

# Acceleration

# DT138



The Acceleration sensor ( $\pm 5$  g) can be connected to the Nova5000, MultiLogPRO or TriLink data loggers.

The Acceleration sensor is a high accuracy accelerometer measuring accelerations from -5 g to +5 g. g is the acceleration due to gravity at the Earth's surface, or  $9.8 \text{ m/s}^2$ .

The sensor measures gravitational forces and acceleration-induced forces in the same way. At rest the sensor measures 1 g when pointing downward, -1 g when pointing upward and zero when positioned horizontally.

The sensor is housed in the Fourier Systems plastic sensor case and is equipped with an offset calibration screw.

## Typical Experiments

- Studying Newton's laws
- Investigating centripetal acceleration on a rotating platform
- Investigating the acceleration on an inclined plane
- Measuring accelerations of cars, amusement park apparatus, bungee jumpers

## How it Works

The Acceleration sensor uses a mass suspended by two springs lying on the sensor's axis. The mass can move in this axis only. The deflection of the mass is measured with a capacitor that consists of two fixed plates and one central plate attached to the moving mass. Acceleration will unbalance the capacitor, resulting in an output voltage that is proportional to the acceleration.

## Sensor Specification

<b>Range for Nova5000:</b>	-5 g to +5 g
<b>Range for MultiLogPRO or TriLink:</b>	-5 g to +5 g -49 m/s <sup>2</sup> to +49 m/s <sup>2</sup>
<b>Resolution (12-bit):</b>	0.0025 g or 0.025 m/s <sup>2</sup>
<b>Default Sample Rate:</b>	10 samples per second
<b>Maximum Sample Rate</b>	100 samples per second
<b>Accuracy:</b>	± 0.02 g
<b>Features:</b>	Equipped with an offset calibration screw

## Calibration

The Acceleration sensor requires no calibration.

For further calibration an offset calibration screw is located at the back of the sensor case.

## Using the Acceleration Sensor with the Nova5000 and MultiLab Software


1. Launch the MultiLab CE software.
2. Connect the Acceleration sensor to the Nova5000's sensor input (starting from I/O-1). The sensor is automatically recognized by the MultiLab software.
3. Click **Setup** on the main toolbar and program the data logger's sample rate and number of samples. Click **Run** on the main toolbar to start the measurement.

## Using the Acceleration Sensor with the MultiLogPRO or TriLink and MultiLab Software

1. Launch the MultiLab software.
2. Connect the Acceleration sensor to the data logger's sensor input (starting from I/O-1). The sensor is automatically recognized by the MultiLab software.
3. Click **Setup** on the main toolbar and program the data logger's sample rate and number of samples. Click **Run** on the main toolbar to start the measurement.

### Selecting units

MultiLab displays the data in  $g$  units. To change the display to  $m/s^2$ :

1. Click **Setup** on the main toolbar.
2. Click **Properties**  next to the Acceleration sensor input.
3. Select the checkbox next to the desired acceleration unit and click **OK**.

## An Example of using the Acceleration Sensor

### Centripetal Acceleration

When a body is moving in a uniform circular motion it undergoes centripetal acceleration, an acceleration that is pointed toward the center of the motion. Using a turntable the relationship between centripetal acceleration and the angular velocity of the circular path can be investigated.

The centripetal acceleration is directly proportional to the square of angular speed and the centripetal acceleration vs. the angular speed graph is parabolic.

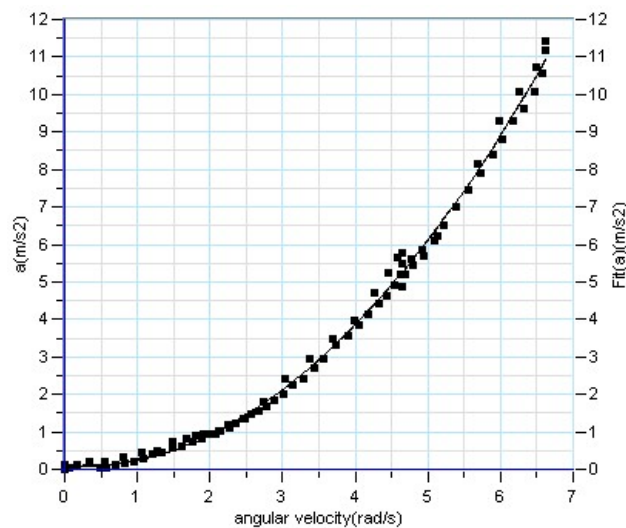


Figure 1: A measurement of centripetal acceleration vs. angular velocity

## **Technical Support**

Please contact Fourier technical support as follows:

Web: [http://www.fourier-sys.com/support\\_support.html](http://www.fourier-sys.com/support_support.html)

Email: support@fourier-sys.com

Consult the FAQs before contacting technical support:

[http://www.fourier-sys.com/support\\_faq.html](http://www.fourier-sys.com/support_faq.html)

## **Copyright and Warranty**

All standard Fourier Systems sensors carry a one-year warranty, which states that for a period of twelve months after the date of delivery to you, it will be substantially free from significant defects in materials and workmanship.

This Warranty does not cover breakage of the product caused by misuse or abuse.

This Warranty does not cover Fourier Systems consumables such as electrodes, batteries, EKG stickers, cuvettes and storage solutions or buffers.