EAGLOTEST

S710

ONLINE EARTH RESISTANCE TESTER



USER MANUAL

CATALOG

Safety Warnings **1**

Introduction **3**

Specification **4**

Structure **6**

Measurement Principle **7**

Operation **8**

6.1 Operation 8

6.2 Test 9

6.2.1 Wire Resistance Calibration 10

6.2.2 Ground Resistance Test 11

6.2.3 Ground Voltage Test 13

6.3 Communication 13

Assembly Drawing **16**

Packing List **17**

SECTION 1

Safety Warnings

Thank you for purchasing S710 Online Ground Tester/Grid Earth Resistance Monitor! Before using the models, please carefully read the user manual and strictly follow the instruction.

- In any case, pay attention to safety when using this instrument.
- Suitable for online monitoring of grounding resistance and grounding voltage.
- It is necessary to prepare the auxiliary ground electrode first, and then install the detector.
- Pay attention to the measurement range and operating environment specified by this detector.
- For outdoor installation, please install protective devices.
- Make sure that the test lead is tightly connected to the instrument and the object under test.
- The housing is made of non-metallic material. There is a potential danger of electrostatic charge. Avoid friction in dangerous places. Please clean it with a damp cloth.
- Do not touch the output jack to avoid electric shock.
- Pay attention to the text and icons on the panel and back panel of the instrument.
- Do not place the instrument in an environment of high temperature, humidity, and direct sunlight for a long time.
- Only authorized personnel can operate, disassemble this instrument, or conduct maintenance.
- Only authorized personnel can conduct disassembly, calibration, and maintenance

SALES OFFICE
Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

of this detector.

- Stop using the instrument immediately in case of any danger will be caused by continuing to use it. Please securely pack the equipment and send it to an authorized organization for disposal.
- The user must follow the danger sign“ ⚠ ”to conduct a safe operation
- The user must follow the extreme danger sign“ ⚡ ”to conduct a safe operation.

SALES OFFICE

Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

SECTION 2

Introduction

S710 Online Earth Resistance Tester is a state of art device that online monitors the real-time earth resistance, grounding voltage, equipotential bonding resistance, and low-value resistance.

Feature：

- Lightweight, easy to install with guide rail design;
- Robust housing with the characteristics of high and low-temperature resistance, anti-corrosion, and flame retardant;
- Wire resistance calibration function;
- High precision, high stability, and high reliability;
- Suitable for long-term online monitoring in the field, underground, or indoors;
- Users can choose RS485 communication according to the provided MODBUS protocol for custom software development to build a network, and realize remote multi-point online monitoring.

SALES OFFICE

Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

SECTION 3

Specification

Function	Online monitoring of grounding resistance, grounding voltage, equipotential bonding resistance, low-value resistance, etc.
Power	12V±1VDC, 150mA Max. Option: 24V±1VDC
Test Method	Three-wire measurement; two-wire measurement
Measurement Method	Electrode method with measurement current 3mA Max, 820Hz；
Display Mode	12864 OLED
Data Mode	Average value
Size of LED	34.5mm×23.0mm； Display Area： 29.42mm×14.7mm
Measurement Range	Resistance： 0.01Ω ~ 2000Ω Voltage： 0.1V ~ 600.0V
Resolution	Resistance： 0.01Ω Voltage： 0.1V
Test Accuracy	Resistance： ±1%rdg±5dgt Auxiliary ground resistance100Ω±5% Ground Voltage < 10V Voltage： ±2%rdg±5dgt
Over Measurement Range	OL
Size of Instrument	Appro 117mm*62mm*88mm
Size of Outer Package	Appro 117mm*62mm*88mm
Weight	Appro 230g
Line Voltage	Ground Voltage： Below AC 600V

SALES OFFICE

Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

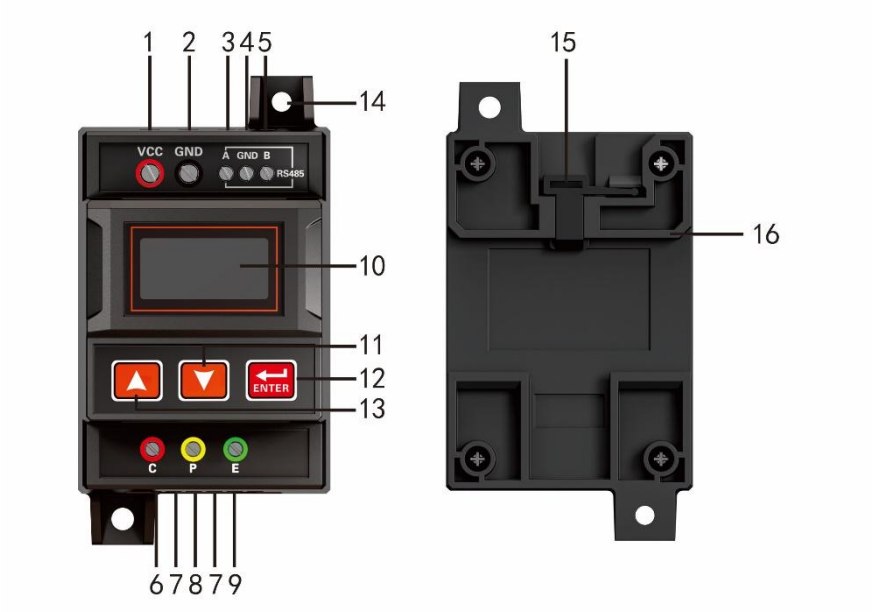
SECTION 3

Test Duration	Appro 30 seconds/time
Test Times	Above 20000 Measure resistance less than 10Ωonce, stop for 30 seconds, and measure again)
Instrument Terminal	Screw Terminal
Communication method	RS485, providing MODBUS protocol for custom software development
Gear Shift	Automatic shift
Power Consumption	Standby: 7mA Max; Measure: 40mA Max
Working Temperature and Humidity	-10℃～40℃； Below 80%rh;
Storage Temperature and Humidity	-20℃～60℃； Below 70%rh
Overload Protection	Grounding resistance: AC 280V/3 seconds between E-P and E-C ports
Insulation Resistance	Above 10MΩ, 500V between circuit and case
Withstand Voltage	AC 3700V/rms between circuit and case
EMC	IEC61010-4-3 Radio Frequency Electromagnetic Fields≤1V/m
Safety Regulation	IEC61010-1(CAT Ⅲ 300V, CAT IV 150V, Pollution Level 2)；IEC61010-031； IEC61557-1(Grounding Resistance)； JJG 366-2004(Ground Resistance Meter).

SALES OFFICE
Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

SECTION 4

Structure



1.+VCC

2. PW-GND

3. RS485 A Terminal (T/A)

4. S-GND

5. RS485 B Terminal (R/B)

6. C Terminal (Current)

7. Spare Terminal

8. P Terminal (Voltage)

9. E Terminal (Grounding)

10. LCD

11. DOWN

12. Enter

13. UP

14. Mounting Holes

15. Hook

16. Din Rail Slot（35mm）

SALES OFFICE

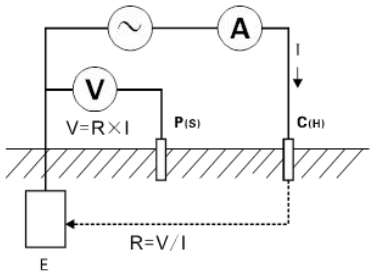
Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

Measurement Principle

1. Ground voltage measurement: average value of full-wave rectification method

2. Earth resistance measurement: rated current pole-changing method, accurately measure single-point grounding systems.

The grounding resistance is calculated according to the formula R=V/I. AC-rated current (I): flowing between the grounding electrode (E) and the current electrode (CH), The potential difference V: the difference between the grounding electrode (E) and the voltage electrode P (S)



3. The operating error (B) in the above two methods is the error obtained in the rated operating conditions, which is calculated by using the inherent error (A) and the variation error (Ei) existing in the instrument.

$$B=\pm\left(|A|+1.15\times\sqrt{E_2^2+E_3^2+E_4^2+E_5^2}\right)$$

A:inherent error

E_2:Variation due to changes in supply voltage

E_3:Changes due to temperature variations

E_4, Variation due to changes in interference voltage

E_5:Variation in resistance of contact electrodes

SALES OFFICE
Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

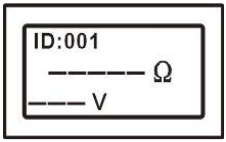
Operation

⚠	The instrument must be operated by trained and authorized personnel, and the operator must strictly abide by the safety rules.

6.1 Operation

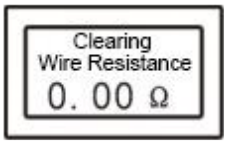
ON/OFF

The instrument is powered by an external power supply with a voltage of 12V±1VDC. After power on, it enters the test interface by default. As the picture shows:



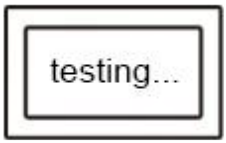
Clearing Wire Resistance

After powering on**,** press the“▽”key to enter the **Clearing Wire Resistance** interface as shown in the figure below, and then press the“△” key to test the wire resistance. After the test, press the“ENTER”key to return to the test interface.



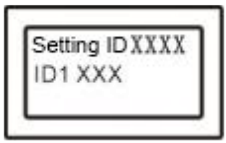
Test

After powering on, press the“ENTER”key to start the test, and it will display testing during the test, as shown in the figure below.



Setting ID

After powering on, press the“△”key to enter the ID setting



SALES OFFICE
Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

interface, enter the correct password to set the ID for the instrument.

Setting password： Press the“△”key to move the position， press the“▽” key to choose the number from 0 to 9，and press the“ENTER”key to confirm the output password. If the password is correct, jump to the ID setting. The setting step is the same as above.

6.2 Test

⚠	Connect the wiring correspondingly, otherwise, it will damage the instrument or other equipment.
	Connect the ground wire of the power supply first and remove it last; connect the positive input wire of the power supply last and remove it first.

1. The user needs to make auxiliary grounding electrodes P and C on the same line near the monitored grounding electrode E at intervals of 5 to 10 meters.

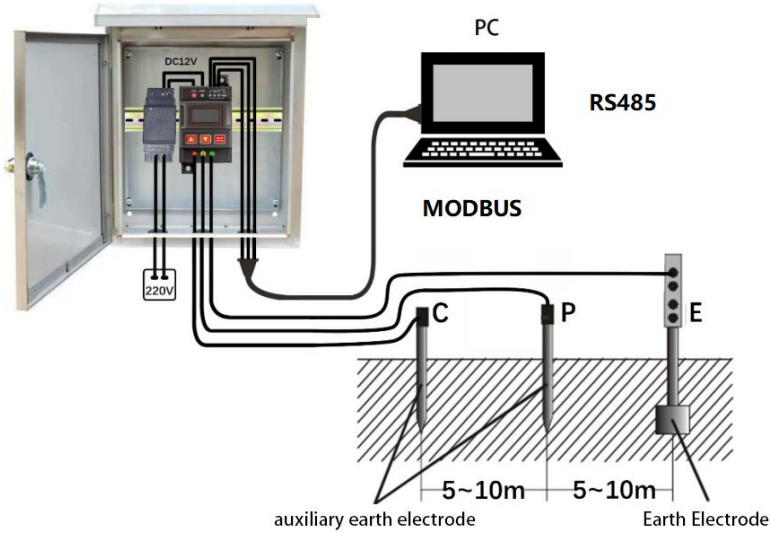
The auxiliary grounding electrode should be made of grounding material or stainless steel to prevent corrosion. The smaller the grounding resistance of the auxiliary grounding electrode, the better. Generally, it is required that the grounding resistance of the auxiliary grounding electrode should not exceed 100Ω, and the voltage to the ground should be less than 10V to ensure the accuracy of online monitoring.

2. Connect the detector, computer, and power supply according to the table. The connection between the detector and the auxiliary ground electrode is preferably fixed with a power line buckle. The wiring diagram is as follows.

Symbol of Terminal	Wiring Explanation
E	Ground electrode under test

SALES OFFICE
Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

P	Voltage
C	Current
A	A terminal of RS485
B	B terminal of RS485
GND	S-GND
GND	PW-GND
VCC	Positive power input



6.2.1 Wire Resistance Calibration

Below factors may cause an error, in order to improve the precision and stability of grounding resistance measurement on-site, design a wire resistance calibration function, which is more accurate for low-value resistance measurement.After connecting the test wires and the meter, short circuit the other ends of all the test wires, when powering on,

SALES OFFICE
Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

press the“ ▽ ”key to enter the clearing wire resistance interface, and press the“ △ ”key to test wire resistance. After the test, OLED displays the wire resistance value and stores it. Press the“ ENTER ”key to return to the test interface.

Shut down the meter, it will save the wire resistance value. If changing the test line, it needs to be re-calibrated next time when turning on the meter.

6.2.2 Ground Resistance Test

⚠	**When measuring, do not touch the exposed conductors to be measured and the exposed parts of the wiring terminals to avoid electric shock.**
	When measuring the grounding resistance, it will generate a voltage of up to 50V between the E and C interfaces. Do not apply an additional voltage between the measurement interfaces to avoid electric shock accidents
	When measuring the grounding resistance, the voltage to the ground must be below 10V. If the voltage is above 10V, the measurement value of the grounding resistance may cause errors. Ground resistance measurement is performed after the ground voltage drops.

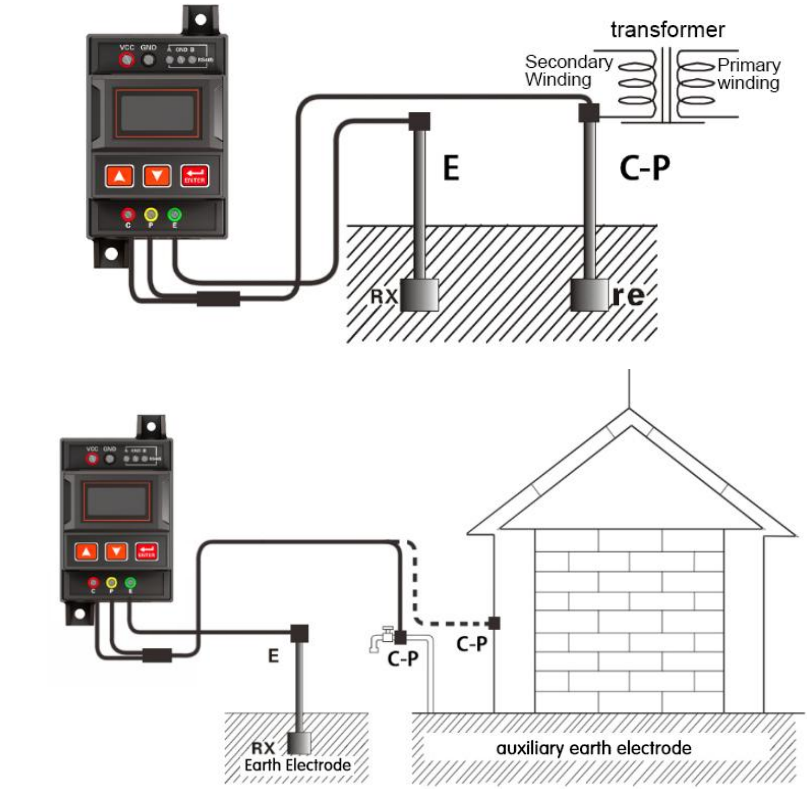
In the test interface, press the“ ENTER ”key to start or stop the test.

There are two methods of testing the online monitoring of grounding resistance, including the precise three-wire method, and the simple two-wire method

Simple two-wire method: use the existing grounding electrode with a small grounding resistance value as an auxiliary grounding electrode, and short circuit C and P interfaces. Metal water pipes, fire hydrants, and other metal buried objects, common grounding of

SALES OFFICE
Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

commercial power systems, or lightning protection grounding electrodes of buildings can be used to replace auxiliary grounding rods C and P. When measuring, remove the oxide layer of the connection point of the selected metal auxiliary grounding electrode. The simple two-wire method test wiring is shown in the figure below:



When using the simple method to measure grounding resistance, the instrument reading is the sum of the grounding resistance value of the measured grounding electrode and the grounding resistance value of the commercial grounding electrode, namely:

$R=R_X + re$

SALES OFFICE

Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

R——instrument reading value；

R_X—grounding resistance value of the measured grounding electrode；

re—grounding resistance value of the commercial grounding electrode.

R_X=R - re

6.2.3 Ground Voltage Test

	An auxiliary ground rod is required for ground voltage testing
⚠	**Connect the meter to the ground through the test wire and the auxiliary ground rod, do not connect other test wires of the meter interface to the L and N wires of the commercial power supply, otherwise, it will cause leakage, and the circuit breaker may start, and there will be safety hazards.**
	The ground voltage under test cannot exceed 600V.
	Do not use it for commercial voltage tests, otherwise, it will damage the meter.

Ground voltage:

The ground: reference point and zero Potential point

Ground voltage is the potential difference between the housing, ground wire, and ground electrode of the grounding equipment, and the zero potential point when a ground fault occurs in electrical equipment.

6.3 Communication

RS485 communication monitoring

The detection instrument adopts RS485 communication, which is suitable for **multi-point**

SALES OFFICE
Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

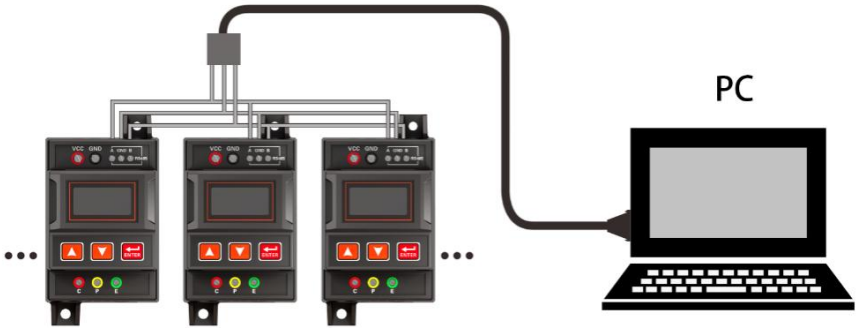
grounding resistance monitoring within a distance of 1500 meters. For multi-point monitoring, the device address of the detector should be different, otherwise, there will be conflicts in control and monitoring.

Users can choose custom software development with MODBUS protocol.

The way to set ID:

1. After powering on, press the“△”key to enter the ID setting interface, enter the correct password to set ID.

2. Enter password: press the“△”key to move the position , press the“▽” key to choose the number from 0 to 9, and press the“ENTER”key to confirm the password. If the password is correct, jump to the ID setting. The wiring diagram is as follows:



MODBUS Protocol

1. Setting ID address (the starting address is 1, and the setting address is 2)

Send：01 06 00 12 00 02 A8 0E

Receive：01 06 00 12 00 02 A8 0E

2. Send starting test command

Send：01 06 00 11 00 01 18 0F

Receive：01 06 00 11 00 01 18 0F

SALES OFFICE

Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

3. Read the resistance value (assumed value: 30.0 ohms)

Send：01 03 00 0D 00 01 15 C9

Receive：01 03 02 01 2C B8 09

Note: 02 represents the effective data length; 01 2C represents the value is 300

4. Read the decimal place of the resistance value (assumed value: 30.0 ohms)

Send：01 03 00 0E 00 01 E5 C9

Receive：01 03 02 00 01 79 84

Note: 02 represents the effective data length; 00 01 represents 1 decimal place

The final reading is 30 ohms (300*0.1)

5. reading resistance value and decimal place (assumed value: 8.00 ohms)

Send：01 03 00 0D 00 02 55 C8

Receive：01 03 04 03 20 00 02 7A 7C

Note: 04 represents the effective data length; 03 20 represents 800 ohms; 00 02 represents 2 decimal places

The final reading is 8.00 ohms (800*0.01)

6. Read the voltage value (39V)

Send：01 03 00 0F 00 01 B4 09

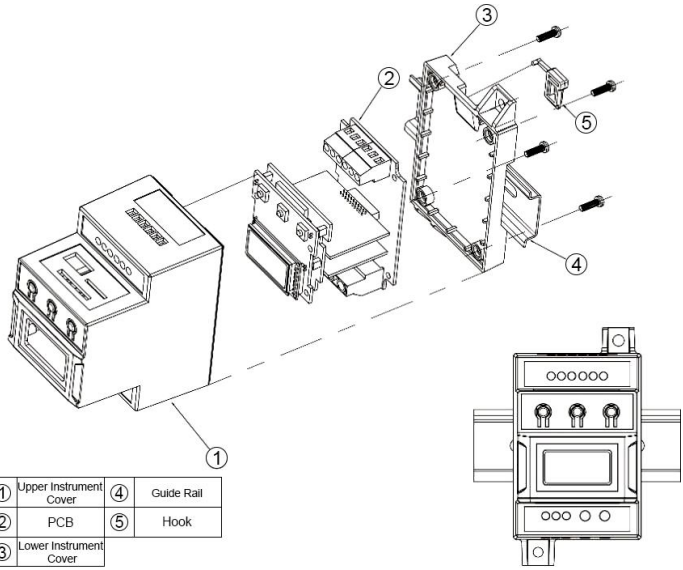
Receive：01 03 02 00 27 F8 5E

Note: 02 represents the data length; 00 27 represents 39V

SALES OFFICE

Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

Assembly Drawing



①	Upper Instrument Cover	④	Guide Rail
②	PCB	⑤	Hook
③	Lower Instrument Cover		

SALES OFFICE

Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China

SECTION 8

Packing List

Instrument	1
Packing Case	1
Communication converter (optional)	1
User Manual, Warranty Card, Certificate of Conformity	1

Note:

- We are not responsible for other damages caused by the use of this product.
- The contents of this user manual do not justify the use of the product for special purpose.
- The Company reserves the right to modify the contents of the user manual. In the case of modification, no further notice will be given.

SALES OFFICE

Email: sales@eaglotest.com
Tel: +86 020 31529626
Add: Building 4, No.18 Keyuan Road,
Baiyun District, Guangzhou, Guangdong, China