einstein™

imagine • explore • learn

Apr 2024

Rotary Motion Sensor

Product Number: ENROT-A148

Overview

Understanding how things move is basic to understanding physics, robotics and mechanical enginering. The Rotary Motion Sensor allows you to explore how things move, accelerate or swing. The pendulum accessory helps students explore another aspect of movement, the effects of gravity on objects in motion.

The Rotary Motion Sensor can be connected to all einstein™ types of data loggers.

www.einsteinworld.com

Typical experiments

Physics

- Oscillation of a pendulum
- Newton's Second Law
- Conservation of angular momentum
- Linear motion on a dynamic track

How it works

The Rotary Sensor contains an optic encoder which sends electronic pulses to a microprocessor. The pulses count how far the sensor's axis spins and in which direction. The microprocessor uses this information to calculate the sensor's speed and direction which is forwarded to the data logger.

Sensor specification

|	
Range:	±360°
Resolution (12-bit):	0.062°
Accuracy:	±0.125°
Maximum Speed:	1 m/s
Default Sample Rate:	10 samples per second
3-Step Pulley Radius:	0.025 m, 0.015 m, 0.005 m
Direction of Motion	Indicates
Data Logger Input Type:	Digital

Data logging and analysis

Android

1. Take your einstein™ Tablet OR pair your einstein™LabMate with your Android or iOS tablet via Bluetooth
2. Insert the sensor cable into one of the sensor ports via the DT to einstein™ sensor adaptor
3. Launch MiLABEx and tap LAB start an Experiment
4. MiLABEx detects the sensor automatically
5. Tap on Sensors to ensure the sensor is selected.
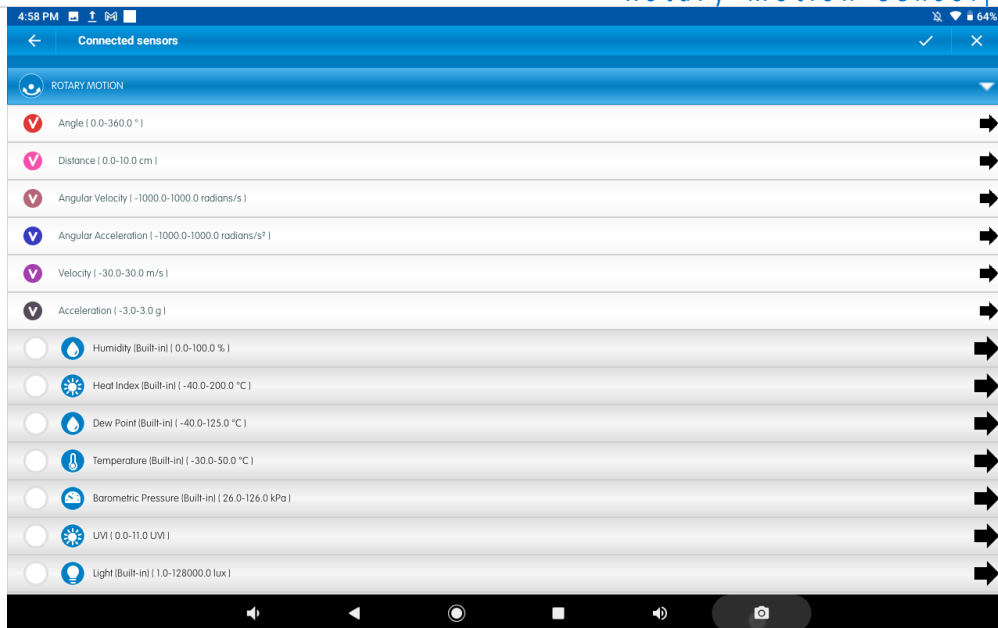
6. Tap the Arrow icon to select the wheel radios
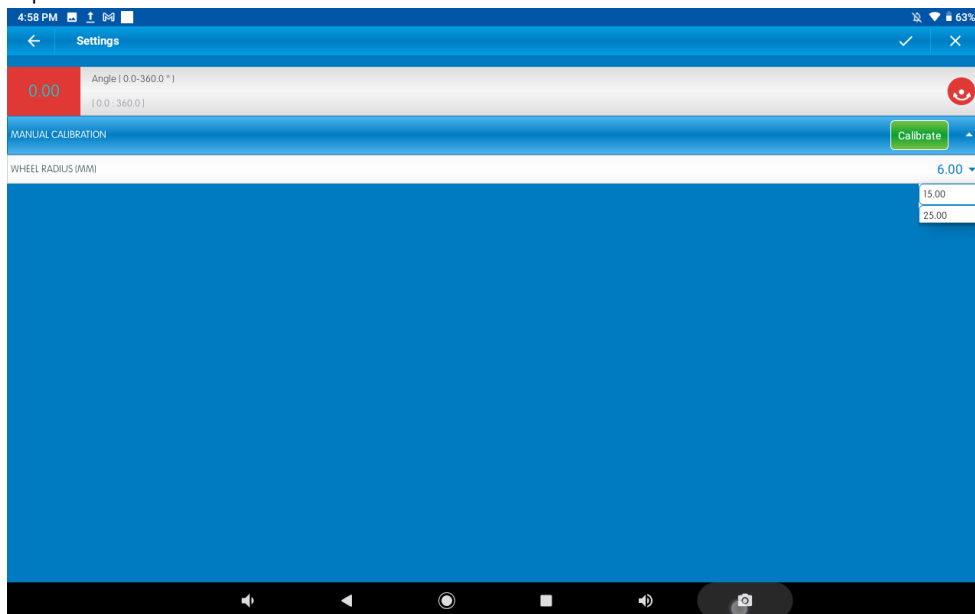
7. Tap on Calibrate
8. Tap on V to save the wheel radius
9. Tap V to save the sensors selection
10. You are ready to start an Experiment

Desktop

1. Pair your einstein™LabMate™ with your desktop machine via Bluetooth or connect it via the USB cable (found in the einstein™LabMate box).
2. Insert the sensor cable into one of the sensor via the DT to einstein™ sensor adaptor
3. Launch MiLABEX and then Click LAB start an Experiment
4. Click on Full Set up in the Current Setup Summary Box
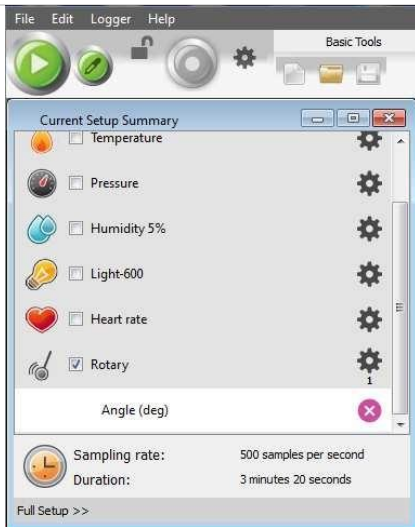
5. Click Full Setup, located at the bottom of the Current Setup Summary window to program the data logger's sample rate, number of samples, units of measurement, and other options
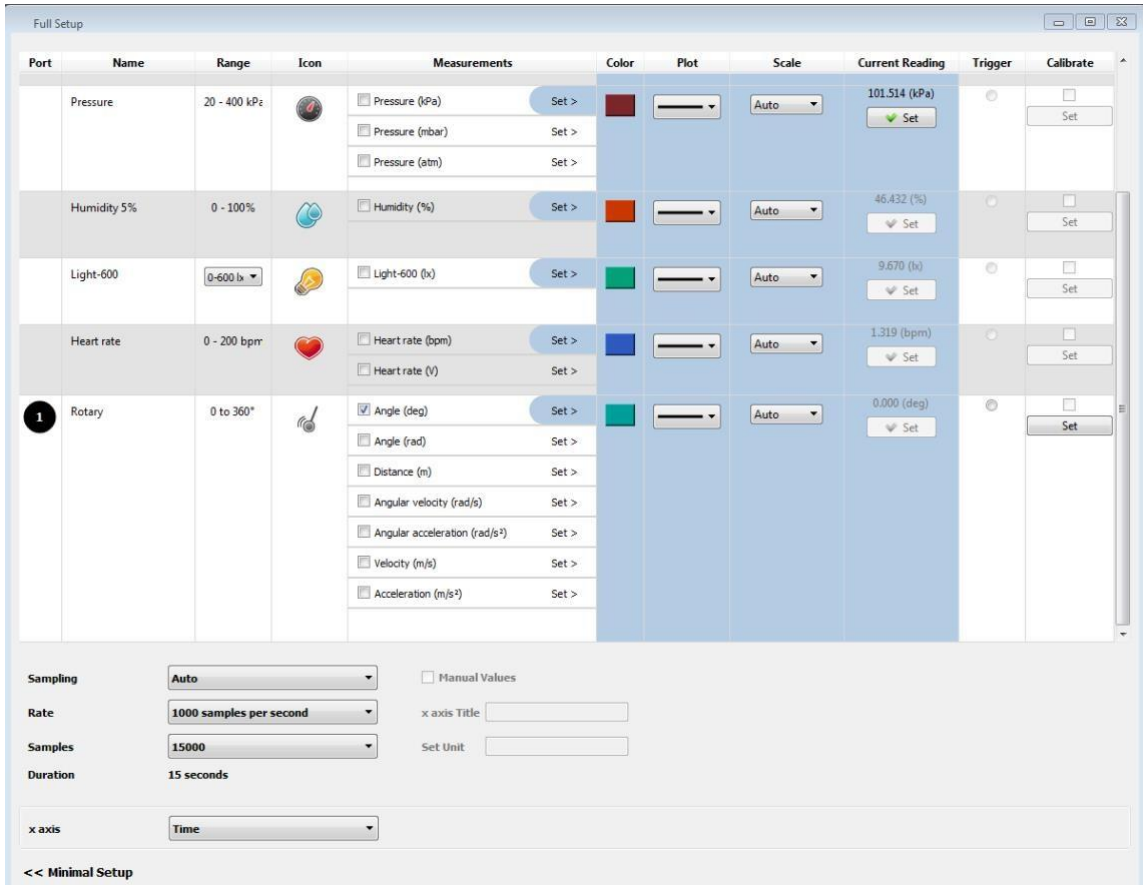
6. Click "set" and chose the wheel Radius:
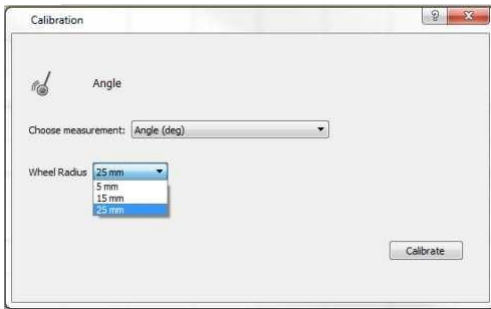
Calibration

As soon as the Rotary Motion sensor is connected to the data logger the angle of the pulley will be set to zero.

What's included

The Rotary Motion Sensor comes with:

- Rotary Motion Sensor
- DT-to-EN adaptor
- 3-Step Pulley
- Mounting Rod

To attach the Mounting Rod, simply screw it into the threaded hole at the bottom of the sensor.

Pendulum

The Pendulum is an optional attachment that is commonly used with the Rotary Motion Sensor. To attach the Pendulum:

1. Use a Philips Head screwdriver to remove the screw connecting the pulley to the sensor.
2. Carefully remove the pulley, reverse it and place it back on the sensor with the hole in the pulley and the hole in the sensor aligned. Do not replace the screw yet.
3. The pendulum can now be attached either at one end for use in pendulum experiments or in the center to find the rotational inertia of point of masses.
4. Line up the appropriate threaded hole in the pendulum with the threaded hole in the pulley and sensor and bolt the three together.

Example of using the Rotary Motion Sensor

Oscillation of a Pendulum

In this experiment we explore the oscillations or repetitive movements of a pendulum and can ask questions regarding factors that affect those oscillations.

Additional Equipment

In addition to the Rotary Motion Sensor you will need:

- The Pendulum attachment
- A Table Clamp
- A Steel Rod
- A right-angle clamp

The Experiment

1. Measure the length and weight of the pendulum rod and record
2. Measure the weight of the weights and record
3. Attach the Mounting Rod to the Center
4. Assemble the Pendulum as explained in Experimental Setup. Make sure the Pendulum is connected through the threaded hole at one end of the rod and not the center.
5. Connect the Rotary Motion Sensor to the data logger and assemble the experiment as shown below
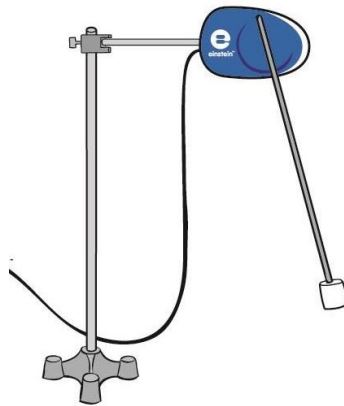
6. Set the Rate at 1000 samples per second and the number of Samples to 150000.
7. Click Run.
8. Lift the lower end of the pendulum up and then release.
9. When the recording ends save the results.
10. Use these results to discuss pendulum oscillations, the Fourier Transformation and harmonic motion.

Troubleshooting

If the Rotary Motion Sensor isn't automatically recognized by MiLAB, please contact Fourier Education's technical support.

Technical support

For technical support, you can contact the Fourier Education's technical support team at: Web: www.einsteinworld.com/support
Email: support@fourieredu.com

Copyright and Warranty

All standard Fourier Systems sensors carry a one (1) 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.