

## Electronic Clinometer

Range:  $\pm 60^\circ$   
Resolution:  $0.001^\circ$   
Choice of Outputs

The Electronic Clinometer is an extremely accurate angle measurement device. This compact and rugged sensor is ideal where space is critical and environmental conditions are serious design concerns.

The heart of the system is a patented, capacitance-based sensor with no moving parts. When rotated about its sensitive axis, this unique sensor provides an exceedingly linear variation in capacitance, which is electronically converted into angular data. The sensor and low-power CMOS electronics are encased in a rugged plastic housing ready to install as a system component or as a stand-alone device.

Designed for easy integration, with a choice of analog, ratiometric, digital or serial models, the clinometer produces an output signal corresponding to direction and magnitude of angular displacement.



### Features

- CE certified**
- Just 2" in diameter**
- Rugged plastic housing**
- Extremely accurate**
- Weighs only 2 oz.**

### Applications

- Wheel alignment**
- Construction equipment**
- Antenna positioning**
- Robotics**

### Performance Specifications

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<b>Total Range</b> .....	$\pm 60^\circ$
<b>Linear Range</b> .....	$\pm 45^\circ$
<b>Threshold</b> .....	$0.001^\circ$
<b>Linearity</b>	
<b>Null to <math>10^\circ</math></b> .....	$\pm 0.1^\circ$
<b>10 to <math>45^\circ</math></b> .....	$\pm 1\%$
<b>45 to <math>60^\circ</math></b> .....	Monotonic
<b>Null Repeatability</b> .....	$0.05^\circ$
<b>Cross Axis Error</b> .....	$< 1\%$ up to $45^\circ$
<b>Time Constant</b> .....	0.3 sec
<b>Freq. Response (-3db)</b> .....	0.5 Hz
<b>RF Susceptibility</b> .....	$< \pm 2^\circ$

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### Environmental Specifications

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<b>Temperature Range</b>	
<b>Operating</b> .....	$-30^\circ$ to $65^\circ\text{C}$
<b>Storage</b> .....	$-55^\circ$ to $65^\circ\text{C}$
<b>Temperature Coefficient</b>	
<b>Null</b> .....	$0.008^\circ/\text{C}$
<b>Scale Factor</b> .....	$0.1\%/\text{C}$
<b>EMC</b>	
<b>Emissions</b> .....	EN55022 (CISPR 22) Limit B
<b>Radiated Immunity</b> .....	IEC 801-3 Level 3 10V/m
<b>Burst Transients</b> .....	IEC 801-4 Level 3 (2 kV)
<b>ElectroStatic Discharge</b> .....	IEC 801-2 Level 2 (8 kV air, 6 kV contact)
<b>Conducted RF</b> .....	MIL-STD 461D, CS114, Curve 2
<b>Cable Length</b> .....	18" standard length with flying lead terminator

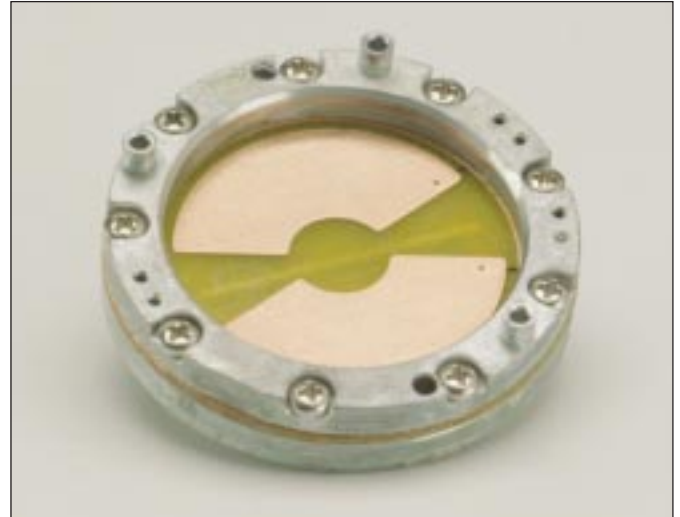
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Range:  $\pm 60^\circ$   
 Resolution:  $0.001^\circ$   
 Choice of Outputs

### Design Concept

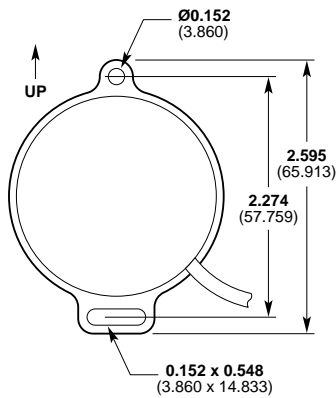
The unique design is based on a common capacitor plate sandwiched between sensor housing halves. The plate has been etched to form two variable capacitors. The assembled sensor is half filled with a dielectric liquid and inert gas. Rotation of the sensor produces a linear change in capacitance resulting in a corresponding output signal.



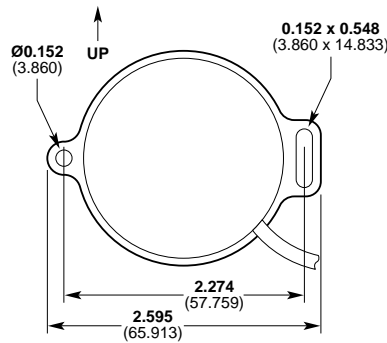
### How to Order

Model Number	Description
	<b>Ratiometric</b>
AS-V-R	Vertical Flange
AS-H-R	Horizontal Flange
	<b>Analog</b>
AS-V-A	Vertical Flange
AS-H-A	Horizontal Flange
	<b>Digital</b>
AS-V-D	Vertical Flange
AS-H-D	Horizontal Flange
	<b>Serial</b>
AS-V-S	Vertical Flange
AS-H-S	Horizontal Flange

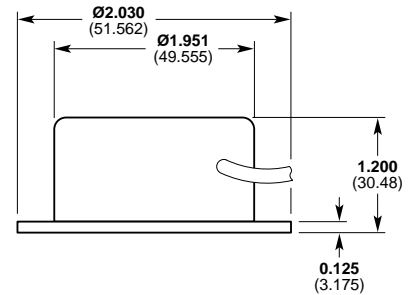
### Dimensions in (mm)



Vertical Flange Mount



Horizontal Flange Mount



## Electronic Clinometer

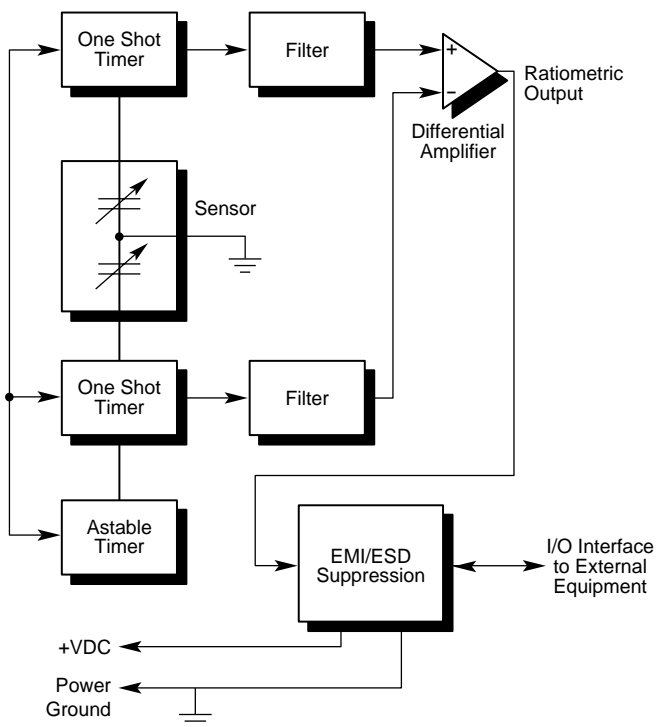
### Ratiometric Output

#### Features

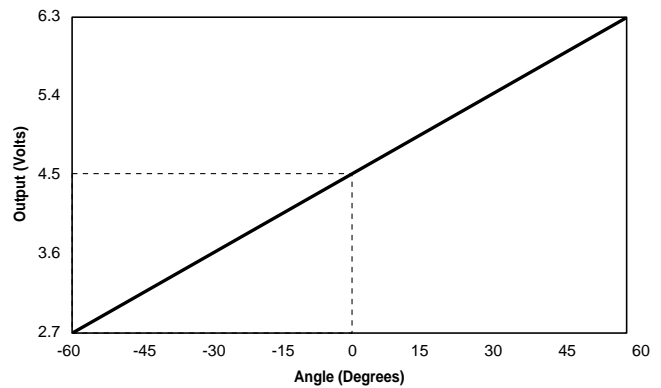
- ❑ **Low power consumption**
- ❑ **3 wire operation**

The Ratiometric clinometer is a signal conditioned sensor that has been designed to operate like a potentiometer. This is a three wire device: power; power ground; and signal. The signal is referenced to power ground. A regulated power supply is required since the output is supply dependent. The midscale output, zero degrees, is 1/2 the supply voltage while the scale factor is also supply dependent. With its low power consumption, 0.5 mA, this device is ideal for battery supplied applications. The Ratiometric clinometer was designed with EMI and ESD suppression circuitry on every line.

#### Ratiometric I/O Block Diagram



Ratiometric Output with 9 VDC supply



#### Ratiometric Electrical Specifications

##### Voltage

##### Voltage Supply

- Nominal ..... +9 VDC
- Range (regulated) ..... +5 to +15 VDC

Current ..... 0.5mA

##### Scale Factor

Nominal (@9VDC) ..... 30mV/degree ±10%

Load Resistance (min.) .... 10 kOhms

Level Output (0°) ..... 1/2V<sub>cc</sub>

#### Electrical Connections

Wire	Source
Black	Power ground
Red	Reg. +5 to +15 VDC
Yellow	Signal output (reference to power ground)