

## Dual Axis Magnetic Field (Axial and Radial) Sensor

**DT036**



### Introduction

The Dual Axis Magnetic Sensor facilitate the measurements of the components of the magnetic field, and demonstrating to the students the fact the magnetic field is vector.

Our new magnetic sensor measures the radial and the axial magnetic fields simultaneously due to the two Hall Effect probe, placed at the right angle to each other. The axial magnetic field measures the magnetic field along the axis of the magnetic sensor and the radial magnetic field is measured at a right angle to the magnetic field (perpendicular to the sensor's axis).

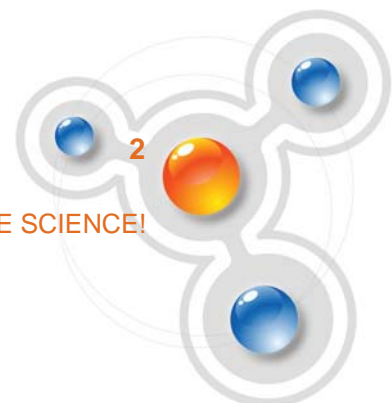
This new sensor enable students to measure the axial and the radial components of the magnetic field of a bar magnet or of a U magnet , the magnetic field vector of coil and a solenoid , showing that the perpendicular component of the magnetic field, to the sensor's axis, inside a solenoid is zero.

The Dual Axis Magnetic Sensor can be used for measuring a wide range of magnetic fields, starting from Earth magnetic field which is a week magnetic field up to strong magnetic fields inside solenoids – up to 100 mT at a very high resolution.

For each range the logger is capable of measuring both components, the axial and radial fields simultaneously.

### Typical Experiments

- Measure the vertical and horizontal component of Earth magnetic field
- Investigate magnetic field patterns around magnets and coils
- Explore the relationship between the field due to a coil and the current in the coil
- Explore the relationship between the field due to a coil and the number of turns in the coil
- Investigate the variation of the field due to Helmholtz coils
- Investigate the magnetic fields created by AC current
- Investigate the field strength of different types of magnet
- Investigate the changes of the magnetic field strength with distance
- Investigate the changes of the magnetic field strength between magnets
- Directly measuring the field due to a magnet or coil

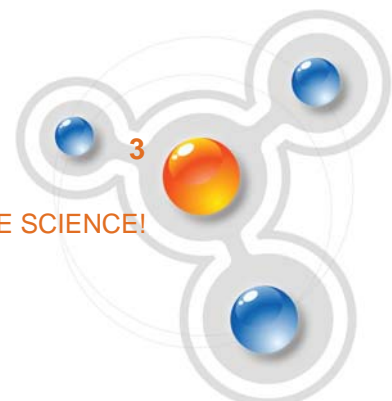


### Sensor Specification

<u>Sensor name</u>	Dual Axis Magnetic 0.2 mT Dual Axis Magnetic 40 mT Dual Axis Magnetic 100 mT		
<u>Range:</u>	± 0.2 mT ± 40 mT ± 100 mT		
<u>Accuracy:</u>	<u>± 5 % from the reading at 25°C</u>		
<u>Resolution (12-bit):</u>	For:		
<u>Default Sample Rate:</u>	<u>10 samples per second</u>	± 0.2 mT : 10 nT ± 40 mT : 0.02 mT ± 100 mT : 0.05 mT	
<u>Max Sampling Rate:</u>	1000 samples per second		
<u>Operating Temperature:</u>	0°C - 70°C		
<u>Features:</u>	Equipped with a mounting rod		
<u>Dimensions</u>	Length : 17 cm Width : 1 cm		
<u>Measurement unit:</u>	<i>mT</i>	millitesla	
<u>Product Compatibility:</u>	NOVA5000, NOVA LINK		

### Calibration

The Dual Axis Magnetic Sensor ships fully calibrated. No further calibration is needed.

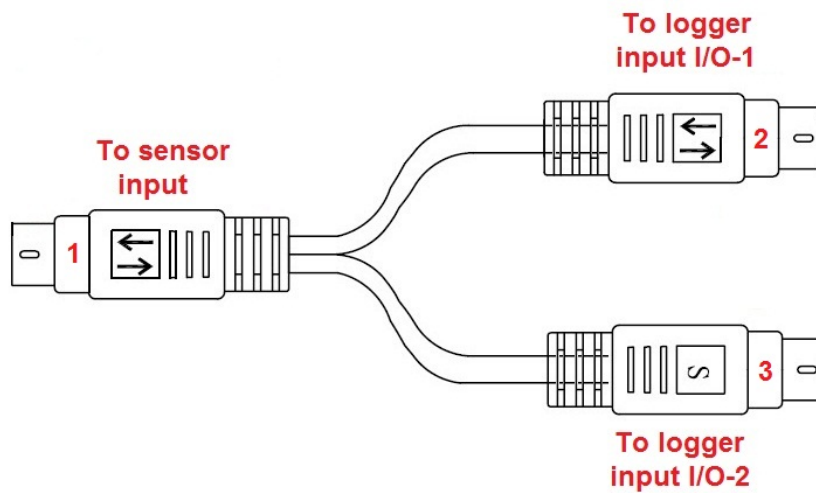


### Sensor Detection

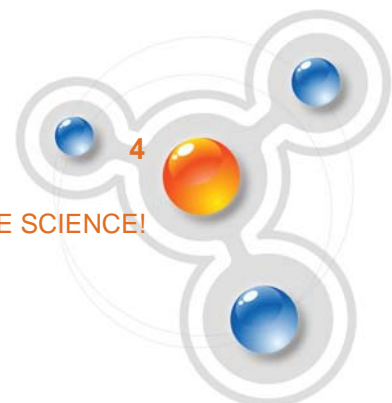
The Dual Axis Magnetic Sensor consists of 2 magnetic sensors. The Sensor is not automatically detected and requires a manual setup when connected to any Fourier device.

### Connecting the sensors

The Dual Axis Magnetic Sensor requires a splitter cable to work correctly. The splitter cable has three ends to it, The main end where both cables are connected is labeled  $\updownarrow$  (1). The cable then splits into two cables labeled  $\updownarrow$  (2) and S (3).



1. Connect the main end (1) of the splitter cable  $\updownarrow$  to the Dual Axis Magnetic Sensor input
2. Connect the 1<sup>st</sup> end (2) of the splitter cable input marked with  $\updownarrow$  to the logger's input I/O-1
3. Connect the 2<sup>nd</sup> end (3) of the splitter cable input, marked with S to the logger's input I/O-2



### Using the Dual axis Magnetic Sensor with the NOVA LINK

It is necessary to have the MultiLab software installed on your Mac or PC. This is Fourier's main data logging program that is used with all of Fourier Sensors

1. Launch the MultiLab PC software
2. Click on the Logger menu and the look for **Auto ID**
  - a) If **Auto ID** is not listed as a menu item, this means the connected logger is already in manual mode
  - b) If **Auto ID** does appear in the menu and it has a check mark next to it, this means that **Auto ID** is enable, select it to disable this function
  - c) If there is no checkbox next to this menu item, then the **Auto ID** function is disabled and no further action is required



3. Click **Setup Wizard** on the main MultiLab toolbar
4. Select the Dual Axis Magnetic Sensor from the drop-down menu next to Input 1 and Input 2

<p><b>NOTE:</b> Make sure to select the Dual Axis Magnetic sensor with the range that is best for the experiment</p>	<p>Dual Axis Magnetic 0.2 mT Dual Axis Magnetic 40 mT Dual Axis Magnetic 100 mT</p>
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5. Click **Next** to select the logger's sample rate and the **next** to select the number of samples. Once you are finished, click **Finish** to exit the Wizard. Click **Run** on the main toolbar to start the measurement

### Using the Dual axis Magnetic Sensor with the NOVA 5000

1. Launch the MultiLab CE software
2. Tap on the Logger menu and choose **Setup**
3. Uncheck the box that shows **Auto Detect Sensors**
4. Select the Dual Axis Magnetic Sensor from the drop-down menu next to Input 1 and Input 2

<p><b>NOTE:</b> Make sure to select the Dual Axis Magnetic sensor with the range that is best for the experiment</p>	<p>Dual Axis Magnetic 0.2 mT Dual Axis Magnetic 40 mT Dual Axis Magnetic 100 mT</p>
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5. Select the **Rate** tab to set the logger's sample rate
6. Select the **Samples** tab to set the number of samples. Once you are finished, click **OK** to exit the Setup Wizard
7. Tap the **Run** icon on the main toolbar to start the measurement

### Benefits

1. The Dual Axis Magnetic Sensors measures the radial and the axial magnetic fields simultaneously, demonstrating that the magnetic field is a vector
2. The sensor has 3 ranges:  $\pm 0.2\text{mT}$ ,  $\pm 40\text{mT}$ ,  $\pm 100\text{mT}$ , for increasing the accuracy of the readings.
3. The high sampling rate enables students to inquire how the magnetic field varies when an alternating current flows through a coil.
4. The sensor is sensitive enough for measuring the vertical and horizontal component of earth magnetic field.
5. The Dual Axis Magnetic Sensor can be used for measuring a wide range of magnetic fields, starting from Earth magnetic field which is a weak magnetic field up to strong magnetic fields inside solenoids – up to 100 mT at a very high resolution.

### Technical Support

Please contact Fourier technical support as follows:

Web: <http://www.fourieredu.com/>

Email: [support@fourieredu.com](mailto:support@fourieredu.com)

### 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.

