GOSSEN METRAWATT

METRA HIT | 27EX
Milliohmmeter
for Use in Potentially Explosive Atmospheres

3-349-335-03
6/8.14

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 Ex ia IIA T4 Gb
- **Prototype test certificate**: INERIS 05ATEX0040
- **DAkkS calibration certificate**
- **Included accessories**: Kelvin probe, Kelvin clip, batteries, protective rubber holster, hard case
- **Guarantee**: 3 years material and workmanship, 1 to 3 years for calibration (depending upon application)

DAkkS
German Accreditation Body
D-K-15080-01-01
DAkkS Calibration Certificate as Standard Feature

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 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 protective rubber holster 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 Ex ia IIA T4 Gb.

- 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.

METRAwin10/METRA*Hit* 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.
METRAwin10/METRA*Hit* software is recommended to this end, which is suitable for display, analysis and documentation of measurement results using Windows XP, VISTA or 7. 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 61010-1:2010 VDE 0411-1:2011	Safety requirements for electrical equipment for measurement, control and laboratory use
EN 60529 VDE 0470, part 1	Test instruments and test procedures Degrees of protection provided by enclosures (IP code)
DIN EN 61326-1 VDE 0843-20-1	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
DIN EN 60079-0:2013 VDE 170-01	Electrical apparatus for explosive gasatmosphere, general requirements
DIN EN 60079-11:2012 VDE 170-7	Explosive atmosphere

Included

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

Characteristic Values

Measuring Function	Measuring Range	Resolution at Upper Range Limit 4¾ 30000 / 3¾ 3000 [1]	Open-Circuit Voltage, Approx.	Meas. Current, Approx.
mΩ (4 L)	30 mΩ	0.01 mΩ	4 … 6 V	100 mA
	300 mΩ	0.01 mΩ		100 mA
	3 Ω	0.1 mΩ		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
mΩ (4 L)	30 mΩ	2 + 20	±0.6 V [3]	Continuous
	300 mΩ	1 + 20 [4]		
	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–).
[4] Valid as of 10% of measuring range

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

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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 ≙ 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 (invalid measurement, poor contact when „0. L" appears)

Power Supply

Batteries	4 x 1,5 V PhilipsLonglife R6L4B (AA-Size)

Service life

Measuring Function	Number of measurements *
mΩ at 100 mA	> 500
Ω at 10 mA	> 800

* 1 measuring cycle = 5 s

Additional consumption for:

Interface operation:	0.5 mA
LCD illumination:	40 mA at 6 V
Battery test	mΩ range at 100 mA: Automatic display of the ⊣ symbol when battery voltage falls below approx. 4.6 V. Instrument is shut down at less than 4.3 V.

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 61010-1:2010 /VDE 0411-1:2011
Measuring category	50 V CAT I
Pollution degree	2
EX designation	CE 0080 Ex II 2 G Ex ia IIA T4 Gb Ex = type tested II = device group 2 = device category G = atmosphere (gas) Ex = conforms with European Ex standards ia = explosion protection (intrinsically safe) IIA = explosion group T4 = temperature class Gb = Equipment Protection Level (EPL)

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/ Interference immunity	EN 61326:2006 Tab A1

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 (1st digit X)	Protection against penetration by solid particles	IP XY (2nd 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 holster)

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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.

Ever-Ready Cases and Hard Cases

The following hard-shell cases are available:

HC20 with space for one **METRAHIT** | and accessories.

HC30 with space for, for example, 2 **METRAHIT** | s, one 2-channel PC recording system with software, adapter, cable and accessories.

HC20

HC30

HitBag Cordura Belt Pouch

For **METRAHIT** |
and METRAport

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 METRAwin10/ METRA*Hit* is included with this package, which can be run with Windows XP VISTA or 7.

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.

METRAwin10/METRA*Hit* Software

METRAwin10/METRA*Hit* PC software is a multilingual, measurement data logging program for recording, visualizing and documenting measured values from **METRA HIT | 27EX** multimeters.

Communication between the PC and the measuring instrument(s) is established via available interfaces and memory adapters. Telephone modems can be interconnected as well.

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

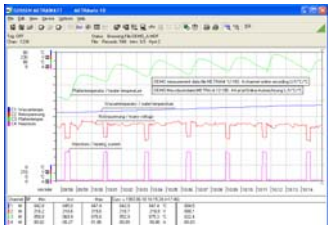
- **Device Configuration**
  Remote configuration and querying of device-specific functions and parameters, for example measuring function, measuring range and memory parameters. Frequently used device settings can be saved to configuration files for easy recall.
- **Online Recording of Measurement Data**
  Read-in, display and recording of momentarily measured data from the interconnected device.
  – Number of measuring channels: up to10
  – Start recording: manual, triggered by measured value, time triggered
  – Recording mode:
  > time controlled with sampling interval of 0.05 s* ... 1 s ... 60 min
  > manually controlled
  > measured value controlled in event of exceeded limit/delta value
  – Recording duration max. 10 million intervals

* Depending upon device type, measuring function, number of measuring channels and communication (e.g. via modem), sample intervals of less than 1 s cannot be used.

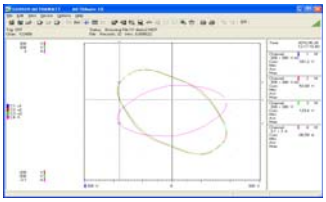
- **Reading Out and Visualizing Stored Data**
  If supported by the device: read-in and display of offline data recorded to device memory.

For purposes of analysis, data recorded online or read in from the device's memory can be displayed in various formats:

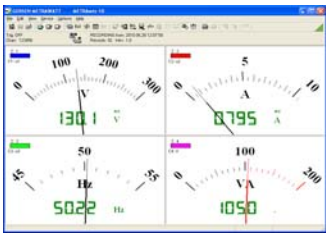
Y(t)-recorder display for up to 6 channels



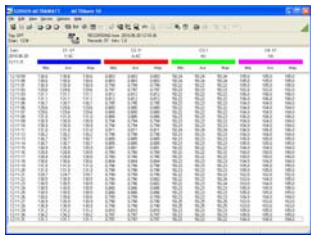
XY-recorder display for up to 4 channels



Multimeter-display for up to 4 channels



Tabular display for up to 10 channels



System Requirements

METRAwin 10 (version 5.x) can be run on IBM compatible PCs with Microsoft Windows® XP, VISTA or 7.

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Order Information

Description	Type	Article Number
Special milliohmmeter for use in potentially explosive atmospheres, EX II 2G EEX ia IIA T4, incl. one Kelvin probe, one Kelvin clip and batteries in hard case HC30 with **DAkkS Calibration Certificate**		
Same version as above, but without particular designation; for customers from the chemical industry or aviation enterprises	**METRAHIT 27EX GMC-I-Ausführung**	M227F
Version for AIRBUS customers (maintenance services of airlines). The milliohmmeter is stipulated in the so-called AMM (Aircraft Maintenace Manual) for aircraft types A300..380, article numbers 97F92003500 and 97000F92001015000	**METRAHIT 27EX AIRBUS-Ausführung**	M227G
Hardware Accessories		
Ex approved Batteries (1 set of 4 ea.) 1,5 V PhilipsLonglife R6L4B (AA-Size)	BAT27	Z206F
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 II	KS17-S	Z110H
Transport Accessories		
Cordura belt pouch for multimeters **METRAHIT**	HitBag	Z115A
Hard case for one **METRAHIT** and accessories	HC20	Z113A
Hard case for two **METRAHIT**s and accessories	HC30	Z113A
Accessories for Operation at a PC		
Single-channel pack consisting of BD232 bidirectional interface adapter, cable, METRAwin10/METRA*Hit* software and installation instructions	BD-Pack 1	Z215A
Bidirectional interface adapter	BD232	GTZ3242100R0001
RS 232 interface cable, 2 m (included with Z3231)	Z3241	GTZ3241000R0001
METRAwin10/METRA*Hit* software update and installation instructions	Z3240	GTZ3240000R0001
IR-USB bidirectional interface adapter for **METRAHIT**	USB-HIT	Z216A
Set consisting of interface adapter USB-HIT, USB cable and METRAwin10/METRA*Hit* software	USB-Pack	Z216B

For additional information regarding accessories please see:

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