GROUND RESISTANCE METER
Habotest HT2302

User Manual

Before using the camera, please read the instructions carefully and keep them for

future goals.

Statement

Safety Statement

⚠ Warning

The '⚠ Warning' sign indicates a condition and action that may cause damage to the meter or its equipment.

Caution is required when performing an action that may cause damage to the camera or its equipment if not handled properly. If these conditions are not met or if they are not fully understood, please do not proceed with any further action indicated by this warning sign.

Before using the meter, please read the manual carefully and remain aware of important safety warning information.

Safety information

This device may only be used and operated by qualified personnel in accordance with the following precautions, specifications and technical data. At the same time, the use of this device requires compliance with all laws and safety rules related to a number of applications. Operating electrical equipment may carry dangerous voltage. Failure to comply with warnings may result in serious personal injury and damage to the device.

"Qualified person" means a person who is familiar with the configuration, installation, commissioning, and operation of the device and is officially qualified to perform the activities in question.

The device is designed and manufactured in accordance with IEC61016 safety specifications and meets GB4793.1-1995 (IEC-1010-1:1990) safety requirements for electronic measuring devices.

⚠ Warning

- Make sure that the rotary switch is set to the correct position and that the measurement cable is fully and properly inserted into the measurement port before starting the measurement.
- Do not use the meter in circuits where the ground voltage exceeds 300 volts DC or AC.
- Do not use the meter near explosive gases, vapors or dust.
- Do not connect the test lead or ground rod when the meter surface or hands are wet.
- Do not touch the connecting meter wire or ground rod during measurement.
- Do not open the battery cover during measurement.
- Do not take measurements under abnormal conditions; for example, when a part of the instrument has been damaged or when metal parts of the instrument or measuring wires have been exposed.
- Do not install replacement parts on the meter or modify the meter. If the unit is defective, return it to your local service location.
- Please set the rotary switch to the "off" position and remove the measuring cable
  Before opening the battery cover for replacement.

⚠ ***Warning***

- When not using the instrument for a long time, please remove the battery and place it properly.
- Do not expose the instrument to sunlight, heat, moisture and dew.
- Do not use abrasives or organic solvents for cleaning, use natural detergents or a damp cloth.
- Do not keep the instrument when it is wet. The instrument must be stored when dry.

Main functions of the meter

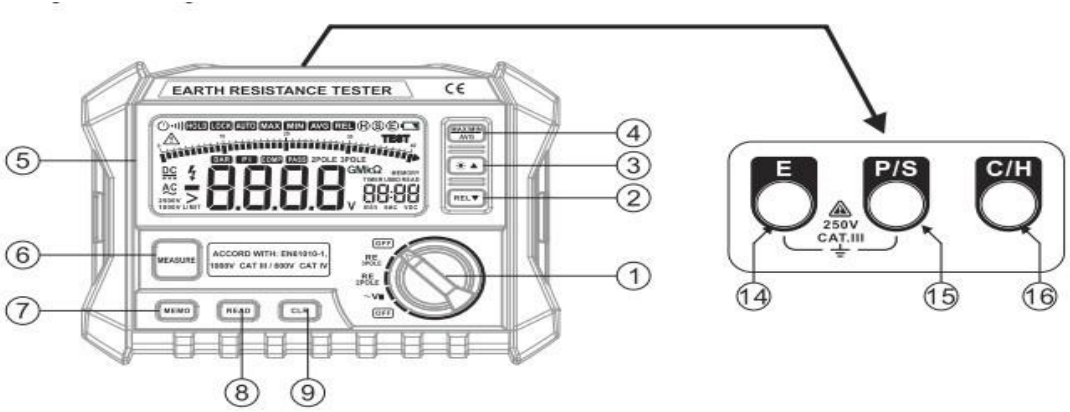
- Measurement of interference voltages
- Measurement of grounding resistance of various equipment (for example, high voltage poles, buildings, grounding systems in electrical engineering, mobile communication base stations, high frequency transmitters, etc.).
- Monitoring and planning of lightning protection systems
- Resistance measurement with auxiliary grounding electrodes

General outline

The device is controlled by an intelligent microcontroller with high reliability and accuracy. It can be used to measure the ground resistance of various electric power distribution cables, indoor wiring, electrical equipment, lightning protection devices, etc. There are two ways of measuring: two-pole method and three-pole method. The device can also measure ground voltage.

The instrument uses a multi-digit backlit display that is easy for users to read. The meter includes a data storage function that can store 100 sets of data measurements, and the data will not be lost in case of power loss, which can be convenient for users making historical measurements. The instrument can measure maximum, mininal and average value, and has a relative measurement function and an automatic shutdown function.

Meter panel description



1- Rotary switch

It can control the power switch. It is also used to select between ground voltage measurement, two-pole resistance measurement or three-pole resistance measurement.

2- REL button

It is used not only to select the relative measurement function, but also serves as a "down" button when reading data.

3- LIGHT button

It is used to switch between measuring the maximum, minimum or average value.

4- LCD

It is used to display measurement results, functions, units and other symbols.

6- MEASURE button

It is used to start and end the resistance measurement.

7- MEMO button

It is used to save measurement results on the device.

8- READ button

It is used to read data from the device.

9- CLR button

It is used to remove data from the measurement.

14- E socket

It is used to connect to the grounding post.

15- *P/S* slot

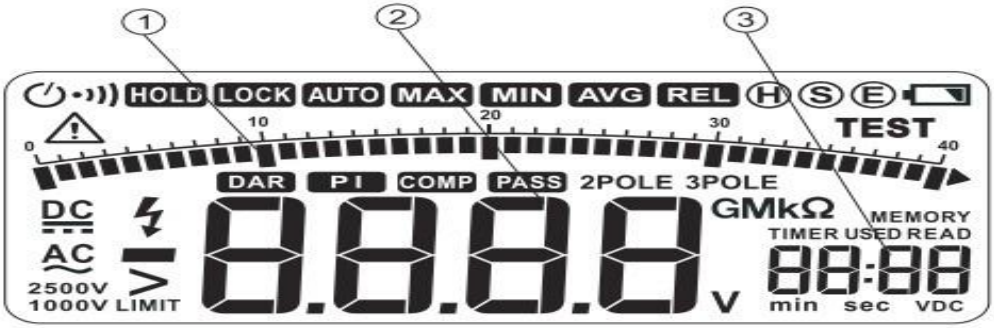
It is used to connect to an auxiliary grounding post.

16- *C/H* socket

It is used to connect to an auxiliary grounding post.

Display description

1- Simulation bar
2- Display of obtained data
3- Display of memory used to store data



Description of the display symbol:

TEST:	Measurement markers	>LIMIT:	The limit has been exceeded
MAX:	Maximum	MIN:	Minimum

AVG: Medium
READ: Reading data USED: There are data in memory
2POLE: A two-pole method is used to measure resistance 2POLE: A three-pole method is used to measure resistance V: Volts (voltage)
~ : AC Symbols

⚠: For alerts

⏻ : Automatic power off has been started with the ON symbol

User Manual

⚠ Warning

When measuring the ground voltage, do not apply more than 300 volts to the measurement connection.

When measuring ground resistance, high voltage will be obtained between E, P/S or E, C/H connectors and the risk of electric shock will be avoided.

Before you use the meter for measurement, first check the battery voltage, turn on the meter switch and see if the undervoltage indicator appears .If the indicator appears, replace the batteryaccording to the procedure described in the section on battery replacement.

Measurement of ground voltage

Turn the rotary switch to the"~V_E" position and insert the measuring cable into the E and P/S sockets. The other end of the measuring cable is connected in parallel to the voltage source or load terminals, and the voltage value is displayed on the LCD screen.

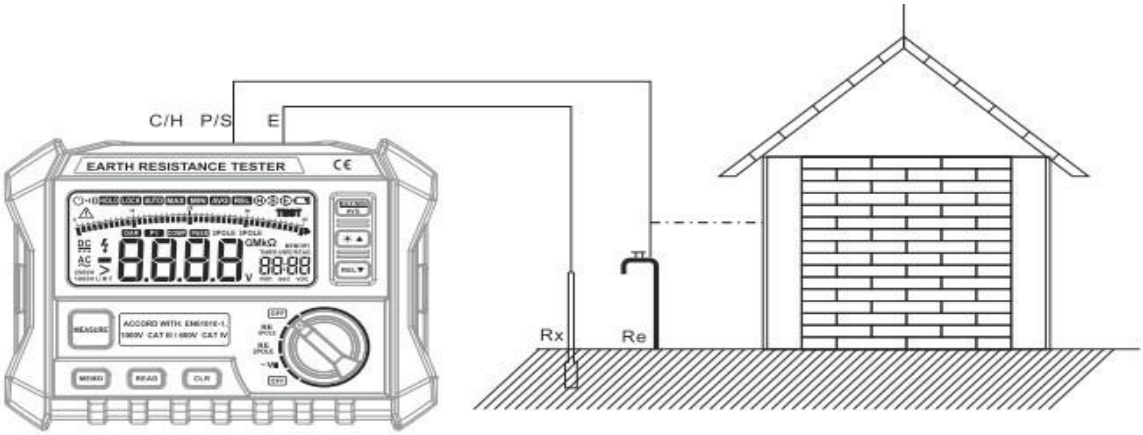
Measurement of earth resistance by the bipolar method (simple measurements)

In this method, the auxiliary grounding rod measurement method is not used. An existing grounding electrode with a known minimum grounding resistance is used as an auxiliary grounding electrode.

The stages of measurement are as follows:

(1) First, measure the ground voltage

The ground voltage is measured before the ground resistance, and whether the measured device has a ground voltage is detected according to the "ground voltage measurement" method. If the ground voltage exists and exceeds 10 V, the resistance measurement will produce a relatively large error. Please cut off the power supply to the object to be measured and make the measurement only after the ground voltage drops.



Grounding resistance measurement

(2) Turn the rotary switch to the "Bi-pole method" position, connect the meter to the measured device as shown above, press the "Measure" button to start measuring, the "Measure" button will light up and start flashing, after the measurement automatically stops, the beeper will turn on and the "Measure" button will turn off, the measured ***Re*** value will be automatically stored in the display for the user to read.

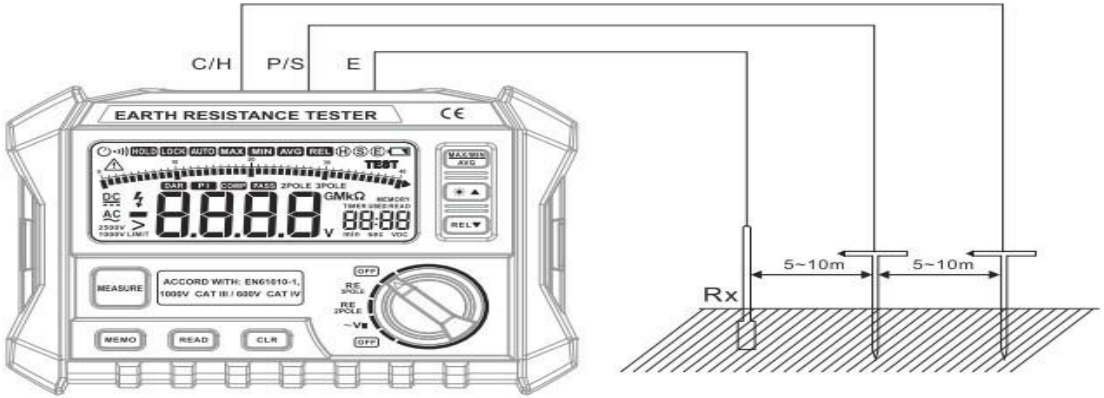
Annotation: if the measurement value is out of range, the display will show a value of >LIMIT 4000Ω indicating that the auxiliary ground resistance of the auxiliary ground rod is too high and current cannot flow through the device.

(3) Calculation of earth resistance values

The measurement value ***Re*** is the sum of the ground resistance value ***re of the*** auxiliary grounding electrode and the actual ground resistance value ***Rx*****,** so the measurement value ***Re*** minus the value ***re*** is the actual ground resistance value ***Rx: Rx* (ground resistance value) = *Re* (measurement value) - *re* (ground resistance value of the auxiliary grounding electrode).**

Measurement of earth resistance by the three-pole method (accurate measurements)

This meter uses the potential difference method to perform ground resistance measurement. Potential difference method refers to the method of calculating the value of grounding resistance ***Rx*** by the rated AC current ***I*** between the measured object ***E*** (grounding electrode) and ***C/H*** (intensity electrode) and the potential difference ***V*** between the measured object ***E*** and ***P/S*** (voltage electrode).



(1) First, check the ground voltage

The measurement of ground voltage occurs before the measurement of ground resistance, and whether the measured device has a ground voltage is detected by the "ground voltage measurement" method. If the ground voltage exists and exceeds 10 V, the measurement of ground resistance will produce a relatively large error.

Please cut off the power supply to the object to be measured and make the measurement only after the ground voltage drops.

（2）Grounding resistance measurement

As shown in the figure above, starting from the measured device. Auxiliary ground rod P and auxiliary ground rod C are placed in a straight line every 5 to 10 meters, and later they are deeply driven into the ground. The measuring wires (black, red, green) are connected from the E, P/S, C/H ports of the meter according to the order of the device, auxiliary ground rod P and auxiliary ground rod C.

The rotary switch is turned to the 'Tri-pole method' position, and measurement is started by pressing the 'Measure' button. The 'Measure' button lights up and flickers. After the measurement is automatically stopped, the sounder beeps and the 'Measure' button goes out. The measurement value is automatically stored on the display screen and the measurement results can be read.

Note: Please insert the auxiliary ground rod into moist soil as far as possible. If you need to insert the rod into dry soil, stone or sand, please moisten the inserted part of the auxiliary ground rod with water to keep the soil moist. When measuring on concrete, please level the ground rod, sprinkle water or put wet towels on the auxiliary ground rod.

Note: If the measured value is out of range, the symbol '>LIMIT4000 ' will be displayed, indicating that the ground resistance of the auxiliary ground strap C is too high for the current flowing through the meter. Please confirm if the wires are loose. Mixing or contacting the test leads can also lead to an error in the measurement value. So, please make sure that the measuring wire is separated before measurement. When the auxiliary ground resistance is too high, the indicator value will produce a large error. Please stick the auxiliary grounding rods P and C respectively in a place with more moisture, and ensure the safety of the connection of each part of the connection.

Storage of measurement data

The meter can store up to 100 sets of data measurements without losing data when power is lost.

(1) Press the 'Record' button in standby mode, and the data will be stored in memory. When the retained data reaches 100, the oldest data will be deleted before the current data is retained.

Reading the measurement data

The meter's readout function allows users to view stored historical measurement data.

(1) Press the 'READ' button in standby mode, the device opens the data reading interface, the 'READ' symbol is displayed. If there are data in the current position, the 'USED' symbol will be displayed. Press the 'READ' button again to exit the data storage interface.

(2) Press the or button briefly to flip the data down or up. In read

(3) mode, press the 'READ' button to exit read mode.

Data deletion

The meter can delete data in read mode. Press the 'Delete' button briefly to delete the data from the current position.

Relative measurement

(1) In relative measurement mode, the 'REL' symbol is displayed. The displayed intensity value is stored in memory as a reference value and for future measurements the displayed value is the difference between the input value and the reference value, for example, **intensity reading = input value - reference value.**

(2) In the ground resistance measurement mode, the relative measurement mode cannot be entered during measurement.

(3) In the mode of reading and preserving data, the relative mode cannot be entered measurement.

(4) When the displayed intensity value exceeds the limit value, the relative measurement mode cannot be entered.

Maximum/minimum/average measurement value

Press the 'Select' button to switch the measurement mode between maximum, minimum, average and normal measurement modes, and the corresponding characters will be displayed on the screen.

(1) **In MAX measurement mode, the** largest data measurement value on the screen will be displayed.

(2) **In MIN measurement mode, the** smallest data measurement value will be displayed on the screen.

(3) **In AVG measurement mode, the** average value of the measurement results made during the measurement process is displayed.

Highlight

Press the backlight button to turn the backlight on or off.

Automatic shutdown

The meter has an auto power off function. Press and hold the 'Auto Power Off' button and turn the rotary switch to enable the auto sleep mode. When the Auto Power Off function is enabled and the meter has not been operated for 10 minutes, the meter will turn off the display, enter sleep mode and beep to remind you before shutting down. The meter can be awakened from sleep mode by pressing any button. If you do not use it for a long time, turn the rotary switch to the 'Off' position.

General specifications

- Measurement methods:

① Ground resistance is measured through a DC conversion method. This method uses a test current with a frequency of about 800 Hz and a size of about 2MA.

② The average numerical conversion method is used to measure the ground voltage.

- The device operates between 0°C and 40°C , relative humidity below 85%
- The storage temperature is from -10 to 50 °C , relative humidity below 85%.

- Power supply: eight 1.5V AA batteries
- Volume: 330 X 125 X 265
- Weight: approximately 3.5kg
- **Accessories:** 3 test leads (one 15-meter red lead, one 10-meter green lead and one 5-meter black lead), 2 auxiliary ground rods

Technical parameters

Accuracy: ± (% rdg + dgts). 'rdg': displayedvalue. 'dgt': itudeof the smallest change

The warranty period is one year.
Initial conditions: Surrounding temperature between 18°C,and 28°C and relative humidity below 80%.

	Zakres	Dokładność	Rozdzielczość
Opór uziemienia	0 ~ 29.99Ω	±(2%rdg + 6d)	0.01Ω
	30.0 ~ 99.9Ω	±(3%rdg + 3d)	0.1Ω
	100 ~ 999Ω	±(3%rdg + 3d)	1Ω
	1.00k~4.00kΩ	±(3%rdg + 3d)	10Ω
Napięcie uziemienia	0V~200V (50/60HZ)	±(1%rdg + 5d)	0.1V

Battery Replacement

Warning

Never replace batteries while the meter is wet.
Never replace batteries while the meter is in use. Turn off the meter and disconnect the test leads and ground rods before replacing to avoid electric shock.

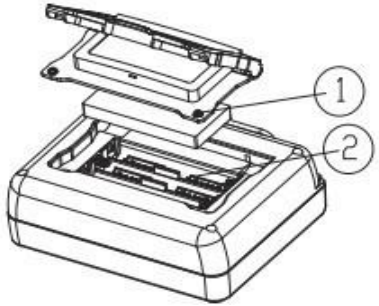
Note

Never mix new batteries with old ones.
Pay attention to the polarity of the battery when replacing it.

（1）Unscrew the battery cover and remove it.

（2）Replace the old batteries with new ones and pay attention to their

（3）polarity. Put the battery cover back on and screw it on.



Environmental protection

Waste electronic equipment labeled in accordance with the European Union directive, must not be placed together with other municipal waste. It is subject to separate collection and recycling at designated points. By ensuring its proper disposal, you prevent potential negative consequences for the environment and human health. The collection system for used equipment complies with locally applicable environmental regulations on waste disposal. Detailed information on this subject can be obtained from the municipal office, the purification plant or the store where the product was purchased.

The product meets the requirements of the directives of the so-called New Approach of the European Union (EU) on issues related to safety of use, health protection and environmental protection, specifying the risks that should be detected and eliminated.