

## NEULOG HEART RATE AND PULSE LOGGER SENSOR GUIDE



### NeuLog heart rate and pulse logger sensor NUL-208

The NeuLog pulse sensor can be used for any science experiment which requires a human heart rate or pulse measurement such as in the fields of Biology, Health Sciences, Physiology, Exercise Science, Psychophysiology, etc.

The sensor comes pre-calibrated so you can start experimentation right out of the box using this guide.

With this sensor, the heart rate can be measured in two ways, beats per minute or analog arbitrary values to demonstrate the wave signal of a heartbeat showing the blood volume in the finger or earlobe.

Among hundreds of possible experiments that can be performed with the NUL-208 sensor are: physiological experimentation, relationship between heart rate and oxygen flow, blood volume, psychological experiments which utilize heart rates, lie detection, exercise experiments, VO<sub>2</sub> max experiments and metabolism.

The heart rate and pulse sensor has two possible units of measurement:

Beats Per Minute (BPM): The amount of heart beats per minute.

Arbitrary analog units (Arb): An arbitrary unit meant to show wave functions.

### Probe usage:

The sensor consists of an infrared LED transmitter and a matched infrared phototransistor receiver (light detector).

#### For best results:

- Wash hands before use.
- Clip the sensor to the little finger (pinky) or earlobe.
- For better results, place the light detector side of the clip (with a white transparent cover) on the pad of your finger, not the nail.
- Remain as still as possible until testing is complete.
- Nail polish can skew the results.
- Let the signal stabilize before reading.

### Included with the sensor:

- NeuLog General Guide
- Fingertip/earlobe clip with IR receiver transmitter

#### Sensor specifications

	Beats per minute	Arbitrary analog units (wave function)
<b>Range and operation modes</b>	0 to 240	0-1023 Analog values
<b>ADC resolution</b>	10 bit	
<b>Accuracy</b>		1
<b>Resolution</b>	1	1
<b>Max sample rate (S/sec)</b>	100	100

**Experiment Duration:** 1 second to 31 days.

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### Sensor features:

- Fully digital data
- Rugged plastic ergonomic case
- Push button switch for Start/Stop experiments in off line mode
- LED indicator of experiment status (blinks while collecting data)
- Pre-calibrated sensing equipment
- Pulse sensing electrodes located in the probe clips attached directly to the sensor's plastic body

**Note:** NeuLog products are intended for educational use.

### Videos and experiment examples:

- Videos, literature and other probes can be found at [www.NeuLog.com](http://www.NeuLog.com).
- In order to access the heart rate and pulse sensor's page, choose "Products" on the main menu and then "Heart rate and pulse".
- In order to access the heart rate and pulse sensor's experiments, choose "Example Labs":
  - Heart Rate and Coughing (B-18)
  - Heart Rate and Physical Activity (B-19)

### Technical background:

The philosophy behind NeuLog's plug and play technology is based on each sensor's ability to store its own data due to an internal flash memory chip and micro-controller in each plastic NeuLog body. This technology allows the sensor to collect and then store the digital data in the correct scientific units ( $^{\circ}\text{C}$ ,  $^{\circ}\text{F}$ , Lux, %, ppm, for example).

The sensor is pre-calibrated at the factory. The built-in software in the logger can be upgraded for free at any time using the provided firmware update.

The pulse sensor's probe consists of a fingertip/earlobe clip which houses an infrared light source and an infrared light detector on opposite sides.

The blood in the finger flows forward (oxygenated) and backward (deoxygenated with  $\text{CO}_2$ ). The IR light absorbed by the deoxygenated blood and the detected light intensity changes are according to the heart pulses.

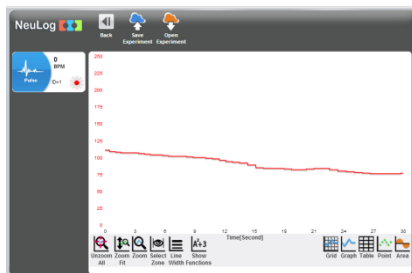
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### Arbitrary analog units (wave function):



### Beats per minute:



The light average intensity changes according to the skin color and/or thickness, the probe's pressure, etc. The sensor's electronics offsets the average intensity, amplifies and passes the pulses only to the internal controller, which calculates the pulses' rate.

### Maintenance and storage:

- Never submerge the NeuLog plastic body in any liquid.
- Do not allow liquid into the NeuLog plastic body.
- After using the probe, wipe off all excess material, liquid or residue from the sensor.

Store in a box at room temperature out of direct sunlight

### Warranty:

We promise to deliver our sensor free of defects in materials and workmanship. The warranty is for a period of 3 years from the date of purchase and does not cover damage of the product caused by improper use, abuse, or incorrect storage. Sensors with a shelf life such as ion selective probes have a warranty of 1 year. Should you need to act upon the warranty, please contact your distributor. Your sensor will be repaired or replaced.

Thank you for using NeuLog!



Flexible, simple, fast, forward thinking.

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