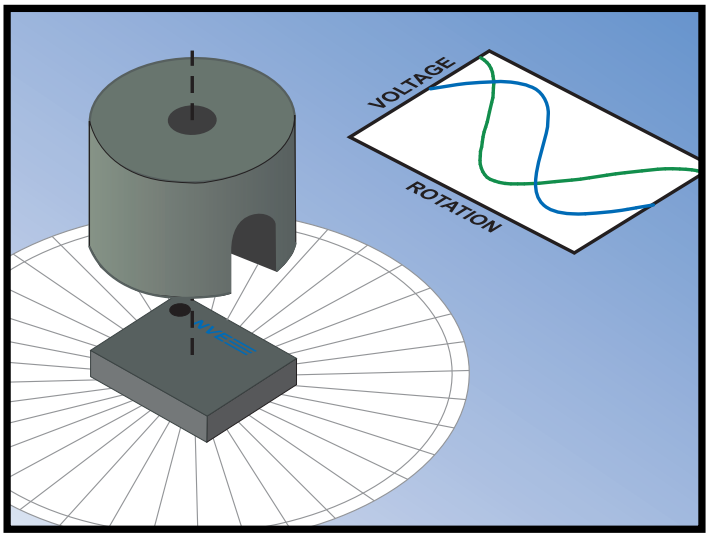
NVE CORPORATION

AG93X-07E
AAT-Series Angle Sensor Evaluation Kit



- ❏ AG930-07E: AAT001 1.25 MΩ Angle Sensor Evaluation Kit
- ❏ AG931-07E: AAT003 40 KΩ Angle Sensor Evaluation Kit
- ❏ AG933-07E: AAT009 6 MΩ Angle Sensor Evaluation Kit

SB-00-050

NVE Corporation (800) 467-7141 sensor-apps@nve.com www.nve.com

Kit Overview

Evaluation Kit Features

- AAT-Series TMR angle sensor
- Part # 12426 split-pole Alnico 5 round horseshoe magnet
- Unity-gain dual op amp buffer
- 1.7 V to 5.5 V supply range
- Magnet locating fixture

AAT-Series Angle Sensor Features

- Tunneling Magnetoresistance (TMR) technology
- High bridge resistance for low power
- 200 mV/V typical output signal
- Low magnetic field requirements
- 1.5% maximim nonsinusoidality error
- Wide magnet airgap tolerance
- Sine and cosine outputs for direction detection
- Ultraminiature 2.5 mm x 2.5 mm x 0.8 mm TDFN6 package

AAT-Series Sensor Applications

- Rotary encoders
- Motor shaft position sensors
- Internet-of-Things sensor nodes
- Battery or harvested power

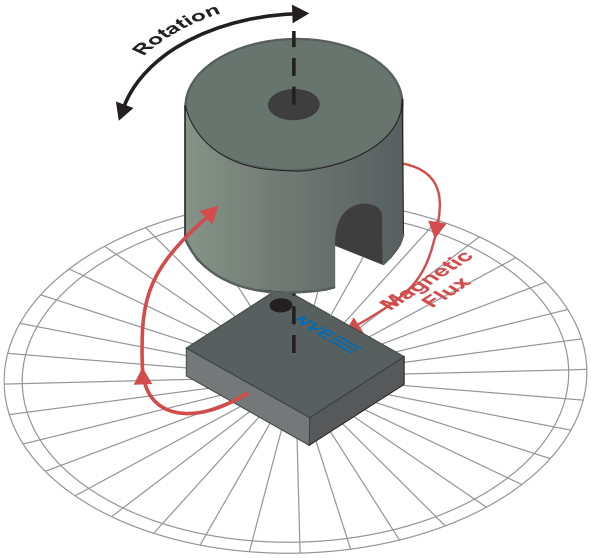
Available AAT-Series Sensors

Part Number	Configuration	Typ. Output (ea. output; p-p)	Required Field	Typ. Device Resistance
AAT001-10E	Half-bridge	200 mV/V	30 Oe	1.25 MΩ
AAT003-10E	Half-bridge	200 mV/V	30 Oe	40 KΩ
AAT006-10E	Half-bridge	200 mV/V	15 Oe	1.5 MΩ
AAT009-10E	Half-bridge	200 mV/V	30 Oe	6 MΩ
AAT101-10E	Full-bridge	400 mV/V	30 Oe	625 kΩ

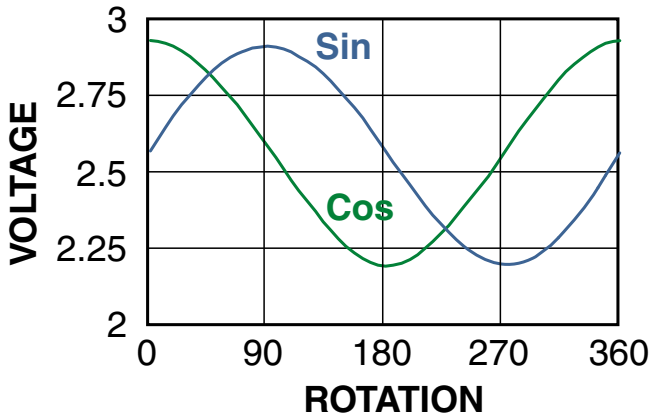
Visit **www.nve.com** for complete product specifications.

Quick Start

⇒ Connect V_{CC1} and V_{CC2} to a 3.3 or 5 V supply.
⇒ Connect the "SIN" and "COS" screw terminals to an oscilloscope or to meters.
⇒ Place the split-pole magnet in the Plexiglas pocket.
⇒ Rotate the magnet.

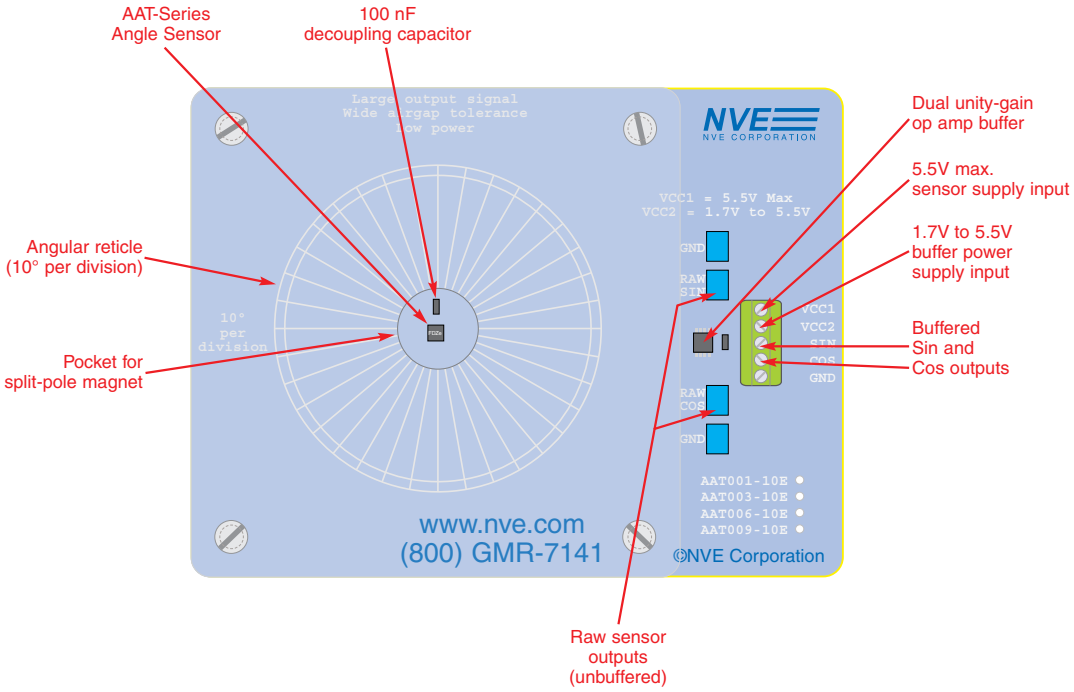


⇒ The outputs should be similar to the following graph:

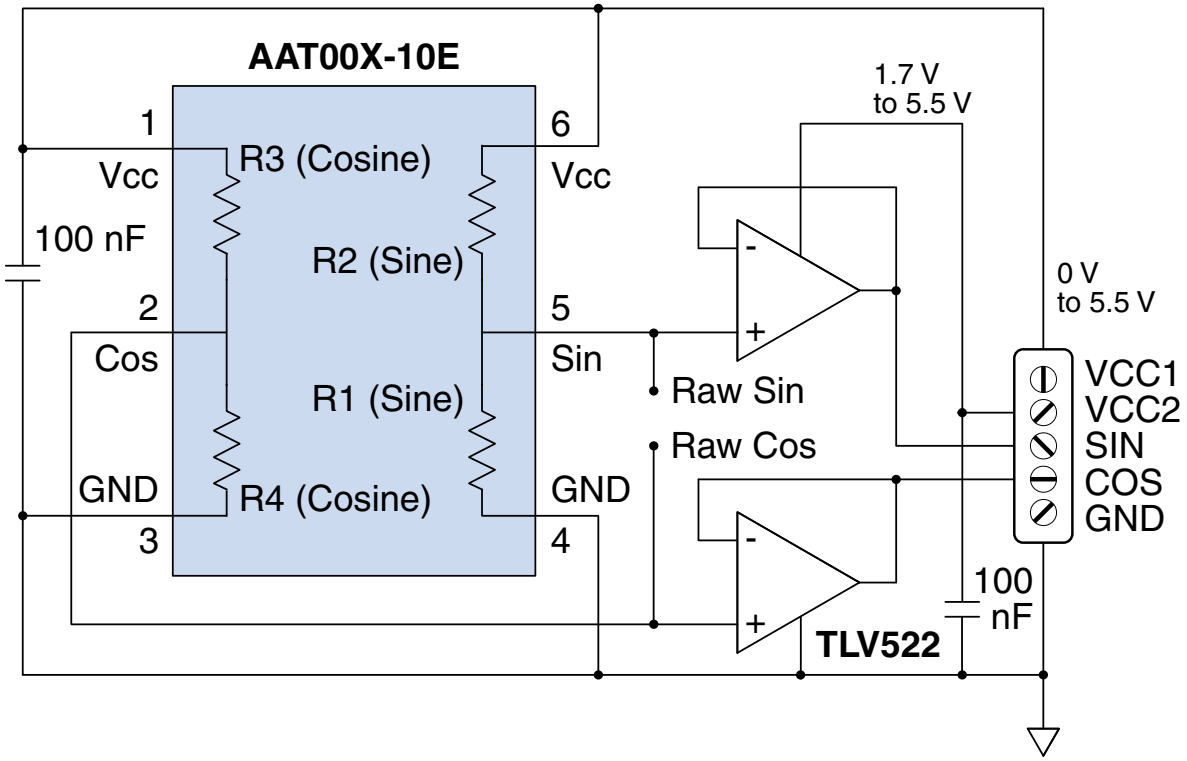


The output is insensitive to magnet spacing over a wide range. Signal is lost if the magnet is too far away; if the magnet is too close the outputs will be non-sinusoidal. A relatively large magnet-sensor airgap is possible with the magnet provided with the kit, although smaller magnets will require a smaller gap.

Evaluation Board Layout



PCB Assembly



Evaluation Kit schematic.

The PCB assembly includes an ultralow-power unity-gain buffer for low-impedance outputs that prevent downstream electronics from loading the sensor bridge. Buffering may not be necessary in the end application depending on the impedance of downstream electronics.

Raw output signals from the sensor are also available as test points, however an unpowered buffer will load the sensor, so the buffer op amp should be either powered or removed to use the raw outputs.

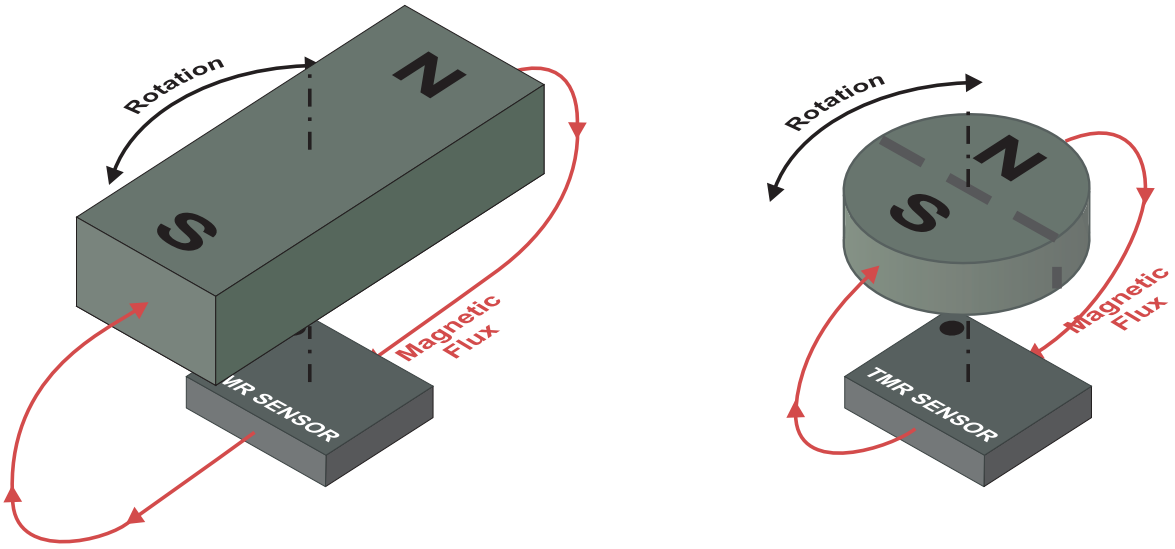
Separate supply connections for the sensor (V_{CC1}) and op amp (V_{CC2}) allow monitoring the sensor supply current only, or V_{CC1} and V_{CC2} can be connected together.

The op amp has a 1.7 V minimum supply voltage, while the sensor has no minimum. Output sensitivity increases proportionately to the sensor supply voltage, as does current consumption.

Principles of Operation

The heart of AAT sensors is arrays of four unique Tunneling Magnetoresistance (TMR) elements, one in each quadrant. TMR technology enables low power and miniaturization, making the sensors ideal for battery operation.

In a typical configuration, an external magnet provides a saturating magnetic field in the plane of the sensor, as illustrated below for a bar magnet and a radially-magnetized disk magnet:



The device contains four sensing resistors at 90 degree intervals. The resistors are connected as two half-bridges, providing the sine and cosine voltage outputs. For each half bridge, the resistance of one element increases and the other decreases as the field rotates. Thus the bridge resistance, device resistance, and output impedances remain constant with rotation.

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