

## NEULOG ACCELERATION LOGGER SENSOR GUIDE



### NeuLog acceleration logger sensor NUL-227 Part# NL-2270

The NeuLog acceleration sensor can be used for any science experiment which utilizes acceleration measurements such as in the fields of Physics, Mechanics, Physiology, Exercise Science, etc.

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

Among hundreds of possible experimental subjects that can be studied with the NUL-227 sensor are: gravitational force, impulse, exercise studies, human and animal acceleration, and many more.

The acceleration sensor's measurement unit is:  
Meters per second squared ( $m/s^2$ ): The SI unit of acceleration or change in velocity over time.

### Sensor's orientation:

The NeuLog acceleration sensor (an accelerometer) measures static acceleration due to gravity and dynamic acceleration due to the sensor's motion. By measuring static acceleration, one can find out the angle the sensor is tilted with respect to the Earth. By measuring dynamic acceleration, one can find out how the velocity of the sensor changes with time.

When the sensor is not moving and is facing upwards, the reading is  $9.8 m/s^2$  (because it includes static acceleration). When the sensor is at free fall and is facing upwards, the reading is  $0 m/s^2$ . If we are

interested only in the vertical axis (Z axis) and in the dynamic acceleration, we can subtract  $9.8 m/s^2$  from the readings and get  $0 m/s^2$  when the sensor is not in motion and  $-9.8 m/s^2$  when the sensor is at free fall.

The NeuLog acceleration sensor has the ability to measure acceleration in three different axes (X, Y and Z). The figure below demonstrates the axes.

Note: You can also determine each axis by using an easy method: First, click on the "Module setup" button located in the acceleration sensor module box in the NeuLog application and select the axis you wish to determine. Then change the physical orientation of the acceleration sensor until the readout is roughly  $\pm 9.8 m/s^2$ . When the sensor reads roughly  $\pm 9.8 m/s^2$ , draw an imaginary line through the sensor towards the ground, either end of the imaginary line (sky and ground) will be the poles of the axis in relation to the sensor you are trying to determine.



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### To view all axes simultaneously:

After collecting data:

1. Open the NeuLog application and connect the acceleration sensor using one of the guides.
2. Once the sensor has been detected, click on the "Off line Experiment" icon.
3. Click on the acceleration sensor "Module setup" button located in the acceleration sensor module box on the left side of the screen.
4. Click on the "Range" button and select an axis (X, Y, or Z).
5. Click the "Load Experiment" icon located on the top of the screen.
6. Click on the experiment you would like to upload so that the button turns green; the default is "Newest" (selects the most recent data collection).
7. Click again the "Load Experiment" icon to load the data from your chosen axis onto the graph.
8. Repeat from step 3 to load the other axes on the same graph.

### Included with the sensor:

- NeuLog General Guide

Sensor's specifications	
Range and operation modes	$\pm 80 \text{ m/s}^2$
ADC resolution	10 bit
Resolution	$0.15 \text{ m/s}^2$
Max sample rate (S/sec)	3000

Experiment Duration: 50 milliseconds to 31 days.

### Sensor's features:

- Fully digital data
- Rugged plastic ergonomic case
- Push button switch for Start/Stop experiments in off line mode
- 3D internal accelerometer for X, Y and Z axes
- LED indicator of experiment status (blinks while collecting data)
- Pre-calibrated sensing equipment

**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 acceleration sensor's page, choose "Products" on the main menu and then "Acceleration logger sensor".
- In order to access the acceleration sensor's experiments, choose "Example Labs":
  - Acceleration of an Elevator (P-47)

### 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).

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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 acceleration IC sensor houses three small thin silicon accelerometers. Each accelerometer is oriented along a different axis (X, Y, or Z) connected to a weight and based on piezoresistive technology. When an accelerometer experiences acceleration along its axis, the silicon changes its resistance proportionally to the acceleration it is experiencing.

These resistor changes are converted into voltage by a Wheatstone bridge circuit and read by the IC internal controller. The IC transmits, upon request, the 3D accelerations in a digital form.

### Maintenance and storage:

- Never submerge the NeuLog plastic body in any liquid.
- Do not allow liquid into the acceleration sensor's body.
- After use, gently wipe away any foreign material from the acceleration 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!

**NeuLog** 

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