Limited Warranty & Limitation of Liability

Rigel Medical, part of the SEAWARD GROUP guarantees this product for a period of two 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 in not effected 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 in to service.

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

www.rigelmedical.com/calibration

© Copyright 2017

All rights reserved. Nothing from this edition may be reproduced, or made public in any form, either electronically, mechanically, by photocopying, recording, or in any manner, without prior written consent from the SEAWARD GROUP. This also applies to accompanying drawings and diagrams.

Due to a policy of continuous development the SEAWARD GROUP 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.

When this symbol is attached to a product it means the product is covered by the European Directive 2012/19/EC.

Please familiarize 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

The following symbols are used throughout this Instruction Manual.

⚠️ 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.
# Index

1. **Introduction**
   - 1.1 Key Features
   - 1.2 Getting to Know Your SafeTest 99:
   - 1.3 In the Box
   - 1.4 Optional Accessories and Replacement Spare Parts
   - 1.5 Icons used on the SafeTest 99

2. **Getting Started**
   - 2.1 Setting your Language
   - 2.2 Displaying the SafeTest 99 Device Information
   - 2.3 Accessing the SafeTest 99 Functions

3. **Ground Continuity Measurement**

4. **NFPA-99 Ground Leakage Measurement**

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


7. **Displaying Line Voltage Supply Characteristics**

8. **Point to Point Measurement**

9. **Warning Messages**

10. **Maintaining the SafeTest 99**
    - 10.1 Cleaning the Analyzer
    - 10.2 User Maintenance
    - 10.3 Calibration or Repair.

11. **Technical Specifications**

Appendix A **Pass / Fail Limits**

Appendix B **NFPA99-2015 Body Model**
Warnings and Cautions

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

Environmental Conditions

The SafeTest 99 has been designed to be operated in a dry environment, at a temperature of 32 to 104 degrees F 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.

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.
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 minimized power cycles
- Manual control of fault conditions
- Large, highly visible color display.
- Secondary ground warnings to ensure valid test setup
- Accurate high current, low energy ground continuity testing
- Supplied with free, protective carry case
- Multi-voltage - operates on any mains supply between 90-264V / 48-64Hz
1.2 Getting to Know Your SafeTest 99:

1, Start key
2, Stop key
3, Reversed key
4, Function keys F1-F5
5, Open ground key
6, Open neutral key
7, EUT socket, 90-264VAC, 48-64Hz
8, Point to point auxiliary probe.
9, Ground continuity and leakage probe (Applied Parts Connector Box)
10, Line inlet 90-264VAC 48-64Hz
1.3 In the Box

Carefully unpack all items from the box and ensure the following items are included:

- AC Power Supply
- Ground Continuity Test Probe with Clip
- ECG Snap Adapters (pack of 10)
- Calibration Certificate
- Applied Parts Connector Box
- SafeTest 99 Carry Case
- SafeTest 99 Instrument
- SafeTest 99 Quick Start Guide
- Applied parts Connection Box Quick Start Guide

1.4 Optional Accessories and Replacement Spare Parts

<table>
<thead>
<tr>
<th>Item</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground continuity cable</td>
<td>44B154</td>
</tr>
<tr>
<td>Mains lead</td>
<td>48531</td>
</tr>
<tr>
<td>Replacement Carry Case</td>
<td>410A950</td>
</tr>
<tr>
<td>Applied Parts Connector Box</td>
<td>417A911</td>
</tr>
<tr>
<td>Applied Part Adaptors</td>
<td>404A951</td>
</tr>
</tbody>
</table>
1.5 **Icons used on the SafeTest 99**

The SafeTest 99 features a high resolution color graphic back lit display that 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 SafeTest 99:

- **Ω** Select Ground Continuity testing
- **μA** Select Leakage testing
- **P2P** Select Point to point testing (Ground Continuity and Leakage)
- **⚙️** Select Setting menu (change Language and display information)
- **👍** Change to the required language
- **ℹ️** Product information (serial number, hardware, firmware, calibration date)
- **🏠** Go to Home screen
- **🔌** Ground Leakage selection
- **Dirs** Chassis Leakage (Touch Current) selection
- ** forState** Patient Lead Leakage selection
- **V/I** Display Line voltage, frequency and load current
- **Ω** Point to point Ground continuity test selection
- **μA** Point to point Leakage test selection
- **連れ** Applies normal mains to EUT
- **-pagination** Stops / Interrupts mains to EUT
Applies reversed mains to the EUT

Warning, EUT socket live

Open Ground single fault condition key

Open Neutral single fault condition key

Ground continuity test lead compensated

Test running (note; not used on all tests)
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

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

Select 🌐 (F1) to change the language.
2.2 Displaying the SafeTest 99 Device Information

From the Home screen, select \(\text{\ding{109}}\) (F5) to enter the settings menu.

| Rigel SafeTest 99 USA |  
|-----------------------|---
| Serial number         | 000-0000  
| H/W version           | 0.1, 3, 1  
| F/W version           | V1.13 (2017-05-15) Build 725 [51c2708]  
| Last calibrated       | 10 May 2017  
| Temperature           | 22 °C  
| Operating system      | ![RTOS Logo]  

Select \(\text{\ding{117}}\) (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 Ω (F1) to enter the **Ground Continuity** test menu. Please see section 3.0 for further information on performing a Ground Continuity test.

Select µA (F2) to enter the **Leakage** test menu. Please see section 4.0 to 7.0 for further information on performing Ground, Chassis (Touch Current) and Patient Leakage test, and also 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 \( \Omega \) (F1) icon from Home screen.

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

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

If Home \( \uparrow \) (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 [μA] (F2) from the Home screen, to enter the *Leakage* test menu.

Use [F1] (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 \( \mu A \) (F2) from the Home screen, to enter the Leakage test menu.

Use \( \text{\textbullet~\textbullet} \) (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 \( \mu \text{A} \) (F2) from the Home screen, to enter the **Leakage** test menu.

In the Leakage test menu, select \( \text{V/I} \) (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.

- **Ground Leakage (NFPA-99)**
- **- - \( \mu \text{A} \)**

- **Load Current**
  - I 0.1A
  - f 60.0Hz
  - H-N 124.5 V
  - H-G 124.6 V
  - N-G 4.9 V
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:

Critical

Secondary ground path detected.
The analyzer is unable to provide a valid reading and will display 0uA unless secondary ground path is removed.
Press OK to continue.

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:

Warning

IT System (Isolated Ground)
Please check ground integrity before proceeding.
ONLY continue when SAFE. Leakage measurements might vary to those done on a TN system as per IEC 60601-1 requirement.

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:-

<table>
<thead>
<tr>
<th>Contact details</th>
<th>Address details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service, Calibration and Repair</td>
<td>Seaward Group USA</td>
</tr>
<tr>
<td>Tel: 813 886 2775</td>
<td>6304 Benjamin Road</td>
</tr>
<tr>
<td>Fax: 813 886 2754</td>
<td>Suite 506</td>
</tr>
<tr>
<td>Email: <a href="mailto:service@seaward-groupusa.com">service@seaward-groupusa.com</a></td>
<td>Tampa, FL 33634</td>
</tr>
<tr>
<td></td>
<td>United States</td>
</tr>
</tbody>
</table>
## 11 Technical Specifications

### Ground Continuity
- **Method**: 2 wire ZAP technique.
- **Test Current**: ± 200mA 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
- **Circuit Protection**: Test inhibited if ≥ 30VAC or DC at 4mm inputs

### Powered Leakage Measurements
- **NFPA-99**: Ground leakage
- **Chassis leakage (Touch Current)**
- **Patient lead leakage**
- **Test Voltage**: Mains Supply Voltage
- **Measuring Range**: 0.1 - 9999μA
- **Measurement/Display Resolution**: 0.1μA
- **Accuracy**: ± 2%, ± 5μA
- **Mains Reversal**: Soft key
- **Single Fault Conditions**: Open neutral via soft key
- **Open ground**: via soft key

### Voltage measurement
- **Application**: H-N, H-G, N-G and touch voltage (IEC 61010)
- **Range**: 0.0V – 300VAC
- **Resolution**: 0.1V
- **Accuracy**: ± 2% ± 2 digits (between 10V – 270VAC)
- **Mains frequency**: 45.0 – 66.0Hz
- **Accuracy**: Unspecified

### 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 (@70°F 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
- **Weight**: 2.5lbs (unit)
  - 5lbs (complete with accessories)
- **Size (L x W x D)**: 9 x 6 x 4"

### Environmental
- **Operating temperature**: 32 to 104°F,
- **Humidity**: 0 - 98% Relative humidity, no-condensation
- **Storage temperature**: 14 to 122°F
- **Altitude**: 0 – 2185 yards
- **Ingress Protection**: IP 40
- **Operating pollution degree**: 2, according to IEC 60529

### 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
- **Meets the safety standard**: BS EN 61010-1:2010 Pollution degree 2
## Appendix A  Pass / Fail Limits

<table>
<thead>
<tr>
<th>Leakage Current Type</th>
<th>NC</th>
<th>SFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Leakage – Fixed Leakage</td>
<td>10.0mA</td>
<td>N/A</td>
</tr>
<tr>
<td>Chassis Leakage (Touch Current)</td>
<td>N/A</td>
<td>0.5mA</td>
</tr>
<tr>
<td>Patient Lead Leakage</td>
<td>0.1mA</td>
<td>0.5mA</td>
</tr>
</tbody>
</table>

Appendix B  NFPA99-2015 Body Model

All resistances are ±1%
All capacitances are ±5%

![Frequency Response Diagram](image-url)