NEULOG HAND DYNAMOMETER LOGGER SENSOR GUIDE

NeuLog hand dynamometer logger sensor
NUL-237

The NeuLog hand dynamometer sensor is useful both as a stand-alone sensor and in conjunction with other NeuLog sensors to add a completely new dimension to experimental data. Scientific fields which can utilize the hand dynamometer are: Exercise science, Biology, Physiology, Psychology, 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-237 sensor are: Muscle fatigue, grip strength differences between dominant and non-dominant hands, physiological studies, psychological studies, and many more.

The hand dynamometer sensor's measurement units are:
Pound (lbs): The English system unit of mass
Kilogram (kg): The SI unit of mass
Newton (N): The SI unit of force.

Reset to zero:

The hand dynamometer sensor comes pre-calibrated; however, after use, you may find that the sensor is slightly off or you may want to run an experiment that requires you to zero it with a constant applied force.
To zero the sensor:

1. Connect the NUL-237 hand dynamometer 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 hand dynamometer sensor module box (on the left side of your screen).
4. Remove all applied force from the sensor and click reset to zero your hand dynamometer sensor.
5. Your hand dynamometer sensor is now reset.

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

Quick start procedure:

PC or Mac Computer

Materials needed:
- NUL-237 Hand Dynamometer Sensor
- USB-200 USB Module
- USB to mini USB cable (included with the USB-200 module)

Your hand dynamometer sensor needs to be connected to a USB-200 module. The USB-200 module then connects to a computer via a USB to mini-USB cable. Please note that you cannot plug the hand dynamometer sensor directly into the computer.

The browser based application can be downloaded for free at www.NeuLog.com as well as a full application user guide.
Choose "Downloads" on the main menu and then choose "Software and Application".

Procedure:

1. Install the NeuLog application.
2. Connect the USB-200 module to the PC or Mac.
3. Connect the hand dynamometer sensor to the USB-200 module (they directly plug together).
4. Open the NeuLog application by clicking on the shortcut on the screen.
5. Once a hand dynamometer sensor module box appears on the left side of the screen the probe has been automatically identified and you can begin experimentation.
6. If the hand dynamometer sensor is not automatically identified, click the “Search for sensors” icon to find the sensor.
7. Click on the “On-line experiment” icon; this will open a graph below.
8. Click on the “Module setup” button located in the hand dynamometer sensor module box to change the sensor's settings if need be.
9. Click on the "Experiment set up" icon to change the experiment settings if need be (experiment duration for example).
10. The hand dynamometer sensor will give a live reading in its module box to the left of the screen while plugged in.
11. To run an experiment and collect data click the “Run experiment” icon.
12. To end data collection early, click the “Stop experiment” icon.

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Tablet, smart phone device

Materials needed:

- NUL-237 Hand Dynamometer Sensor
- WIFI-201 WiFi Module
- BAT-200 Battery Module

Your hand dynamometer sensor needs to be connected to a WIFI-201 module. The WIFI-201 module will create a closed NeuLog WiFi network which will stream the NeuLog data to a device of your choosing. Once your device is wirelessly connected to the NeuLog network, you can run experiments and collect data through a browser of your choosing.

Procedure:

1. Connect the hand dynamometer sensor directly to the left side of a WIFI-201 (no wires required).
2. Connect a BAT-200 module to the right side of the WIFI-201 module.
3. Although not required, we recommend plugging the BAT-200 to an outlet using a USB to mini USB charger (such as a typical cell phone charger). The WIFI-201 module will run for 60-90 minutes (depending on the sensor) without being plugged in.
4. The WIFI-201 module can be powered directly using a mini to USB cord and plugging it into your computer or a wall charger. Please note this function is only available on WIFI-201 modules with the USB icon on the cover.
5. For further WIFI-201 instructions or the WIFI-201 quick start guide please visit: www.NeuLog.com; Choose "Products" on the main menu, then choose "WiFi Communication module".
6. The WIFI-201 indicator lights will flash; take no action until the LED to the far left turns blue; this can take up to one minute.
7. Take your tablet or smart phone, go to the WiFi settings and select the NeuLog network (NeuLog0184 for example) which matches the ID found on the back of the WIFI-201 module (0184 for example).
8. Give your device about 20 seconds to connect to the WIFI-201 module.
9. Once the device is connected, go to your browser and type the website **wifi201.com** into the URL bar, then wait for 30-60 seconds.
10. You will see a “Control mode” icon in the application, click on this icon.
11. The application will then load a new screen and begin to auto detect the sensor(s); this can take a minute. (You can stop the search when the sensor is found.)
12. If the application does not auto detect the sensor(s), select “Search for sensors”.
13. Once the sensor is found you will see a module box on the left side of the screen for the hand dynamometer sensor. In this box, real time data will be displayed.
14. Click on the “Module setup” button located in the hand dynamometer sensor module box to change the hand dynamometer probe settings if need be.
15. Click on the “Experiment setup” icon to change the experiment settings if need be (Experiment duration for example).
16. To run an experiment and collect data, click on the “On-Line experiment” icon, then click the "Run experiment" icon.
17. If you have a newer generation WIFI-201 module (with the USB icon on the cover) this can be used as a USB-200, meaning you can tether the probes directly to the computer using the WIFI-201. To engage operation in this fashion, press 3 times on the panel button. Repeating this operation will return the module to WiFi mode.

Operation with NeuLog Graphic Display Module (viewer)

Materials needed:

- NUL-237 Hand Dynamometer Sensor
- VIEW-101 Graphic Display Module
- BAT-200 Battery Module

Procedure:

1. Connect the hand dynamometer sensor to the left side of the viewer.
2. Connect the BAT-200 module to the right side of the viewer.
3. The VIEW-101 will auto detect the sensor and you will see it appear on the left side of the screen.
4. Once the sensor appears it will be monitoring data in real time.
5. To run an experiment and collect data press the run icon (little green person).

Off-line experiments

(Off-line experiments are when you do not have a sensor connected directly to a computer, tablet, smartphone, or NeuLog viewer).

Materials needed:

- NUL-237 Hand Dynamometer Sensor
- BAT-200 Battery Module

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Materials needed to configure your offline experiment:

- USB-200 Module, WIFI-201 module or VIEW-101 Module
- USB to mini USB cable (included with the USB-200 module)

Procedure:

1. To determine the experiment settings, first connect to your chosen device (PC, Mac, tablet, smart device) and click on the "Off-line experiment" icon after the sensor search has ended. (For more information on how to change the experiment settings, view the quick start procedure section for your chosen device in this document.)
2. Connect the hand dynamometer sensor directly to the left side of a charged BAT-200 module.
3. When ready to collect data press the "Start/Stop" button on the hand dynamometer sensor, a red light will turn on for the duration of the experiment.
4. After the experiment has concluded (when the "Start/Stop" button is pressed again or the data collection period ends) connect the sensor to your chosen device. (full instructions in each device's quick start procedure section)
5. Open NeuLog application.
6. Click the "Off-line experiment" icon.
7. Click the "Load data from sensors" icon.
8. Select which experimental data to upload (5 experimental runs can be stored at one time on the NUL-237 hand dynamometer sensor).

Restoring sensor's factory default settings:

Procedure:

1. Connect the USB-200 to a PC, Mac, tablet, or smart device.
2. Connect the hand dynamometer sensor to a USB-200 module (they directly plug together).
3. Open the NeuLog application.
4. Click the "Tools" icon.
5. Click the "Restore sensor's factory defaults" on the menu.

Included with the sensor:

- NeuLog NUL-237 Hand Dynamometer Sensor Guide (this document)
- Hand dynamometer plastic grip attachment

Sensor's specifications			
	Newtons	**Pounds**	**Kilograms**
Range and operation modes	0 to 500 N	0 to 112 lb.	0 to 50 kg
ADC resolution	16 bit		
Resolution	0.1 N	0.02 lb.	0.01 kg
Max sample rate (S/sec)	100	100	100

Experiment Duration: 1 second to 31 days.

Sensor's 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
- Internal strain gauges located in the grip attachment for accurate data readings
  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 hand dynamometer sensor's page, choose "Products" on the main menu and then "Hand dynamometer logger sensor".
- In order to find the science experiments, choose "Experiments" on the main menu of the NeuLog website, then choose "Physics", "Chemistry", "Biology" or "Environmental Science".
- Biology Experiment:
  - Muscle Strength (B-44)

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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 hand dynamometer 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.

When a force is applied to the strain gauge, minor bends and compressions add enough resistance to the current to be measured. Lastly, the change in resistance is converted into voltage inside the sensor's hardware, which is converted into force by the sensor's firmware.

Maintenance and storage:

- Never submerge the NeuLog plastic body in any liquid.
- Do not allow liquid into the hand dynamometer sensor's body or grip attachment.
- After use, gently wipe away any foreign material from the hand dynamometer sensor.
- Store in a box at room temperature out of direct sunlight.
- Store with as little force being applied to the grip attachment as possible.

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.

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