

GEOHM ERP-1

Adapter for flexible AC Current Sensors GEOHM FLEX 1-3

3-447-062-03
1/8.19



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1 Safety

GEOHM ERP-1 adapter is designed to adapt earth tester GEOHM PRO and XTRA for the measurements of earth resistance of various objects e.g. power pillars, using flexible AC current sensors (GEOHM FLEX 1-3). The adapter is designed to work with earth tester GEOHM PRO and XTRA that provide the user with a choice of performing the measurement using 3-wire method with flexible AC current sensors. In order to ensure correct operation, the following recommendations must be observed:

- Before you proceed to operate the GEOHM ERP 1 adapter, acquaint yourself thoroughly with this manual and observe the safety regulations and specifications provided by the producer.
- Any application that differs from those specified in the present manual may result in a damage to the adapter and constitute a source of danger for the user.
- The Adapter should be operated only by suitably qualified persons having the necessary permissions to carry out measurements on electrical systems. Operating the Adapter by unauthorised personnel may result in damage to the device and constitute a source of danger for the user.
- Using this manual does not exclude the need to comply with occupational health and safety regulations and with other relevant fire regulations required during the performance of a particular type of work. Before starting the work with the device in special environments, e.g. potentially fire-risk/explosive environment, it is necessary to consult it with the person responsible for health and safety.
 - ⇒ it is damaged and completely or partially out of order,
 - ⇒ its cords and cables have damaged insulation,
 - ⇒ it has been stored for an excessive period of time in disadvantageous conditions (e.g. excessive humidity). **After moving the device from a cool to a warm place with a high level of relative humidity, do not start measurements until the device is warmed up to the ambient temperature (approximately 30 minutes).**
- Before measurement, it must be assured that the cables are connected to the appropriate measurement sockets
- Do not operate the adapter with an open or incorrectly closed battery (accumulator) compartment or power it from other sources than those specified in the present manual.
- Repairs may only be carried out by our service department (see address in section 12).
- The device meets the requirements of EN 61010-1 and EN 61557.

Note:

The manufacturer reserves the right to introduce changes in the design, accessories and technical data of the adapter.

Note:

GEOHM ERP-1 Adapter is not a stand-alone measuring device. This is an accessory designed to work with earth tester GEOHM PRO und GEOHM XTRA.

2 Description of the adapter GEOHM ERP-1



Meaning of symbols on the adapter

CAT IV 300 V

Measuring category CAT IV 300 V device



Protection category II device



This device may not be disposed of with the trash. Further information regarding the WEEE mark can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term „WEEE“.



Indicates European conformity



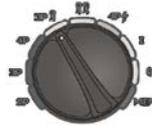
Warning concerning a point of danger (Attention: observe documentation)

3 Measurements

Note:

Before the measurement arrange the spacing of the electrodes and the test leads taking into account considerable distances. In case of truss structures, the distance between the legs at their base may exceed a few meters. The spot of connecting the earth tester to the structure with a cable from terminal E, should be free of dirt and contaminants such as paint, rust, etc., as they may affect the measurement result.

1. Turn the adapter ON by pressing  button.
2. LED  will light up for 5 seconds indicating the stabilization process of the earth tester.
3. LED  will turn off and at the same time LEDs for selecting flexible AC current sensors and indicating the number of wraps around the structure leg will light up:    and .
4. Connect the adapter to earth tester using the cable (length: 2 m) coming out from the terminal marked with letters **MRU**. This cable is an integral part of GEOHM ERP-1 adapter.
5. Connect flexible AC current sensors to the adapter using the cable coming out from the terminal marked with symbol **FLEX** .
6. Press  button on the adapter to select the type of flexible AC current sensors - follow the labelling on the current sensors.
7. Press  button on the adapter to specify the number of flexible AC current sensors wraps around the leg of the structure/object.
8. On the earth tester select the measurement method as **3p+clamps**, setting the rotational



function selector in the position shown here:

9. Flexible AC current sensors connected to ERP-1 adapter should be wrapped around the leg of the structure and around the steel strip (hoop) - if present - below the connecting point of cable E to the structure leg. (Remember that flexible AC current sensors should not be placed directly onto the test leads as their interference may impact the measurement results). Wrap the flexible AC current sensors as many times as its possible due to their length (max 4 times).

Note:

When wrapping the flexible AC current sensors around the leg of the tested structure, remember that the arrow stamped on current sensors (indicating the direction of current flow) should be downward (indicating the ground).

10. Trigger the measurement on earth tester by pressing **START** button, after selecting the measuring voltage and frequency of the tested network.
11. After completing the measurement on the first leg of the structure/object (when there is more than one leg), proceed to perform similar measurement on the next leg.

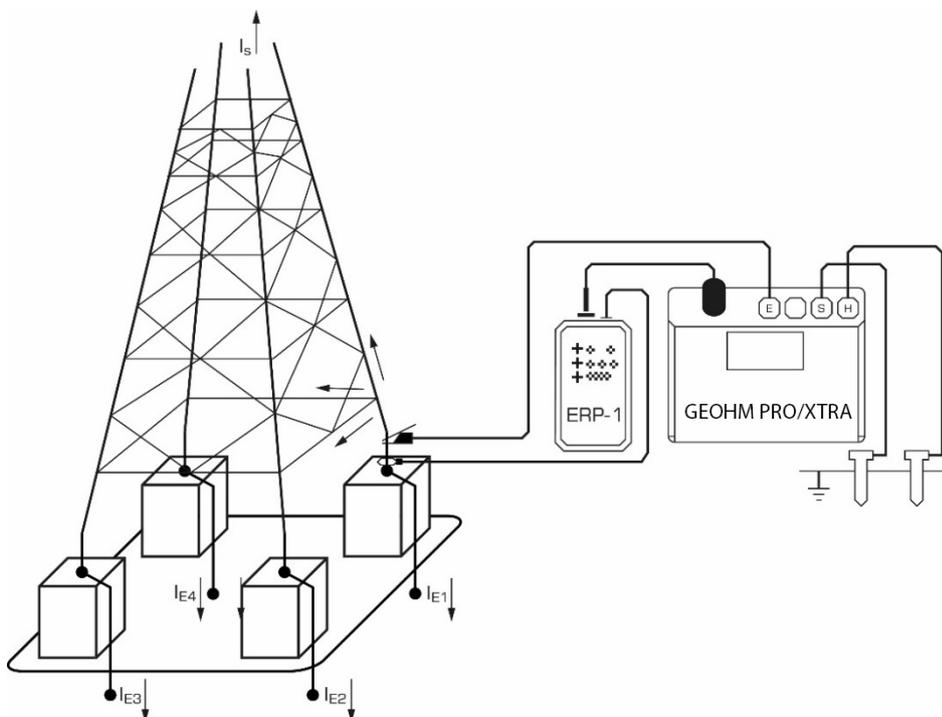
12. After obtaining the results of earth resistance for each leg, calculate the resultant resistance of the whole structure, using the following formula.

$$R_E = \frac{1}{\frac{1}{R_1} + \dots + \frac{1}{R_n}}, [1]$$

where:

R_E – resultant resistance of the object,
 R_1 – resistance of the first leg of the object,
 R_n – resistance of the last leg of the object,
 n – number of legs of the object.

Note:
In case of measurements on a damaged structure or on a structure with defective grounding system, the result calculated with the above formula [1] may be burdened with a considerable error.



$I_{E1} \dots I_{E4}$ – current flowing to the ground through the individual legs of the pole

I_S – current flowing upwards to the lightning protection wire

E, S, H – markings on the meter sockets

Fig. 1 Schematic diagram of the static resistance measurement on electricity poles using flexible AC current sensors and earth tester GEOHM PRO or GEOHM XTRA.

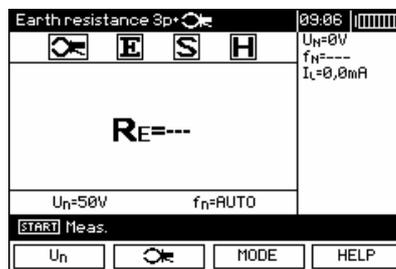
Note:

Before using flexible AC current sensors for the first time, they should be calibrated according to the description included in the operating instructions of earth tester. Repeat the procedure each time you change the flexible AC current sensors. It is recommended to perform the calibration every time the current sensor type is changed. The number of wraps (coils) of current sensors around the leg of the pole during the measurement should be identical to the number of wraps used during their calibration. This will ensure using the appropriate calibration factor during the measurements.

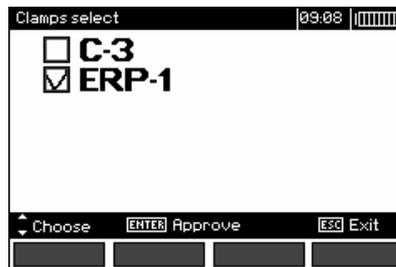
APPENDIX for earth testers GEOHM PRO and GEOHM XTRA

As additional functions are available in earth testers GEOHM PRO and GEOHM XTRA (measurements with flexible AC current sensors), the manufacturer provided an additional option for automatic calculation of the resultant resistance of the earth tester.

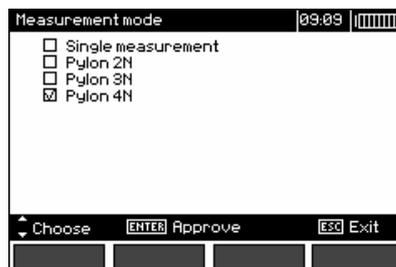
a) After selecting **3P+clamps**, the following screen is displayed:



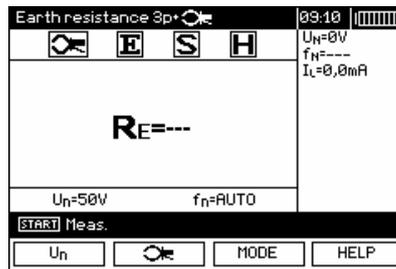
b) After pressing **F2** button, the window for current sensors is shown. You may select between hard clams (C-3) and ERP-1 adapter by operating buttons **▲**, **▼**. Accept your choice by pressing **ENTER**. Exit without saving the change by pressing **ESC**.



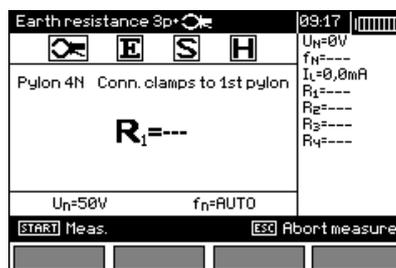
c) After pressing **F3** you may select the number of legs of the tested structure/object using buttons **▲**, **▼**. Accept your choice by pressing **ENTER**. Exit without saving the change by pressing **ESC**.



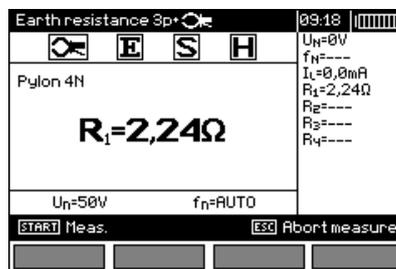
- d) After selecting an object with four legs the following screen is shown. After connecting the flexible AC current sensors to ERP-1 adapter and connecting the adapter to the earth tester; when the number of wraps and type of current sensors are set, the right side of the screen will show the following values: U_N – interference voltage, f_N – interference frequency and I_L – leakage current:



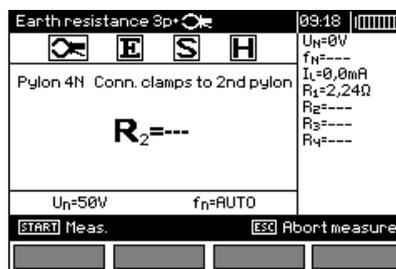
- e) Press **START** button to display the following screen. Follow the command on the screen and fix the clamps to the first leg (if not already done). The measurement will be triggered by pressing again **START** button.



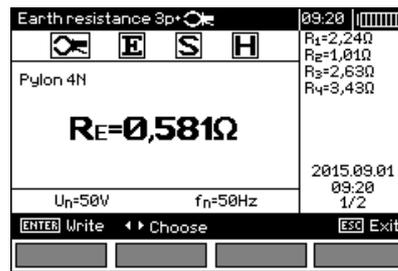
- f) This screen is shown for 5 seconds from the moment of displaying calculated R₁ value, then screen "before the second measurement" will be shown. You may recall the last measurement result by pressing **ENTER** (the screen with the first measurement is shown for 5 seconds).



Similarly to the situation before the first measurement. The same applies before the measurement on third and fourth leg.



g) After completing the measurements on the last leg of the structure and after displaying (for 5 seconds) the resistance result (R_4), the following screen will be displayed:



After completing a series of measurements (on each leg), the screen will display the resultant earth resistance R_E . Use buttons ◀ and ▶ to change results displayed by the auxiliary screen on the right.

4 Power supply of GEOHM ERP-1

4.1 *Monitoring the power supply voltage*

The adapter is powered by three 1.5 V LR6 batteries or by three 1.2 V LR6 rechargeable batteries of NiMH type. When **BAT** LED is light up, it indicates the need to replace the batteries or to recharge the rechargeable batteries.

4.2 *Replacing (rechargeable) batteries*

To replace the (rechargeable) batteries:

- Disconnect current sensors and switch the adapter off.
- Unscrew the screw and remove the cover of the battery compartment (in the bottom of the housing).
- Replace all (rechargeable) batteries, observing the correct polarity.
- Install the cover back and fix it with the screw.

▲ CAUTION!

Do not use the adapter when the battery compartment is removed or open. Do not power the adapter from other sources than those mentioned in this manual.

4.3 *Charging the rechargeable batteries*

Rechargeable batteries must be recharged in an external charger.

5 Cleaning and maintenance

▲ CAUTION!
Use only the maintenance methods specified by the manufacturer in this manual.

The adapter GEOHM ERP-1 or flexible AC current sensors GEOHM FLEX 1-3 are cleaned as follows:

- The casing of the adapter may be cleaned with a soft, damp cloth using all-purpose detergents. Do not use any solvents or cleaning agents which might scratch the casing (powders, pastes, etc.).
- Current sensors and test leads should be cleaned with water and detergents, and then dried.

Note:
The electronic system of the Adapter does not require maintenance.

6 Storage

During the storage of the adapter, the following recommendations must be observed:

- Unplug the adapter from the earth tester
- Disconnect the current sensors from the adapter and earth tester.
- Thoroughly clean the adapter and current sensors.
- If adapter is to be stored for a prolonged period of time, the batteries must be removed from the adapter.
- In order to prevent a total discharge of the battery in the case of a prolonged storage, remove and charge the batteries in an external charger from time to time.

7 Dismantling and Disposal

During the dismantling and disposal of the adapter, the following recommendations must be observed:

- Worn-out electric and electronic equipment should be gathered selectively, i.e. it must not be placed with waste of another kind.
- Worn-out electronic equipment should be sent to a collection point in accordance with the law of waste electrical and electronic equipment.
- Before the equipment is sent to a collection point, do not dismantle any elements.
- Observe local regulations concerning disposal of packages, waste batteries and accumulators.

8 Technical specifications

Abbreviation "m.v." used in the specification of measurement uncertainty means a standard measured value.

8.1 Basic data

Flexible AC current sensors GEOHM FLEX 1

R_E measurement

Uncertainty of the adapter

Range	Ω	$\Omega\Omega$	$\Omega\Omega\Omega$	$\Omega\Omega\Omega\Omega$
0,000 Ω ...1999 Ω *	\pm (8 % m.v. + 10 digits)	\pm (8 % m.v. + 10 digits)	(7 % m.v. + 10 digits)	\pm (7 % m.v. + 4 digits)

* for R_E > 500 Ω uncertainty unspecified

Uncertainty specified for earth tester GEOHM PRO und GEOHM XTRA
 Uncertainty not specified for flexible AC current sensors GEOHM FLEX 1

Current measurement

Range	Resolution	Basic uncertainty
0,0 mA ... 99,9 mA	0,1 mA	unspecified
100 mA...999 mA	1 mA	\pm (8 % m.v. + 3 digits)*
1,00 A...4,99 A	0,01 mA	\pm (5 % m.v. + 5 digits)**

* uncertainty unspecified in the range of 0 mA...199 mA

** above 5 A the uncertainty is unspecified

Flexible AC current sensors GEOHM FLEX 2

R_E measurement

Uncertainty of the adapter

Range	Ω	$\Omega\Omega$	$\Omega\Omega\Omega$	$\Omega\Omega\Omega\Omega$
0,000 Ω ...1999 Ω *	\pm (6 % m.v. + 8 digits)	\pm (6 % m.v. + 8 digits)	\pm (6 % m.v. + 6 digits)	\pm (6 % m.v. + 4 digits)

Uncertainty specified for earth tester GEOHM PRO und GEOHM XTRA

Basic uncertainty for U _n = 25 V					
Range	Resolution	Ω	$\Omega\Omega$	$\Omega\Omega\Omega$	$\Omega\Omega\Omega\Omega$
0,000 Ω ...3,999 Ω	0,001 Ω	\pm (14 % m.v. + 4 digits)	\pm (14 % m.v. + 4 digits)	\pm (12 % m.v. + 4 digits)	\pm (12 % m.v. + 4 digits)
4,00 Ω ...39,99 Ω	0,01 Ω	\pm (14 % m.v. + 3 digits)	\pm (14 % m.v. + 3 digits)	\pm (12 % m.v. + 3 digits)	\pm (12 % m.v. + 3 digits)
40,0 Ω ...399,9 Ω	0,1 Ω				
400 Ω ...1999 Ω *	1 Ω				

Basic uncertainty for U _n = 50 V					
Range	Resolution	Ω	$\Omega\Omega$	$\Omega\Omega\Omega$	$\Omega\Omega\Omega\Omega$
0,000 Ω ...3,999 Ω	0,001 Ω	\pm (12 % m.v. + 4 digits)	\pm (12 % m.v. + 4 digits)	\pm (10 % m.v. + 4 digits)	\pm (10 % m.v. + 4 digits)
4,00 Ω ...39,99 Ω	0,01 Ω	\pm (12 % m.v. + 3 digits)	\pm (12 % m.v. + 3 digits)	\pm (10 % m.v. + 3 digits)	\pm (10 % m.v. + 3 digits)
40,0 Ω ...399,9 Ω	0,1 Ω				
400 Ω ...1999 Ω *	1 Ω				

* for R_E > 500 Ω uncertainty unspecified

Current measurement

Range	Resolution	Basic uncertainty
0,0 mA ... 99,9 mA	0,1 mA	unspecified
100 mA...999 mA	1 mA	± (8 % m.v. + 3 digits)
1,00 A...4,99 A	0,01 mA	± (5 % m.v. + 5 digits)*

* above 5 A the uncertainty is unspecified

Flexible AC current sensors GEOHM FLEX 3

R_E measurement

Uncertainty of the adapter

Range	Ω	$\Omega\Omega$	$\Omega\Omega\Omega$	$\Omega\Omega\Omega\Omega$
0,000 Ω ...1999 Ω *	± (5 % m.v. + 6 digits)	± (5 % m.v. + 4 digits)	± (5 % m.v. + 4 digits)	± (5 % m.v. + 4 digits)

Uncertainty specified for earth tester GEOHM PRO und GEOHM XTRA

Basic uncertainty for U _n = 25 V					
Range	Resolution	Ω	$\Omega\Omega$	$\Omega\Omega\Omega$	$\Omega\Omega\Omega\Omega$
0,000 Ω ...3,999 Ω	0,001 Ω	± (12 % m.v. + 4 digits)	± (12 % m.v. + 4 digits)	± (10 % m.v. + 4 digits)	± (10 % m.v. + 4 digits)
4,00 Ω ...39,99 Ω	0,01 Ω	± (12 % m.v. + 3 digits)	± (12 % m.v. + 3 digits)	± (10 % m.v. + 3 digits)	± (10 % m.v. + 3 digits)
40,0 Ω ...399,9 Ω	0,1 Ω				
400 Ω ...1999 Ω *	1 Ω				

Basic uncertainty for U _n = 50 V					
Range	Resolution	Ω	$\Omega\Omega$	$\Omega\Omega\Omega$	$\Omega\Omega\Omega\Omega$
0,000 Ω ...3,999 Ω	0,001 Ω	± (10 % m.v. + 4 digits)	± (10 % m.v. + 4 digits)	± (8 % m.v. + 4 digits)	± (8 % m.v. + 4 digits)
4,00 Ω ...39,99 Ω	0,01 Ω	± (10 % m.v. + 3 digits)	± (10 % m.v. + 3 digits)	± (8 % m.v. + 3 digits)	± (8 % m.v. + 3 digits)
40,0 Ω ...399,9 Ω	0,1 Ω				
400 Ω ...1999 Ω *	1 Ω				

* for R_E > 500 Ω uncertainty unspecified

Current measurement

Range	Resolution	Basic uncertainty
0,0 mA ... 99,9 mA	0,1 mA	± (8 % m.v. + 3 digits)*
100 mA...999 mA	1 mA	± (8 % m.v. + 3 digits)
1,00 A...4,99 A	0,01 mA	± (5 % m.v. + 5 digits)**

* uncertainty unspecified in the range of 0 mA...50 mA

** above 5 A the uncertainty is unspecified

Other technical specifications

- a) type of insulation:double, according to EN 61010-1 and IEC 61557
- b) measurement category:IV 300V according to EN 61010-1
- c) degree of housing protection acc. to EN 60529: IP67
- d) power supply of the meter:3 batteries of LR6 type (1.5 V) or 3 NiMH rechargeable batteries of LR6 type (1.2 V)
- e) time of automatic shut-off of the device (Auto-Off): approx. 2 h
- f) dimensions: 146 x 88 x 33 mm
- g) weight of the adapter with batteries:approx. 340 g
- h) operating temperature: -10..+50°C
- i) reference temperature:23 ±2°C
- j) storage temperature: -20..+80°C
- k) relative humidity: 20..90%
- l) nominal relative humidity 40..60%
- m) altitude (above sea level): <2000 m
- n) electric field: max 3 V/m
- o) quality standard, design and manufacturing are ISO 9001 compliant
- p) the product meets the EMC requirements according to:EN 61326-1:2006 and EN 61326-2-2:2006

8.2 Additional data

Thresholds for triggering **NOISE** LED for sinusoidal current of 50 Hz.

	Ω	00	000	0000
GEOHM FLEX 1 = F	> 5 A			
GEOHM FLEX 2 = FS	> 5 A		> 3,3 A	> 2,5 A
GEOHM FLEX 3 = FSX	> 3,5 A	> 1,7 A	> 1,2 A	> 0,9 A

Additional uncertainty of the electrodes determined for earth tester GEOHM PRO und GEOHM XTRA

R _E	R _H , R _S	Additional uncertainty caused by the electrodes for U _n = 25 V [%]
0,000 Ω ...3,999 Ω	R _H ≤ 500 Ω und R _S ≤ 500 Ω	Within the basic uncertainty
	R _H > 500 Ω oder R _S > 500 Ω oder R _H und R _S > 500 Ω	$\pm \left(\frac{R_S}{R_S + 10^6} \cdot 200 + \frac{R_H^2}{R_E \cdot R_H + 200} \cdot 5 \cdot 10^{-3} + \left(1 + \frac{1}{R_E}\right) \cdot R_H \cdot 4 \cdot 10^{-4} \right)$
> 3,999 Ω	R _H ≤ 1 kΩ und R _S ≤ 1 kΩ	Within the basic uncertainty
	R _H > 1 kΩ oder R _S > 1 kΩ oder R _H und R _S > 1 kΩ	$\pm \left(\frac{R_S}{R_S + 10^6} \cdot 200 + \frac{R_H^2}{R_E \cdot R_H + 200} \cdot 5 \cdot 10^{-3} + R_H \cdot 20 \cdot 10^{-4} \right)$

R _E	R _H , R _S	Additional uncertainty caused by the electrodes for U _n = 50 V [%]
0,000 Ω ...3,999 Ω	R _H ≤ 500 Ω und R _S ≤ 500 Ω	Within the basic uncertainty
	R _H > 500 Ω oder R _S > 500 Ω oder R _H und R _S > 500 Ω	$\pm \left(\frac{R_S}{R_S + 10^6} \cdot 200 + \frac{R_H^2}{R_E \cdot R_H + 200} \cdot 5 \cdot 10^{-3} + \left(1 + \frac{1}{R_E}\right) \cdot R_H \cdot 4 \cdot 10^{-4} \right)$
> 3,999 Ω	R _H ≤ 1 kΩ und R _S ≤ 1 kΩ	Within the basic uncertainty
	R _H > 1 kΩ oder R _S > 1 kΩ oder R _H und R _S > 1 kΩ	$\pm \left(\frac{R_S}{R_S + 10^6} \cdot 200 + \frac{R_H^2}{R_E \cdot R_H + 200} \cdot 5 \cdot 10^{-3} + R_H \cdot 15 \cdot 10^{-4} \right)$

9 Scope of Delivery

- 1 GEOHM ERP-1: adapter for GEOHM FLEX 1-3
- 3 AA batteries type LR6 (1,5 V)
- 1 Operating instructions

10 Optional accessories

- 1 Flexible AC current sensor GEOHM FLEX 1 (Z592P)
- 1 Flexible AC current sensor GEOHM FLEX 2 (Z592V)
- 1 Flexible AC current sensor GEOHM FLEX 3 (Z592W)

11 Device Return and Environmentally Compatible Disposal

The instrument is a category 9 product (monitoring and control instrument) in accordance with ElektroG (German Electrical and Electronic Device Law).

This device is subject to the RoHS directive.

Furthermore, we make reference to the fact that the current status in this regard can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term WEEE.

We identify our electrical and electronic devices in accordance with WEEE 2012/19/EU and ElektroG with the symbol shown to the right per DIN EN 50419.



These devices may not be disposed with the trash. Please contact our service department regarding the return of old devices.

12 Repair and Replacement Parts Service, Calibration Center and Rental Instrument Service

If required please contact:

GMC-I Service GmbH

Service Center

Beuthener Straße 20

90471 Nürnberg, Germany

Phone: +49 911 817718-0

Fax: +49 911 817718-253

E-mail: service@gossenmetrawatt.com

www.gmci-service.com

This address is only valid in Germany.

Please contact our representatives or subsidiaries for service in other countries.

13 Product support

If required please contact:

GMC-I Messtechnik GmbH

Product Support Hotline

Phone: +49-911-8602-0

Fax: +49 911 8602-709

E-mail: support@gossenmetrawatt.com

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