TR-5300

CLAMP-ON GROUND RESISTANCE TESTER

MANUAL

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I. Attention

Thank you for purchasing clamp on ground resistance tester TR-5300
In order to have better experience with this product, please
be certain:
---To read this user manual carefully.
---To comply with the operating cautions presented in this manual.
♦Under any circumstances, pay special attention to safety in the use of the Meter.
♦Do not exceed the measuring range and endenviroment provided.
♦Pay attention to text labeled on front panel and back plane of the meter.
♦Before booting up, trigger should be pressed for a couple of times to ensure jaws are well closed.
♦DO NOT OPERATE the trigger or clamp wires during boot-up stage.
♦Measurement can be performed only when LCD shows 'OL' after sel inspenction in

boot-up stage.

♦Keep jaw and jaw contact clean.

♦Pollution will effect accuracy of measurement.

♦Keep meter away from any impact, especially jaw contact planes.

♦It is normal that the meter has some sound buzzing during measurement.

Please remove batteries if long time without operation.

♦Disassembling, calibration and maintenance on the Meter shall be operated by the authorized engineer.

♦In case of hazards generated itself caused by continuing use, stop using immediately, send to authorized agencies for further operation.

II. Brief Introduction

Clamp on ground resistance tester TR-5300 is a major breakthrough in traditional grounding resistance measurement. It is widely used in the grounding resistance measurement of the power, telecommunications, meteorology, oilfield, construction and the industrial and electrical equipment.

Clamp on ground resistance tester TR-5300, in the measurement of a grounding system with loop, does not require breaking down the grounding wire, and need no auxiliary electrode. It is safe, fast and simple.

Clamp on ground resistance tester TR-5300 is equipped with a long jaw sized 55mmX 32mm, particularly suitable for the grounding with the flat steel.

III. Specification

1. Model of Series

Model	Jaw specification(mm)
TR-5300	55x32

2. Ranges and Accuracy of Measurement

Earth resistance

Range	Resolution	Accuracy
0.010-0.099Ω	0.001	(±1%+0.01Ω)
0.10-0.99Ω	0.01Ω	(±1%+0.01Ω)
1.0-49.9Ω	0.1Ω	(±1.5%+0.1 Ω)
50.0-99.5Ω	0.5Ω	(±2%+0.5 Ω)
100-199Ω	1Ω	(3%+1Ω)

200-395Ω	5Ω	(±6%+5 Ω)
400-590Ω	10Ω	(±10%+10Ω)
600-1000Ω	20Ω	(±20%+20 Ω)

3 . Technical Specifications

Power Source: 6VDC (4 X 5# alkaline battery)

Working Temperature: -10 ℃ to 55 ℃

Relative Humidity: 10%-90%

LCD: 4-digital LCD, 47 X 28.5mm in length

Span of Jaw: 28mm

Meter Quality (including batteries): 1320g

Meter Size: 286mm(L) X 84mm(W) X 56mm(H)

Protection Level: double insulation

Featured: by clamp

Range Shift: Automatic

External Magnetic Field: <40A/m

External Electric Field: <1V/m

Single Measuring Time: 1 second

Maximum resolution of resistance Measurement Resolution•,••ا :Ω

Range of resistance Measurement Rangeا•••-•,•ا :Ω

Number of record sets stored: 99 sets

Confingurable resistance alarm value: 1-199Ω

4. Reference conditions

Conditions	Reference
Ambient	(20±3℃)
Relative humidity	50%RH±10%
Battery voltage	6V±0.5V
External magnetic field	<40A/m
External electric field	<1V/m
Operating position	Clamp horizontal

Position of conductor in the clamp	Centred
Proximity to metallic the clamp	>10cm
Loop resistance	Non choke resistance
Rate of distortion	<0.5%
Interferance current on measurement of loop resistance	Nil

5. Variations in the nominal working range

Distirtion quantity	Limit of operating range	Distortion
Temperature	-10℃ to 55	1.5 class of accuracy per 10°
Relative humidity	10%RH to 90%RH	1.5 class
Battery voltage	5.5V to 6.5V	0.25 class
Conductor position	From edge to centre	0.1 class
Clamp position	±180°	0.5 class
Proximity of magnetic mass	1mm steel plate against jaw face	0.25 class
Magnetic field 50-60Hz	400A/m	0.25 class
Electric field 50-60Hz	0-10KV/m	0.25 class

IV. Structure of Meter

1. Liquid Crystal Display (LCD)

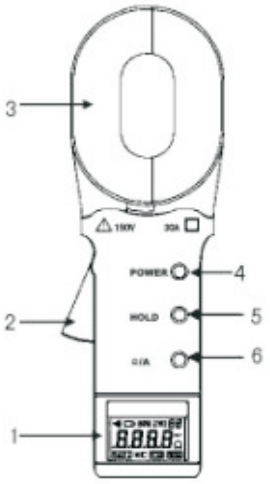
2. Trigger: to open and close the jaw

3. Jaw: sized 55mm(L) x 32mm(W)

4. POWER Key: Boot Up / Shutdown /*Quit

5. HOLD Key: lock / Release display

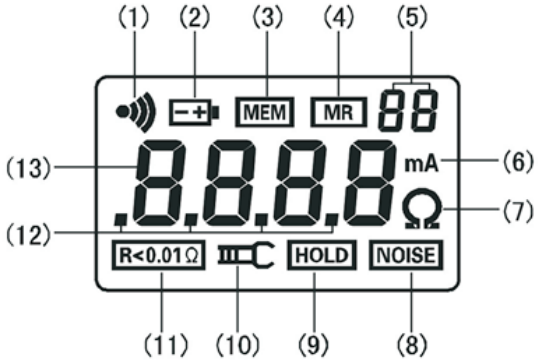
6. MEN/READ:data store and review



V. Crystal Display

1. LCD Screen

(1) Alarm: Shows when the measured value exceed the configured alarm value.



(2) Low battery voltage

(3) Store data record

(4) Review data record

(5) Number in sequence of data records

(6) Current unit (not applicable in TR-5300)

(7) Resistance unit

(8) Noise signal

(9) Data hold

(10) Jaw is open

(11) Resistance measured lower than 0.01ohm

(12) Metrication decimal point

(13) 4-digital LCD figures display

2. Description of Special Symbols

(1) Symbol of an open jaw: shows as a jaw is in open state. In this case, trigger may be artificially pressed, or the jaws have been seriously polluted, and not available for measurement.

(2) Symbol of low battery voltage: shows when the battery voltage is lower than 5.3V. In this case, accuracy of the measurements cannot be guaranteed unless batteries are replaced.

(3)"OL Ω " symbol indicates that the measured resistance exceeds the upper limit of the meter.

(4) "L0.01Ω" symbol indicates that the measured resistance exceeds the lower limit of the meter.

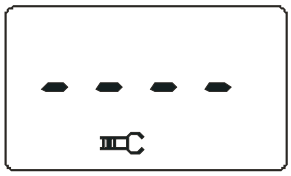
(5) MEM symbol of storing data records

(6) MR symbol of reviewing data records: shows when reviewing data records stored, as well as number of record.

(7) NOISE symbol of noise signal: shows when there is noise current in earth resistance to measure. In this case, accuracy of measurement cannot be guaranteed.

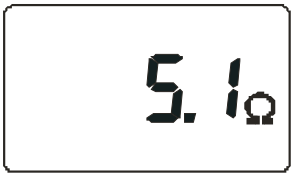
3. Examples of displays

(1)---Jaw is in open state, not available for measurement



(2)---The measured resistance is under 0.01Ω

(3)---Loop resistance measured ٥,١is Ω



(4)---Loop resistance measured Γ,١is Ω
---current reading was lockedΓ,١ :Ω

(5) ---Review No.26 data record stored
--- Loop resistance measured is 0.028Ω

(6)---Alarm raised, the measured resistance exceed the configured alarm value.
---Review NO.8 data record stored
---The resistance measured: 820Ω

VI. Operate the meter

1. Boot Up

Before to boot up, press trigger for few times to ensure the jaws are well closed. Press power to boot up the meter. Firstly, self in pection is performed. It is ready for resistance measurement when 'OL' shown on screen after self inspection.

During self inspection, DO NOT press the trigger, nor open the jaw, nor clamp any wire.

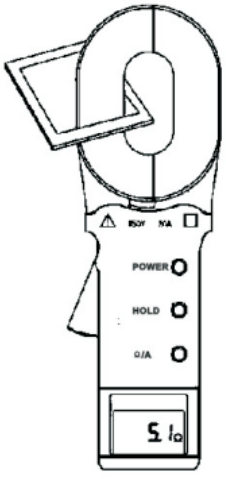
During self inspection process, make sure to keep the meter free. Do not overturn the meter, nor impose any external force on jaw. Otherwise, accuracy of measurement cannot be guaranteed. If jaws clamped around a conductor loop during self inspection, any following measurement will be inaccurate. In this case, please remove conductor loop and reboot.

2. Shutdown

When the meter is power on, press POWER key to shut it down. After five minutes the meter started up, LCD screen start flashing, In order to save battery life, the meterwill automatically shut down after the flashing state is sustained for 30 seconds. To press POWER key when flashing, the meter resume status of working. In HOLD state, it is required to firstly press HOLD key to quit from HOLD state, then press POWER key to shut it down.

3. Resistance Measurement

After booting self inspection it shows, is completed 'OLΩ' ready to proceed with resistance measurement. At this point, press trigger to open jaw, clamp the loop to measure, read out resistance value. If necessary, self calibration can be done with verification resistor in standard accessory as shown in the following figure.



The reading should be consistent with the normal value on verification resistor ٥,١Ω .Carlibrated value of verification resistor is in condition of temperature of 20℃. It is normalto find a difference of numerical 1 word between the shown value and nominal value For instance: If nominal value of verification resistor ٥,١is Ω , ٥,•showing Ω or 5.2Ω is normal and accepted. Showing 'OL Ω' indicates that the measured resistance value exceeded the upper limit of this meter. Showing '•,•١LΩ' indicates that the measured resistance value exceeded the lower limit of this meter.

4. Data Hold/Release/Store

In resistance measurment mode, press HOLD button to lock displayed value with symbol HOLD showing, as figure 1 shown below.

Press HOLD button again to unlock.

In measurment mode, press MEM/READ to enter data storage mode with symbol MEM showing on screen. The displayed reading is stored and numbered with number shown on top right of screen.

Press POWER button again to quit storage mode and revert back to measurment mode.

To repeat above operation can stored up to 99 pieces of data points.

To quit storage mode, press MEM/READ button.

All stored datas will not removed after rebooting the meter.

Figure 1

Figure 1, save the measured 0.016ohms as No. 01 data record.

Figure 2

All stored datas are in memory and won't drop when shutdown.

5. Review stroed data

Figure 3

When the meter is under measuring, long press (more than 3 seconds) MEM/READ button to enter data review mode, with MR symbol shown , as fig. 3 shown above. The No. 1 stored data is shown by default. Press MEM/READ button to review every pieces

To quit data review mode, long press MEM/READ button.

Press HOLD button to scroll up the recalling data.

6. Configure alarm value

In resistance measurement mode, long press HOLD button to enter configuration mode for alarm value, as figure 4 below . The first digit to configure is the top digit. Press button MEM/READ to switch digit from the high to low. When configuration finishes, long press MEM/READ to return to measurement mode.

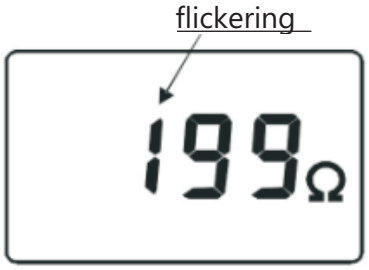


Figure 4

Figure 4 Setup value alarm for resistance measuremet

7. Review configured alarm value

long press button HOLD, In resistance measurment mode to examine the configured alarm value with the top digit flickering and last configuration shown. Long press button HOLD to go back to measurement.

the configured alarm, Take below chart as example for ohmsΓ• resistance is .

Figure 5

8. Delete Data

Firstly long press button MEM/READ to enter review mode of stored data. Short press POWER button to delete the last record in memory. Long press POWER button to enter CLR screen, then press POWER button again to delete all data or press MEM/READ to cancel deletion.

VII. On site application

1. Application in power system

(1)Measurement for earth resistance of power transmission line tower

Generally, grounding of power transmission line tower forms multipoint grounding system. To measure out earth resistance, just simply clamp grounding rods with this instrument.

(2) Measurement for earth resistance of neutral point of transformer

There are 2 cases in neutral point grounding of transformer: if multiple grounding applied, it is multipoint grounding system, else single point grounding .

For measurement, if the instrument shows 'L 0.01Ω', it may mean that same pole & tower or transformer has more than 2 grounding rods, linked together under ground. In this case, you should unveil other grounding rods, and keep one rod remain.

(3)Application in substation of power plant

Clamp on ground resistance tester is able to check status of touch and link in circuit. With assistance from a line, it is able to measure link status between equipments in station and earth grid. Earth resistance is measured accordingto single point grounding.

2. Application in telecommunication system

(1)Measurement of earth resistance of machinery room in telecom building

In general, telecommunication system prefers to set its machinery room in high floor of the building, which makes it hard to measure with usual earth meter. However, it is easy and convenient to measure with this instrument. Details are as follows: link fire hydrant and grounding electrode to measure with a test line (fire hydrant is equipped in the machinery room), then measure the test line with clamp on ground resistance tester.

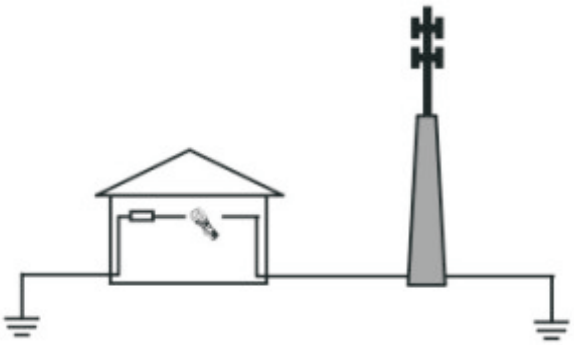
Reading of resistance = earth resistance of machinery room + resistance of testing line + earth resistance of fire hydrant

If earth resistance of fire hydrant is very small, then:

Earth resistance of machinery room resistance of clamp meter - resistance of testing line.

(2) Measurement of earth resistance of machinery room and transmitter tower

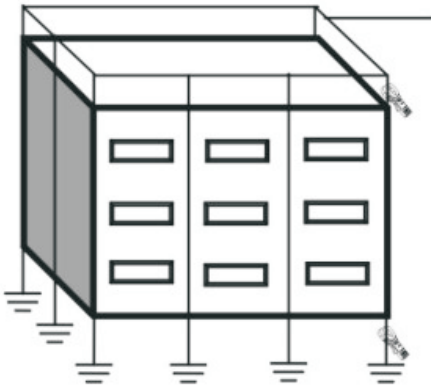
Grounding of machinery room and transmitter tower usually forms two-points grounding system shown as following chart.



If the measured value of the instrument is lower than permitted value of earth resistance, it is confirmed that earth resistance of the machinery room and transmitter tower is qualified. if reading bigger than the permission value, please apply measurement of single point grounding.

3. Application in thunder-prevention grounding system of buildings

If grounding electrode of bulding is separated from each other, earth resistance of various electrodes can be measured as the following chart.



Thunder-prevention

Overhead conductor

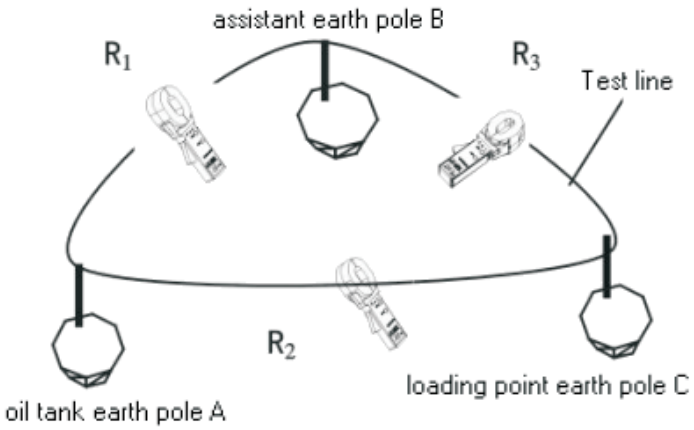
4. Application in grounding system in gas station

In environment full of explosive gas, such as gas station, oil field and oil groove, it is very necessary to adopt explosion-proof products.

Generally, gas station is requested to ensuse earth resistance and link resistance as following:

Number	Item to measure	Technical requirement
1	Earth resistance of oil tank	⩽10Ω
2	Earth resistance of loading point	⩽10Ω
3	Earth resistance of oiling machine	⩽4Ω
4	Link resistance of oil hose of oiling machine	⩽5Ω

(1)Measurement of earth resistance of oil tank and loading point



Shown as the above chart, as for grounding system in gas station, oil tank earth pole A is connected with the oiling machine, and loading point earth pole C is an independent earth pole. Then, find another independent earth pole as assistant earth pole B (such as the underground water pipe, etc), and respectively measure out value of R1, R2 and R3 by clamp on ground resistance tester according to three-point method.

We will get:

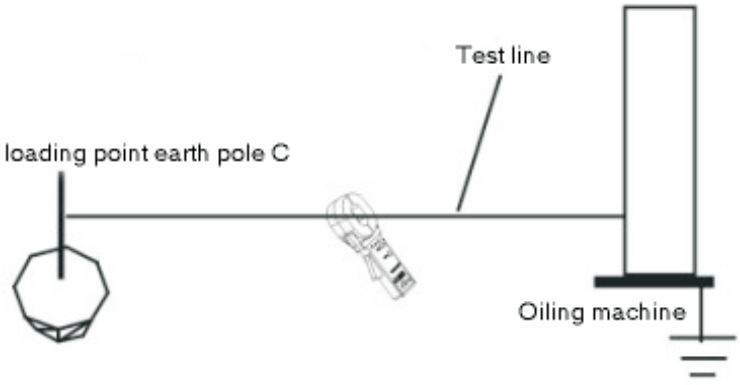
Earth resistance of oil tank: $R_A = \frac{(R_1 + R_2 - R_3)}{2}$

Earth resistance of assistant earth pole: $R_B = R_1 - R_A$

Earth resistance of loading point: $R_C = R_2 - R_A$

Note: when measuring R_1, we should make sure that no conductor link between BC and AC, which is reqursted for measuring R_2 and R_3.

(2)Measurement of earth resistance of oiling machine



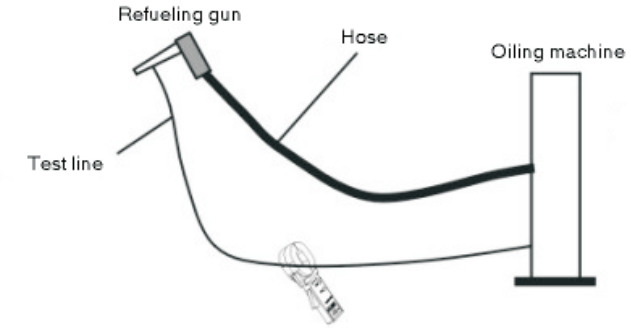
Listed as the above chart, find an earth pole which is apart from earth pole of oiling machine, such as earth pole of loading point; then, connect the two points with test line and measure out the value RT with the instrument. Finally, it is to calculate:

Earth resistance of oiling machine: $R = R_T - R_C$

In which: RT is the resistance measured by the instrument;

RC is the earth resistance of loading point.

(3) Measurement of link resistance of oil hose of oiling machine



Connect refueling gun and oiling machine with a test line and measure out the value RT with the instrument. We will get:

Link resistance of oil hose of oiling machine: $R = R_T - R_L$

In which: RT is the resistance measured by clamp on ground resistance tester;

RL is the resistance of test line.

VIII. Important notes for measuring earth resistance

1. It is usual for users to make comparison between testing values measured respectively by clamp on ground resistance tester and traditional method-voltage & current method. It is found that the difference between two methods is rather big. For this problem, kindly please keep following issues as important notice:

(1)Whether unclasp (grounding body to measure is separated from grounding system) has been done when measuring resistance by traditional voltage & current method. If not, the earth resistance that measure refers to parallel connection value of earth resistance of all grounding bodies.

It is meaningless to measure parallel connection value of earth resistance of all grounding bodies. To measure earth resistance is to make comparison between the earth resistance and a permitted value regulated by relevant standards, to decide whether earth resistance is qualified.

In industry standard example: It is definitely stated: 'earth resistance of per radix tower refers to the resistance measured when grounding body cut off electric connection with

ground wire. If grounding body doesn't cut off electric connection with ground wire, earth resistance measured refers to parallel connection value of earth resistance of multi-radix towers. '

This regulation is quite definite.

As mentioned before, the reading of clamp on ground resistance tester is referring to earth resistance of every spur track. As long as ground wire is in good contact, the measured resistance represents earth resistance of single grounding body.

In this case obviously, it is meaningless to compare values measured out respectively by traditional voltage & current method and clamp earth resistance tester. Since the object measured is different, it must be different for two results.

(2)Earth resistance measured out by clamp earth resistance tester is integrated resistance of that grounding spur track, which includes the contact resistance, down-lead resistance and grounding body resistance from the spur track to common earth wire. However, even in situation of unclasp, the value measured by traditional voltage & current method only refers to the resistance of grounding body.

Obviously, the measuring value of former is bigger than the latter one. The balance reflects how much of the contact resistance from spur track to common earth wire.

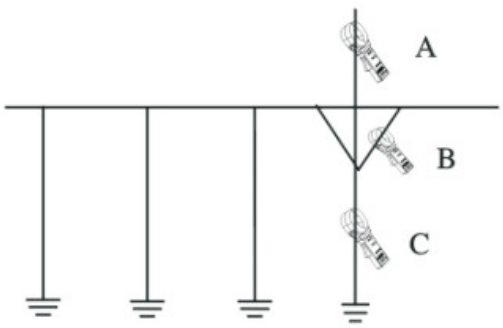
In addition, earth resistance prescribed in industry standards includes resistance of grounding down-lead. It has the following explanation for the term - Earth Resistance of Grounding Equipment: 'summation of resistance to earth of earth electrode or natural earth electrode and resistance of ground lead'.

This kind of regulation is also very definite, for resistance of down-lead and earth resistance of grounding body play an equal role in preventing thunder.

2. Selection for measuring point

In some grounding system, as listed in the following chart, a proper point should be chosen for measurement; otherwise different measure results could be got.

When measuring in point A, the spur track measured is out of circuit, the instrument shows 'OLW'. In this case a new measurement point should be considered.



When measuring in point B, the spur track measured is a circuit formed by metal conductor, and it shows 'OL Ω' or resistance value of metal circuit. A new measurement point should be considered.

When measuring in point C, what we measure is earth resistance of the spur track.

IX. Packing list

Clamp on ground resistance tester	1 piece
Verification Resistor	1 piece
AA 1.5V dry cell	4 pieces
Carry case	1 piece
Operation instruction	1 piece