



# **LET-500-VPC**

## **TOUCH & STEP VOLTAGE AND EARTH MEASUREMENT UNIT**

# **User's Manual**



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**WARNING**

**The essence of these tests is the simulation of faulty, hence hazardous and potentially lethal conditions in the surroundings of the work area. Adequate planning and rigorous observation of safety rules for high-voltage working environment must therefore be conducted. Unwarned people must be kept out from the test area, and specific clothing, insulation shoes and other protective precautions must be taken.**

**The premises and electrical installations must be brought fully out of service. Therefore, an autonomous power generator will be needed for equipment’s supply.**

**The personnel involved in the tests must maintain a minimum safety distance of 25 meter from the nearest injection spot.**

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## **INTRODUCTION**

In order to measure the step & touch voltage characteristics of the protective earthing installations in substations and other electrical facilities, a regulated current must be injected through the earth circuit and the voltage drop must be measured between two test spots.

The LET-500-VPC delivers 50 kVA power for adequate earth measurements in small transformer sites and also in big substations that can be partitioned into smaller areas for this purpose. This equipment, features all the necessary regulation and measurement elements for the application.

Output current can be regulated in the LET-500-VPC between 5 and 50 A, in order to obtain the minimum measurable voltage drop in the test domain, which is adequately filtered against medium- and high-frequency noise perturbations before it is shown in the unit's instrument display.

## **LET-500-VPC DESCRIPTION**

The LET-500-VPC features the following functional systems -

CURRENT GENERATION AND REGULATION

REGULATED CURRENT MEASUREMENT

MEASUREMENT OF THE RESULTING TOUCH & STEP VOLTAGE DROP

Everything is contained in a single, heavy-duty steel box with wheels, the control and measurement instruments being installed on a control board made of strong, high dielectric rigidity plastics. Wheels can be blocked to avoid accidents when working in non-horizontal surfaces.

The rear panel holds the unit's supply intake and two 40A fuse holders.

## **CURRENT GENERATION AND REGULATION**

Regulation of injection current is achieved by a continuous regulation autotransformer at the primary winding of the output transformer stage.

These are the system's technical characteristics:

Power Supply:	220V. 50Hz.
Output taps:	0 – 50 A
Power:	50 KVA – 1000V

Injection is switched on by means of a relay-driven contact activated by an illuminated push button.

The power generation system is protected against sustained overload by an automatic breaker located at the front pane of the unit.

Output taps are adequately sized to withstand the current demand, and are labeled to easily identify the current range.

Regulation from zero to maximum is achieved by turning the regulation knob clockwise, as graphically indicated on the control board.

## **OUTPUT CURRENT MEASUREMENT**

Output current is measured over an internal set of specific-purpose shunts, and its value is continuously shown in Amperes on a 3 ½ - digit LED display with an end-of-scale accuracy of  $\pm 0.5\%$ . Adequate measurement range is selected by means of a rotary switch. Measured current values are expressed in a percentage (%) of the selected output scale. Following are the technical characteristics:

Measurement ranges:	0 – 50 A.
Accuracy:	± 0.5 % end of scale.

### **TOUCH & STEP VOLTAGE MEASUREMENT**

A 3 ½ -digit display gives the direct reading of the voltage drop at the test spots under the injected current. A second rotary switch is provided for the selection of the adequate voltage range with automatic decimal point placement.

Due to the inherent instability of voltage readings in this kind of measurement, a HOLD push button is provided to freeze the displayed value at any time, thus making repetitive reading easier for average calculations. Following are the technical characteristics:

Measurement ranges:	0 – 0.2/2/20/200V
Accuracy:	± 1% end of scale

### **TECHNICAL CHARACTERISTICS**

#### SPECIFICATIONS

POWER SUPPLY	220V 50/60 Hz
OUTPUT	0-50 A/ 1000V
NOMINAL POWER	50 KVA continuous duty

#### VOLTAGE MEASUREMENT

DIGITAL VOLTMETER	3 ½ Digits LED type (96x48 cm.)
MEASUREMENT RANGES	4 fields 0.2V 2V 20V 200V
INTERNAL RESISTANCE	1KΩ in all fields.
ACCURACY	± 1% end of scale

#### OUTPUT CURRENT MEASUREMENT

DIGITAL AMMETER	3 ½ Digits LED-type (96x48 cm).
MEASUREMENT RANGES	4 0-50 A
ACCURACY	± 0.5% end of scale

## PRODUCT DESCRIPTION

HOUSING	Enameled Steel with wheels
FRONT PANEL	Isolating plate
DIMENSIONS AND WEIGHT	HEIGHT 1000mm. WIDTH 6800mm. DEPTH 700mm. WEIGHT 415 Kg
ACCESSORIES	2 normative-compliant 25-kg measurement electrodes ("feet") 200 mm H x 100 mm diameter

## OPERATION

### GENERAL DIRECTIONS

As previously stated, the LET-500-VPC is basically a current regulator. To attain the desired current value at the output follow this procedure:

1. Connect the unit to a 220VAC / 50 Hz supply that can sustain a minimum 50 kVA power, using the connectors located on the top surface.
2. Turn the regulation knob to the leftmost (minimum) anticlockwise position.
3. Connect one test lead between the Zero (common) output tap and a spot on the tested terrain.
4. Connect another test lead between to the best suited (5 – 50A) tap for the desired injection range and the auxiliary ground.
5. Select the correct range with the current measurement field selector.
6. Energize the unit turning the automatic breaker in the top face ON.
7. Gently turn the regulation knob clockwise until the desired current value is displayed by the digital ammeter. A given amount of current can be harder or easier to attain depending on the ground resistance.

For the voltage measurement, a digital multi-range voltmeter with 1 k $\Omega$  internal resistance is furnished. The voltage is read in the inputs labeled **INV 0-220V** after the correct measurement range has been selected.

To compensate for the effect of telluric currents, an inversion switch is provided with the label "INVER". An automatic delay of some seconds before the effective inversion takes place will prevent an instantaneous FCM pulse from building up, specially in open circuit conditions.

### MEASURING THE STEP VOLTAGE

According to the M.I.E.-RAT 13 definition contained in the CEI.11-8-176 normative, the 'step voltage' is the voltage that can be measured between any two ground spots at an adult's step distance from each other in a working electrical environment.

A ground contact surface of 100 mm<sup>2</sup> under a weight of 25 kg are also specified for each of the measurement electrodes used. Two electrodes built under these specifications are included in the standard accessories set of the LET-500-VPC.

The step voltage is calculated using the following formula:

$$V_s = \frac{V_m \times I_{\max}}{I_s}$$

where -

Vs =	calculated step voltage in volts.
Vm =	measured voltage drop between both electrodes in volts.
I <sub>max</sub> =	maximum phase-earth short circuit current value stated in the installation's building specifications, in Amperes.
I <sub>s</sub> =	Injected test current in Amperes.

### PREVIOUS PRECAUTIONS



The essence of these tests is the simulation of faulty, hence hazardous and potentially lethal conditions in the surroundings of the work area. Adequate planning and rigorous observation of safety rules for high-voltage working environment must therefore be conducted. Unwarned people must be kept out from the test area, and specific clothing, insulation shoes and other protective precautions must be taken.

The premises and electrical installations must be brought fully out of service. Therefore, an autonomous power generator will be needed for equipment's supply.

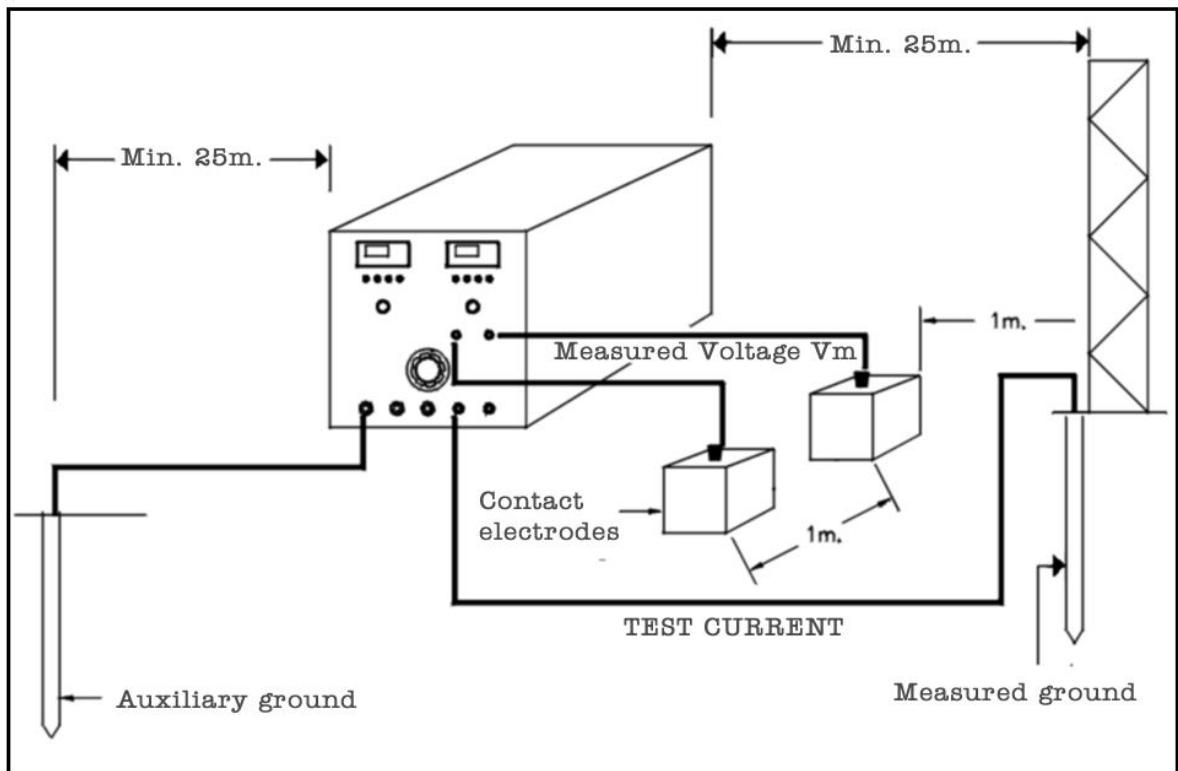
The personnel involved in the tests must maintain a minimum safety distance of 25 meter from the nearest injection spot.

### WIRING

Any connection to the ground installation must be undone before starting the tests.

Then, follow the diagram below for a complete test setup.

## STEP VOLTAGE TEST SETUP



**STEP VOLTAGE MEASUREMENT**

One of the test electrodes must be placed in the exact measurement spot at a distance of one meter from the other. The maximum step voltage values are usually found near the measured ground spot. Please refer to section 1 above for a description of the LET-500-VPC operation procedures.

## TOUCH VOLTAGE MEASUREMENT

Similarly to step voltage, touch voltage is defined as the voltage to which an individual might be exposed when coming into contact with metallic structures, machine armatures and fences which are not normally subject to significant voltage.

Touch voltage is calculated with the following formula:

$$V_t = \frac{V_m \times I_{\max}}{I_t}$$

where

V <sub>t</sub> =	Touch voltage in Volts.
V <sub>m</sub> =	Measured voltage drop between the point of contact and the electrodes, in Volts.
I <sub>max</sub> =	maximum phase-earth short circuit current value stated in the installation's building specifications, in Amperes.
I <sub>t</sub> =	Injected test current in Amperes.



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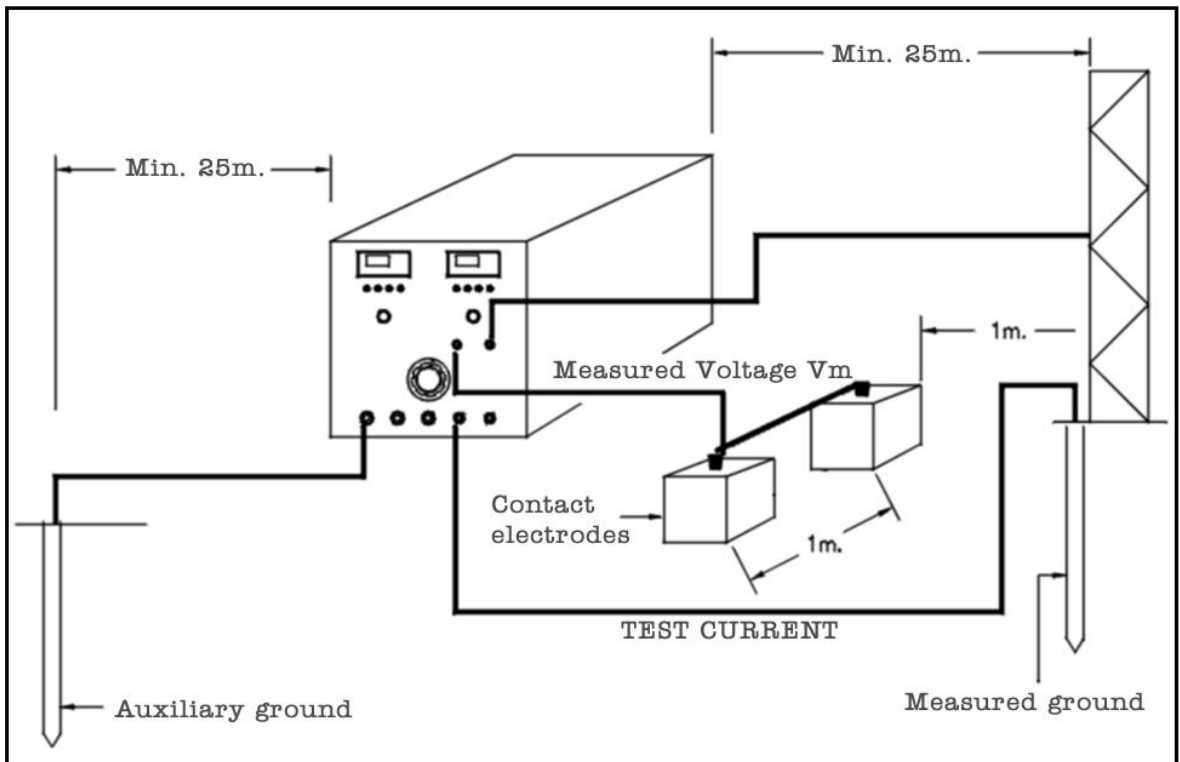
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Any connection to the ground installation must be undone before starting the tests. Then, follow the diagram below for a complete test setup.

TOUCH VOLTAGE TEST SETUP



**TOUCH VOLTAGE MEASUREMENT**

The maximum touch voltage values are usually found far from the measured ground spot. Please refer to section 1 above for a description of the LET-500-VPC operation procedures.

## **AFTER-SALE SERVICES AND WARRANTY**

### WARRANTY

Our warranty is an expression of the confidence that we have in our products, based on the reliability and performance that are expected by our customers.

The warranty covers repairs and/or replacement of defective components at no costs.

Warranty period: all products made by EuroSMC are guaranteed for a period of one year from the date indicated in the warranty statement, which is included with the unit.

The following may cause the warranty to be revoked:

Improper use of the product, incorrect connections or operation not specified or not described in this instruction manual.

Undue manipulation, repairs, adjustments or changes made in the product by unauthorized persons.

Use of the product beyond its technical specifications.

### AFTER-SALE SUPPORT

EUROSMC guarantees the supply of parts and components in all of our products for 3 years after the product is discontinued . We extend our technical support for a 5-year period.

## **OTHER EUROSMC PRODUCTS**

Our product range includes

- Test equipment for voltage, current, frequency, synchronizing and other protective relays.
- Handheld chronometers and phase angle meters.
- AC and DC test & measurement equipment.
- Current supplies.
- HV, MV and Molded-case circuit breakers test equipment.
- Voltage and current regulation equipment.

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