

# Rigel UNI-SiM

The world's smallest integrated  
 NiBP, SpO2 and patient simulator.

The UNI-SiM is a handheld and battery-operated vital signs simulator capable of undertaking six synchronized vital signs parameters. This enables medical device engineers to quickly, easily and accurately perform NiBP, SpO2, ECG, temperature, IBP and respiration functionality tests simultaneously, using a single portable instrument.

With a fast boot up and single button simulation to repeat the last simulation value in seconds, the UNI-SiM reduces the time taken to test the correct performance of a wide range of medical devices and equipment.

It is easy-to-use and incorporates the full functionality of conventional NiBP and SpO2 simulators with a comprehensive patient simulator.

Compatibility with the Rigel PULS-R universal SpO2 simulation finger creates a truly versatile and valuable tool for every biomed engineer in need of a cost-effective and lightweight solution for testing the performance of vital signs monitors.



## Key Features

- Compact and cost-effective
- 6-in-1 vital signs simulation
- Fast start up and single button simulation
- Accurate and real-life simulations
- User definable NiBP simulations
- On-board automation and data storage
- User programmable patient conditions
- Universal SpO2 simulation with PULS-R
- Easy and accurate probe placement with PULS-R

## Simulation Functions

- NiBP (systolic and diastolic)
- ECG
- Respiration
- SpO2
- IBP
- Temperature

## End User Types

BMETs requiring a cost-effective solution for carrying out performance checks and full PMs on vital signs monitors.

► **Compact and cost-effective**

A highly cost-effective and compact solution for testing 6 of the most common vital signs using a single battery-powered simulator.



◀ **6-in-1 vital signs simulation**

The UNI-SiM incorporates full NiBP simulation including dynamic and static pressure simulation and leak and over-pressure testing with a comprehensive SpO2 and ECG simulator, all in a single hand-held enclosure.

► **Fast start up and single button simulation**

Automatic power-up of the most recent settings provides simulation of all 6 vital signs with the press of a single button, saving valuable time when setting up the simulator.





#### ◀ **Accurate and real-life simulations**

Fully synchronized simulation signals provide the closest and most accurate representation of a real patient.

#### ▶ **User definable NiBP simulations**

User configurable and physiologically correct systolic and diastolic pressures provide a truly universal and accurate NiBP simulator.



#### ◀ **On-board automation and data storage**

Simple record management for up to 5,000 asset records. The simulated values from the patient monitor can be entered directly into the UNI-SiM using the built-in keyboard, improving traceability and reducing the need for manual data recording.

### ► User programmable patient conditions

Patient specific physiological conditions can be created and stored in the UNI-SiM to provide a highly customisable simulator. A truly versatile tool capable of meeting even the most demanding test protocols.



### ◀ Universal SpO2 simulation with PULS-R

Reduce the need for separate accessories with the universal PULS-R SpO2 simulation finger.

This compact SpO2 simulation enables accurate SpO2 simulations in 1% resolution from as low as 30%\* using the pre-programmed manufacturer specific R-curves. \* subject to monitor capability

### ► Easy and accurate probe placement with PULS-R

Unique probe placement LED's ensure accurate and correct simulation for each type of SpO2 probe.

The Rigel PULS-R has status LEDs which light up to indicate whether a probe connection has been achieved.



## Technical Specifications - UNI-SiM

### Non-Invasive Blood Pressure Simulation

|                   |                                                      |
|-------------------|------------------------------------------------------|
| Waveform          | Oscillometric                                        |
| Pulse Volume      | High, Medium, Low, Paediatric                        |
| Heart Rate        | 20 - 300BPM                                          |
| Integrated Pump   | 0 to 350mmHg user configurable                       |
| Leak Test         | User configurable between 0-350mmHg                  |
| Chronometer       | Configurable up to 999 secs                          |
| Digital Manometer | 0 - 410mmHg                                          |
| Pressure Accuracy | +/- 0.5% FS                                          |
| Pressure Units    | mmHg, inHg, kg/cm2, cmH2O, mBar, PSI, in H2O and kPa |

### Oxygen Saturation Simulation (PULS-R)

|               |                                                                                                                      |
|---------------|----------------------------------------------------------------------------------------------------------------------|
| Range         | 30 to 100%                                                                                                           |
| Repeatability | ± 5%** of reading between 30-59% SPO2<br>± 3% of reading between 60-89% SPO2<br>± 1% of reading between 90-100% SPO2 |

Accuracy of simulation when used with the corresponding R-curves

\*Based on using the same probe and monitor setup

\*\*Note that some monitor types might not be able to display low range sats

|               |                                                                                                                              |
|---------------|------------------------------------------------------------------------------------------------------------------------------|
| Heart Rate    | 30-300BPM***                                                                                                                 |
| Accuracy      | ± 1BPM                                                                                                                       |
| Compatibility | Beijing Choice, Criticare, GE Tufts, Masimo, Mindray, Nellcor, Nellcor Oximax, Nihon Kohden, Nonin, Novamatrix, Philips / HP |

\*\*\*Subject to monitor capability

### ECG Arrhythmia Simulator

|                           |                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Simulation                | 5 lead simulation including high level output on Normal Sinus Rhythm (NSR), ST Elevation, ST Depression, Myocardial Infarction, Tall T                                                                                                                                                                                                                         |
| Heart Rate                | 20 – 300 BPM                                                                                                                                                                                                                                                                                                                                                   |
| Accuracy                  | ±1 BPM                                                                                                                                                                                                                                                                                                                                                         |
| Amplitudes                | Lead II : 0.5 – 5 mV (in steps of 0.5 mV).<br>Other leads are proportional to Lead II by the following percentages:<br>Lead I : 60 %<br>Lead II : 100 %<br>Lead III : 40 %<br>V1 : 63 % [ Reference LA ]<br>V2 : 71 % [ Reference LA ]<br>V3 : 68 % [ Reference LA ]<br>V4 : 80 % [ Reference LA ]<br>V5 : 55 % [ Reference LA ]<br>V6 : 49 % [ Reference LA ] |
| Accuracy                  | ±2%                                                                                                                                                                                                                                                                                                                                                            |
| Connection high-level ECG | 3.5mm jack plug                                                                                                                                                                                                                                                                                                                                                |

### ST Elevation / Depression

|                 |                          |
|-----------------|--------------------------|
| Heart Rate      | 20 – 300BPM              |
| Elevation %     | 7%, 13%, 20%             |
| Elevation Slope | Positive, Negative, Flat |

### Myocardial Infarction

|            |                                                   |
|------------|---------------------------------------------------|
| Type       | Ischemia, Injury, Infarction, Inferior Infarction |
| Heart rate | 20 – 300 BPM                                      |

### Tall T

|                  |                            |
|------------------|----------------------------|
| Heart Rate       | 80 bpm                     |
| T wave Amplitude | 0 – 1.2mV (steps of 0.1mV) |

### Arrhythmia Waveforms (Atrial)

|                               |                                                     |
|-------------------------------|-----------------------------------------------------|
| Simulation                    | 5 lead simulation                                   |
| Amplitudes                    | 0.5 / 1 / 1.5 / 2 / 2.5 / 3 / 3.5 / 4 / 4.5 / 5 mV. |
| Heart rate (where applicable) | 20 – 300 BPM                                        |

### Atrial

Sinus Arrhythmia (SA), Missing beat, Atrial Flutter (AFLT), Atrial Fibrillation (AFB), Paroxysmal Atrial Tachycardia (PAT), Junctional Premature Contraction

### Atrial Conduction

First Degree AV Block, Second Degree AV Block - Mobitz I, Second Degree AV Block - Mobitz II, Third Degree AV Block, Right Bundle Branch Block (RBB), Left Bundle Branch Block (LBB), Left Anterior Hemiblock

### Ventricular

Premature Ventricular Contraction - Intermittent Premature Ventricular Contraction – Continuous, Bigeminy, Trigeminy, Ventricular Flutter (VFLT), Ventricular Fibrillation Fine (VFBF), Ventricular Fibrillation Coarse (VFBC), Monomorphic Ventricular Tachycardia (MVT), Polymorphic Ventricular Tachycardia (PVT) Right Focal (PVC).

### Performance Waveforms

|           |                                                                     |
|-----------|---------------------------------------------------------------------|
| Shape     | Sine, Square, Triangle                                              |
| Rate      | 0.1 to 0.9Hz (in steps of 0.1Hz)<br>1 to 100Hz (in steps of 1Hz)    |
| Amplitude | Lead II : 0.5 – 5 mV (in steps of 0.5 mV).<br>Other leads as above. |
| Accuracy  | 2%                                                                  |
| Shape     | Pulse                                                               |
| Rate      | 20 ms pulse duration, 4 second delay                                |
| Amplitude | Lead II : 1 mV. Other leads as above                                |
| Accuracy  | 2 %                                                                 |

### Pacer Waveforms

|                       |                                                                                                    |
|-----------------------|----------------------------------------------------------------------------------------------------|
| Available             | synchronous atrial, asynchronous atrial, paver only, ventricular pacer, atrial & ventricular pacer |
| QRS                   | 1mV                                                                                                |
| Pacer Pulse Amplitude | 0.1 – 2 mV                                                                                         |
| Pacer pulse Polarity  | positive, negative                                                                                 |
| Pacer pulse width     | 0.1 – 2ms                                                                                          |

### R Wave Detection

|              |                             |
|--------------|-----------------------------|
| Heart Rate   | 70 bpm                      |
| R wave width | 10 – 120 ms (steps of 10ms) |

### Temperature Simulation

|                 |                              |
|-----------------|------------------------------|
| Simulation      | YSI 400 / 700 Static         |
| Range           | preset at 25, 33, 37and 41°C |
| Accuracy        | ±0.1 °C                      |
| Default setting | YSI 400 37°C                 |

### Respiration Simulation

|                       |                                                   |
|-----------------------|---------------------------------------------------|
| Rates                 | 5, 10, 15, 30, 60, 120, 180 Breaths per Minute    |
| Base resistances      | 250, 500, 750, 1000 ohms                          |
| Accuracy              | ±5%                                               |
| Resistance Variations | 0.1, 0.5, 1.0, 1.5 ohms                           |
| Accuracy              | ±10%                                              |
| Default Settings      | 15bpm / 250Ω / 0.1Ω                               |
| Apnoea Simulation     | 0 – 60 seconds duration 0 – 300 seconds interval. |

## Technical Specifications - UNI-SiM (Continued)

### Invasive Blood Pressure Simulation

|                    |                                                |
|--------------------|------------------------------------------------|
| Channels           | 2 channels (Channel 2 set at 50% of Channel 1) |
| Static             | 0 to 300mmHg                                   |
| Dynamic            | 0-300mmHg for Systolic & Diastolic             |
| Accuracy           | ± 1mmHg                                        |
| Excitation Voltage | 2 – 16V                                        |
| Impedance          | 350Ω                                           |
| Nominal Simulated  |                                                |
| Sensitivity        | 5μV / V / mmHg                                 |

## General Specifications - UNI-SiM

|                          |                                                      |
|--------------------------|------------------------------------------------------|
| Operation                | Battery cell, in-situ charge                         |
| Battery Charger          | 100-240VAC, 50/60Hz                                  |
| Supply                   | 12VDC centre positive                                |
| Battery Life             | 8 hours standby or a maximum of 200 NiBP simulations |
| Memory Capacity          | Approx. 5,000 records                                |
| Communication            | via Bluetooth                                        |
| Display                  | Monochrome, ¼ VGA full graphics                      |
| Keypad                   | Alpha-numeric                                        |
| Weight                   | <1.5kg, <3.5lbs                                      |
| Size (L x W x D)         | 270 x 110 x 75mm / 10.5 x 4 x 3"                     |
| Operating Conditions     | 10-30°C, 0-90% RH - NC                               |
| Storage Environment      | -15° - +60°C                                         |
| Environmental Protection | IP 40                                                |

### Service & Warranty

UNI-SiM comes with a free upgraded 24 month warranty (subject to terms and conditions, available at [www.rigelmedical.com/register-product](http://www.rigelmedical.com/register-product))

### Standard Accessories (supplied with UNI-SiM)

|                      |                        |
|----------------------|------------------------|
| ■ Carry case         | ■ ECG snap-on adaptors |
| ■ NiBP tubing kit    | ■ Quick start guide    |
| ■ ECG adaptor module | ■ Power supply         |

### Optional Accessories

|                      |                              |
|----------------------|------------------------------|
| ■ IBP connect cables | ■ Temperature connect cables |
| ■ NiBP accessories   | ■ ECG cables and leads       |

To find out more, visit [www.rigelmedical.com/sim-accessories](http://www.rigelmedical.com/sim-accessories)

## Specifications - PULS-R

### Supported Default R Curves

|                |              |
|----------------|--------------|
| Beijing Choice | Criticare    |
| GE Tuftsat     | Masimo       |
| Mindray        | Nellcor      |
| Nellcor Oximax | Nihon Kohden |
| Nonin          | Novamatrix   |
| Philips / HP   |              |

|                    |                                                 |
|--------------------|-------------------------------------------------|
| Heart Rate Setting | 30-300BPM<br>(subject to Monitor Compatibility) |
|--------------------|-------------------------------------------------|

### Standard Accessories (supplied with PULS-R)

PULS-R universal SpO2 simulation finger  
Quick Start Guide

### Accuracy of Simulation when used with the Corresponding R Curves

| Resolution | Range   | Repeatability* |
|------------|---------|----------------|
| 1% steps   | 30-59%  | ±5%**          |
| 1% steps   | 60-89%  | ±3%            |
| 1% steps   | 90-100% | ±1%            |

### Part Numbers

|         |         |
|---------|---------|
| UNI-SiM | 370A930 |
| PULS-R  | 399A910 |