



RIGEL MEDICAL
TESTED, TRUSTED... WORLDWIDE.

SafeTest 99 USER MANUAL



Limited Warranty & Limitation of Liability

Rigel Medical, guarantees this product for a period of 2 years. The period of warranty will be effective at the day of delivery.

To activate your 2-year warranty, register your product at the below link. Terms and conditions apply.

www.rigelmedical.com/register

Calibration Statement

The Rigel SafeTest 99 hand-held electrical safety analyzer is fully calibrated and found to be within the specified performance and accuracy at the time of production. The Seaward Group provides its products through a variety of channels; therefore, it may be possible that the calibration date on the provided certificate may not represent the actual date of first use.

Experience has indicated that the calibration of this instrument is not affected by storage prior to receipt by the user. We therefore recommend that the recalibration period be based on a 12-month interval from the first date the unit is placed into service.

For information on service or calibration please go to the link below.

www.rigelmedical.com/calibration

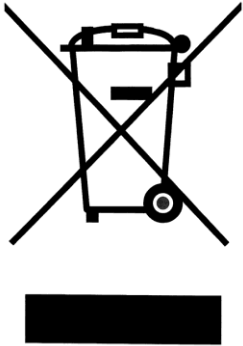
Date received into service; / / .

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Due to a policy of continuous development Rigel Medical reserves the right to alter the equipment specification and description outlined in this publication without prior notice and no part of this publication shall be deemed to be part of any contract for the equipment unless specifically referred to as an inclusion within such contract.

Disposal of old product



The Rigel SafeTest 99 has been designed and manufactured with high quality materials and components, which can be recycled and reused.

Please familiarise yourself with the appropriate local separate collection system for electrical and electronic products or contact your local supplier for further information.

Please dispose of this product according to local regulations. Do not dispose of this product along with normal waste material. By offering your old products for recycling, you will help prevent potential negative consequences for the environment and human health.

User Notes

These operating instructions are intended for the use of adequately trained personnel.



Warning of electrical danger!

Indicates instructions must be followed to avoid danger to persons.



Important, follow the documentation! This symbol indicates that the operating instructions must be adhered to in order to avoid danger.

Environmental Conditions

The SafeTest 99 has been designed to be operated for indoor use in a dry environment, at a temperature of 0 to 40 degrees C without moisture condensation, and at an operating altitude 0 – 2000m.

The SafeTest 99 has a protection rating of IP40 and is rated for operation at pollution degree 2 according to IEC 60529.

The following symbols are used in these operating instructions and on the Rigel SafeTest 99.

Safety Notes



If the SafeTest 99 is used in a manner not specified by these operating instructions, then the protection provided may be impaired.



Only accessories recommended or approved by the manufacturer should be used with the SafeTest 99.



Do not connect the SafeTest 99 to electrical circuits with nominal voltage greater than CAT II 300 V AC/DC.



Do not touch test probes beyond the hand barrier on the test probe.



The SafeTest 99 may apply high voltage or mains power to the appliance under test. Do not touch conductive parts of the appliance while tests are active.



Do not open the SafeTest 99, no user serviceable parts



Do not operate the SafeTest 99 in an explosive gas or dust environment.



The SafeTest 99 and all associated cables and leads must be checked for signs of damage before equipment is operated. Do not use if there are signs of damage.



Where safe operation of the SafeTest 99 is no longer possible it should be immediately shut down and secured to prevent accidental operation

It must be assumed that safe operation is no longer possible:

- if the instrument or leads show visible signs of damage or
- the instrument does not function or
- after long periods of storage under adverse environmental conditions.



To verify the correct operation of the unit, perform test functions using a known appliance or checkbox or return the unit to an approved agent for service.



When testing multiple applied parts, only the SafeTest 99 Applied Parts Connection Box should be used.



This symbol is also used for tips and guidance notes in the manual

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1. Introduction

The SafeTest 99 is a dedicated medical safety analyzer, ideal for testing high volumes of basic medical and laboratory equipment. A robust and reliable design ensures that the SafeTest 99 can withstand a busy schedule of testing medical equipment.

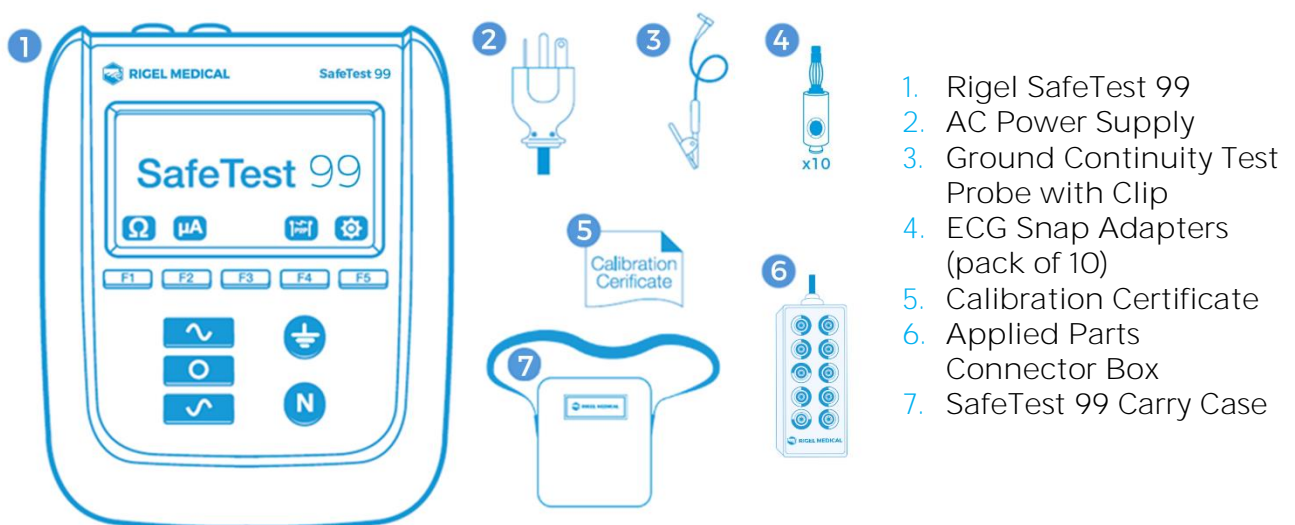
With a large color display and a color coded user interface, it's easy to select the required tests with a single key press, while a fast step-through of the test routine makes the testing process speedy and dependable. Though physically small, the SafeTest 99 includes a range of safety tests to enable compliance to the NFPA 99-2015 safety standard, including leakage and ground continuity testing.

Full manual control offers the benefit of executing only those specific tests that are required and provide the user with full control of the power cycles, making testing simple, easy, and fast. An automatic warning of secondary ground paths ensures users are made aware when invalid readings are made, thus ensuring correct and accurate test results first time, every time.

1.1. Key Features

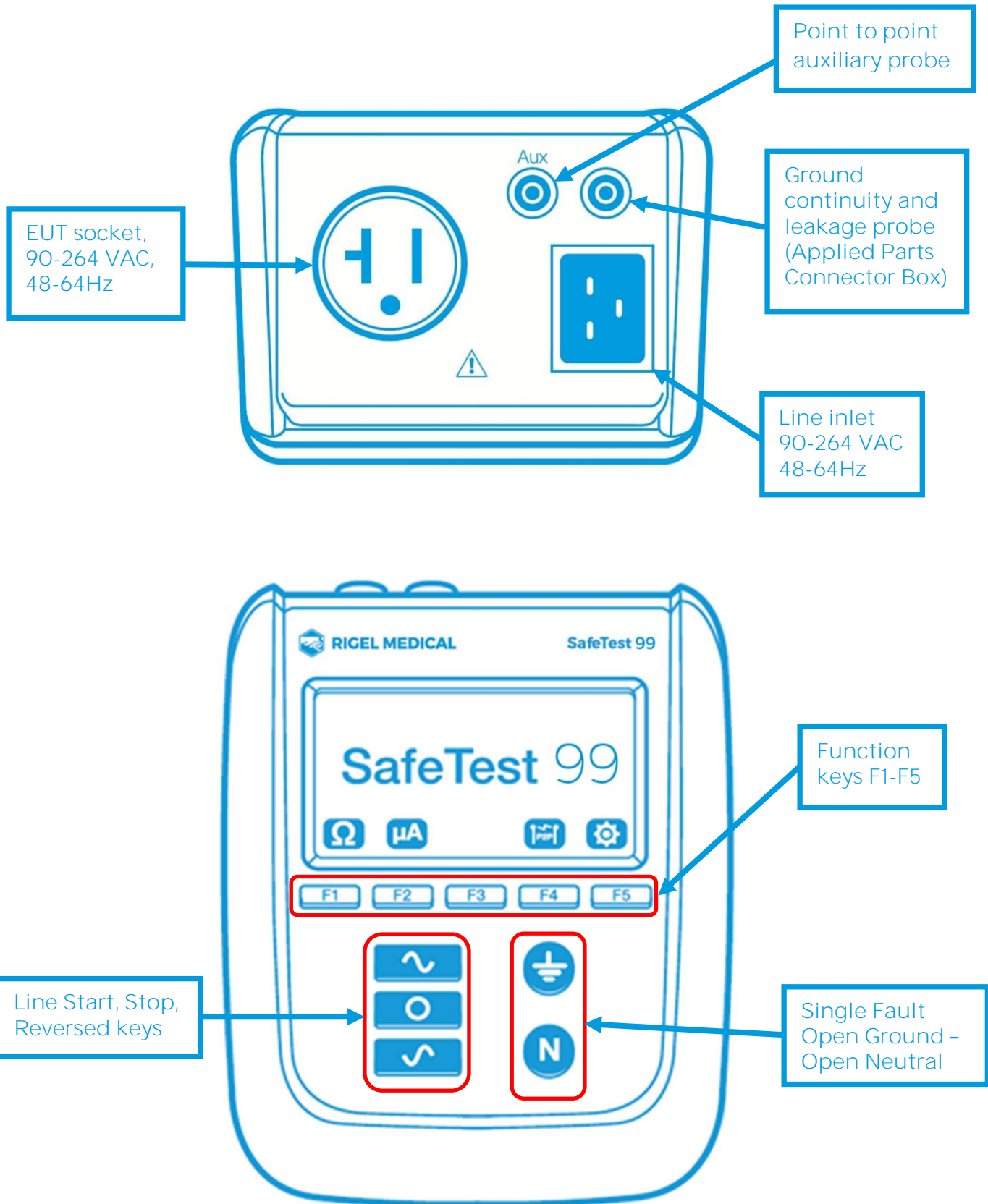
- Compact, robust and portable design
- Fast step-through of test routines with minimised power cycles
- Manual control of fault conditions
- Tests to standard NFPA 99-2015
- Large, highly visible color display
- Secondary earth warnings to ensure valid test setup
- Accurate high current, low energy ground bond testing
- Supplied with free, protective carry case
- Multi voltage - operates on any mains supply between 90-264V / 48-64Hz

1.2. Rigel SafeTest 99 Includes:



1. Rigel SafeTest 99
2. AC Power Supply
3. Ground Continuity Test Probe with Clip
4. ECG Snap Adapters (pack of 10)
5. Calibration Certificate
6. Applied Parts Connector Box
7. SafeTest 99 Carry Case

1.3. Interfaces



1.4. Optional Accessories

| | |
|-----------------------------|---------|
| Ground continuity cable | 44B154 |
| Mains lead | 48531 |
| Replacement Carry Case | 410A950 |
| Applied Parts Connector Box | 417A911 |
| Applied Part Adaptors | 404A951 |

1.5. Unique use of ICONS

The Rigel SafeTest 99 features a high resolution color graphic back lit display provides a unique user experience and to help guide the user through the different test steps.

Below are of some of the icons used in the Rigel SafeTest 99:



Select Ground Bond Testing



Select Leakage Testing



Select Point to Point Testing (Ground Continuity and Leakage)



Select Settings menu (change Language and Test Standard)



Select to the required standard



Change to the required language



Product information, serial number



Confirm / OK















Display Line voltage, frequency and load current



Point to point Ground continuity test selection



Point to point Leakage test selection

-  Applies normal mains to EUT
-  Applies reversed mains to the EUT
-  Interrupts mains to EUT
-  Warning, EUT socket live
-  Select Ground leakage
-  Select Chassis leakage
-  Patient Lead Leakage selection
-  Open Ground single fault condition key
-  Open Neutral single fault condition key
-  Ground bond test lead compensated
-  Test running (note; not used on all tests)
-  Go to Home screen

2. Getting Started

The SafeTest 99 can perform electrical safety tests in accordance with NFPA 99-2015. To get started, simply follow these instructions;

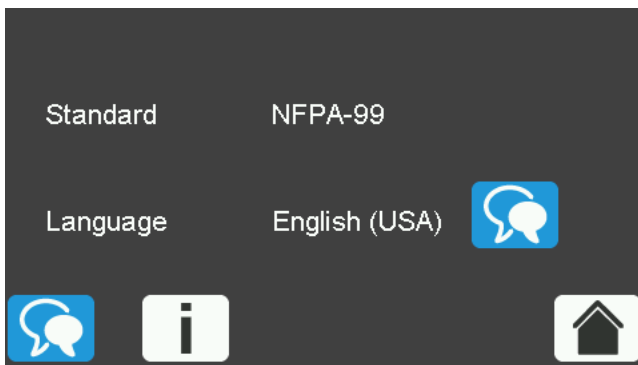
Switch ON:


To switch on the SafeTest 99, please insert the mains cable to the power inlet, the SafeTest 99 will automatically power up to the Home screen.

2.1. Setting your Language



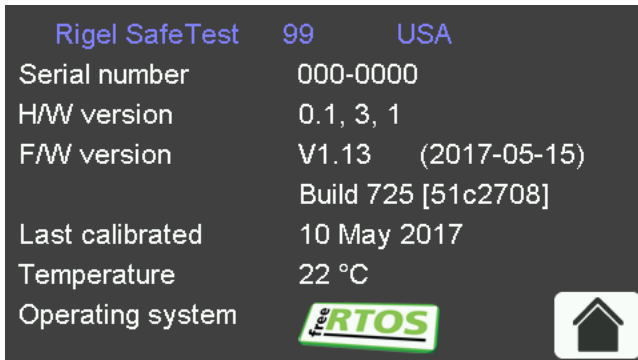
Press  from Home screen to enter Settings menu;



Select  (F1) to change the language

2.2. Displaying the SafeTest 99 Device Information

From the Home screen, select (F5) to enter the settings menu.



Select (F2) to view the SafeTest 99 information

- Serial Number
- Hardware version
- Firmware version
- Last calibration date

2.3. Accessing the SafeTest 99 Functions



From the SafeTest 99 Home screen, select the required test;

Select (F1) to enter the Ground Continuity test menu.

Please see section 3.0 for further information on performing a Ground Continuity test.

Select (F2) to enter the Leakage test menu.

Please see section 4.0 to 7.0 for further information on performing Ground, Chassis (Touch Current) Patient Leakage test, and displaying mains voltage.

Select (F3) to enter the Point-to-point test menu.

Please see section 8.0 for further information on point-to-point Ground Continuity and point to point Leakage testing.

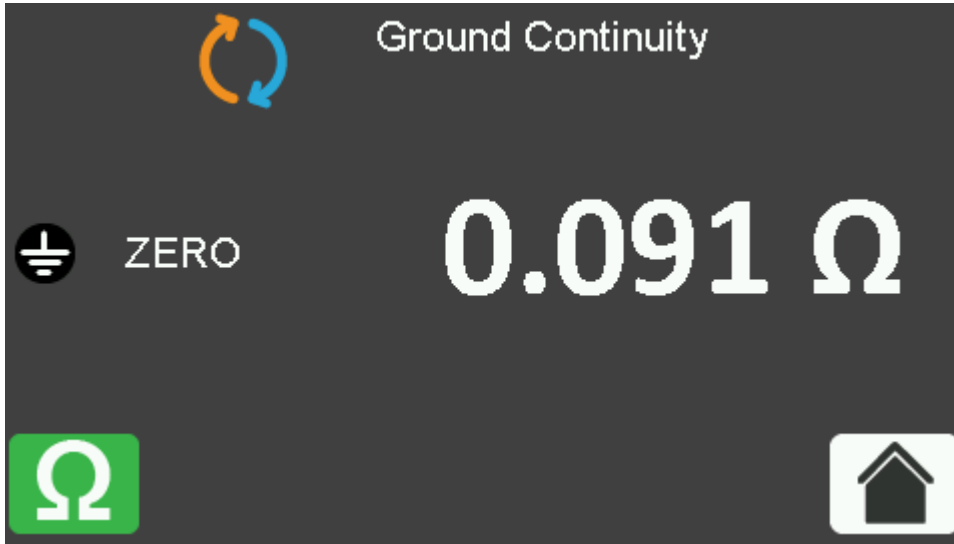
Select  (F5) to enter the Settings menu.



Please see section 2.0 for product information such as serial number, hardware, firmware and calibration date.



In any of the above test menus, use  (F5) to return to the Home screen.

3. Ground Continuity Measurement

To perform a Ground continuity test, select the  (F1) icon from the Home screen.

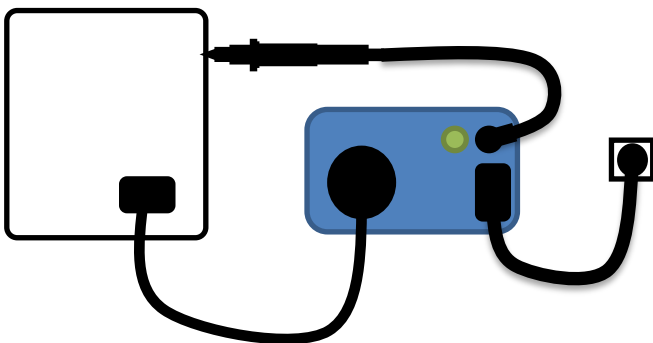


The SafeTest 99 will automatically start measuring when the Ground continuity test,  (F1), is selected from the Home screen. When testing the Test running icon, , is displayed.

The test will run until either  (F1) or the stop  button is selected.

If Home  (F5) is selected, then the test is stopped and the instrument returns to the Home screen.

Connection between EUT and SafeTest 99;
Ground Continuity Testing






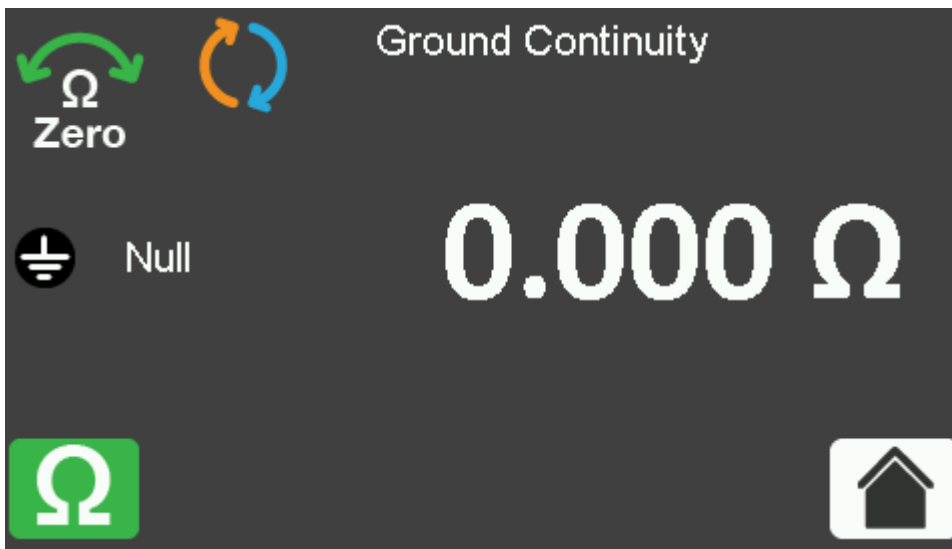
Each time the ground bond probe is placed on a new test point, the zap circuit will be reactivated, ensuring accurate readings at every measurement point.



Do not exceed the maximum permitted voltage of 30 V AC/DC with respect to ground potential! Electric Shock danger!

To compensate for the test cable resistance, connect the test cable between the black ground bond socket and the EUT ground, then select the  button on the front panel.

When the lead compensation is activated, the  icon will appear on the screen.



To remove the lead compensation, remove the cable and select the  button.




When different ground bond cables are used, the NULL function must be repeated for each different cable.

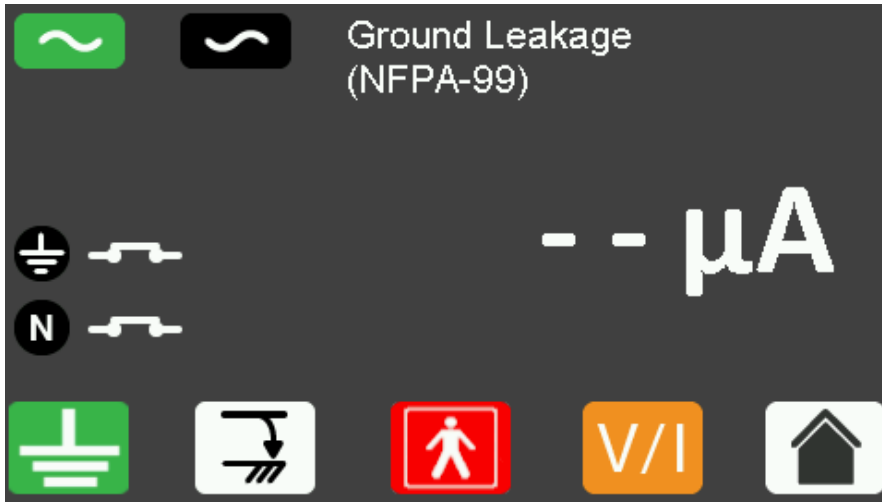


Switching off the SafeTest 99 will not cancel the 'probe zero'.

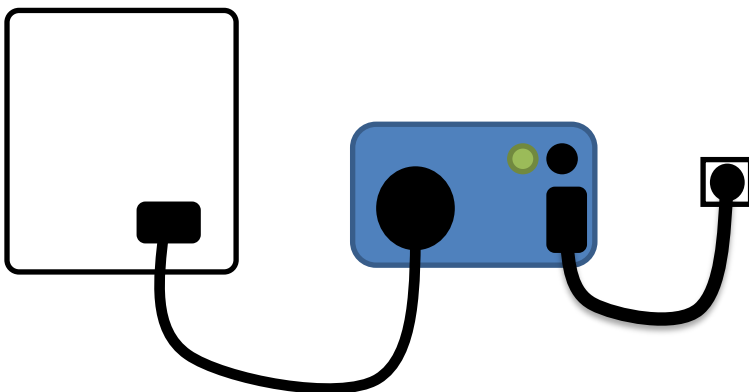
4. NFPA-99 Ground Leakage Measurement

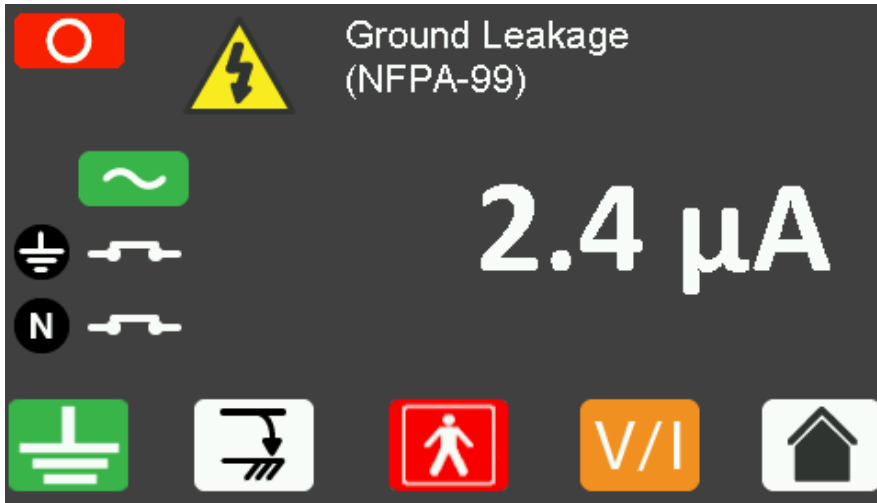
To perform a NFPA 99-2015 **Ground leakage** test, select  (F2) from the Home screen, to enter the **Leakage** test menu.



Use  (F1), to select the **Ground Leakage** test menu. Note in the Leakage menu, you can switch between Leakage tests and the SafeTest 99 will alter internal settings accordingly.






Connection between EUT and SafeTest 99;
Ground Leakage NFPA 99-2015






To apply mains voltage in normal polarity, and start the test, select the  button on the front panel. The test will run until the  button is pressed.

To apply mains voltage in reversed polarity, and start the test, select the  button on the front panel. The test will run until the  button is pressed.


The EUT socket live icon, , will appear on the screen when the DUT socket is activated.


To activate single fault conditions, use the  button on the front panel, this opens the neutral fault condition relay. Note: Opening the Neutral will cause the Device under Test to power off.



The leakage screen will indicate the current state of the selected fault conditions;

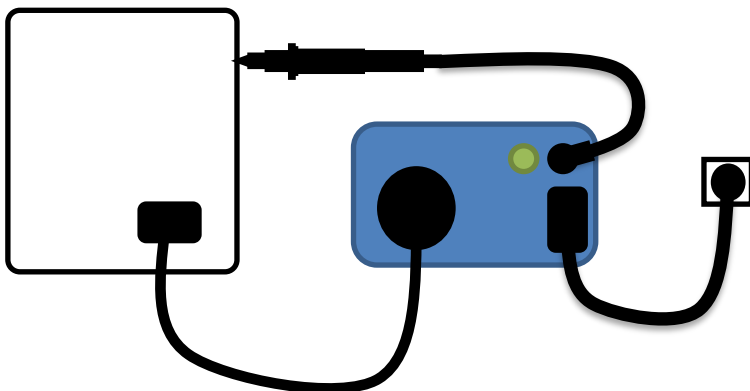
5. NFPA-99 Chassis Leakage (Touch Current) Measurement

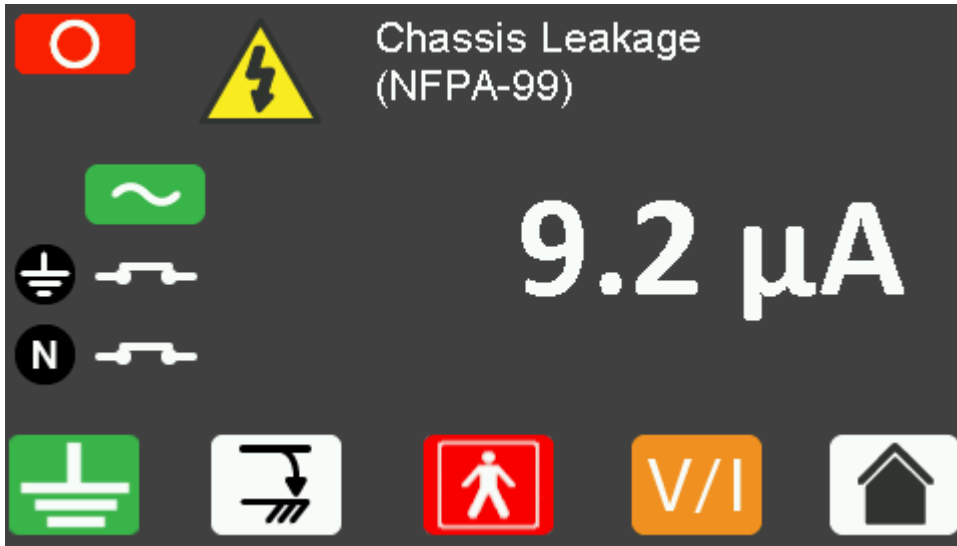
To perform a NFPA 99-2015 **Chassis leakage** (Touch Current) test, select  (F2) from the Home screen, to enter the **Leakage** test menu.



Use  (F2), to select the **Chassis Leakage** (Touch Current) test menu. Note in the Leakage menu, you can switch between Leakage tests and the SafeTest 99 will alter internal settings accordingly.





Connection between EUT and SafeTest 99;
Chassis Leakage (Touch Current) NFPA 99-2015





To apply mains voltage in normal polarity, and start the test, select the  button on the front panel. The test will run until the  button is pressed.

To apply mains voltage in reversed polarity, and start the test, select the  button on the front panel. The test will run until the  button is pressed.

The EUT socket live icon, , will appear on the screen when the DUT socket is activated.

To activate single fault conditions, use the  and  buttons on the front panel.  opens the ground fault condition relay while the  opens the neutral fault condition relay.

The leakage screen will indicate the current state of the selected fault conditions;



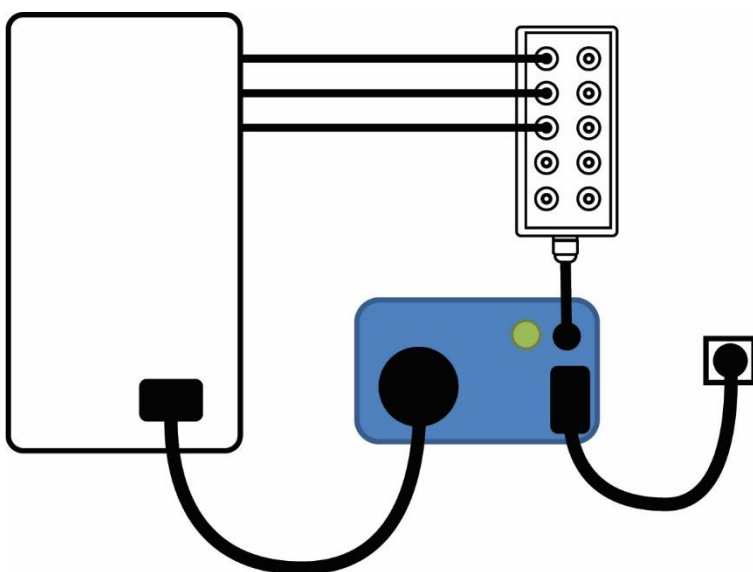
6. NFPA-99 Patient Lead Leakage Measurement

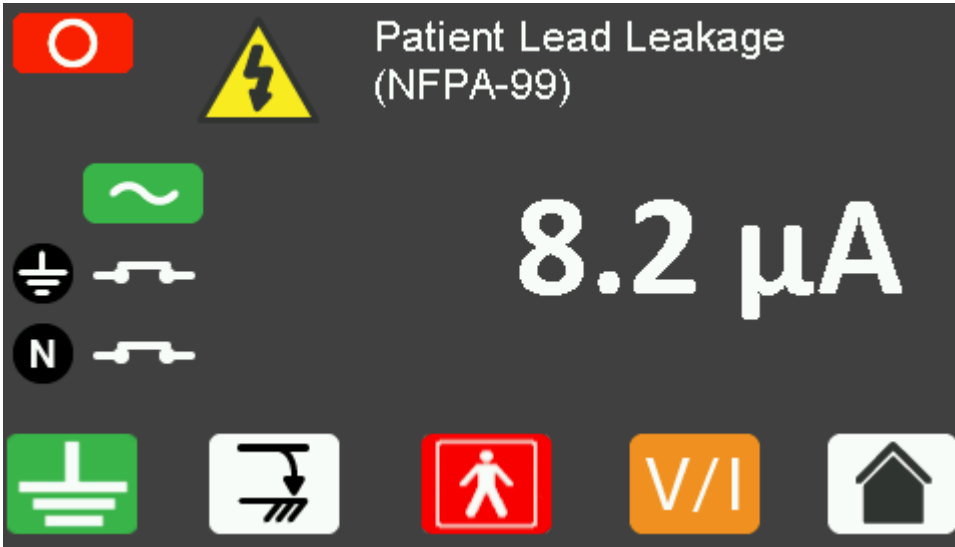
To perform a NFPA 99-2015 **Patient Lead leakage** test, select **μA** (F2) from the Home screen, to enter the **Leakage** test menu.



Use **⚡** (F3), to select the **Patient Lead Leakage** test menu. Note in the Leakage menu, you can switch between Leakage tests and the SafeTest 99 will alter internal settings accordingly.






Connection between EUT and SafeTest 99;
Patient Lead Leakage NFPA 99-2015





To apply mains voltage in normal polarity, and start the test, select the  button on the front panel. The test will run until the  button is pressed.

To apply mains voltage in reversed polarity, and start the test, select the  button on the front panel. The test will run until the  button is pressed.

The EUT socket live icon, , will appear on the screen when the DUT socket is activated.

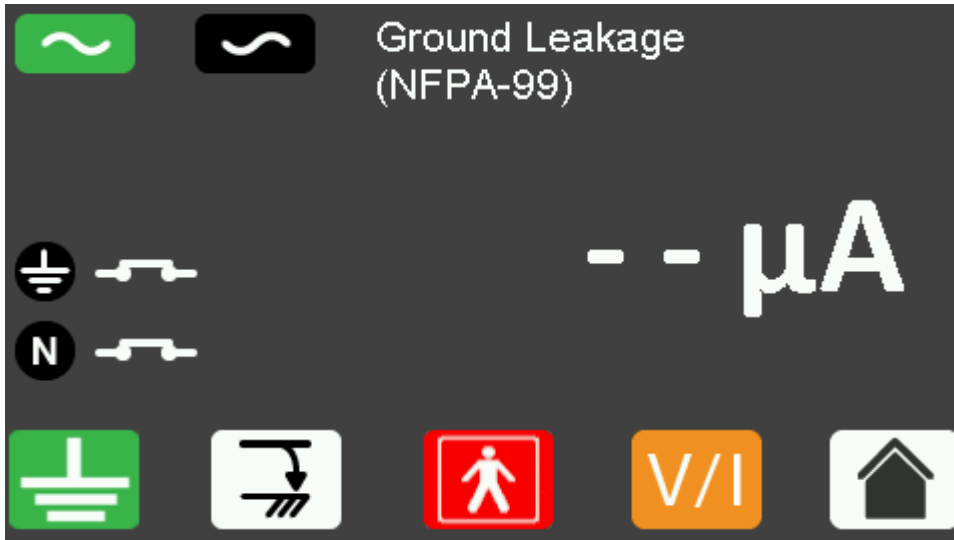
To activate single fault conditions, use the  button on the front panel, this opens the ground fault condition relay.

The leakage screen will indicate the current state of the selected fault conditions;

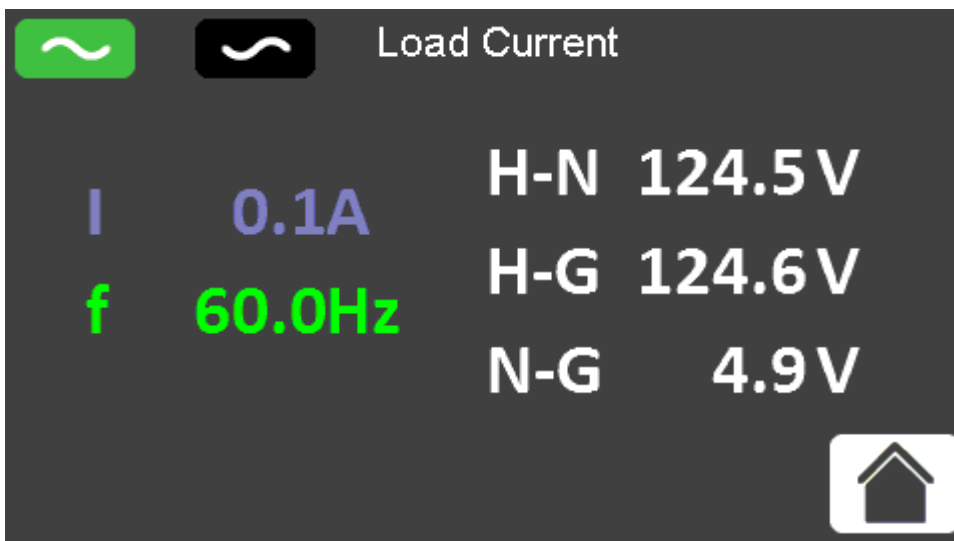


7. Displaying Line Voltage Supply Characteristics


To display the mains supply characteristics, select **μA** (F2) from the Home screen, to enter the Leakage test menu.

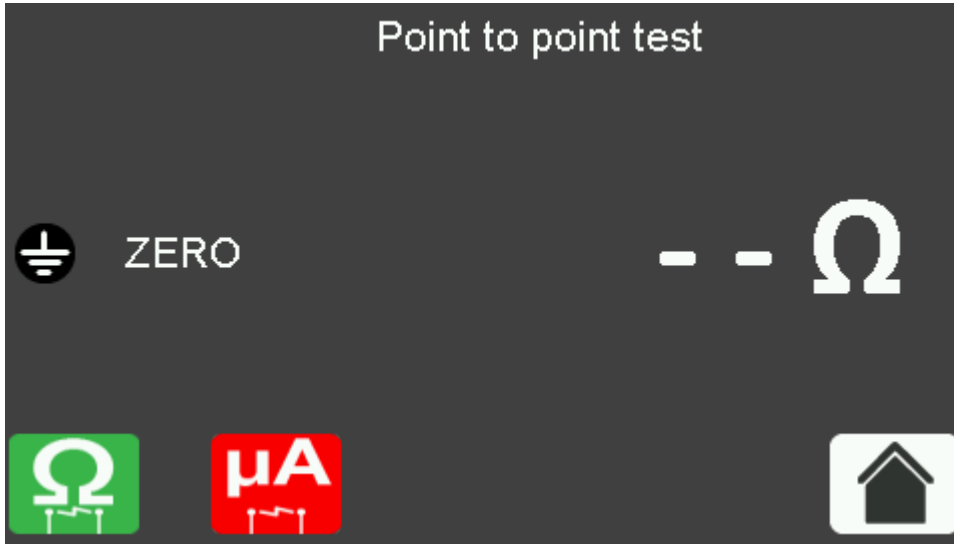


In the Leakage test menu, select **V/I** (F4) to display the line voltage, frequency and load current. Note in the Leakage menu, you can switch between Leakage tests and the SafeTest 99 will alter internal settings accordingly.



8. Point to Point Measurement

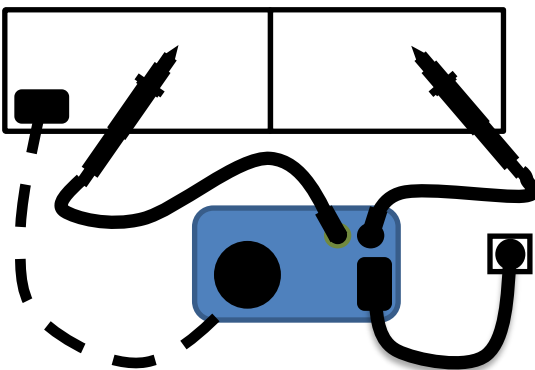
To perform a Point to point test, select  (F3) from the Home screen, to enter the **Point to point** test menu.



Connect the Point to point probes between the black and green socket on the back panel. The EUT socket will power up during leakage tests however the mains cable is not part of the measurement circuit, it is shown as optional and not required.

The Point to point test is ideal for ground continuity testing on larger and or fixed installed installations.




Connection between EUT and SafeTest 99;
Point to Point Testing




Use  (F1) to perform a point-to-point Ground Continuity measurement

Use  (F2) to perform a point-to-point Leakage measurement

When testing the  icon is displayed.

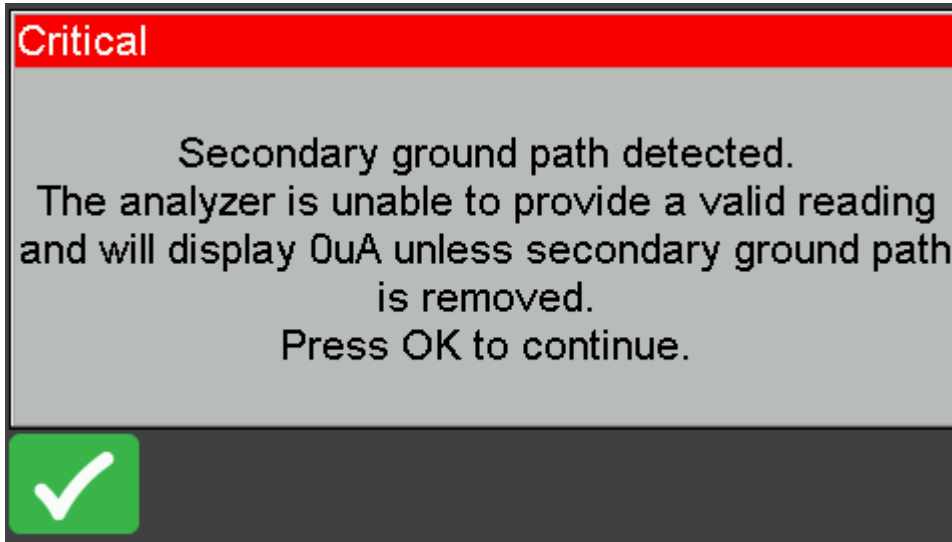
The test will run until either  (F1),  (F2) or the stop  button is selected.

If Home  (F5) is selected the test is stopped and the instrument returns to the Home screen.

9. Warning Messages

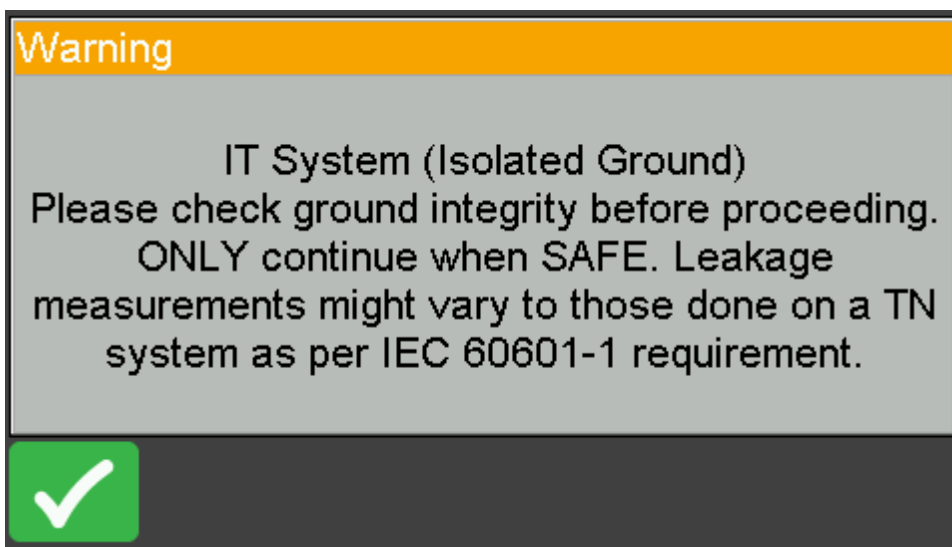
The SafeTest 99 will warn the user of possible incorrect test setups such as secondary grounding and isolated mains supply (line voltage isolated from ground).

Secondary ground warning:



To perform a valid test, the secondary ground must be removed. Testing with a secondary ground will lead to invalid readings as the leakage current will flow through the low resistance secondary ground rather than the high resistance (1kΩ) body model in the SafeTest 99.

Isolated ground error:



Please note that leakage values can appear at half the value as would be expected under a normal line configuration.

10. Maintaining the SafeTest 99

10.1. Cleaning the Analyzer

The SafeTest 99 case can be cleaned with a damp cloth with, if necessary, a small amount of mild detergent. Prevent excessive moisture around the socket panel or in the lead storage area.

Do not allow liquid inside the SafeTest 99 or near the sockets. Do not use abrasives, solvents or alcohol.

If any liquid is spilt into the SafeTest 99 case, the Analyzer should be returned for repair, stating the cause of the defect.

10.2. User Maintenance

The SafeTest 99 is a rugged quality instrument. However, care should always be taken when using, transporting and storing this type of equipment. Failure to treat the product with care will reduce both the life of the instrument and its reliability. If the SafeTest 99 is subject to condensation, allow the Analyzer to completely dry before use.

- Always check the SafeTest 99 and all test leads for signs of damage and wear before use.
- Do not open the SafeTest 99 under any circumstances.
- Keep the instrument clean and dry.
- Avoid testing in conditions of high electrostatic or electromagnetic fields.
- Maintenance should only be performed by authorized personnel.
- There are no user replaceable parts in the SafeTest 99.
- The unit should be regularly calibrated (at least annually).

10.3. Calibration or Repair.

For calibration or repair return the instrument to: -

Contact details

Service, Calibration and Repair
Tel: 813 886 2775
Fax: 813 886 2754
Email: service@seaward-groupusa.com

Address details

Seaward Group USA
6304 Benjamin Road
Suite 506
Tampa, FL 33634
United States

14. Technical Specifications

| | |
|---|--|
| Ground Continuity | |
| Method | 2 wire ZAP technique |
| Test Current | >± 200mADC into 2Ω |
| Max Test Voltage | 4-24Vrms o/c |
| Measuring Range (Low Range) | 0.001 – 0.999Ω |
| Resolution | 0.001Ω |
| Measuring Range (Mid Range) | 1.00 – 9.99Ω |
| Resolution | 0.01Ω |
| Measuring Range (High Range) | 10.0 – 19.9Ω |
| Resolution | 0.1Ω |
| Accuracy | ± 1% of value, ± 5mΩ ± 1% of value, ± 5mΩ |
| Circuit Protection | Test inhibited if ≥ 30VAC or DC at 4mm inputs |
| Powered Leakage Measurements NFPA-99 | Ground Leakage Chassis Leakage Patient Lead Leakage Mains Supply Voltage |
| Test Voltage | 0.1 - 9999μA |
| Measuring Range | 0.1 μA |
| Measurement/Display Resolution | ± 2%, ± 5 μA |
| Accuracy | Soft Key |
| Mains Reversal | Open Neutral and Open Ground Via Soft Key |
| Single Fault Conditions | |
| Voltage Measurement | |
| Application | H-N, H-G, N-G and touch voltage (IEC 61010) |
| Range | 0.0V – 300VAC |
| Resolution | 0.1V |
| Accuracy | ± 2% ± 5 digits (between 10V – 270VAC) |
| Mains frequency | 45.0 – 66.0Hz |
| Resolution | 0.1Hz |
| Accuracy | Unspecified |
| Overvoltage category | CAT II 300V |
| EUT Load Current Measurement | |
| Range | 0.0A – 20.0A |
| Resolution | 0.1A |
| Accuracy | ±5% ± 2 digits |
| Power Source | |
| Maximum Current Rating | 20A @ 120V / 16A @ 230V |
| Duty cycle (@21°C ambient) | 16A to 20A, 3 min. on/ 10 min. off 10A to 15A, 3 min. on/ 5 min. off 0A to 10A, continuous |
| Mains Power | 90-264V 48-64Hz |

14.1. General Specifications

| | |
|------------------|---|
| Weight | 2.5lbs (unit) 5lbs (complete with accessories) |
| Size (L x W x D) | 9 x 6 x 4" |

14.2. Environmental Conditions

| | |
|----------------------------|---|
| Operating Temperature | 0 to 40°C |
| Humidity | 0 -98% Relative humidity, non-condensating |
| Storage Temperature | -10 to 50°C |
| Altitude | 0 – 2000m |
| Ingress Protection | IP 40 |
| Operating Pollution Degree | 2, according to IEC 60529 |

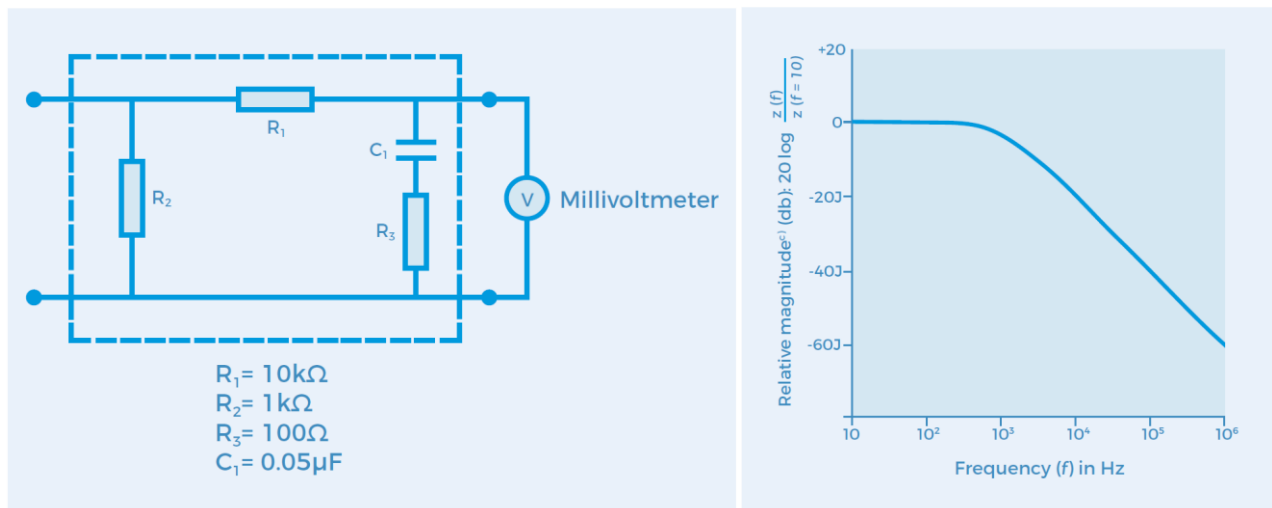
14.3. Applied Parts Connection Box

| | |
|---------------------------|--|
| Size (L x W x D) | 6.1 x 2.6 x 1.1" (not including flying lead) |
| Weight | 0.33lbs |
| Rating | Category I |
| Environmental Protection | IP 40 |
| Impact rating | 5J |
| Pollution Degree | 2 |
| Meets the safety standard | BS EN 61010-1:2010 |
| Voltage rating (maximum) | 230Vac |

Appendix A NFPA 99 Pass / Fail Limits

| Test | Single Fault Condition | Limit |
|-----------------------------------|------------------------|------------|
| Ground bond | None | 0.5 Ω |
| Leakage current (fixed equipment) | None | 10mA AC/DC |
| Touch Current | Open Ground | 500µA |
| Lead Leakage | None | 100µA |
| Lead Leakage | Open Ground | 500µA |

Appendix B NFPA 99 (2021) Body Model and Frequency Response



Rev 2