highly insulated (CAT III/600 V)

Input:

230 V~  $\pm$ 10%; 50/60 Hz

For all countries with a mains voltage between 220 and 240 V which, however, have different mains plugs, we recommend our charging unit in combination with a commercially available mains adapter for Euro plugs.





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### Accessories

(See also table "Order Information" below)

The following accessories, some of which are included as standard equipment, are recommended for use with the METRA HIT 27:

#### Milliohm Measurement with Type KC4 Kelvin Clips

Kelvin clips are suitable for establishing contact between the METRA HIT 27 and low-resistance devices under test. They compensate for influence resulting from cable and contact resistance. The KC4 set includes two clips with insulated, twist-resistant jaws and good clamping action. They can be used for establishing contact with very fine wires, up to rails and rods with a maximum diameter of 15 mm. 4-pole connection is highly advisable for the measurement of values of less than 30  $\Omega$ .



#### Milliohm Measurement with Type KC27 Kelvin Probe

Same usage as KC4, but with two 2 spring loaded steel tips for piercing insulation coatings (e.g. on the outer skin of aircraft) and oxide layers (e.g. at oxidized battery contacts), in order to assure good contact for milliohm measurements, as well as for current and voltage measurements.

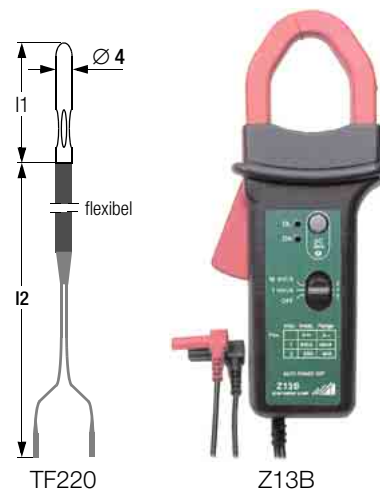


#### Extension Cable VL15



#### Temperature Measurement with TF220 / Current Measurement with Z13B

The TF220 is just one of many temperature sensors which can be selected from a wide ranging product spectrum. For further information regarding temperature and current sensors, as well as other accessories, please refer to our "Measuring Instruments and Testers" catalog or visit [www.gossenmetrawatt.com](http://www.gossenmetrawatt.com)



#### Ever-Ready Cases and Hard Cases

The following hard-shell cases are available:

HC20 with space for one METRA HIT and accessories.

HC30 with space for 2 METRA HIT instruments, one 2-channel PC recording system with software, adapter, cable and accessories.

F836 imitation leather carrying pouch for one METRA HIT and accessories (dimensions: 175 x 210 x 75 mm)

F840 imitation leather carrying pouch for two METRA HIT instruments, 2 adapters and accessories (dimensions: 305 x 285 x 70 mm)



HC20



HC30



F836



F840 (with sample contents)

# METRA HIT 27M and 27I Milliohm Resistance Meter and Digital Multimeter, Insulation Tester and Data Logger

**Cordura belt pouch HitBag**  
for multimeters of the  
METRA HIT and  
METRAport series



**Avionics Set METRA HIT 27AS**



**Recording System with BD Pack**

This option includes all additionally required hardware and software components for creating a PC supported measuring and recording system together with the METRA HIT 27. A full version of METRAwin<sup>®</sup>10/METRAHit<sup>®</sup> is included with this package, which can be run with Windows 95, 98, 2000, NT or XP (see figure on page 2).



**USB-HIT Interface Adapter**

Regarding its functions, this adapter conforms to the BD232 interface adapter, except that the bidirectional transmission takes place between the IR and USB interface.

A commercially available USB-Hub module is required to establish a multi-channel system.



## Order Information

| Description   | Type                           | Article Number     |
|---|--------------------------------|--------------------|
| Milliohm resistance meter and multimeter with memory  | METRA HIT 27M                  | M227A              |
| Insulation tester, milliohm resistance meter and multimeter with memory   | METRA HIT 27I                  | M227B              |
| Avionics set: insulation tester, milliohm resistance meter and multimeter with memory, adapter, software and extensive accessories  | METRA HIT 27AS                 | M227C              |
| <b>Hardware Accessories</b>   |                                |                    |
| Charging unit, 230 V~/5 V, 600 mA   | NA5/600                        | Z218F              |
| Fuses for all mΩ measuring ranges   | FF (UR) 1.6 A/<br>1000 V AC/DC | Z109C              |
| Kelvin clips (1 set = 2 each) for 4-pole connection of low-resistance DUTs, cable length: 120 cm  | KC4                            | Z227A              |
| Kelvin probes (1 set=2 each) with double steel tips for 4-pole connection of low-resistance DUTs  | KC27                           | Z227B              |
| Cable set with 2 mm diameter steel tips and 120 cm cable, 1000 V / CAT III  | KS17S                          | Z110H              |
| Extension cable 1.5 square mm, max. 5 A / 33 V, 15 m long, on reel, for METRA HIT 27, 28C, 30M  | VL15                           | Z110I              |
| Pt1000 temperature sensor, -20 ... +220 °C for measurement in household appliances, as well as in gases and liquids, 3.2 mm diameter stainless steel immersion tube                         | TF220                          | Z102A              |
| <b>Transport Accessories</b>  |                                |                    |
| Imitation leather carrying pouch for METRA HIT  | F829                           | GTZ 3301 000 R0003 |
| Cordura belt pouch for multimeters of the METRA HIT series  | HitBag                         | Z115A              |
| Imitation leather ever-ready case with cable compartment  | F836                           | GTZ 3302 000 R0001 |
| Ever-ready case for 2 METRA HITs, 2 adapters and accessories  | F840                           | GTZ 3302 001 R0001 |
| Hard case for one METRA HIT and accessories   | HC20                           | Z113A              |
| Hard case for two METRA HITs and accessories  | HC30                           | Z113B              |
| <b>Accessories for Operation with PCs</b>   |                                |                    |
| Single-channel pack consisting of METRAHit <sup>®</sup> BD232 bidirectional interface adapter, cable, METRAwin <sup>®</sup> 10/METRAHit <sup>®</sup> software and installation instructions | BD-Pack 1                      | Z215A              |
| Bidirectional interface adapter   | BD232                          | GTZ 3242 100 R0001 |
| Single-channel pack including cable, METRAwin <sup>®</sup> 10/METRAHit <sup>®</sup> software and installation instructions  | Z3231                          | GTZ 3231 000 R0001 |
| RS 232 interface cable, 2 m long (included with Z3231)  | Z3241                          | GTZ 3241 000 R0001 |
| METRAwin <sup>®</sup> 10/METRAHit <sup>®</sup> software update and installation instructions  | Z3240                          | GTZ 3240 000 R0001 |
| Bidirectional interface adapter IR/USB for METRA HITs   | USB-HIT                        | Z216A              |

For further information concerning accessories please refer to

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

# METRA HIT 27M and 27I

## Milliohm Resistance Meter and Digital Multimeter, Insulation Tester and Data Logger

| Current Measuring Accessories  |  |  |                  |                    |                                     |                                  |                                 |                       | Suitable for METRA HIT |          |
|--|--|--|------------------|--------------------|-------------------------------------|----------------------------------|---------------------------------|-----------------------|------------------------|----------|
| All current sensors and transformers are equipped with a connector cable (1.2 to 1.5 m long) with 4 mm safety banana plugs |  |  |                  |                    |                                     |                                  |                                 |                       | 22S/M                  | 23.26S/M |
| Type   | Designation  | Measuring Range                              | Meas. Category   | Max. Wire Dia.     | Transformation Ratio                | Frequency Range                  | Intrinsic Error ±(% rdg. + ...) | Article Number        | 27M/I                  | 28S/29S  |
| <b>AC/DC Current Sensors with Voltage Output</b>   |  |  |                  |                    |                                     |                                  |                                 |                       |                        |          |
| Z201A  | Clip-on current sensor with battery mode (30 h)                          | 0.01 ... 20 A~/30 A-                         | 300 V / CAT III  | 19 mm              | 100 mV / A                          | DC ... 400 Hz<br>... 20 kHz      | 1% + 0.002 A                    | Z201A                 | ●                      | ●        |
| Z202A  | Clip-on current sensor with 2 measuring ranges, battery mode (50 h)      | 0.1 ... 20 A~/30 A-,<br>1 ... 200 A~/300 A-  | 300 V / CAT III  | 19 mm              | 10 mV / A,<br>1 mV / A              | DC ... 2 kHz<br>... 10 kHz       | 1% + 0.03 A,<br>1% + 0.3 A      | Z202A                 | ●                      | ●        |
| Z203A  | Clip-on current sensor with 2 measuring ranges, battery mode (50 h)      | 1 ... 200 A~/300 A-,<br>1 ... 1000 A~/A-     | 300 V / CAT III  | 31 mm              | 1 mV / A                            | DC ... 10 kHz                    | 1% + 0.5 A                      | Z203A                 | ●                      | ●        |
| Z13B   | Clip-on current sensor with 2 measuring ranges, battery mode (50 h)      | 0.2 ... 40 A~/60 A-,<br>0.5 ... 400 A~/600A- | 300 V / CAT IV   | 50 mm              | 10 mV / A,<br>1 mV / A              | DC ... 65 Hz<br>... 10 kHz       | 1.5% + 0.5 A<br>2.5%            | Z13B                  | ●                      | ●        |
| <b>AC Current Sensors with Voltage Output</b>  |  |  |                  |                    |                                     |                                  |                                 |                       |                        |          |
| WZ12B  | Clip-on current sensor   | 10 mA~ ... 100 A~                            | 300 V / CAT III  | 15 mm              | 0.1 mV / mA                         | 45 ... 65<br>... 500 Hz          | 1.5% + 0.1 mA                   | Z219B                 | ●                      | ■        |
| WZ12C  | Clip-on current sensor with 2 measuring ranges                           | 1 mA~ ... 15 A~,<br>1 ... 150 A~             | 300 V / CAT III  | 15 mm              | 1 mV / mA,<br>1 mV / A              | 45 ... 65<br>... 400 Hz          | 3% + 0.15 mA,<br>2% + 0.1 A     | Z219C                 | ●                      | ■        |
| WZ11B  | Clip-on current sensor with 2 measuring ranges                           | 0.5 ... 20 A~,<br>5 ... 200 A~               | 600 V / CAT III  | 20 mm              | 100 mV / A,<br>10 mV / A            | 30 ... 48 ... 65<br>... 500 Hz   | 1 ... 3%                        | Z208B                 | ●                      | ■        |
| Z3512A   | Clip-on current sensor with 4 measuring ranges                           | 1 mA ... 1/10 A~<br>100/1000 A~              | 600 V / CAT III  | 52 mm              | 1 V/A, 100 mV/A,<br>10 mV/A, 1 mV/A | 10 ... 48 ... 65<br>... 3 kHz    | 0.5 ... 3%,<br>0.2 ... 1%       | Z225A                 | ●                      | ■        |
| AF033A   | AmpFLEX flexible current sensor with 2 measuring ranges, battery (150 h) | 5 ... 30 A~,<br>5 ... 300 A~                 | 1000 V / CAT III | Length:<br>600 mm  | 100 mV / A,<br>10 mV / A            | 10 ... 100 Hz<br>... 20 kHz      | 1% + 0.5 A,<br>1% + 0.5 A       | Z207A                 | ▲                      | ■        |
| AF11A  | AmpFLEX flexible current sensor, battery (150 h)                         | 5 ... 1000 A~                                | 1000 V / CAT III | Length:<br>450 mm  | 1 mV / A                            | 10 ... 100 Hz<br>... 20 kHz      | 1% + 2 A                        | Z207D                 | ▲                      | ■        |
| AF33A  | AmpFLEX flexible current sensor with 2 measuring ranges, battery (150 h) | 5 ... 300 A~,<br>5 ... 3000 A~               | 1000 V / CAT III | Length:<br>900 mm  | 10 mV / A,<br>1 mV / A              | 10 ... 100 Hz<br>... 20 kHz      | 1% + 0.5 A,<br>1% + 2 A         | Z207B                 | ▲                      | ■        |
| AF101A   | AmpFLEX flexible current sensor with 2 measuring ranges, battery (150 h) | 5 A~... 1 k A~,<br>50 A~... 10 k A~          | 1000 V / CAT III | Length:<br>1200 mm | 1 mV / A,<br>0.1 mV / A             | 10 ... 100 Hz<br>... 20 kHz      | 1% + 2 A,<br>1% + 10 A          | Z207C                 | ▲                      | ■        |
| <b>AC Current Transformers with Current Output</b>   |  |  |                  |                    |                                     |                                  |                                 |                       |                        |          |
| WZ12A  | Clip-on current transformer  | 15 ... 180 A~                                | 300 V / CAT III  | 15 mm              | 1 mA / A                            | 45 ... 65<br>... 400 Hz          | 3%                              | Z219A                 | —                      | ■        |
| WZ12D  | Clip-on current transformer  | 30 mA ... 150 A~                             | 300 V / CAT III  | 15 mm              | 1 mA / A                            | 45 ... 65<br>... 500 Hz          | 2.5% + 0.1 mA                   | Z219D                 | —                      | ●        |
| WZ11A  | Clip-on current transformer  | 1 ... 200 A~                                 | 600 V / CAT III  | 20 mm              | 1 mA / A                            | 48 ... 65<br>... 400 Hz          | 1 ... 3%                        | Z208A                 | —                      | ●        |
| Z3511  | Clip-on current transformer  | 4 ... 500 A~                                 | 600 V / CAT III  | 30 x 63 mm         | 1 mA / A                            | 48 ... 65<br>... 1 kHz           | 3% + 0.4 A                      | GTZ 3511<br>000 R0001 | —                      | ●        |
| Z3512  | Clip-on current transformer  | 0.5 ... 1000 A~                              | 600 V / CAT III  | 52 mm              | 1 mA / A                            | 30 ... 48 ...<br>65<br>... 5 kHz | 0.5% ... 0.7%                   | GTZ 3512<br>000 R0001 | —                      | ●        |
| Z3514  | Clip-on current transformer  | 1 ... 2000 A ~                               | 600 V / CAT III  | 64 x 150 mm        | 1 mA / A                            | 30 ... 48 ...<br>65<br>... 5 kHz | 0.5% + 0.1 A                    | GTZ 3514<br>000 R0001 | —                      | ●        |
| <b>Shunt Resistors for Multimeters without Current Measuring Function</b>  |  |  |                  |                    |                                     |                                  |                                 |                       |                        |          |
| NW300mA  | Plug-in shunt resistor, encapsulated                                     | 0 ... 300 mA                                 | 300 V / CAT III  | —                  | 1 mV / mA                           | DC ... 10 kHz                    | 0.5%                            | Z205C                 | ▲                      | —        |
| NW3A   | Plug-in shunt resistor, encapsulated                                     | 0 ... 3 A                                    | 300 V / CAT III  | —                  | 100 mV / A                          | DC ... 10 kHz                    | 0.5%                            | Z205B                 | ▲                      | —        |

● Without restriction    ■ Not for power measurement with METRA HIT 29S    ▲ Not for METRA HIT 27M/I

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