NEULOG FORCE LOGGER SENSOR GUIDE

NeuLog force logger sensor
NUL-211

The NeuLog force sensor can be used for any science experiment which involves both constant and changing forces such as in the fields of Physics, Physiology, Mechanics, Biomechanics, Biology, etc.

With the ability to hang the sensor using a stand and rod, an attached hook to hang weights, as well as two directional measurement capabilities that work by applying force on either side of the probe, the NeuLog force sensor can easily be set up to your specific requirements to give quick, easy, accurate, and reliable data.

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

The sensor can easily be reset to zero at any time.

Among hundreds of possible experimental subjects that can be studied with the NUL-211 sensor are: Applied forces and energy, friction, Newton's Laws of Motion, physiological concepts, collisions, harmonic motion, and many more.

This sensor measures force in both the push and pull directions.
The unit of measurement that the force sensor collects data in is the newton:

Newton (N): The SI unit of force.
$1\ N = 1\ kg \cdot m/s^2$
(± 10 N or ± 50 N)

Reset to zero:

The force sensor comes pre-calibrated, however, after use you may find that the sensor is slightly off because of changes in its position; or you may want to run an experiment that requires you to zero the sensor with a constant applied force on it.

To zero the sensor:

1. Connect the NUL-211 force sensor to a computer/tablet/smart device following one of the guides below.
2. Open the NeuLog application.
3. When your sensor has been detected, click on the force sensor module box (on the left side of your screen).
4. Click on the "extra command" button.
5. Remove all force from the sensor and click "Reset" to zero your force sensor.
6. You can also reset the sensor to zero by pressing and holding the sensor push button for 3 seconds.
7. Your force sensor is now reset to zero.

Note: You can zero the scale with a constant force being applied to it to set that value as your new "zero".

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Negative and positive forces:

1. Connect the NUL-211 force sensor to a computer/tablet/smart device following one of the guides below.
2. Open the NeuLog application.
3. When your sensor has been detected, click on the force sensor module box (on the left side of your screen).
4. Click on the “extra command” button.
5. In order to set that an applied push force appears as a negative value and an applied pull force appears as a positive value, click on the "Push=Negative" icon.

   In order to set that an applied push force appears as a positive value and an applied pull force appears as a negative value, click on the "Push=Positive" icon.

Included with the sensor:

- NeuLog General Guide
- Utility probe with hook attached to the sensor by a durable rubber-coated wire. Screw for easy attachment to a lab stand.

Sensor specifications		
	10 N range	**50 N range**
Range and operation modes	± 10 N	± 50 N
ADC resolution	16 bit	
Accuracy	+/-2%	
Resolution	0.02 N	
Max sample rate (S/sec)	3000	3000

Experiment Duration: 50 milliseconds to 31 days.

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
- Strong plastic force utility sensor with hook attached to the sensor’s plastic body by a durable rubber-coated wire
- The force sensor takes measurements in two directions for both pushing and pulling experiments and can measure applied forces on either side of the probe.

  Note: NeuLog products are intended for educational use.

Videos and experiment examples:

- Videos, literature and other probes can be found at www.NeuLog.com.
- In order to access the force sensor's page, choose "Products" on the main menu and then "Force logger sensor".
- In order to access the force sensor's experiments, choose "Example Labs":
  - Friction Force (P-6)
  - Pulley System (P-8)
  - An Inclined Plane (P-9)

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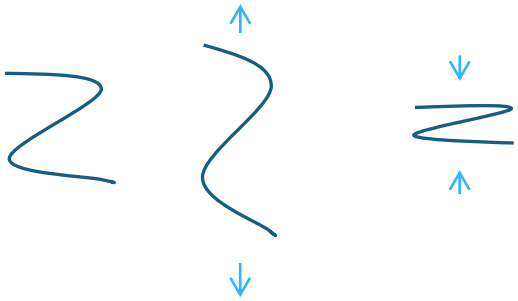
Technical background:

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 (^{o}C, ^{o}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 force sensor is based on a metal rod connected at both sides to the force sensor hooks in a special shape called 'S' shape. A strain gauge is attached to the metal rod and connected to a very sensitive operational amplifier.

No force is applied **Pull force** **Push force**



Pulling or pushing the hooks bends very little the metal rod, changes the strain gauge resistances and the amplifier output voltage. This voltage is converted into force (N) by the sensor's controller.

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.
- Avoid storing with weight applied directly to the sensor.

Do not apply more than 250 Newtons of force to the sensor.

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

Flexible, simple, fast, forward thinking.
W: www.neulog.com
E: info@neulog.com
A: 850 St Paul Street, Suite 15, Rochester, NY 14605
P: 1.866.553.8536

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