

METRA HIT | 27EX

Milliohmmeter

for Use in Potentially Explosive Atmospheres

3-349-335-03
2/1.07

Compact milliohmmeter for the measurement of low value contact resistance in potentially explosive atmospheres, for example at contacts inside aircraft fuel tanks (bonding test), as well as for general low value resistance measurements inside and outside of potentially explosive atmospheres, for example on aircraft outer skins (lightning protection and wick test)

- **Measuring ranges:** 30 mΩ, 300 mΩ, 3 Ω, 30 Ω
- **Resolution:** 10 μΩ
- **Measuring method:** Kelvin connection (4-wire measurement)
- **DATA Hold memory:** 1200 measured values
- **EX designation:** Ex II 2 G EEx ia IIA T4
- **Prototype test certificate:** INERIS 05ATEX0040
- **DKD calibration certificate**
- **Included accessories:** Kelvin probe, Kelvin clip, NiMH batteries, protective rubber cover, hard case
- **Guarantee:** 3 years material and workmanship, 1 to 3 years for calibration (depending upon application)



DKD Calibration Certificate
DIN EN ISO/IEC 17025



Features

- **Indicator Displays**
LCD panel: 4¾-place display for measured values, two auxiliary displays for special functions, background illumination, LCD test and overload display
2 LEDs : red and green, for evaluating contact quality
- **Kelvin Connection (4-wire measurement)**
Suppresses influence from conductor and contact resistance on measuring results
- **Offset Balancing**
In the lower measuring ranges an automatic offset balancing is conducted by thermovoltage compensation.
- **DATA Hold**
For quick, reliable measurement and storage of individual measured values
- **Auto-Ranging**
The instrument is equipped with automatic and manual measuring range selection
- **Power Supply**
The instrument is operated with two Ex approved rechargeable NiMH batteries.
Power management: If none of the keys are actuated for a lengthy period of time, the milliohmmeter is shut down automatically. The instrument is also shut down automatically if the minimum voltage required to perform the selected measurement is fallen short of.
- **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.

Applications

The **METRA HIT | 27EX** 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. The instrument is certified for use in potentially explosive atmospheres in accordance with Ex II 2 G EEx ia IIA T4.

- Adjustment of shunts in instrumentation
- Testing of electrical connections at conductor bars for open-pit mining, in potential bonding systems, in industry and in 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 power current circuits
- Testing of coil 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
- Contact resistance testing at welding seams

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General

The **METRA HIT | 27EX** milliohm resistance meter is the modern alternative to the well known TH2 (Thomson) and Wh2 (Wheatstone) measuring bridges. It provides an expanded measuring range, greater accuracy and easier reading. As a universal measuring instrument, it acquires resistance values by feeding a test current through the respective resistor, conductor or contact, and records them to its integrated memory module.

Easy Operation

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

Integrated Measured Value Memory and Interface

The **METRA HIT | 27EX** is equipped with a measured value memory module and can be utilized as a data logger or a recording instrument. 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, characteristic curves can be displayed and analyzed in line recorder format relative to real time, or individual measured values can be saved with the DATA Hold function and analyzed at a PC in tabular form.

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[®] or **METRA | VIEW** software is recommended to this end, which 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) are easy to connect and install and include everything required for high performance measurement data processing.

Applicable Regulations and Standards

IEC/EN 61 010-1:2001 VDE 0411-1:2002	Safety requirements for electrical equipment for measurement, control and laboratory use
EN 60529 VDE 0470, part 1	Test instruments and test procedures Degrees of protection provided by enclosures (IP code)
DIN EN 61 326 VDE 0843, part 20	Electrical equipment for control technology and laboratory use – EMC requirements
DIN EN 50020:2002	Electrical equipment for potentially explosive atmospheres – intrinsically safe: "i"

Included

- 1 **METRA HIT | 27EX**
- 1 GH18 protective rubber cover (blue) including carrying strap
- 8 Ex approved rechargeable NiMH batteries
- 1 KC27 Kelvin probe (1 ea. – not a set)
- 1 KC4 Kelvin clip (1 ea. – not a set)
- 1 HC30 hard case
- 1 DKD calibration certificate
- 1 Ex certificate: INERIS 05ATEX0040
- 1 set operating instructions

Characteristic Values

Measuring Function	Measuring Range	Resolution at Upper Range Limit	Open-Circuit Voltage, Approx.	Meas. Current, Approx.
		4¾ 30000 / 3¾ 3000 ¹⁾		
mΩ (4 L)	30 mΩ	0.01 mΩ	3.3 ... 4,6 V	100 mA
	300 mΩ	0.01 mΩ		100 mA
	3 Ω	0.1 μW		10 mA
	30 Ω	1 mΩ		10 mA

- ¹⁾ Display
 4¾-place in the 300 mΩ, 3 Ω and 30 Ω ranges
 3¾-place in the 30 mΩ range
 A different sampling rate and can also be selected in the rAtE menu for saving and transmitting measured values.

Measuring Function	Intrinsic Error at Max. Resolution under Reference Conditions ±(% rdg. + ... d)		Overload Capacity ²⁾	
	Value	Time	Value	Time
mΩ (4 L)	30 mΩ	2 + 20	±0.6 V ³⁾	Continuous
	300 mΩ	1 + 20		
	3 Ω	1 + 10		
	30 Ω	1 + 10		

- ²⁾ At 0° ... + 40° C
³⁾ The integrated 500 mA / 600 V~ fuse blows in the event of overloading (terminals I+, I-).

Key

rdg. = reading (measured value), d = digit(s), 4 L = 4-wire measurement

Influencing Quantities and Influence Error

Influencing Quantity	Sphere of Influence	Measuring Range ¹⁾	Influence Error ± (... % rdg. + d)/10 K
Temperature	0 ... +21° C and +25 ... +40° C	mΩ, Ω	1 + 10

- ¹⁾ With zero balancing

Influencing Quantity	Sphere of Influence	Measuring Range ¹⁾	Influence Error
Relative Humidity	90% 3 days instrument off	All measuring ranges	1 x intrinsic error

- ¹⁾ With zero balancing

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%
 Battery voltage 5.0 V ± 0.1 V

Response Time

Response Time (after manual range selection)

Measuring Range	Response Time Digital Display	Measured Quantity Waveshape
mΩ, Ω	1.5 s	From ∞ to 50% of upper range limit value

- * Without parallel connected capacitance

Milliohmmeter for Use in Potentially Explosive Atmospheres

Indicator Displays

LCD panel (65 x 30 mm) with display of up to 2 measured values, unit of measure and various special functions.

Display / char. height 7-segment characters
Main display: 12 mm
Auxiliary displays: 7 mm

Number of places 4¾-place \geq 30,999 steps

Overflow display "D. L" appears

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

Background illumination can be switched on and off

OK LED (green) lights up to indicate good contact at the measuring point

Error LED (red) lights up to indicate interrupted test current (invalid measurement, poor contact when „D. L“ appears)

Power Supply

Rechargeable batteries 4 ea. 1.2 V NiMH batteries (size AA) (> 2100 mAh), EX approved, SANYO Twicell (cell type: HR-3U) (article no. Z206E)

Service life with 2300 mAh NiMH battery set

Measuring Function	Number of measurements *
mΩ at 100 mA	> 150
Ω at 10 mA	> 250

* 1 measuring cycle = 5 s

Additional consumption for:

Interface operation: 0.5 mA

LCD illumination: 36 mA at 4.8 V

Battery test mΩ range at 100 mA:
Automatic display of the \rightarrow symbol when battery voltage falls below approx. 4.6 V. Instrument is shut down at less than 4.3 V.

Charging time 1.1 hours at 2300 mA with C-200 NiCd / NiMH charger from Cellon (article no. Z206D) class T4 at 50° C

Fuses

Fuse link
F1 for mΩ / Ω ranges 500 mA / 600 V AC, switching capacity: 60 A at 600 V AC

F2 for batteries 250 mA / 125 V AC EX

Electrical Safety

Safety class II per IEC/EN 61010-1:2001 / VDE 0411-1:2002

Measuring category 50 V CAT I

Fouling factor 2

Test voltage 500 V~ per EN 50020:2002

EX designation Ex II 2 G EEx ia IIA T4
Ex = type tested
II = device group
2 = device category
G = atmosphere (gas)
EEx = conforms with European Ex standards
ia = explosion protection (intrinsically safe)
IIA = explosion group
T4 = temperature class

Tamb. = -10° C ... +50° C
(Tamb. = ambient temperature)

Prototype test certificate INERIS 05ATEX0040
INERIS = test and certification authority
05 = year
ATEX = directive (atmosphere, explosive)
0040 = test report no. 40

Electromagnetic Compatibility (EMC)

Interference emission EN 61326:2002 class B

Interference immunity EN 61326:2002
IEC 61000-4-2:1995/A1:1998
Feature A:
8 kV atmospheric discharge
4 kV contact discharge
IEC 61000-4-3:1995/A1:1998
Feature B:
3 V/m

Data Interface

Data transmission (data transfer) Bidirectional, optical via infrared light through the housing (read data and configure parameters)

With interface adapter as accessory

BD232 IR to RS 232C, serial, per DIN 19241, can be cascaded for multi-channel operation

USB-HIT IR to USB 1.1 / USB 2.0, single-channel operation

Baud rate (MM ↔ PC) 9600 baud

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 45% ... 90%, no condensation allowed

Elevation to 2000 m

Mechanical Design

Protection IP 54

Table Excerpt Regarding Significance of the IP Code

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

Dimensions 84 x 195 x 35 mm

Weight Approx. 380 g with batteries (without GH18 protective rubber cover)

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Accessories

(See also table below: "Order Information".)

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

Milliohm Measurement with KC4 Kelvin Clips

Kelvin clips are suitable for establishing contact between the METRA HIT | 27EX 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, right on up to rails and rods with a maximum diameter of 15 mm.

4-pole connection is highly advisable for measuring values of less than 30 Ω.



Milliohm Measurement with KC27 Kelvin Probe

Same application as KC4, but with 2 spring-loaded steel tips each for piercing insulation coatings (e.g. on aircraft outer skins) and oxide layers (e.g. at oxidized battery contacts) in order to assure good contact for milliohm measurements.



Z206D Quick Charger for NiMH Batteries

Microprocessor controlled, quick charger for 1 to 4 rechargeable type AA or AAA (micro or mignon) NiMH or NiCd batteries with power pack for 100 to 240 V AC and a 10 to 15 V DC cable for charging automotive batteries.

A set of 4 spare rechargeable batteries for potentially explosive atmospheres is available as an accessory (article no. Z206E, NiMH, size AA, 2300 mAh).

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, for example, 2 METRA HIT | s, one 2-channel PC recording system with software, adapter, cable and accessories.



HitBag Cordura Belt Pouch
For METRA HIT |
and METRAport



for Use in Potentially Explosive Atmospheres

Accessories for Operation with PCs

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 | 27EX**. A full version of METRAWin[®]10/ METRAHit[®] is included with this package, which can be run with Windows 98, 2000, NT or XP.



USB-HIT Interface Adapter

This adapter is functionally identical to the BD232 interface adapter, except that bidirectional transmission takes place between the IR and the USB interfaces in this case.



USB-Pack

Set consisting of USB-HIT interface adapter, USB cable and METRAWin 10 / METRAHit software.

Software METRA | VIEW

The **METRA | VIEW** PC software is a multilingual measurement data logging program for time-related recording, visualizing, evaluating and documenting measured values from the multimeters of the **METRAHIT |** series.

Communications between the PC and the measuring instrument(s) is established via the bidirectional interface adapter IR/USB.

Depending upon device type, one or several of the following operating types are possible:

A demo software with restricted functions is enclosed with the instrument or can be downloaded from the internet.

Configuration of the Measuring Instrument

Remote configuration and querying of device-specific functions and parameters such as measuring function, measuring range and memory parameters:

- start/stop recording, delete memory,
- display of memory occupancy
- setting of recording speed in 3 groups
 - 0.1 ... 50 seconds
 - 1 ... 50 minutes
 - 1 ... 9 hours

as a function of time per measured value.

Online Recording of Measurement Data

Read-in, display and recording of momentarily measured data from the interconnected device.

- Number of measuring channels maximum of 4 (further channels in preparation)
- Start of recording manual or triggered by measured value
- 0.1 s/measurement ... 5 min/measurement
- max. 2,000 measurements/channel
- Recording:** consecutive no., measuring duration, measured value and measurement quantity, recording either in text file or Excel format.

Reading Out Stored Data

Read-out and display of the measurement data recorded to the device's memory and filing as a text file.

Display of Measured Values (Online Measurement)

- Display of measured value, measuring quantity and range in numeric decimal values (see figure 1, left-hand side)
- scalable representation in the form of 1, 2 or 4 measuring mechanisms (see figure 1, right-hand side). Each measuring mechanism can also be shown as a full-frame display
- Print-out of measuring mechanism diagram.
- Parallel display and recording of 4 measuring channels as storable data table, see figure 1, middle section (date, time of measurement, measured value, measuring quantity, measuring range)
- Bargraph display (bargraph indicator) either for channel 1, 2, 3 or 4 with adjustable filter function (see figure 1, bottom)



Figure 1: 1-channel display with table, view of measuring mechanism and bargraph with filter function

Graphic Display

Upon keystroke, a stored data table can easily be converted into a chart with the following features:

- scalable scope representation of a maximum of 4 channels
- selectable sampling rate and scalings
- Choice of background and chart colour
- „Line thickness“ can be switched between normal/bold.

The chart can subsequently be stored as a bmp file or printed out.

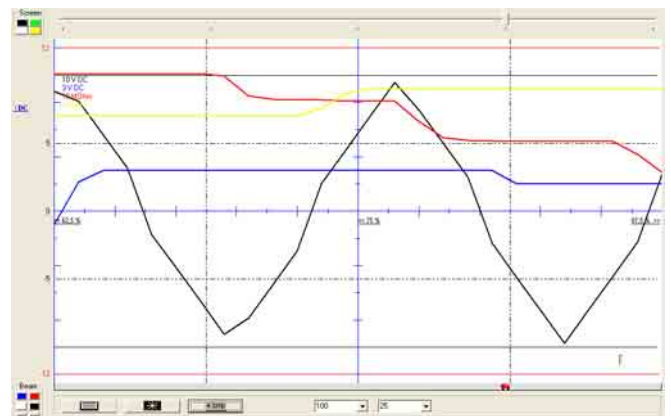


Figure 2: 4-channel graphic display

Order Information

Description	Type	Article Number
Milliohmmeter for use in potentially explosive atmospheres	METRA HIT 27EX	M227D
Hardware Accessories		
Quick charger without batteries	Z206D	Z206D
4 rechargeable NiMH batteries (EX approved, SANYO Twicell)	Z206E	Z206E
Kelvin clips (1 set of 2 ea.) for 4-pole connection of low-resistance DUTs, cable length: 120 cm	KC4	Z227A
Kelvin probes (1 set of 2 ea.) 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 and 30M	VL15	Z110I
Transport Accessories		
Cordura belt pouch for multimeters METRA HIT 	HitBag	Z115A
Hard case for one METRA HIT and accessories	HC20	Z113A
Hard case for two METRA HIT s and accessories	HC30	Z113A
Accessories for Operation at a PC		
Single-channel pack consisting of BD232 bidirectional interface adapter, cable, METRAwin [®] 10/METRAHit [®] software and installation instructions	BD-Pack 1	Z215A
Bidirectional interface adapter	BD232	GTZ 3242 100 R0001
RS 232 interface cable, 2 m (included with Z3231)	Z3241	GTZ 3241 000 R0001
METRAwin [®] 10/METRAHit [®] software update and installation instructions	Z3240	GTZ 3240 000 R0001
IR-USB bidirectional interface adapter for METRA HIT 	USB-HIT	Z216A
Set consisting of interface adapter USB-HIT, USB cable and METRAwin [®] 10/METRAHit [®] software	USB-Pack	Z216B
METRA VIEW software	METRA VIEW	Z211G

For additional information regarding accessories please see:

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