

**±60° SPI Dual-Axis Inclinometer**  
**Part Number: 0729-1751-99**

Operating Specifications	
Interface	SPI
Supply Voltage	3.3 V DC to 5 V DC
Supply Current	6 mA (5 V DC), 4 mA (3.3 V DC)
Operating Range	±60°
Linear Range	±25°
Axes of Measurement	2
Repeatability	±0.1°
Resolution	≤0.003°
Null Offset	±5°
Long Term Stability/Drift	≤0.1°
Null Temperature Coefficient	≤0.006° per °C
Scale Temperature Coefficient	0.1% per °C
Materials	Contains magnetic metals
Operating Temperature	-40 °C to 85 °C
Storage Temperature	-40 °C to 125 °C
Temperature Sensor Range	-40 °C to 125 °C
Time Constant (63.2% of output)	≤100 ms

Physical Characteristics	
Housing	None (PCBA)
Electrical Connections	7 Pin, 2.54 mm (0.1") spacing
Weight	5.5 g
Length	31.75 mm (1.25")
Width	31.75 mm (1.25")
Height	16.10 mm (0.63")
Hole Center	26.67 mm (1.05")

Ordering Information	
Part Number	Description
0729-1751-99	Inclinometer, ±60°, 2 Axis, SPI

Related Products	
Part Number	Description
0717-4318-99	Tilt Sensor, ±60°, 2 Axis
1-6200-005	Signal Conditioner, 1 or 2 Axis, SPI
0729-1752-99	Inclinometer, ±60°, 2 Axis, RS-232
0729-1753-99	Inclinometer, ±60°, 2 Axis, Analog and PWM
0729-1754-99	Inclinometer, ±60°, 2 Axis, RS-485
0729-1755-99	Inclinometer, ±60°, 2 Axis, Analog
0729-1759-99	Inclinometer, ±60°, 2 Axis, RS-232
0729-1760-99	Inclinometer, ±60°, 2 Axis, RS-485
0729-1765-99	Inclinometer, ±25°, 2 Axis, Analog/RS-232
0729-1763-XX	Tilt Switch, ±1° to ±45°, 2 Axis, Relay/RS-232
0729-1736-99	Tilt Switch, ±1° to ±45°, 2 Axis, Relay/RS-232
0729-1757-99	Tilt Switch, ±1° to ±45°, 1 Axis, Open Collector
0729-1758-99	Tilt Switch, ±1° to ±45°, 1 Axis, Open Collector

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**Description**

The **0729-1751-99** dual-axis SPI inclinometer is part of Fredericks' inclinometer family of products designed and manufactured in the USA for use in industrial, commercial, and military applications. It combines the **0717-4318-99** wide-range, dual-axis electrolytic tilt sensors and the **1-6200-005** signal conditioning electronics in one easy to use package.

Its wide operating angle range and SPI communications combined with its small footprint make it simple to integrate into new or existing systems and designs.

**Key Features and Benefits**

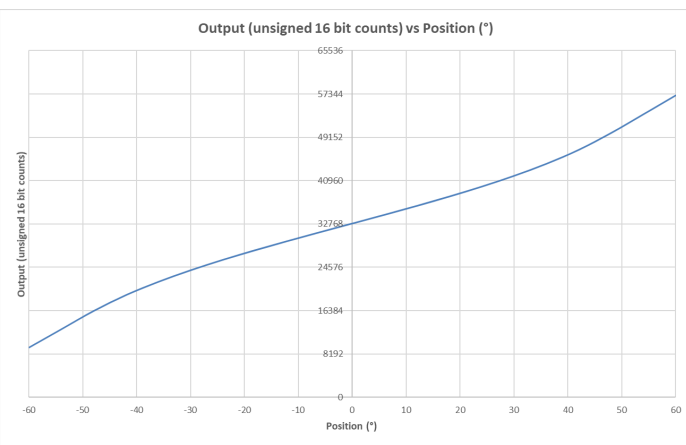
- ±0.1° repeatability, ≤0.003° resolution, very high accuracy
- ≤0.1° long term drift with an extremely long life
- Minimal drift compared to MEMS devices
- -20 °C to 85 °C operating temperature for industrial applications
- Live text and video chat technical support

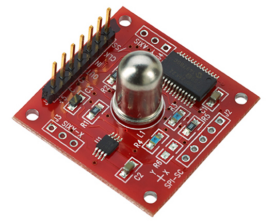
**Applications**

- [Geotechnical and structural monitoring](#)
- [Construction tools, laser leveling](#)
- [Construction machinery and equipment](#)
- Aerial work platforms (AWP), elevating work platforms (EWP)
- Mobile elevating work platforms (MEWPS)

View the full list at [www.frederickscompany.com/markets](http://www.frederickscompany.com/markets).

**Operating Range Behavior**





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SPI Slave Information	
<b>Clock</b>	From master, idle high, 500 kHz to 1 MHz
<b>Data Transfer Edge</b>	Clock high to low
<b>Data Bits</b>	8, MSB first
<b>Start Bits</b>	1
<b>Stop Bits</b>	1
<b>Slave Select Polarity</b>	Idle high, low when transferring data

SPI Commands, ASCII and Hexadecimal Values	
<b>'1', 0x31</b>	X axis high byte of 16-bit output
<b>'2', 0x32</b>	X axis low byte of 16-bit output
<b>'3', 0x33</b>	Y axis high byte of 16-bit output
<b>'4', 0x34</b>	Y axis low byte of 16-bit output
<b>'5', 0x35</b>	Board temperature high byte of 10-bit output
<b>'6', 0x36</b>	Board temperature low byte of 10-bit output
<b>'9', 0x39</b>	Update all data (software version 2.0.0 and higher)

Electrical Connections	
<b>J1 Pin 1 (+5)</b>	Power supply (+)
<b>J1 Pin 2 (C)</b>	Power supply (-)
<b>J1 Pin 3 (C)</b>	Ground
<b>J1 Pin 4 (OUT)</b>	SDO, SPI slave data output
<b>J1 Pin 5 (IN)</b>	SDI, SPI slave data input
<b>J1 Pin 6 (CLK)</b>	SCK, SPI slave clock input
<b>J1 Pin 7 (/SS)</b>	SPI slave select
<b>L1</b>	Dual axis sensor connection
<b>J3</b>	Single axis sensor x axis connection
<b>J4</b>	Single axis sensor y axis connection

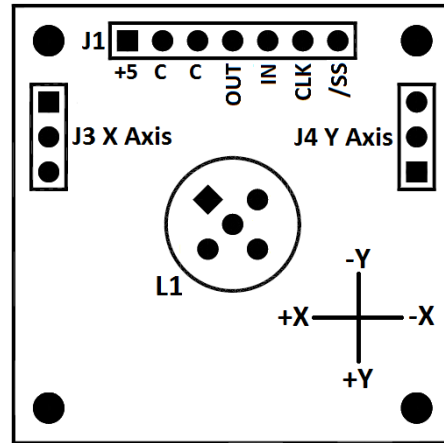
**Example SPI Command Sequence**

Update data and retrieve X and Y axis tilt values which both return 32768 (0° tilt), transmit and receive values are listed in hexadecimal:

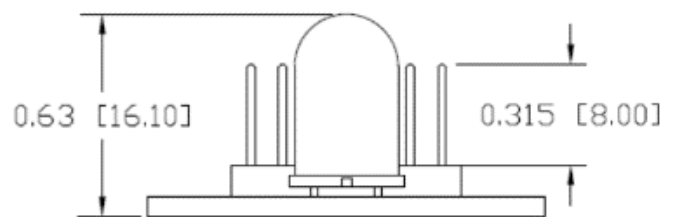
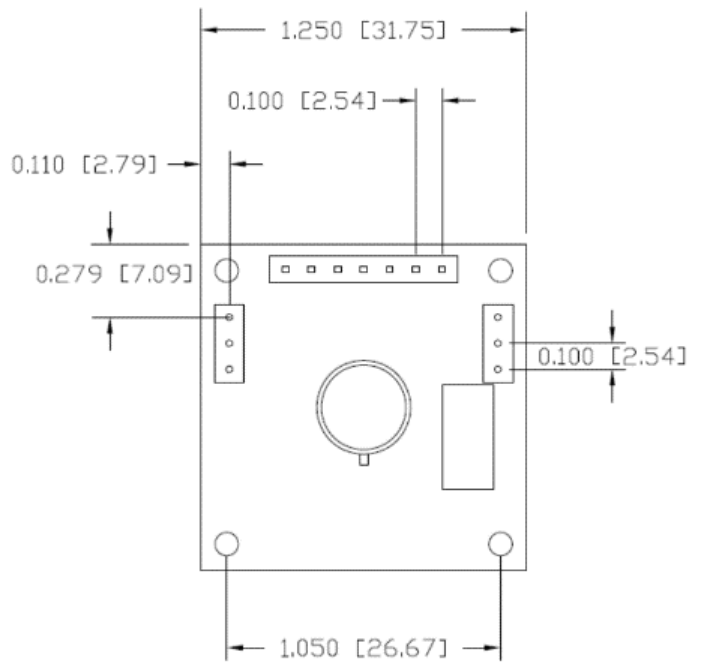
```
[Master TX] 0x39 //update all values
[Master RX] ignore //no valid data in buffer yet
Delay 1 ms
[Master TX] 0x31 //request x axis high byte
[Master RX] 0x2A //'*' response to 0x39 command, data updated
Delay 1 ms
[Master TX] 0x32 //request x axis low byte
[Master RX] 0x80 //x axis high byte, response to 0x31 command
Delay 1 ms
[Master TX] 0x33 //request y axis high byte
[Master RX] 0x00 //x axis low byte, response to 0x32 command
Delay 1 ms
[Master TX] 0x34 //request y axis low byte
[Master RX] 0x80 //y axis high byte, response to 0x31 command
Delay 1 ms
[Master TX] 0x39 //update all values
[Master RX] 0x00 //y axis low byte, response to 0x32 command
```

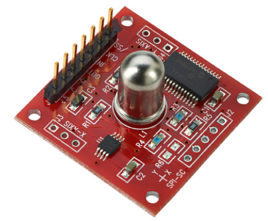
X axis value = 0x8000 = 32768 = 0° tilt  
 Y axis value = 0x8000 = 32768 = 0° tilt

**Direction of Measurement**



**Dimensional Drawings**





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**Converting Temperature Values**

The board temperature output is a 10-bit value (0 to 1023). To convert that value to a temperature in °C, use the following equation:

$$\text{Temperature in } ^\circ\text{C} = (((\text{output}/1023) * \text{supply voltage}) - 0.5) / 0.01$$

**Mounting Notes**

The 0729-1751-99 and all inclinometers in this series must be mounted horizontally (parallel to the surface of the earth and perpendicular to the force of gravity). For best performance, isolate the unit from vibrations when mounting it.

**Certifications and Ratings**

- RoHS Compliant

**Additional Documentation**

AN1000	<a href="#">Electrolytic Tilt Sensor Excitation</a>
AN1001	<a href="#">Temperature Compensation of Electrolytic Tilt Sensors</a>
AN1003	<a href="#">Configuring Tera Term to Use with TFC Tilt Products</a>
AN1005	<a href="#">Converting Tilt Angle to Degrees</a>
Article	<a href="#">Structural Monitoring Case Study: Resensys</a>
Datasheet	<a href="#">0717-4318-99 Wide Range Tilt Sensor</a>
Datasheet	<a href="#">1-6200-005 SPI Signal Conditioner</a>

**Company Information**

**Specialty Manufacturing Services That Promise Precision** - Since 1935, The Fredericks Company has been a global provider and U.S. designer and manufacturer of the highest performance tilt and vacuum measurement products on the market, with manufacturing processes that ensure the reliability of our products.

**Tilt Measurement Products and Sensors That Set Standards** -

Fredericks' comprehensive tilt measurement product portfolio offers [electrolytic tilt sensors](#), [inclinometers](#), and [tilt switches](#). Engineered to outperform competing technology, our tilt sensors are accurate and repeatable with excellent resolution. Our tilt measurement products have no planned obsolescence and serve industries ranging from [construction](#) and [RV leveling](#) to aerospace applications and everything in between.

**A Partnership That Prioritizes Uptime, Lead Time, and Service** -

Fredericks guarantees customer satisfaction and our "not too big, not too small" operation is what enables us to offer a true partnership experience. Our dedicated representatives and engineers offer exceptionally responsive service and the fastest lead times in the industry, knowing that uptime is the key to your success. With anytime access to our leadership team and solutions that enhance your products, you will feel the Fredericks difference.

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