

Force Sensor

DT272



The Force sensor can be connected to the Nova5000, MultiLogPRO or TriLink data loggers.

The Force sensor is a popular force dual range sensor, capable of measuring pushing and pulling forces. It has two ranges: ± 10 N or ± 50 N. It can be easily mounted on a ring stand or dynamics cart, or used as a replacement for a hand-held spring scale. The Force sensor can be used for a variety of experiments in Physics.

Typical Experiments

- Studying Hook's law
- Measuring frictional forces
- Measuring a force on a dynamic car
- Studying simple harmonic motion
- Studying force and impulse during collision

How it Works

The Force sensor uses strain gauge technology to measure force, based on the bending of a beam. Strain gauges attached to both sides of the beam change resistance slightly as the beam bends. These resistors are built into a bridge circuit such so changes in resistance result in a small change in voltage. An amplifier circuit inside the sensor steps up this voltage so that it can be measured by the lab interface. Potentiometers are included in the amplifier circuit to allow adjustment of the Resolution and the voltage produced when no force is applied. The Force sensor was designed to produce a voltage that varies in a linear way with force.



Sensor Specification

Range:	- 10 N to +10 N - 50 N to +50 N
Accuracy:	±2 % over entire range
Resolution (12-bit) for ±10 N:	0.005 N
Resolution (12-bit) for ±50 N:	0.025 N
Default Sample Rate:	10 samples per second
Feature:	Equipped with a gain and offset calibration screw

Technical Notes

Tare the output to zero Newton before each use, by disconnecting the Force sensor from the data logger and reconnecting again. Always tare with the sensor in the orientation used during the experiment.

Calibration

The Force sensor is shipped fully calibrated. However, the sensor is equipped with gain and offset calibration screws should you require further calibration:

Offset Calibration:

1. Turn on the data logger.
2. Fasten the Force sensor vertically so that the hook will point downwards.
3. Switch to ± 10 N range.
4. Connect the Force sensor to the data logger.
5. Begin logging.
6. Insert a flat screwdriver to the Offset calibration hole and slowly turn the calibration screw until a zero reading is reached (make sure that no force is applied to the sensor).

Gain Calibration:

1. Perform offset calibration as described above.
2. Switch to ± 50 N range.
3. Hang a reference weight of about 30 N on the sensor's hook.
4. Begin logging.
5. Insert a flat screwdriver to the Offset calibration hole and slowly turn the calibration screw until the reference reading is reached.

Note: You can perform the gain calibration in the ± 10 N range with a lighter weight.
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Using the Force Sensor with the Nova5000 and MultiLab Software

1. Launch the MultiLab CE software.
2. Connect the Force 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.

Selecting positive direction

By default MultiLab CE regards pushing the sensor as positive force. To reverse the positive direction (pull - positive), use the Sensor Preferences dialog:



1. Click **Logger** on the main toolbar.
2. Click **Preferences** and open the dialog box next to **Force positive direction**.
3. Select the desired option.
4. Click **OK**.

Using the Force Sensor with the MultiLogPRO or TriLink and MultiLab Software

1. Launch the MultiLab software.
2. Connect the Force 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 positive direction

By default MultiLab regards pushing the sensor as positive force. To reverse the positive direction (pull - positive), use the Sensor Properties dialog:

1. Click **Setup Wizard**  on the main toolbar.
2. Click **Properties**  next to the Force sensor input.
3. Check the checkboxes next to the desired option to select it.
4. Click **OK**.

Setting the Current Reading of the Force Sensor to Zero

1. Launch the MultiLab software (from either your PC or Nova5000).
2. Connect the Force sensor to the data logger's first sensor input I/O-1.
3. The Force sensor is automatically recognized by the MultiLab software.
4. Click **Setup** on the main toolbar.

5. Click **Properties**  next to the Force sensor input.
6. Click the **Set Zero** tab.
7. Check the box next to the **Set the current reading to zero**.
8. Click **OK**.
9. Program the data logger's sample rate and number of samples. Click **Run** on the main toolbar to start the measurement.

An Example of using the Force Sensor

Dynamic and static friction force

An increasing force is being exerted on a block which is at rest. This force is equal to the static friction and is measured using the Force sensor. When the block starts to move, the static friction changes into kinetic friction and decreases. The graph below shows the change from static friction to kinetic friction.

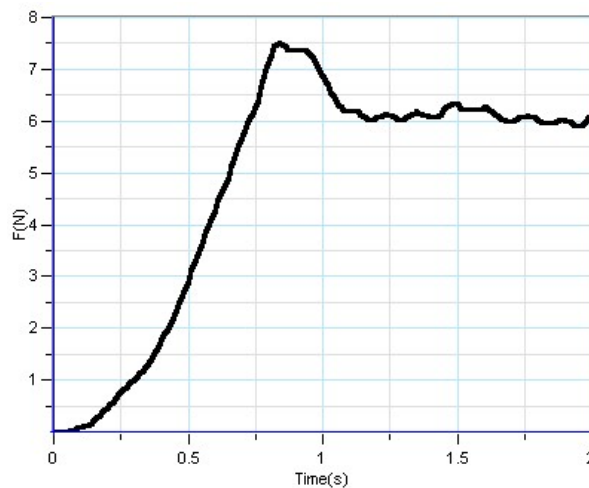


Figure 1: Change from static to kinetic friction

Technical Support

Please contact Fourier technical support as follows:

Web: 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



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.