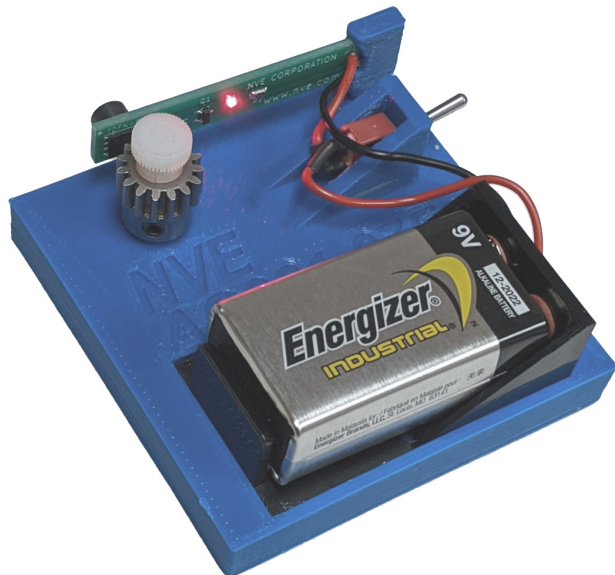


AG921-07E Digital Gear-Tooth Sensor Demonstrator



SN12454

About This Demonstrator

GT Sensors™ are designed to detect spindle gear teeth and magnetic encoder wheels in industrial speed sensing.

This demonstrator is based on an AKL-Series GT Sensor, which provides a 50% duty cycle digital current-modulated output.

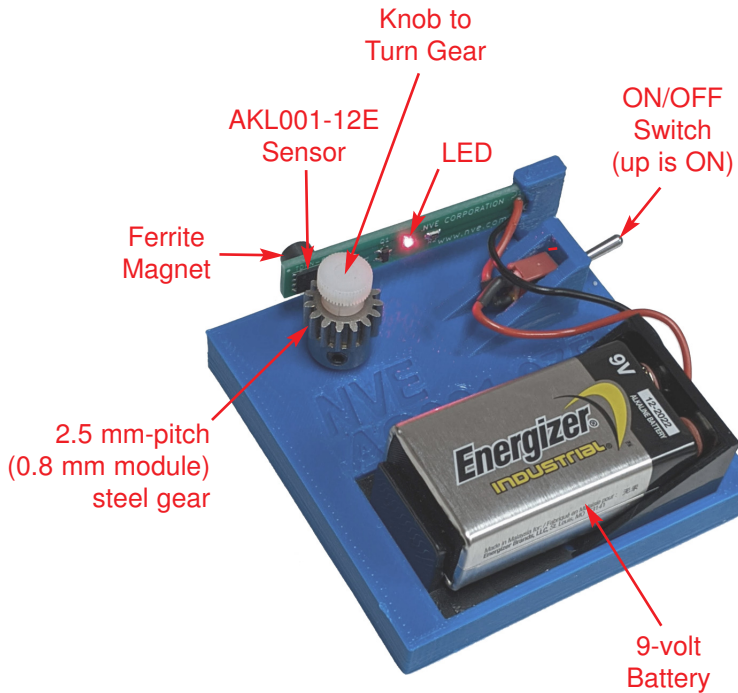
The demonstrator also includes a circuit board with an LED and a transistor driver; a small gear that can be rotated; and a battery to power the circuit.

GT Sensors are based on Giant Magnetoresistance (GMR), providing the sensitivity to detect small gear teeth and wide air gaps. GT Sensors can operate to DC, and can therefore detect a wide range of speeds, including very slow speeds.

In addition to AKL-Series digital sensors, NVE offers ABL-Series analog gear-tooth sensors, which provide sinusoidal outputs. Single- or dual-bridge analog sensors are available. The dual-bridge versions have two out-of-phase outputs for determining direction.

For a demonstration: www.youtube.com/NveCorporation

Quick Start



Quick Start

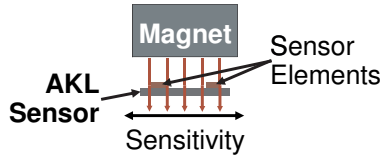
- Turn the demonstrator ON (switch in the up position).
- Turn the PCB to adjust the sensor-to-gear airgap if necessary.
- Turn the gear slowly and observe the LED tuning ON and OFF.
- Turn the demonstrator OFF after use to preserve battery life.

Note:

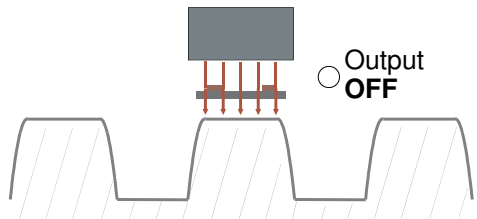
Style may vary from the above image.

Magnetic Operation

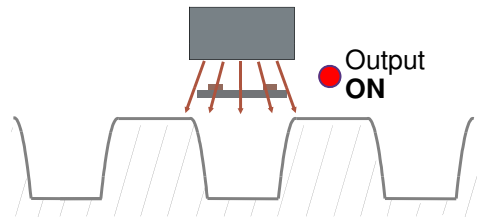
As shown in the diagrams at right, the direction of sensitivity is parallel to the plane of the AKL sensor. A biasing magnet provides magnetic field.



As the gear turns, the magnetic flux lines are deflected into the direction of sensitivity by passing steel gear teeth.



The sensor produces a digital output with one cycle per tooth.



Magnetic Design Considerations

The Right Sensor for the Application

AKL-Series sensors have two sensor elements with various spacings. The following table shows popular models:

Part No.	Element Spacing	Recommended Gear Pitch	Recommended Gear Module
AKL001-12E*	1 mm	1.7 – 6 mm	0.5 – 2 mm
AKL002-12E	0.5 mm	0.8 – 1.7 mm	0.25 – 0.5 mm
AKL003-12E	0.3 mm	0.5 – 0.8 mm	0.16 – 0.25 mm

*Included in the demonstrator

The best design margin is when the sensor element spacing is equal to approximately one-half the gear pitch. In this demonstrator, the gear pitch is approximately 2.5 mm, so the 1 mm sensor (AKL001) is used.

Sensor-to-Magnet Spacing

This demonstrator has the sensor and magnet on opposite sides of a circuit board, providing approximately 1.5 millimeter spacing between the sensor and magnet. The AKL001 airgap range is typically 1 to 3.5 mm.

Magnet Selection

Ferrite magnets, like the NVE number 12216 disk magnet used in this demonstrator, are recommended for most gear-tooth applications because of their low cost and good field properties. Alnico-8 magnets can be used for high-temperature applications. Care should be taken using rare-earth magnets to avoid saturating the sensors.

Design Support

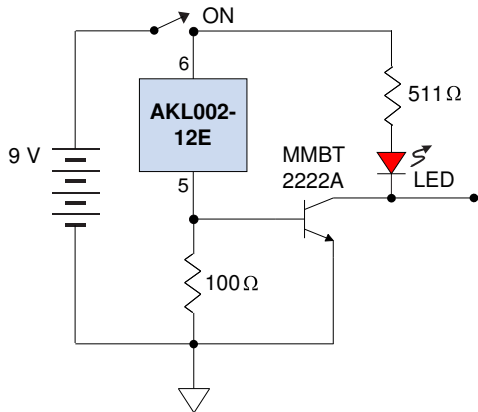
Check out our free Web application for GT sensor design support:
<https://www.nve.com/spec/calculators.php#tabs-GT-Sensor-Output>

Schematic and Electrical Operation

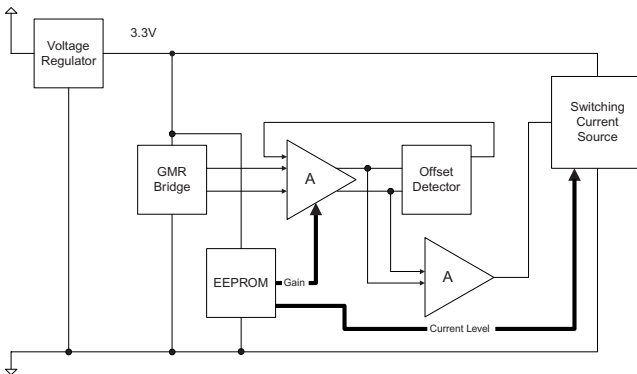
Demonstrator Circuitry

AKL-Series Gear-Tooth Sensors have 4-to-8 mA two-wire interfaces. This demonstrator uses a circuit board with an LED and transistor driver.

When the sensor current is 4 mA, the voltage across the 100 ohm resistor is 0.4 V, which is not enough to turn on the transistor. With 8 mA the transistor turns on, illuminating the LED.



Demonstrator Schematic

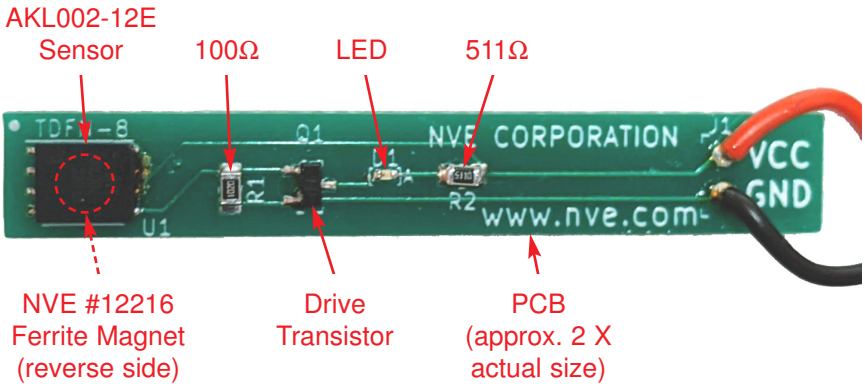


AKL-Series Sensor Block Diagram

AKL Operation

AKL-Series sensors include a GMR bridge consisting of two GMR sensor elements, a voltage regulator to allow a wide range of supply voltages, a factory-programmable EEPROM for calibration, and an output driver.

Circuit Board



For more information: www.nve.com/Downloads/gtsensor_catalog.pdf

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