

Operating Instructions /
Gebrauchsanleitung /
Manuel d'utilisation /
Guida all'uso /
Manual de instrucciones

GROUND LOOP TESTER /
ERDSCHLEIFENMESSGERÄT /
APPAREIL DE TEST DE BOUCLE
DE TERRE /
TESTER DI TERRA A TENAGLIA /
MISURATORE DI TERRA

HEME GEO 30



LEM HEME

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Order Reference

Order No.

HEME GEO 30

SE 8130 Z

Scope of delivery

1 battery 9V alkaline (type IEC LR6, installed)

1 Resistance test/check loop


1 Users manual E/G/F/I/ES

1 Professional carrying case

Unpacking: Check delivery for damage during transport.

Keep the packing material for later transport and check scope of delivery.

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1 Safety Regulations



General

This measuring device is only to be installed and operated by qualified personnel and according to the technical data in compliance with the safety precautions and regulations set forth below. Additionally, the use of this equipment requires compliance with all legal and safety regulations pertaining to each specific application. Similar regulations apply to the use of accessories.

Operating electrical devices implies that parts of the device carry dangerous voltages. Disregarding warning notices may lead to serious physical injury and material damage.

It can be assumed that safe operation is no longer possible if the device

- shows visible damage,
- has been exposed to unfavourable conditions (e.g. storage beyond the permissible climatic limits without adaptation to the ambient climate, dewing etc.) or
- has been exposed to major strain during transport (e.g. been dropped from some height without visible external damage etc.).

No measurements must be performed on unprotected measuring circuits.

Qualified Personnel

Are persons familiar with the setting up, installation, starting of and operation of the device and possess an appropriate qualification required for such activities.

Special warnings

- Use of rubber gloves is a good safety practice even if the equipment is properly operated and grounded.
- Safety is the responsibility of the operator.
- Use extreme caution when using the instrument around energized electrical equipment.
- Do not attempt to use the ground tester to twist or pry the ground electrode or ground wire away from the equipment being grounded.
- All metal objects or wires connected to the electrical system should be assumed to be lethal until tested. Grounding systems are no exception.

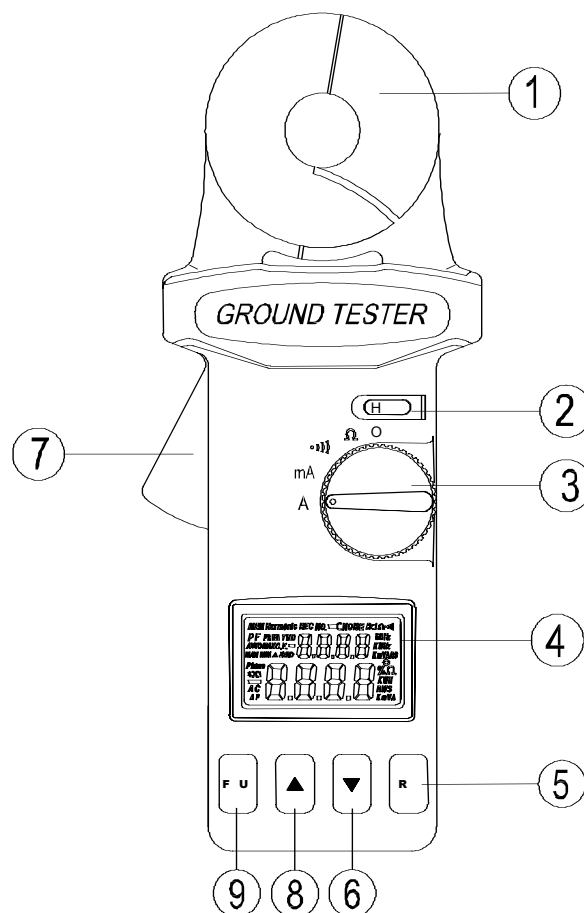
2 Description of Instrument

The compliance with the actual EMC-regulations is documented by the attached CE-sign. The clamp-on ground resistance tester enables the user to measure ground resistance of the ground rod without the use of auxiliary ground rods. Clamp-on ground resistance testers are used in multi-grounded systems without disconnecting the ground under test.

Applications:

- earth resistance of various installations (high voltage pylons, buildings, cell phone substations, RF transmitters etc.)
- inspection of lightning protection systems

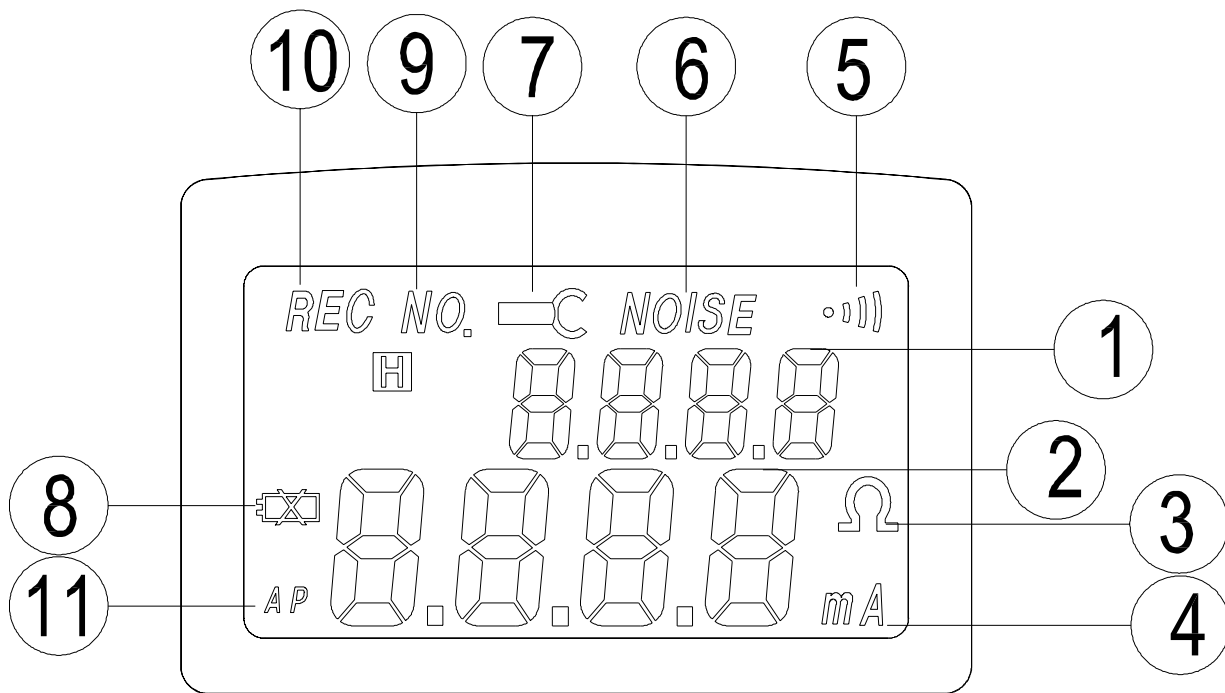
Instrument description:




- ① Jaws: To enclose electrode or ground wire. No air gap is allowed between the two halves of the jaws.
- ② HOLD button: Press this button to hold the displayed value
- ③ Rotary switch: Power on and function selection
- ④ Display unit, liquid crystal display (LCD)
- ⑤ REC button: When one of the functions is selected by FUNC button, it is used to increment value. If no function is selected, it is used to start data logging, or record one data.

- ⑥ ▼ button: to decrement value, press this button
- ⑦ Jaws trigger
- ⑧ ▲ button: to increment a value press this button
- ⑨ FUNC button: press to select HI (hi alarm), LO (low alarm), SEC (seconds), or no. (of reading)

Display



- ① Function Display of current selected function or current record number
- ② Digits Display value from 0 to 9999 with decimal point.
- ③ Ohm Symbol will be shown in Ω and alarm functions
- ④ mA Display ground leakage current in mA or A
- ⑤  This symbol is displayed if the rotary switch is in the alarm position
- ⑥ NOISE: Noise present in ground electrode or ground rod.
- ⑦ Jaw Open If the jaw is not properly closed during measurement, this symbol and the word "OPEN" will be shown on the LCD.
- ⑧ Low Battery When the battery voltage is lower than required, this symbol will be shown in LCD. Replace the battery.
- ⑨ NO. Indicate the READ function
- ⑩ REC Indicates data logging is in progress
- ⑪ AP Indicate Autopower off will operate in 4 to 6 minutes

3 Ground Loop Measurements

- ❶ Open the jaws and make sure the jaw mating surfaces are clean and free of dust, dirt or any foreign substances.
- ❷ Snap (open and close) the jaws a few times to ensure the jaws mate properly.
- ❸ Turn the power on, and set the rotary switch to the Ω position.
Do not clamp on to any conductor or open the jaws at this moment or during self-calibration.
- ❹ At powering on, the clamp-on ground tester will self-calibrate for better accuracy. Users should wait for the self-calibration to finish before making measurements. During the self-calibration, the LCD will show CAL7, CAL6,..., CAL2, CAL1.
- ❺ When the ground tester is ready, a beep sound will be heard.
- ❻ Clamp on to the electrode or ground rod to be measured.
- ❼ Read the value of R_g (ground loop resistance) from LCD.

Note: For better measurement:

Snap (open and close) the jaws a few times before powering on.
Do not clamp on to any conductor at the moment of powering on.

Note: If self-calibration does not stop:

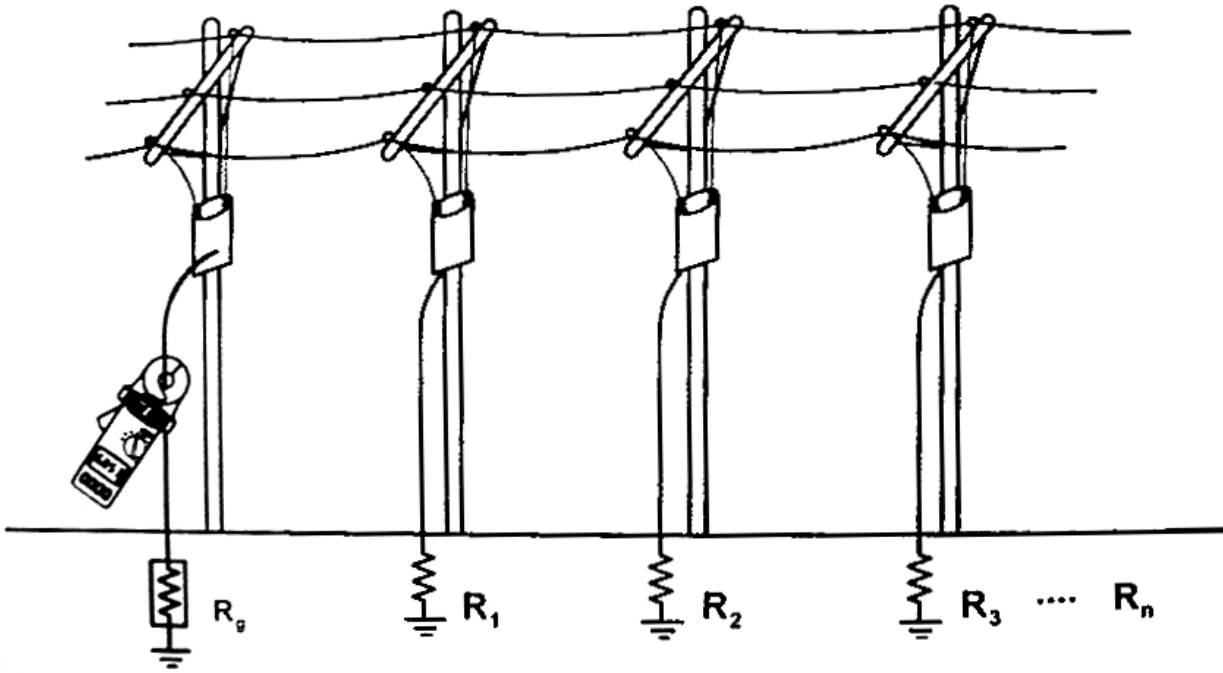
This is because the self-calibration is not complete. The ground tester will continue the process until a proper self-calibration is complete.
Check the jaw mating surfaces. If there is any dirt, dust, or any foreign substance, clean the surface and power up again.

Note: Noise present in the electrode or ground rod:

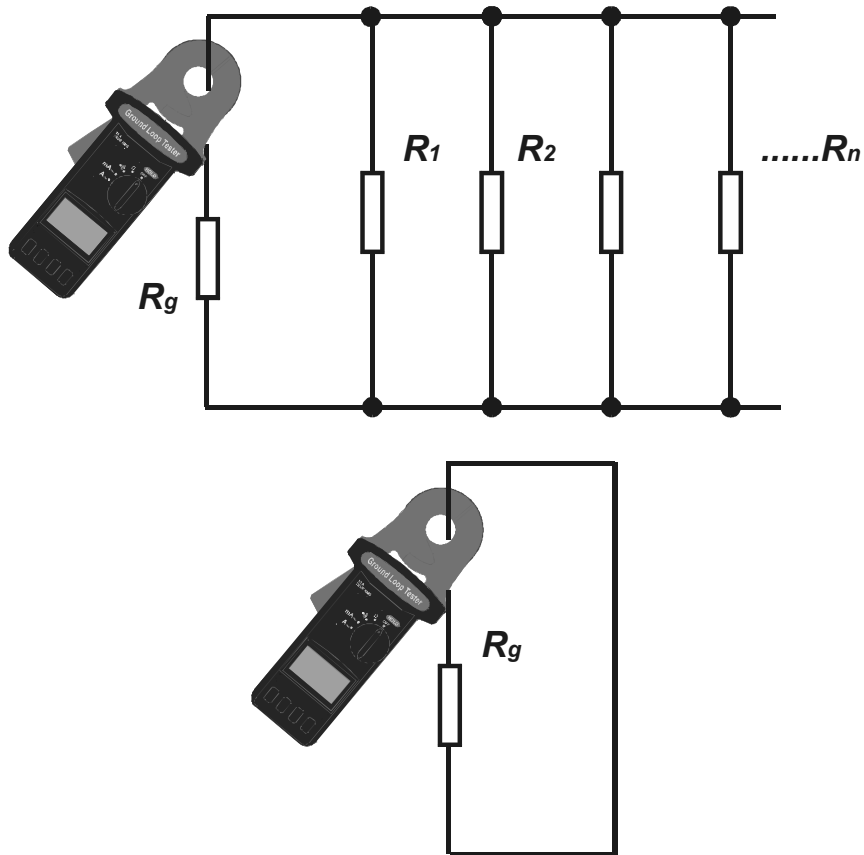
If there exists over 3A current or 30V in ground rod, the symbol "NOISE" will be shown in LCD. Under the presence of noise, the reading is no longer accurate.

Note: If the jaw assembly is open during measurement, a symbol and the word "OPEN" will be displayed on LCD.

Ground resistance measurements principle:



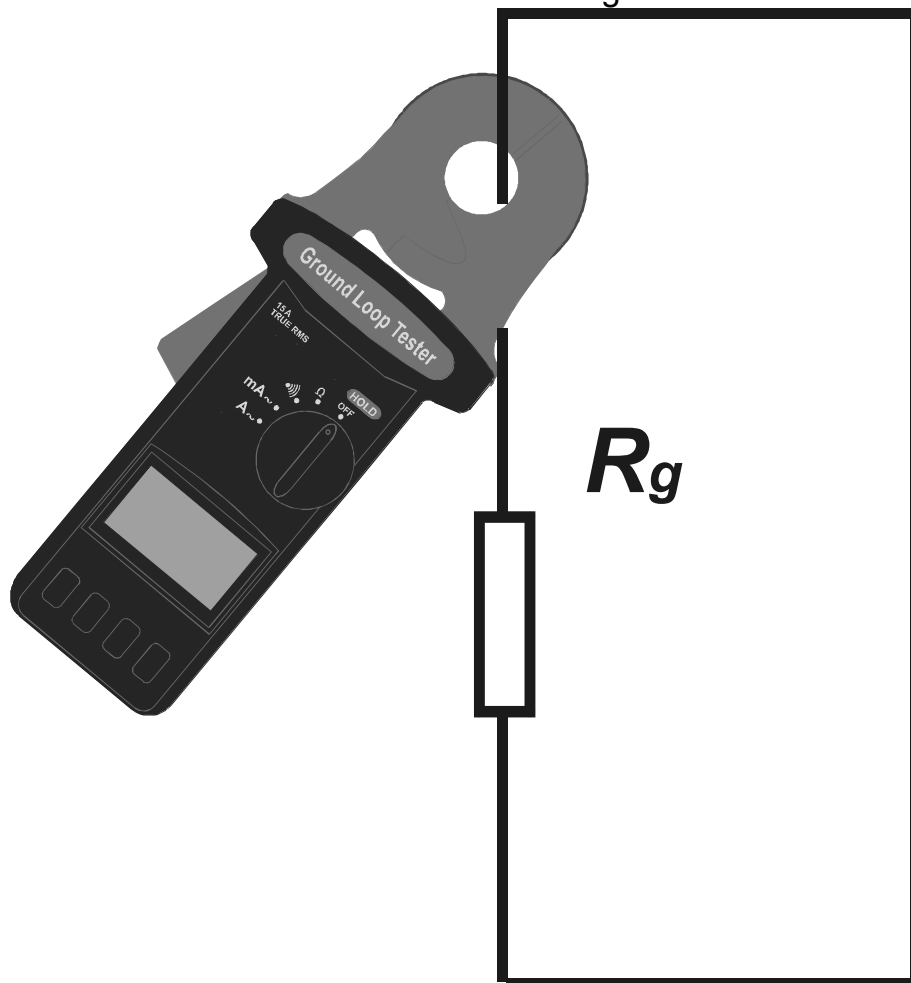
Equivalent circuit diagram:



4 Continuity Loop Test

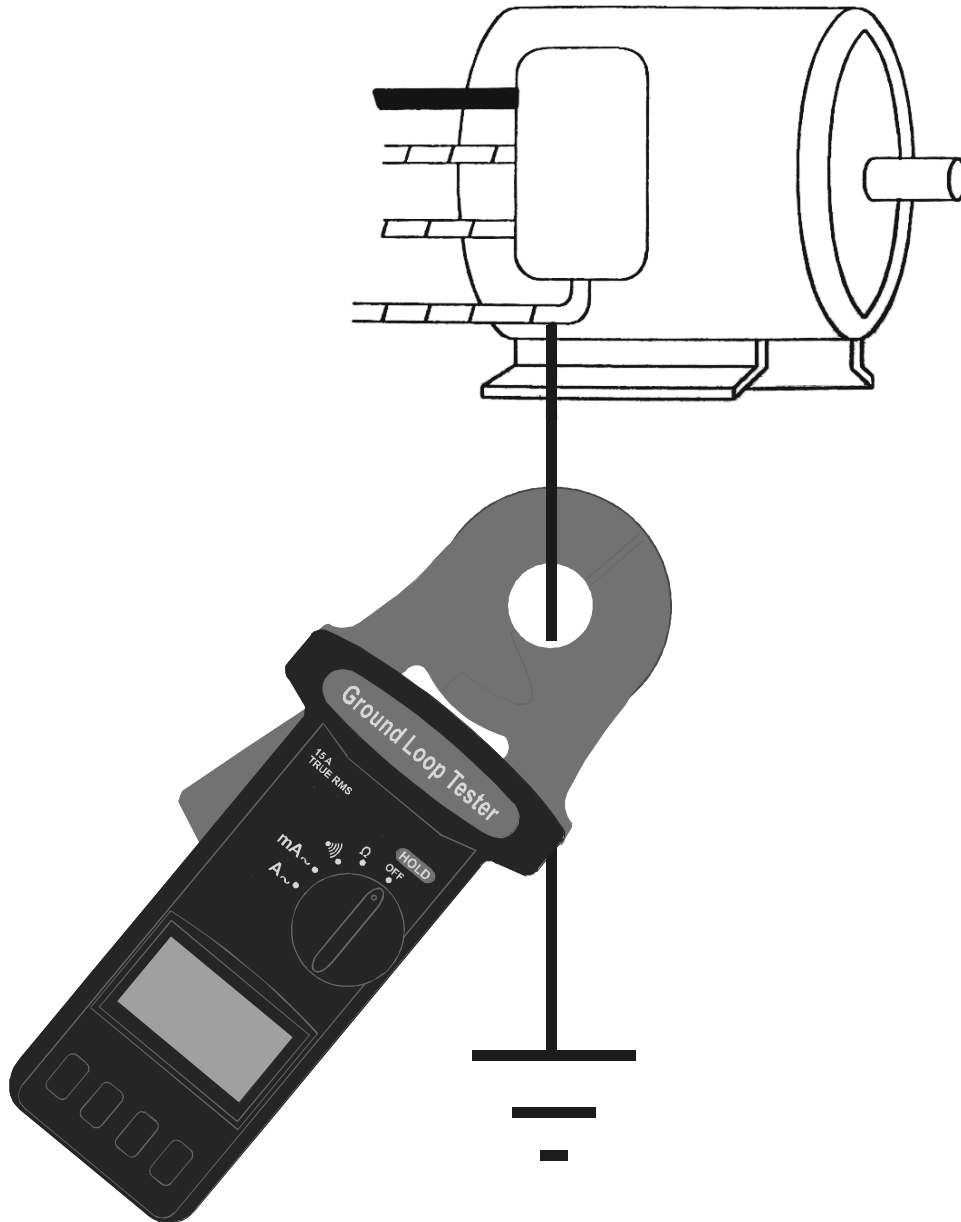
The testing procedures are the same as ground resistance measurement:

- ❶ Open the jaws and make sure the jaw mating surfaces are clean and free of dust, dirt or any foreign substances.
- ❷ Snap (open and close) the jaws a few times to ensure the jaws mate properly.
- ❸ Turn the power on, and set the rotary switch to the “Continuity” position.
Do not clamp on to any conductor or open the jaws at this moment or during self-calibration.
- ❹ At powering on, the clamp-on ground tester will self-calibrate for better accuracy. Users should wait for the self-calibration to finish before making measurements. During the self-calibration, the LCD will show CAL7, CAL6,..., CAL2, CAL1.
- ❺ When the ground tester is ready, a beep sound will be heard.
- ❻ Clamp on to the electrode or ground rod to be measured.
- ❼ A beep sound will be heard if resistance R_g is less than 40Ω .





5 Ground Leakage Current Measurement

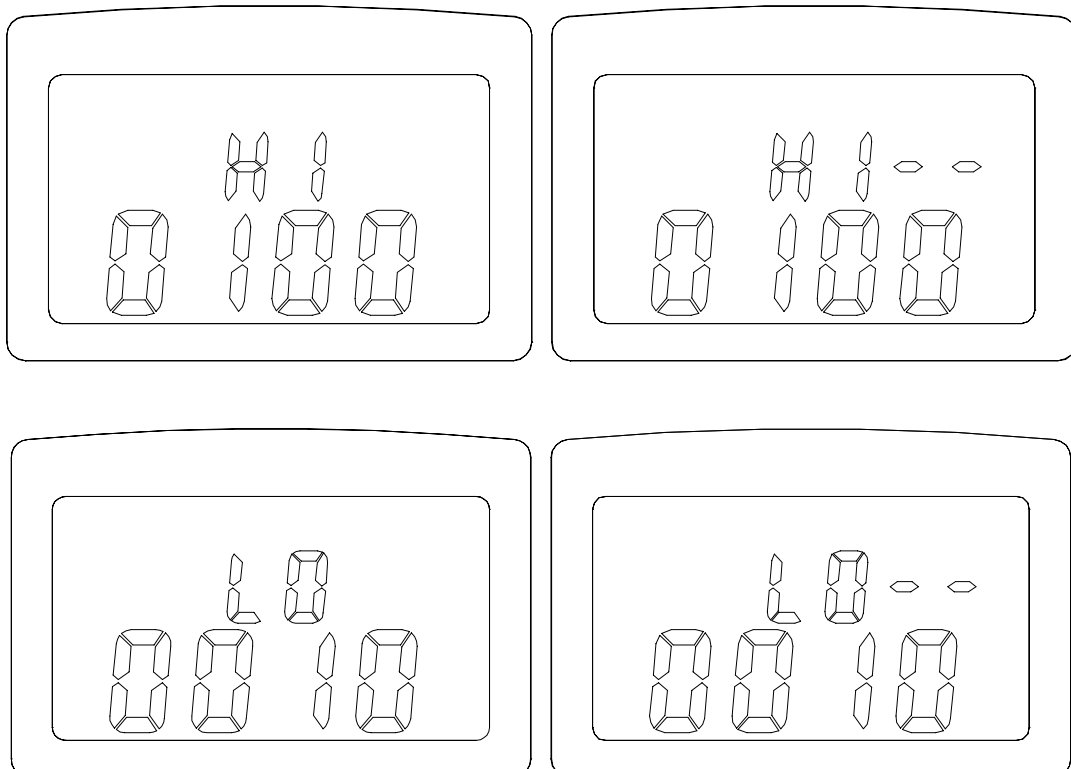
- 1 Turn the power on, set the rotary switch at the mA~ or A~ position.
- 2 Clamp on to the electrode or ground rod.
- 3 Read the value of leakage current displayed on LCD.

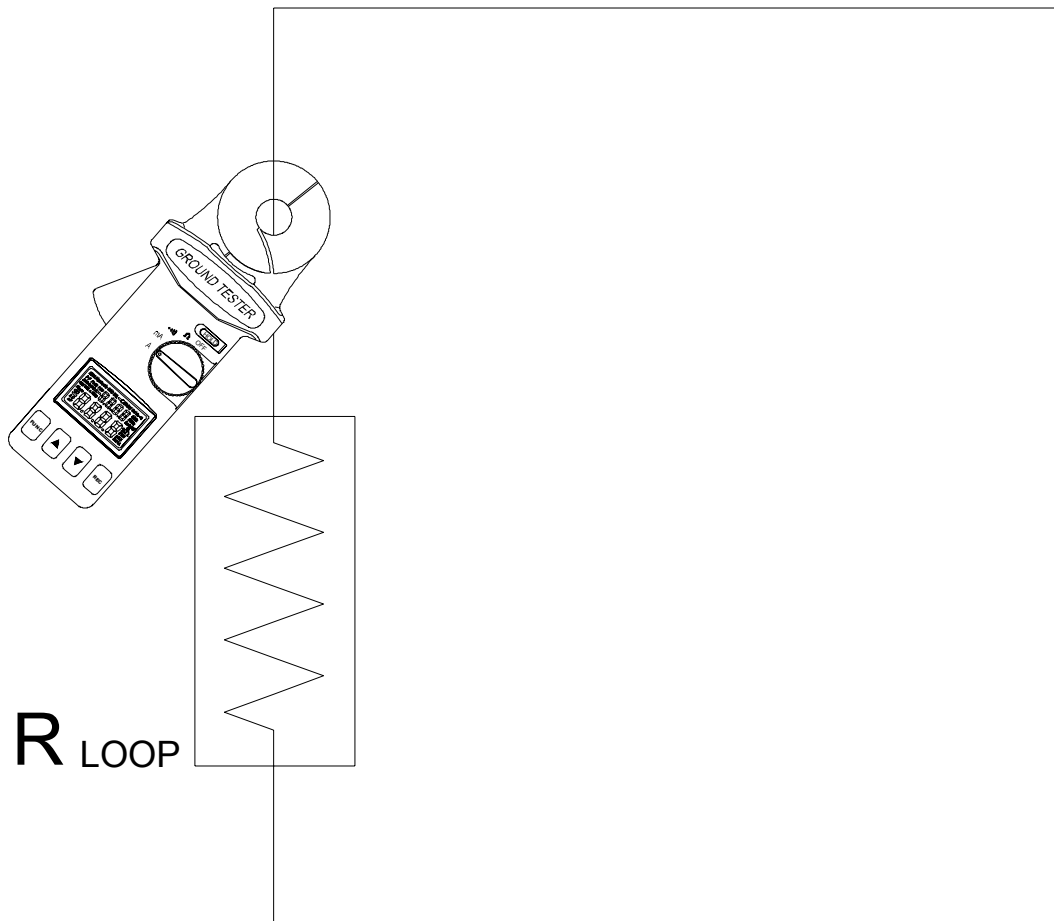


6 Memory and Alarm Functions

6.1 High and Low Alarm ()

1. Set the rotary switch at the  position.
2. Press the FUNC button to select “HI” or “LO” alarm. The current value of High or Low alarm will be shown in the upper row of LCD.
3. Press the ▲ button or ▼ button to increment/decrement the value by 1 ohm. As users hold the button longer, the speed of incrementing/decrementing will become faster. The value can be increment from 0 ohm to 1510 ohm and then OL. Or the value can be decrement from OL to 1510 ohm to 0 ohm. The value will roll over to OL/0 if the current value is 0/OL.
4. Once the value is set, press the FUNC button several times until the upper row LCD show no letters.
5. When the rotary switch is set at the  position. The unit will compare the current value with the high and low values. If the current measurement is larger than HI value, the unit will beep and show HI -- in the upper row of LCD. If the current measurement is smaller than the LO value, the unit will beep and show LO – in the upper row of LCD.





NOTE: If the HI value is set at OL, or the LO value is set at 0, the ALARM function will not be performed. So they are method to disable one of the HI or LO alarm.

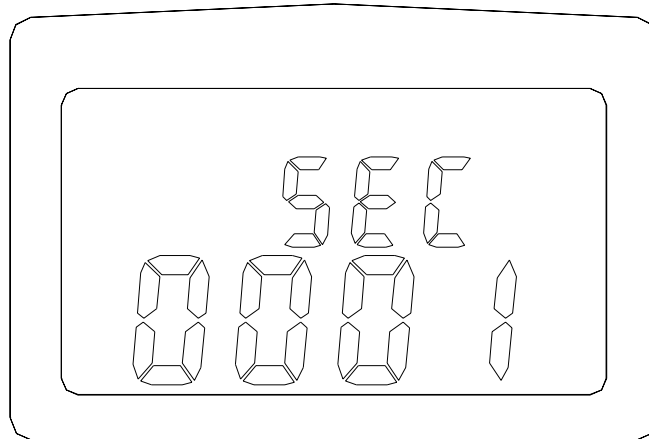
NOTE: The HI value can't be smaller than the low value. And the LO value can't be larger than the HI value. HI value will be adjusted to LO value plus 1 when rollover occurs. The maximum value of LO value is HI value minus 1.

NOTE: If data logging is progressing, sound of beeping will be disabled to save battery power. But the LCD still shows the warning letters of "HI—" or "LO—".

NOTE: The values for the high and low alarm are stored in the memory. They are restored when the power is turned on.

6.2 Setting the Sampling Interval

1. Press the FUNC button until letters of “SEC” are shown in the upper row of LCD.
2. The unit shows the current sampling interval in seconds.
3. Press the ▲ or ▼ button to increment/decrement the value by 1 second. As users hold the button longer, the speed of incrementing/decrementing will become faster. The value can be incremented/decremented from 0 to 255 / 255 to 0 seconds. Value will roll over when the value of maximum 255/minimum 0 seconds is reached.
4. Press the FUNC button several times until the upper row LCD show no letters.



6.3 Data Logging

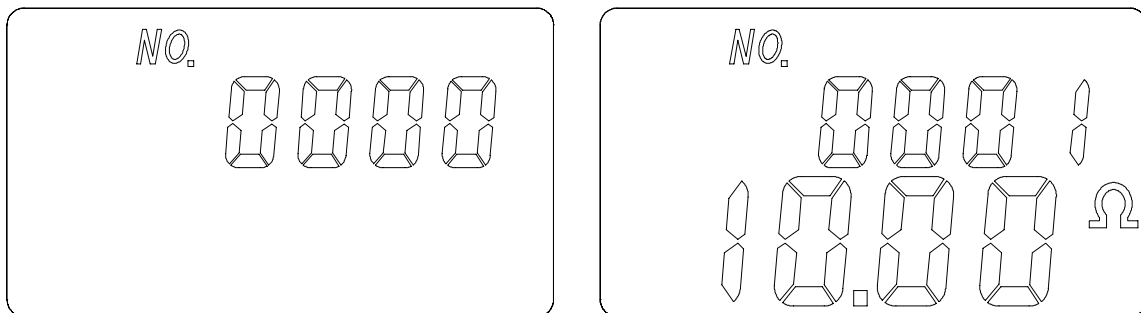
The unit will start data logging if the REC button is pressed, and a symbol of REC will be shown in LCD. Data will be recorded at the specified sampling interval.

Data logging will be stopped if the memory is full, or the unit detects the condition of low battery, or the REC button is pressed again.

NOTE: If the sampling interval is set at 0 seconds, only one data is recorded. To record next data, users can press the REC button again. The record number is also displayed for about 1 seconds.

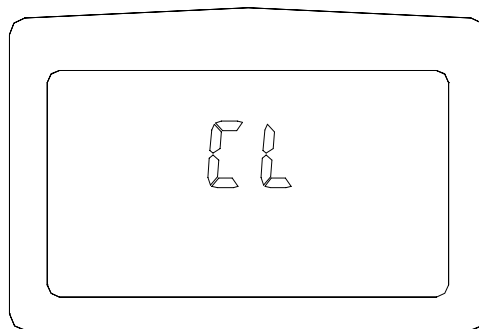
6.4 Read the Data Stored in Memory

1. Press the FUNC button until a symbol of “NO.” is shown in LCD. The current record number is shown in the upper row of LCD. And the data is shown in the lower row of LCD.
2. Press the ▲ or ▼ button to read the next/previous data,
3. If the users hold the ▲ or ▼ button longer, the record number will be incremented/decremented faster. The record number will roll over when the last/first record is reached.



6.5 Clear Data Memory

Press and hold the REC button, then turn the power on. Letters of “CL” will be shown to indicate that memory is cleared.



6.6 Cancel the Auto Power Off

When the unit is turned on, a symbol of AP is displayed in LCD. That means the unit will turn itself off in about 4 to 6 minutes. To cancel this function, user can hold the FUNC button, then turn the power on. Symbol of AP will not be displayed in LCD.

7 Principle of Operation

The following diagram (fig. 1) shows a simplified typical grounded distribution system. Its equivalent circuit (fig. 2) is shown below. If $R_1, R_2, R_3, \dots, R_n$ is combined as R_{eq} , then only R_g and R_{eq} are left in the circuit (see figure). If a constant voltage is applied to the circuit, the following equation is valid:

$$\frac{U}{I} = R_g + R_{eq}$$

where

$$R_{eq} = \frac{1}{\sum \frac{1}{R_i}}, i = 1, 2, \dots, n$$

If R_g and R_1, R_2, \dots, R_n are about the same, and n is a large number (such as 200), then R_{eq} will be much less than R_g and maybe approach zero.

$$R_g \gg (R_{eq} \rightarrow 0)$$

Example:

If R_g and R_1, R_2, \dots, R_n are all 10Ω , respectively and $n = 200$, then R_{eq} by calculation equals

$$R_{eq} = \frac{1}{\frac{1}{10} + \frac{1}{10} + \dots + \frac{1}{10}} = 0,05\Omega \quad \frac{U}{I} = R_g + R_{eq} = 10 + 0,05 = 10,05 \rightarrow R_g$$

In this example, we can see that as long as the number of multiple electrodes is large enough, the equivalent resistance is negligible with respect to the ground resistance to be measured.

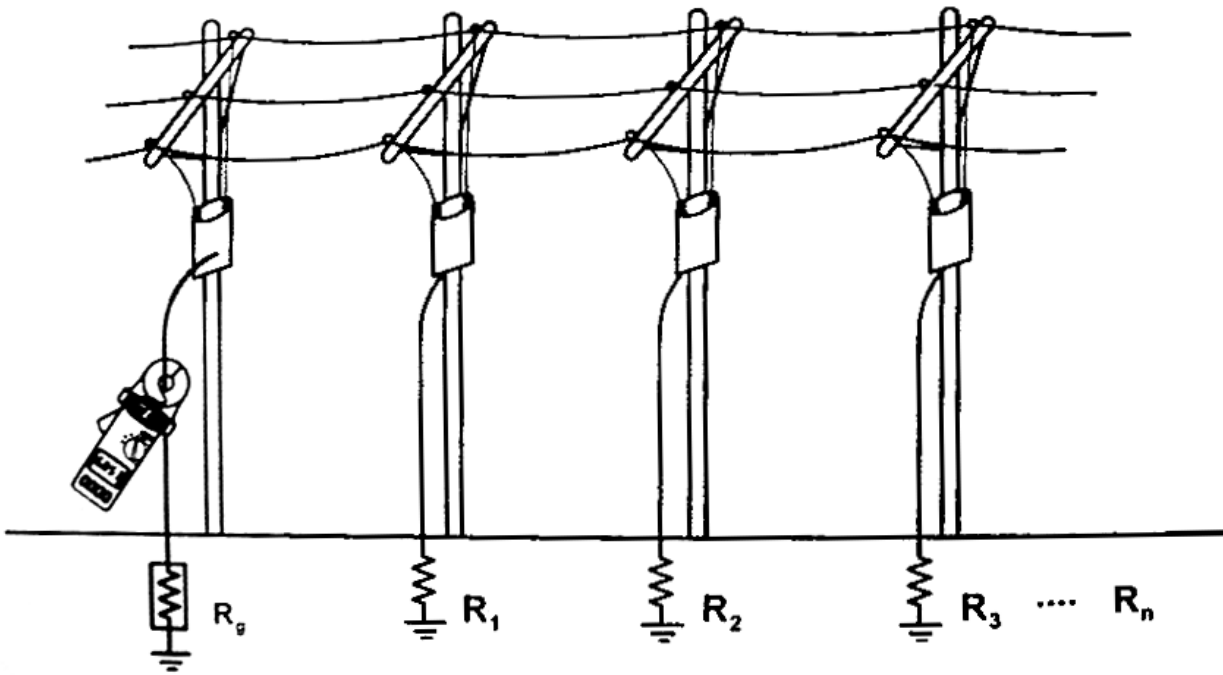


Fig. 1: Typical grounded distribution systems

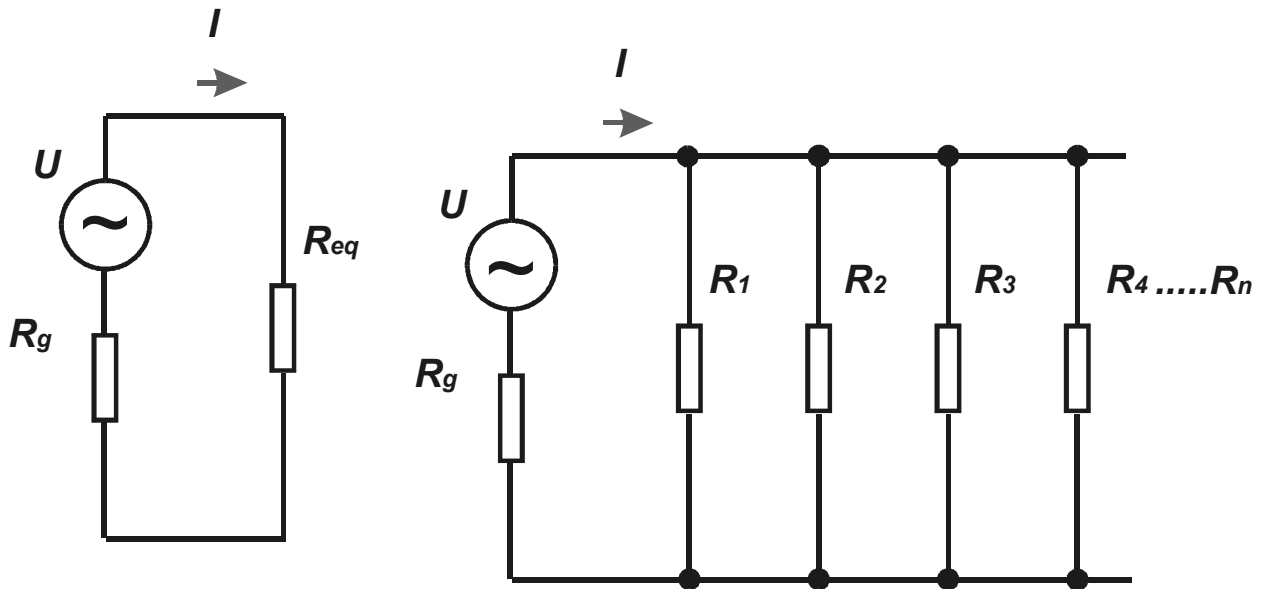


Fig. 2: Equivalent circuit diagram

8 Specification

Electrical Specification

Display: 9999 digit LC-display with special symbols

Temperature ranges:

Operating humidity: Less than 85% RH

Storage

temperature: -20 °C ... +60 °C (-4 °F ... +140 °F)

Storage humidity: Less than 75% RH

Reference temp.: +23 °C ± 5 °C (+73 °F ± 9 °F)

Temperature coeff.: 0,1% o. rdg. / Kelvin

Operating error: Refers to the operating temperature range

Protective type: IP20 according to IEC 529 / EN 60529

Safety: 300V, installation CAT III / pollution degree 2
(according to EN 61010-1:1992)

EMC (Emission): IEC 1000-4-2, IEC 61326-1 class B

EMC (Immunity): IEC 61000-4-2 8 kV (air) perf. criteria B,
IEC 61000-4-3 3 V/m perf. criteria A

Range selection: Auto

Overload indication: OL

Measuring time: 0,4 sec

Measurement

frequency: 1.667KHz

Auxiliary power: 9V alkaline (type IEC 6 LR 61)

Power consumption: 40 mA

Low battery

indication:  Symbol

Mechanical Specification

Conductor size: 23mm (0.9") approx.

Dimensions: 257 mm (L) x 100 mm (W) x 47 mm (H)
10" (L) x 3.9"(W) x 1.9"(H)

Weight: 640 g (1,4 lbs)

Ground Loop Resistance (Autorange):

Operating temp.: 0 °C ... +50 °C (+24 °F ... +122 °F)

| Range | Resolution | Operating error ⁽¹⁾ |
|-----------------|------------|--------------------------------|
| 0.025 - 0.250 Ω | 0.002 Ω | ±1.5%rdg ± 0.05 Ω |
| 0.250 - 9.999 Ω | 0.02 Ω | ±1.5%rdg ± 0.1 Ω |
| 10.00 - 99.99 Ω | 0.04 Ω | ±2.0%rdg ± 0.3 Ω |
| 100.0 - 199.9 Ω | 0.4 Ω | ±3.0%rdg ± 1.0 Ω |
| 200.0 - 400.0 Ω | 2 Ω | ±5.0%rdg ± 5 Ω |
| 400.0 - 600.0 Ω | 5 Ω | ±10%rdg ± 10 Ω |
| 600.0 - 1500 Ω | 20 Ω | ±20% |

⁽¹⁾ Loop resistance with no inductance, external field < 50 A/m, external electrical field < 1 V/m, conductor centered.

Continuity

Operating temp.: 0 °C ... +50 °C (+24 °F ... +122 °F)

Beep if resistance < approximately 40.00 Ω

Ground/Leakage Current mA~

Operating temp.: -10 °C ... +50 °C (+14 °F ... +122 °F)

(Autorange, 50/60 Hz, True RMS, crest factor CF< 3.0)

| Range | Resolution | Operating error |
|------------------|------------|--------------------|
| 0.200 - 1.000 mA | 0.001 mA | ±2.5%rdg ± 0.05 mA |
| 1.00 - 10.00 mA | 0.01 mA | ±2.5%rdg ± 0.05 mA |
| 10.0 - 100.0 mA | 0.1 mA | ±2.0%rdg ± 0.3 mA |
| 100 - 1000 mA | 1 mA | ±2.0%rdg ± 3 mA |

Ground/Leakage Current A~ (50/60 Hz, True RMS, crest factor CF< 3.0)

Operating temp.: -10 °C ... +50 °C (+14 °F ... +122 °F)

| Range | Resolution | Operating error |
|-----------------|------------|-------------------|
| 0.20 - 15.00 A | 0.01 A | ±2.0%rdg ± 0.03 A |
| 15.00 - 30.00 A | 0.01 A | ±3.0%rdg ± 0.03 A |

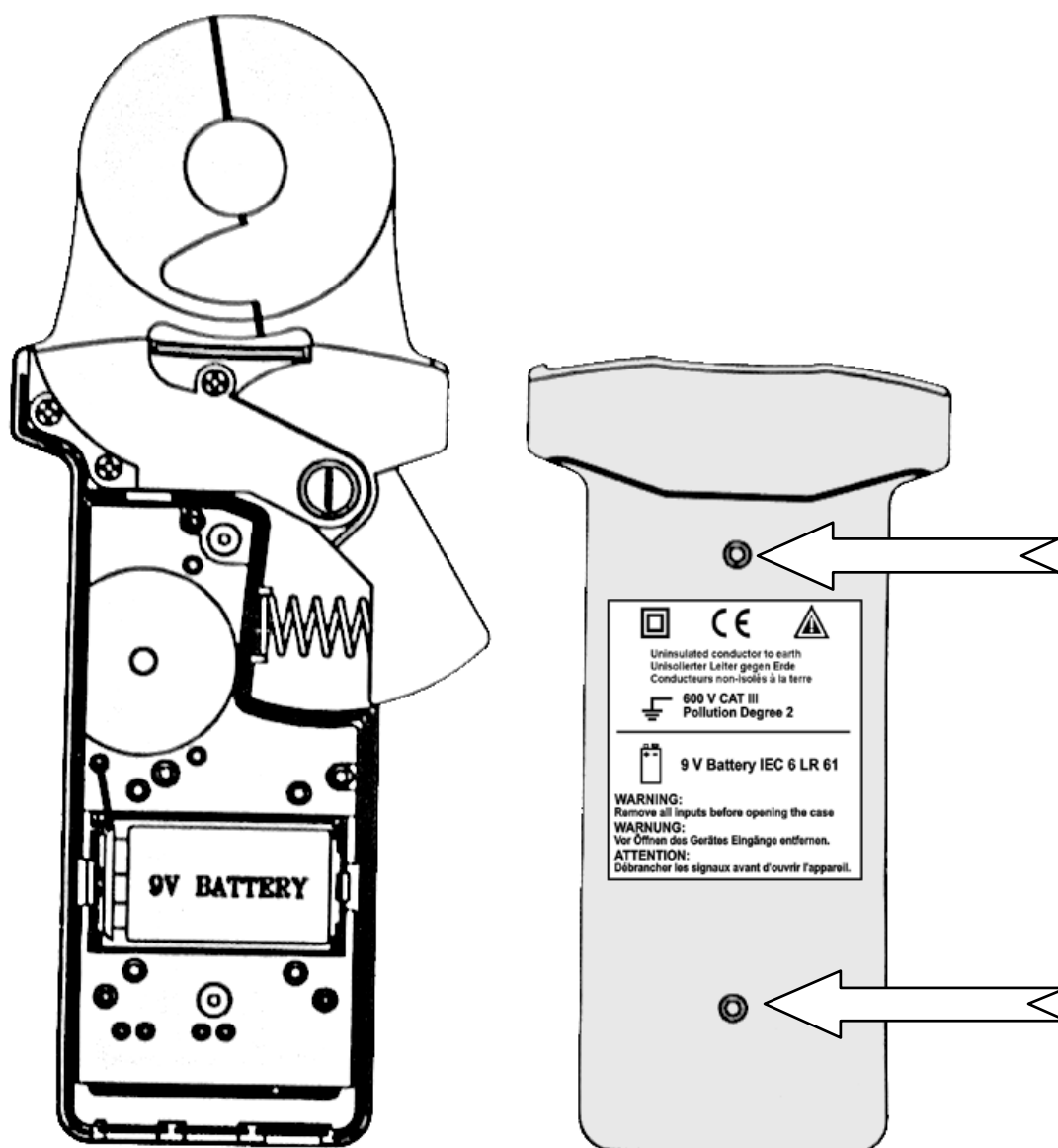
Max. Current Protection: 100A continuous, 200A (< 60 sec.) 50/60Hz.

| |
|--|
| Current Overload Protection: 100A Continuous, 200A (< 60 seconds) 50/60Hz. |
|--|

Battery Replacement

When the low battery symbol is displayed in LCD, replace the battery.

- Turn the power off.
- Remove the bottom case screws.
- Lift and remove the bottom case.
- Remove the old battery.
- Install new 9V battery.
- Replace the bottom case and secure the screws.



9 Maintenance, Service

If the instrument is operated and handled properly it does not require specific maintenance and service. Maintenance work must only be undertaken by trained and qualified staff and during the warranty period only by authorised service centres.

Calibration

As an additional service we offer a regular inspection and calibration of your instrument. Upon request and for a fee we supply company test certificates or test certificates from national calibration services.

Storage

In case the instrument is either not used or stored for a longer period, remove the battery and keep it separately to avoid possible damage from leaking battery electrolyte.

Service

This instrument has been manufactured and tested according to the latest technological innovations and in compliance with the **quality assurance system DIN ISO 9001**.

If there should still be reason for complaint please refer to your nearest service centre, giving a **detailed description of the defect** by using the enclosed service card and including a copy of the invoice or the delivery note. If the instrument is operated as agreed we guarantee fault free function of the instrument for a period of TWO (2) years after the date of the first end-user purchase.

This warranty does not apply to any damage caused by improper treatment or operation or by impermissible overload.

Packing

Use for shipping the original packing only. The manufacturer doesn't accept any charges for damage that may have been caused by inappropriate packing.

1 year warranty entitlement to repairs free of charge in case of malfunction of the instrument excluding damage caused by misuse.

Note: For reasons of clarity this manual does not contain detailed information about all models and applications, modes of operation and maintenance.

10 Other products

LEM offers a comprehensive range of electrical test products to ensure the safe and efficient operation of electrical equipment and installations including:

| | |
|------------------------------|---|
| Earth/ground testers: | HANDY GEO, SATURN GEO, UNILAP GEO (X) |
| Installation testers: | SATURN 100, UNILAP 100, UNILAP 100 (X)E |
| Insulation testers: | HANDY ISO, SATURN ISO, UNILAP ISO X, UNILAP ISO 5kV |
| Clamp-on meters: | LH Series and Analyst 2050/60 |
| Current probes: | PR Series and LEM~Flex |
| Multimeters: | Unigor Series |
| Power Quality | Analyst 3Q – Three and Four phase analyser |
| Analysers | Analyst 3P – Three phase energy analyser |

A full range of accessories is available including: interfaces (RS232, IrDA®), data memory and PC-software for report generation.

Other products from the LEM group include systems and analysers for power and power quality monitoring and transducers for current and voltage measurement. LEM provides complete measurement solutions in current, voltage and power quality - please, contact our sales partners worldwide for more information.

LEM policy is one of continuous product improvement and the company reserves the right to revise the above specifications without notice.