

# METRA HIT | 27EX

## Milliohmmeter

### for Use in Potentially Explosive Atmospheres

3-349-335-03  
1/9.06

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**  
Automatic offset balancing for the lower measuring ranges.
- **DATA Hold**  
For quick, reliable measurement and storage of individual measured values
- **Auto-Ranging**  
Equipped with automatic and manual 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

#### 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<sup>®</sup>10/METRAHit<sup>®</sup> 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<sup>®</sup>10/METRAHit<sup>®</sup> 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) 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 <sup>1)</sup>		
mΩ (4 L)	30 mΩ	0.01 mΩ	3.3 ... 4.2 V	100 mA
	300 mΩ	0.01 mΩ		100 mA
	3 Ω	0.1 μW		10 mA
	30 Ω	1 mΩ		10 mA

<sup>1)</sup> 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 <sup>2)</sup>		
		Value	Time	
mΩ (4 L)	30 mΩ	±0.6 V <sup>3)</sup>	Continuous	
	300 mΩ			2 + 20
	3 Ω			1 + 20
	30 Ω			1 + 10

<sup>2)</sup> At 0° ... + 40° C

<sup>3)</sup> 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 <sup>1)</sup>	Influence Error ± (... % rdg. + d)/10 K
Temperature	0 ... +21° C and +25 ... +40° C	mΩ, Ω	1 + 10

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

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

<sup>1)</sup> 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 4.8 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 "0. 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

**Power Supply**

Rechargeable batteries 4 ea. 1.2 V NiMH batteries (size AA) (> 2100 mAh), EX approved, SANYO Twicell (cell type: HR-3U)

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. 4.4 V. Instrument is shut down at less than 4.2 V.

Charging time 1.1 hours at 2300 mA with C-200 NiCd / NiMH charger from Cellon (order 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 <sup>st</sup> digit X)	Protection against penetration by solid particles	IP XY (2 <sup>nd</sup> 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)

# METRA HIT | 27EX

## Milliohmmeter

### for Use in Potentially Explosive Atmospheres

#### 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 HITs, one 2-channel PC recording system with software, adapter, cable and accessories.



#### HitBag Cordura Belt Pouch

For METRA HIT and METRAport



#### 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 95, 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

# METRA HIT | 27EX

## Milliohmmeter

### for Use in Potentially Explosive Atmospheres

#### Order Information

Description	Type	Article Number
Milliohmmeter for use in potentially explosive atmospheres	METRA HIT   27EX	M227D
<b>Hardware Accessories</b>		
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
<b>Transport Accessories</b>		
Cordura belt pouch for multimeters METRA HIT	HitBag	Z115A
Hard case for one METRA HIT and accessories	HC20	Z113A
Hard case for two METRA HITs and accessories	HC30	Z113A
<b>Accessories for Operation at a PC</b>		
Single-channel pack consisting of 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 (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
IR-USB bidirectional interface adapter for METRA HIT	USB-HIT	Z216A

For additional information regarding accessories please see:

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

Prepared in Germany • Subject to change without notice • PDF version available on the Internet

**GMC-I**  **GOSSEN METRAWATT**

GMC-I Gossen-Metrawatt GmbH  
Thomas-Mann-Str. 16-20  
90471 Nürnberg • Germany

Phone: +49-(0)-911-8602-111  
Fax: +49-(0)-911-8602-777  
E-Mail: [info@gossenmetrawatt.com](mailto:info@gossenmetrawatt.com)  
[www.gossenmetrawatt.com](http://www.gossenmetrawatt.com)