

MEASURING EQUIPMENT

Ground resistance tester

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German Cathodic Protection



GEOHM[®]C - Ground Resistance Tester

Battery operated tester for the measurement of ground resistance meets international standards for performing such tests. This instrument allows measurement of soil resistivity and ohmic resistance by means of the ammeter-voltmeter test method.

Features

- 3 or 4-wire measurement selectable from menu
- No balancing required
- Continuous monitoring of interference voltage and auxiliary earth electrode resistance with indication of limit value violations
- Indication is displayed if maximum probe resistance is exceeded at the beginning of the measurement
- Voltage measurement with automatic switch-over function between direct voltage and alternating voltage:
Direct voltage measuring range 1.0 ... 250 V (with polarity display)
Alternating voltage measuring range 0 ... 300 V

Applications

The GEOHM[®]C is a compact instrument for the measurement of ground resistance in electrical systems in accordance with:

- DIN VDE 0100 Installation of power systems with nominal voltages of up to 1000 V
- DIN VDE 0141 Grounding in AC systems with nominal voltages of greater than 1 kV
- DIN VDE 0800 Installation and operation of telecommunications systems including data processing systems: equipotential bonding and grounding

Testing of lightning protection systems in accordance with DIN VDE 0185

The instrument is also capable of determining soil resistivity which is essential in calculating dimensions for grounding systems.

It can thus be taken advantage of for simple, geological surveys, and for the planning of grounding systems.

Beyond this, ohmic resistance can be measured at both solid and liquid conductors, as well as internal resistance at conductive elements, as long as these are capacitance and induction-free.

Special Functions

Hold function: The measurement value is frozen at the display after the measurement key is released

Storage of measurement values to memory

Data interface for the transmission of measurement values and for software updates

Convenient report generating software, can be expanded into a comprehensive database

Operation

The instrument is easy to operate. A multifunction key allows for one-hand operation for menu selections and the initialization of measurements. Basic functions and sub-functions are selected with the help of four softkeys.

The instrument functions in accordance with the ammeter-voltmeter principle, and thus requires no balancing. Automatic measuring range selection, limit value monitoring and direct selection of 3 or 4-wire measurement assure easy operation as well.

Display

The LCD consists of a backlit dot matrix display at which menus, setup options, measuring results and online help can be viewed. Various display languages can be selected depending upon the country in which the instrument is used.



Signal Lamps

The instrument automatically recognizes errors which occur during measurement, and signals them with four LEDs as shown in the table below.

LED	Status	Measuring Function	Meaning
U _{Stör} / U _{noise}	red	Interference voltage	U > 10 V
Netz Mains	red	Voltage	Mains voltage is present
R _s >max	red	Probe resistance	Limit value exceeded
R _H >max	red	Auxiliary earth electrode resistance	Limit value exceeded

Battery Monitoring and Self-Test

A battery symbol with five segments ranging from depleted to fully charged continuously indicates the charging level of the batteries in the main menu.

Automatic shutdown ensures if the batteries are fully depleted, and the instrument includes an integrated charge monitoring circuit for safe charging of rechargeable NiMH or NiCd batteries.

During the self-test, a series of test patterns can be displayed one after the other, and indicator LEDs and relays are tested.

Rugged Housing for Harsh Operating Conditions

Soft plastic jacketing protects the instrument against damage due to impact and dropping.

Data Interface

Measurement data can be uploaded to a PC via the integrated IRDA interface for processing and archiving, or for the generation of official reports.

Software Updates

The test instrument can always be kept current thanks to device software updates via the IRDA interface. Software updates are performed during the course of re-calibration by our service department, or by the user himself.

Applicable Regulations and Standards

IEC 61010/EN 61010-1/ VDE 0411-1	Safety requirements for electrical equipment for measurement, control and laboratory use
IEC 61557/EN 61557/ VDE 0413	Devices for testing, measuring and monitoring protective measures Part 1: General requirements Part 5: Earth resistance
DIN 43751 Part 1, 2	Digital measuring instruments
VDE 0106 Part 1	Protection against electrical shock, classification of electrical and electronic equipment
EN 60529, VDE 0470 Part 1	Test instruments and test procedures, protection provided by enclosures (IP code)
DIN EN 61326 VDE 0843 Part 20	Electrical equipment for measurement, control and laboratory use - EMC requirements



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Regulations and Standards for Use of the Test instrument

DIN VDE 0413 Part 5	Devices for testing, measuring and monitoring protective measures
DIN VDE 0100	Regulations for the installation of power systems with nominal voltages of up to 1000 V
DIN VDE 0141	Earthing in AC systems with nominal voltages of greater than 1 kV
DIN VDE 0800	Setup and operation of telecommunication systems including electronic data processing: equipotential bonding and grounding
DIN VDE 0185	Lightning protection systems-general installation regulations
International regulations and standards	
BS 7430 + BS 7671, NFC 15-100, IEC 60364	

Characteristic Values

Measured Quantity	Display Range	Measuring Range	Impedance/ Test Current
R_E	0.01 ... 20 Ω	1.0 ... 20 Ω	10 mA
	0.1 ... 200 Ω	5 ... 200 Ω	1 mA
	1 Ω ... 2 k Ω	50 Ω ... 2 k Ω	100 μ A
	10 Ω ... 20 k Ω	500 Ω ... 20 k Ω	100 μ A
	10 Ω ... 50 k Ω	500 Ω ... 50 k Ω ¹⁾	100 μ A
$U_{\dots}^{2)}$	1.0 ... 99.9 V	10 ... 250 V	500 k Ω
	100 ... 250 V		
$U_{\sim}^{3)}$	1.0 ... 99.9 V	10 ... 250 V	500 k Ω
	100 ... 300 V		
$f^{3)}$	15 ... 99.9 Hz	45 ... 200 Hz	500 k Ω
	100 ... 400 Hz		

Measured Quantity	Intrinsic Error	Measuring Error
R_E	\pm (3% rdg. + 6d)	\pm (10% rdg. + 6d)
		\pm (10% rdg. + 6d)
		\pm (10% rdg. + 6d)
		\pm (10% rdg. + 6d)
		\pm (16% rdg. + 10d)
$U_{\dots}^{2)}$	\pm (2% rdg. + 2d)	\pm (4% rdg. + 3d)
$f^{3)}$	\pm (0.1% rdg. + 1d)	\pm (0.2% rdg. + 1d)

¹⁾ Manual measuring range selection only
²⁾ as from software version AD
³⁾ for sinusoidal measured quantities only

Output voltage: max. 50 Vrms at 128 Hz \pm 0.5 Hz

Reference Conditions

Battery Voltage: 5.5 V \pm 1%
 Ambient Temperature: + 23 °C \pm 2 K
 Relative Humidity: 40 ... 60%

Nominal Ranges of Use

Temperature Range: 0 °C ... + 40 °C
 Battery Voltage: 4.5 ... 6.5 V
 Line Frequency : 50/60 Hz \pm 0.2 Hz
 Line Voltage Waveshape: sine (deviation between RMS and rectified value < 1%)

Nominal Conditions of Use

Series Mode
 Interference Voltage: < 3 V AC DC
 Additional Error caused by Probe and Auxiliary Earth
 Electrode Resistance: < 5% of ($R_E + R_A + R_P$)
 Max. Probe Resistance: < 70 k Ω
 Max. Auxiliary Earth Electrode Resistance: < 50 k Ω
 Max. Earth and Auxiliary Earth Electrode Resistance: \leq 50 k Ω , R_E as a function of R_H

Ambient Conditions

Operating Temperature: -10 ... + 50 °C
 Storage Temperature: -20 ... + 60 °C (without batteries)
 Relative Humidity: max. 75%, no condensation allowed
 Elevation: max. 2000 m

Power Supply

Batteries: 4 ea. 1.5 V C-size (4 x C-Size) (alkaline-manganese per IEC LR14)
 Battery Voltage: 4.6 ... 6.5 V
 Battery Service Life: 30 h or 1000 measurements at RE (with 10 s on-time, each measurement performed until the instrument switches off automatically, without display illumination)
 Rechargeable Batteries: NiCd or NiMH
 Battery Charger: NA 0100S (Article No. Z501D), (not included)
 Charging Voltage: 9 V
 Charging Time: approx. 9 hours
 As a rule, fewer measurements can be performed with rechargeable batteries due to their limited charging capacity.

Electrical Safety

Safety Class: II per IEC 61010-1
 Operating Voltage: 250 V
 Test Voltage: 2.3 kV
 Measuring Category: 250 V CAT II
 Contamination Degree: 2
 Fuse: F0.1H250V

Electromagnetic Compatibility (EMC)

Interference Emission/Immunity IEC 61326/EN 61326

Data Interface

Type: infrared interface (SIR/IrDa) bidirectional, half-duplex
 Format: 9600 baud, 1 start bit, 1 stop bit, 8 data bits, no parity, no handshake
 Range: max. 10 cm recommended distance: < 4 cm

Mechanical Design

Display: multiple dot matrix display, 128 x 64 pixels (65 mm x 38 mm), illuminated
 Dimensions: 275 mm x 140 mm x 65 mm
 Weight: approx. 1.2 kg with batteries
 Protection: housing: IP 54 per EN 60529 with pressure compensating diaphragm of microporous ePTFE, non-ageing, 8 mm dia. in battery compartment lid

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Extract from table on the meaning of IP codes

IP XY (1 st digit X)	Protection against foreign object entry	IP XY (2 nd digit Y)	Protection against the penetration of water
3	≤ 2.5 mm Ø	3	spraying water
4	≤ 1.0 mm Ø	4	splashing water
5	dust protected	5	water jets

Standard Equipment

- 1 GEOHM® C test instrument
- 1 carrying strap
- 1 set of batteries
- 1 set of comprehensive instructions covering the following topics:
 - Measurement of earth resistance with instructions for 3 and 4-wire methods, with physical considerations regarding the potential gradient area as related to dissipation resistance of grounding systems of various size, with important tips for the performance of measurements on difficult terrain
 - Measurement of soil resistivity with geologic analysis and calculation of dissipation resistance
 - Measurement of ohmic resistance
- 1 PC software WinProfi for communication with GEOHM® C
The PS3 CD-ROM includes the software WinProfi with the following content and functions:
 - up-to-date test instrument software
 - for loading other user interface languages
 - for loading firmware version updates
 - Transmission of measured data from test instrument to PC

Accessories

E-Set 3 Earth Testing Set



Accessories

E-Set 4 Earth Testing Set



Accessories

E-Set 5 Earth Testing Set



Order Information

Designation	Type	Article Number
Basic Instrument		
Digital Earth Tester	GEOHM® C	M590A
Add-Ons		
IR interface for connection to a USB port at a PC for data exchange between the PC and the GEOHM® C, e.g. for software updates to the tester or visualization of measurement values at the PC	Converter IrDa-USB	Z501J
Accessories		
4 special NiMH baby cells (rechargeable)	Akku-Set	GTY 1040 042 E25
Adapter for charging batteries inside the GEOHM® C	NA 0100S	Z501D
Hard-shell case with compartment for one C series test instrument and accessories	HC30-C	Z541C
Earth testing set: Synthetic leather case with 2 reels, two 25 measurement cables, one 40 m measurement cable, two 3 m measurement cables, 4 earth spikes (zinc plated), 2 spike pullers and 1 hammer	E-Set 3	GTZ 3301 005 R0001
Earth testing set: Synthetic leather case with 2 reels, two 25 m cables, one 40 m cable, two 3 m measurement cables and 4 earth drills	E-Set 4	Z590A
Earth testing set: Carrying case accommodating GEOHM® C 1 drum with 25 m measurement cable 2 drums with 50 m measurement cable each 4 measurement cables, 3 x 0.5 m long, 1 x 2 m long 1 test clamp 4 earth drills, each 350 mm long 1 dust cloth 2 pads of earth testing measurement data forms	E-Set 5	Z590B
Reel with 25 m measurement cable and banana plugs at both ends	TR25	GTZ 3303 000 R0001
Drum with 50 m measurement cable, banana plug / jack socket	TR50	GTY 1040 014 E34
Earth drill, 35 cm long, can be connected by means of 4 mm banana plugs	SP350	GTZ 3304 000 R0001