

GEOHM | PRO, GEOHM | XTRA

Earth Testers

3-349-914-03
3/5.19

GEOHM PRO/XTRA:

- 3 and 4-wire earth resistance measurement
- 3-wire earth resistance measurement with current clamp
- Loop resistance measurement with 2 current clamps without disconnection (in case the use of auxiliary electrodes isn't possible)
- Soil resistivity (Wenner method)
- Current measurement with the help of clamp meters (e.g. leakage current measurement) and flexible clamp meters
- Low-resistance of the PE conductor with 200 mA (per IEC 60364-6-61, point 6.12.2)

GEOHM XTRA:

- Integrated GPS module
- Measured values are save together with GPS coordinates



Additional Features

- R_S and R_H resistance measurements with auxiliary electrodes
- Measurement of interference voltages
- Measurement of interference frequencies
- Measurement even where interference voltages occur in systems with 16%, 50 and 60, as well as 400 Hz (with automatic and manual selection of the right measurement signal frequency)
- Measuring voltage selection (25 V or 50 V)
- Entry of distances between the electrodes in meters (m) and feet (ft) for measurement of soil resistivity
- Memory for 990 measured values (10 banks with 99 units each)
- Clamp meter calibration
- RTC real-time clock
- Data transmission to the PC (USB)
- Symbolic display of battery voltage

Applicable Regulations and Standards

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

Regulations and Standards for Use of the Test Instrument

DIN VDE 0413-5	Devices for testing, measuring or monitoring protective measures; earth resistance
DIN VDE 0100	Stipulations for the setup of electric power installations 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	Setup and operation of telecommunications systems including data processing equipment; equipotential bonding and grounding
DIN VDE 0185	Lightning protection systems – general setup
International regulations and standards	
BS 7430 + BS 7671, NFC 15-100, IEC 60364	

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Characteristic Values

- Specified accuracy makes reference to the terminals at the measuring instruments.
- Definition of primary measuring uncertainty: "rdg." = reading, "d" = digit(s)

Measurement of Interference Voltage UN (RMS)

Range	Resolution	Primary Uncertainty
0 ... 100 V	1 V	±(2% rdg. + 3 D)

- Measurement for f_N 15 ... 450 Hz
- Measurement frequency – at least 2 measurements per second

Measurement of Interference Frequency f_N

Range	Resolution	Primary Uncertainty
15 ... 450 Hz	1 Hz	±(1% rdg. + 2 d)

- Measurement of interference voltages > 1 V (f_{---} is displayed for interference voltage < 1 V)

Resistance Measurement at Protective Conductors and Equalizing Leads (2-wire method)

Technical measuring method: in accordance with IEC 61557-4

Measuring Range	Resolution	Primary Uncertainty
0.000 ... 3.999 Ω *	0.001 Ω	±(2% rdg. + 4 d)
4.00 ... 39.99 Ω	0.01 Ω	±(2% rdg. + 2 d)
40.0 ... 399.9 Ω	0.1 Ω	
400 ... 3999 Ω	1 Ω	
4.00 ... 19.99 k Ω	0.01 k Ω	±(5% rdg. + 2 d)

* No accuracy is specified within a range of 0.000 ... 0.045 Ω .

Measurement of Earthing Resistance (3 or 4-wire method)

Technical measuring method: in accordance with IEC 61557-5

Measuring Range	Resolution	Primary Uncertainty
0.000 ... 3.999 Ω *	0.001 Ω	±(2% rdg. + 4 d)
4.00 ... 39.99 Ω	0.01 Ω	±(2% rdg. + 2 d)
40.0 ... 399.9 Ω	0.1 Ω	
400 ... 3999 Ω	1 Ω	
4.00 ... 19.99 k Ω	0.01 k Ω	±(5% rdg. + 2 d)

* No accuracy is specified for 3-wire measurement within a range of 0.000 ... 0.045 Ω .

Resistance Measurement at the Auxiliary Electrodes

Range	Resolution	Primary Uncertainty
0 ... 999 Ω	1 Ω	±(5% (RE+RH+RS) + 8 d)
1.00 ... 9.99 k Ω	0.01 k Ω	
10.0 ... 19.9 k Ω	0.1 k Ω	

Resistance Measurement of Multiple Earthing with the Help of Clamp Meters

(3-wire method with clamp meters)

Technical measuring method: in accordance with IEC 61557-5

Measuring Range	Resolution	Primary Uncertainty
0.000 ... 3.999 Ω *	0.001 Ω	±(8% rdg. + 4 d)
4.00 ... 39.99 Ω	0.01 Ω	±(8% rdg. + 3 d)
40.0 ... 399.9 Ω	0.1 Ω	
400 ... 1999 Ω	1 Ω	

* No accuracy is specified within a range of 0.000 ... 0.045 Ω .

Loop Resistance Measurement with 2 Current Clamps

Range	Resolution	Primary Uncertainty
0.00 ... 19.99 Ω	0.01 Ω	±(10% rdg. + 3 d)
20.0 ... 149.9 Ω	0.1 Ω	±(20% rdg. + 3 d)

Measurement of Soil Resistivity, Measuring Method According to Wenner, $\rho = 2\pi LRE$

Range	Resolution	Primary Uncertainty
0.0 ... 199.9 Ω / m	0.1 Ω / m	Depending on primary measuring uncertainty RE in 4-pole system, but not less than ±1 digit
200 ... 1999 Ω / m	1 Ω / m	
2.00 ... 19.99 k Ω / m	0.01 k Ω / m	
20.0 ... 99.9 k Ω / m	0.1 k Ω / m	
100 ... 999 k Ω / m	1 k Ω / m	

- Distance between measuring probes (L): 1 ... 50 m

Current Measurement (rms)

Range	Resolution	Primary Uncertainty
0.1 ... 99.9 mA ¹	0.1 mA	±(8% rdg. + 5 d)
100 ... 999 mA ¹	1 mA	±(8% rdg. + 3 d)
1.00 ... 4.99 A ^{1,2}	0.01 A	±(5% rdg. + 5 d) ¹ not specified, 2
5.00 ... 9.99 A ^{1,2}	0.01 A	±(5% rdg. + 5 d)
10.0 ... 99.9 A ^{1,2}	0.1 A	
100 ... 300 A ^{1,2}	1 A	

¹ Current clamps (diameter: 52 mm) – C-3

² Current clamps, curved – F-1

- Frequency range: 45 ... 400 Hz

Earthing Resistance Measurement According to the Pulse Method

Range	Resolution	Primary Uncertainty
0.0 ... 99.9 Ω	0.1 Ω	±(2.5% rdg. + 3 d)
100 ... 199 Ω	1 Ω	

- Type of burst pulse: 4/10 μ s, 8/20 μ s or 10/350 μ s
- Pulse measuring current: 1 A
- Voltage at the peak: 1500 V

Further Technical Data

Max. AC + DC interference voltage at which measurement is conducted	24 V
Max. measured interference voltage	100 V
Max. interference current at which earthing resistance measurement is conducted using the clamp meter method	$3 I_{Rms}$
Measuring current frequency	125 Hz for 16%, 50 and 400 Hz systems, as well as 150 Hz for 60 Hz systems
Measuring voltage & current, 2-pole	$U < 24 V_{rms}$, $I \geq 200$ mA for $R \leq 2 \Omega$
Measuring voltage for 3-pole, 4-pole	25 or 50 V
Measuring current (short-circuit current) for 3-pole, 4-pole	> 200 mA
Max. measuring electrode resistance	20 k Ω
Indication of too little current at the clamp meters for	≤ 0.5 mA

Electrical Safety

Type of insulation	Double per EN 61010-1 and IEC 61557
Measuring category	CAT III 600 V per EN 61010-1
Fuses	F2 (charging process): 2 A / 250 V, 5 x 20 mm, F1 (power supply): 1 A / 250 V, 5 x 20 mm

Power Supply

Rechargeable batteries	Battery pack: NiMH, 4.8 V, 4.2 Ah
Battery charger parameters	100 ... 240 V, 50 ... 60 Hz
Number of measurements for R, 2-pole	> 1500 (1 Ω , 2 meas. per min.)
Number of measurements for RE	> 1200 (RE = 10 Ω , RH = RS = 100 Ω , 2 meas. per min.)
Time required for resistance measurements using 2-pole method	< 6 seconds
Time required for resistance measurements using other methods, as well as earth resistance	< 8 seconds

Mechanical Design

Dimensions	W x H x D: 40 x 17 x 31 cm
Instrument weight with batteries	Approx. 4 kg
Protection for the housing per EN 60529	IP 54

Ambient Conditions

Operating temperature	-10 ... +50 °C
Temperature range within which the battery can be charged	+10 °C ... +40 °C

Temperatures at which the charging process is interrupted	$< +5$ °C and $\geq +50$ °C
Reference temperature	23 \pm 2 °C
Storage temperature	-20 °C ... +80 °C
Relative humidity	20 ... 85%
Nominal relative humidity	40 ... 60%
Elevation	< 2000 m

Electromagnetic Compatibility (EMC)

The test instrument fulfils EMC requirements in accordance with EN 61326-1:2013.

Additional Data

Data concerning additional measuring uncertainty are helpful for the most part when a measuring instrument is used under non-standardized conditions or in measuring laboratories for calibration.

Influence of Series Interference Voltage on Resistance Measurement for the Functions 3-Pole, 4-Pole and 3-Pole + Clamp Meters

R	Additional Measuring Uncertainty [Ω]
0.00 ... 9.99 Ω	$\pm(0.0025 RE + 0.012) U_Z$
10.0 Ω ... 1.99 k Ω	$\pm(0.0005 R + 0.02) U_Z$

Influence of Series Interference Voltage on Resistance Measurement for the ρ Function

$$\Delta_{add} [\Omega] = \pm 2.5 \cdot (10^{-3} \cdot RE + 10^{-6} \cdot RH \cdot U_Z) \cdot U_Z$$

Where $RE = \rho / 2\pi L$

Influence of the Auxiliary Electrodes on Earthing Resistance Measurement for the Functions 3-Pole, 4-Pole and 3-Pole + Clamp Meters

RH, RS	Additional Measuring Uncertainty [%]
RH ≤ 1 k Ω and RS ≤ 1 k Ω	Within the limits of primary measuring uncertainty
RH > 1 k Ω or RS > 1 k Ω or RH i RS > 1 k Ω	$\pm \left(\frac{R_S}{R_S + 1M} \cdot 200 + \frac{R_H^3}{R_E} \cdot 4 \cdot 10^{-11} + 3 \cdot 10^{-3} \cdot R_H \right)$

RE [Ω], RS [Ω] and RH [Ω] are the values displayed by the instrument.

Influence of the Auxiliary Electrodes on Earthing Resistance Measurement for the ρ Function

RH, RS	Additional Measuring Uncertainty [%]
RH ≤ 1 k Ω i RS ≤ 1 k Ω	Within the limits of primary measuring uncertainty
RH > 1 k Ω or RS > 1 k Ω or RH i RS > 1 k Ω	$\delta_{dod} = \frac{R_H \cdot (R_S + 30000\Omega)}{R_E} \cdot 3,2 \cdot 10^{-7}$

RE [Ω], RS [Ω] and RH [Ω] are the values displayed by the instrument.

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Influence of the Auxiliary Electrodes on Earthing Resistance Measurement According to the Pulse Method

RH	ZE	Measuring Uncertainty [%]
$RH \leq 150 \Omega$	0.0 ... 199 Ω	Within the limits of primary measuring uncertainty
$RH > 150 \Omega$	0.0 ... 4.9 Ω	0.04 (RH-100)/ZE
	5.0 ... 199 Ω	0.007 (RH-100)

ZE[Ω] and RH[Ω] are the values displayed by the instrument.

Influence of Interference Current on the Measurement Results for Earthing Resistance, 3-Pole + Current Clamp

The GEOHM PRO measuring instrument can perform measurements as long as any existing interference current does not exceed a value of $3 A_{rms}$ and frequency coincides with the value selected in the menu.

RE	Uwy	Measuring Uncertainty [Ω]
$\leq 50 \Omega$	25 V	$5 \cdot 10^{-3} \cdot RE \cdot I_{Int2}$
	50 V	$2.5 \cdot 10^{-3} \cdot RE \cdot I_{Int2}$
$> 50 \Omega$	25 V	$70 \cdot 10^{-6} \cdot RE2 \cdot I_{Int2}$
	50 V	$50 \cdot 10^{-6} \cdot RE2 \cdot I_{Int2}$

Performance of measurements is disabled at an value of $> 3 A$.

Influence of Interference Current on the Measurement Results for Earth Resistance with the Help of Two Clamp Meters

The GEOHM PRO measuring instrument can perform measurements as long as any existing interference current does not exceed a value of $3 A_{rms}$ and frequency coincides with the value selected in the menu.

RE	Measuring Uncertainty [Ω]
0.00 ... 4.99 Ω	Within the limits of primary measuring uncertainty
5.00 ... 19.9 Ω	$0.005 \cdot RE2 \cdot I_{Int3}$
20.0 ... 149.9 Ω	$0.06 \cdot RE2 \cdot I_{Int3}$

Performance of measurements is disabled at a value of $> 3 A$.

Influence of the Relationship of Resistance Measured with the Clamp Meters at Branches with Multiple Earthing to the Resultant Resistance (3-pole + clamp meters)

RC	Measuring Uncertainty [Ω]
$\leq 99.9 \Omega$	$0.003 RC / RW2$
$> 99.9 \Omega$	$0.06 RC / RW2$

RC [Ω] is the resistance which is measured between the branches' clamp meters and displayed by the instrument, and RW [Ω] is the value of the resistance resulting from multiple earthing.

Additional Measuring Uncertainty per IEC 61557-4 (2-pole)

Influencing Quantity	Designation	Additional Measuring Uncertainty
Position	E1	0%
Supply voltage	E2	0% (bAt does not appear)
Temperature	E3	$R \leq 3.999 \Omega \pm 0.3 d$ per $^{\circ}C$
		$R > 3.999 \Omega$ and $< 1 k\Omega \pm 0.2 d$ per $^{\circ}C$
		$R \geq 1 k\Omega: \pm 0.07\%$ per $^{\circ}C \pm 0.2 d$ per $^{\circ}C$

Additional Measuring Uncertainty per IEC 61557-5 (3-pole, 4-pole, 3-pole + clamp meters)

Influencing Quantity	Designation	Additional Measuring Uncertainty
Position	E1	0%
Supply voltage	E2	0% (bAt does not appear)
Temperature	E3	$R \leq 3.999 \Omega: \pm 0.3 d$ per $^{\circ}C$
		$R > 3.999 \Omega$ and $< 1 k\Omega: \pm 0.2 d$ per $^{\circ}C$
		$R \geq 1 k\Omega: \pm 0.07\%$ per $^{\circ}C \pm 0.2 d$ per $^{\circ}C$
Series interference voltage	E4	In accordance with the formulas under "Influence of Series Interference Voltage on Resistance Measurement for the Functions 3-Pole, 4-Pole and 3-Pole + Clamp Meters" ($U_z = 3 V / 50, 60, 400, 16\% Hz$)
Resistance of the electrodes and the auxiliary earth electrodes	E5	In accordance with the formulas under "Influence of Series Interference Voltage on Resistance Measurement for the ρ Function"

Scope of Delivery

- GEOHM PRO: earth tester without GPS modem
- GEOHM XTRA: earth tester with GPS modem
- Carrying pouch
- Measurement cable, 1.2 m, red
- Measurement cable, 2.2 m, black
- Alligator clips, red/black
- Measurement cables, 25 m, red and green
- Measurement cable, 50 m, blue
- Earth spikes, 30 cm
- USB cable
- Automotive charging cable
- Screw terminal
- Power pack
- Set of operating instructions
- Calibration certificate

Order Information

Description	Type	Article Number
Earth tester per VDE 0413-1-5, 2, 3, 4-pole measurement, selective 3-pole measurement, 4-pole measurement per pulse method, earth loop resistance per 2 clamp method, soil resistivity according to Wenner, low-resistance measurement with 200 mA, current measurement with clamp meter, measurement of interference voltages, measuring voltage: 24 V / 50 V, RTC real-time clock, storage of 990 measured values, USB port, IP54, CAT III 600 V	GEOHM PRO	M592A
Earth tester per VDE 0413-1-5 with internal GPS modem , 2, 3, 4-pole measurement, selective 3-pole measurement, 4-pole measurement per pulse method, earth loop resistance per 2 clamp method, soil resistivity according to Wenner, low-resistance measurement with 200 mA, current measurement with clamp meter, measurement of interference voltages, measuring voltage: 24 V / 50 V, RTC real-time clock, storage of 990 measured values with GPS coordinates, USB port, IP54, CAT III 600 V	GEOHM XTRA	M592B
Accessory Measurement Cables, Alligator Clips and Earth Spikes		
Measurement cable with banana plug, 1.2 m, red	MCABLE-1-2m-red	Z592A
Measurement cable with banana plug, 2.2 m, black	MCABLE-2-2m-black	Z592B
Alligator clip, black	CROCODILE-CLIP-black	Z592F
Alligator clip, red	CROCODILE-CLIP-red	Z592G
Screw terminal	CONNECTION-TERMINAL	Z592H
Earth spike for GEOHM PRO/XTRA; 1 spike, length: 0.80 m	EARTH-CONTACT-TEST PROBE-GEOHM-PRO/XTRA	Z592R
Earth measurement case consisting of imitation leather case including 1 drum with 25 m measurement cable, 2 drums with 50 m measurement cable, three 0.5 m measurement cables, one 2 m measurement cable, 1 test clamp, four 350 mm earth drills, 1 dust cloth, 2 pads with forms	E-Set 5	Z590B
Accessories for earthing measurement consisting of 1 x carrier bag, 4 earth spikes 500 mm, 1 x measuring lead 40 m blue on cable drum with hand strap, 1 x measuring lead 20 m red on cable drum with hand strap, 1 x measuring lead 5 m black, 1 x measuring lead 5 m green, 1 x test clamp with black 4 mm socket, 1 x test clamp with green 4 mm socket, 1 x hammer, 1 x roller tape measure, 1 x duster, 1 x writing pad with pen	E-SET PROFESSIONAL	Z592Z

Description	Type	Article Number
Accessory Coils and Clamp Meters		
Adapter for GEOHM FLEX 1 through 3 (Rogowski coils) for measuring earthing resistance a utility poles, measuring range: 0 ... 4.99 A AC, frequency range up to 125 Hz (50 Hz systems) / up to 150 Hz (60 Hz systems), IP 67, measuring category: 300 V CAT IV	GEOHM ERP-1	Z592S
Rogowski coil for GEOHM ERP-1 (Z592S), measuring range: 0 ... 4.99 A AC, frequency range: 40 Hz ... 10 kHz, max. cable diameter: 360 mm, measuring category: 600 V CAT IV	GEOHM FLEX 1	Z592P
Rogowski coil for GEOHM ERP-1 (Z592S), measuring range: 0 ... 4.99 A AC, frequency range: 40 Hz ... 20 kHz, max. cable diameter: 4000 mm, measuring category: 600 V CAT IV	GEOHM FLEX 2	Z592V
Rogowski coil for GEOHM ERP-1 (Z592S), measuring range: 0 ... 4.99 A AC, frequency range: 40 Hz ... 20 kHz, max. cable diameter: 2000 mm, measuring category: 600 V CAT IV	GEOHM FLEX 3	Z592W
Clamp meter for GEOHM PRO/XTRA, measuring range: 0.001 ... 1200 A AC, max. cable diameter: 52 mm, transformation ratio: 1000 A / 1 A, frequency range: 30 Hz ... 10 kHz, IP 40, measuring category: 300 V CAT IV	CURRENT-CLAMP-C3-GEOHM-PRO-XTRA	Z592X
Generator clamp for GEOHM PRO/XTRA, measuring range: 0.1 ... 1200 A AC, max. cable diameter: 52 mm, transformation ratio: 1000 A / 1 A, frequency range: 30 Hz ... 10 kHz, IP 40, measuring category: 300 V CAT IV	CLAMP-GENERATOR-N1-GEOHM-PRO-XTRA	Z592Y
Measurement cable for generator clamp N1 (Z592Y) with banana plug, 2.0 m, black	MCABLE-CLAMP-GENERATOR-N1	Z5920
Power Supply Accessories		
Charger for GEOHM PRO/XTRA	CHARGER-ACCUPACK-GEOHM-PRO-XTRA	Z592N
Battery charging cable	ACCU-CHARGER-CABLE	Z592J
Charging cable for 12 V car cigarette lighter for GEOHM PRO/XTRA	CAR-CHARGER-GEOHM-PRO-XTRA	Z592M
Accessory Pouches		
Universal carrying pouch for accessories for GEOHM PRO/XTRA	CASE-GEOHM-PRO-XTRA	Z592K
Case for 0.80 m earth spikes (Z592R) for GEOHM PRO/XTRA	CASE-EARTH-PROBES	Z592T

For additional information regarding accessories please refer to:

- the data sheet for the respective device or our Measuring Instruments and Testers catalogue.
- www.gossenmetrawatt.com

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



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