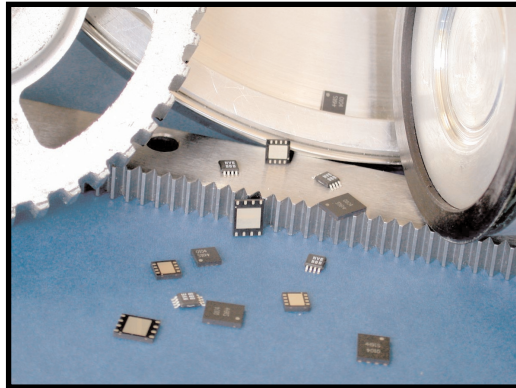


**AG920-07E**

**GT**   
sensor

**Evaluation Kit**



SN12197D

## What's in This AG920-07E Kit?

Qty.	Part No.	Marking	Description
1	ABL004-00E	FDBe	Single Differential Sensor, 1.0 mm Element Spacing
1	ABL005-00E	FDCe	Single Differential Sensor, 0.5 mm Element Spacing
1	ABL014-00E	FDDe	Dual Differential Sensor, 1.0 mm Element Spacing, 0.5 mm Phase Shift
1	ABL015-00E	FDFe	Dual Differential Sensor, 0.5 mm Element Spacing, 0.25 mm Phase Shift
1	AKL001-12	P/N	Digital Output Differential Sensor, 1.0 mm Element Spacing
1	AKL002-12	P/N	Digital Output Differential Sensor, 0.5 mm Element Spacing
2	DD001-12	P/N	Digital Output Signal Processing IC for ABL Sensors
2	AG915-06	N/A	M8 Round PCB for Mounting ABL Sensor
2	AG914-06	N/A	M10 Round PCB for Mounting AKL Sensor
1	AG918-06	N/A	Long, Narrow PCB for Mounting ABL Sensor Parallel to Long Axis
1	AG919-06	N/A	Long, Narrow PCB for Mounting ABL Sensor Perpendicular to Long Axis
1	AG913-06	N/A	PCB for Mounting Two DD001-12 ICs
1	AG916-06	N/A	Long, Narrow PCB for Mounting AKL Sensor Perpendicular to Long Axis
1	AG917-06	N/A	Long, Narrow PCB for Mounting AKL Sensor Parallel to Long Axis
1	AG911-06	N/A	Long, Narrow PCB for Mounting ABL Sensors Parallel to Long axis, and One or Two DD001-12 ICs
1	AG912-06	N/A	Long, Narrow PCB for Mounting ABL Sensors Perpendicular to Long axis, and One or Two DD001-12 ICs
5	12216	N/A	6 mm Diameter x 4 mm Thick Round Ferrite Magnets
5	12217	N/A	3.5 mm Diameter x 4 mm Thick Round Ferrite Magnets

# Putting Things Together

## Soldering TDFN Packages

Apply a small amount of solder paste to the PCB pads. The part can then be hand placed on the PCB. If a reflow oven is available, the PCB can be run through the reflow oven to complete the soldering. In lieu of a reflow oven, parts can be soldered with a heat gun. Care should be taken to avoid overheating the parts.

## Attaching Magnets

Two Ceramic-8 ferrite magnet sizes are included in this evaluation kit. Most of the PCBs in the kit have a circle indicating the magnet location. For testing, adhesives such as two-part household epoxies, “Super Glue” (cyanoacrylate adhesive), or RTV can be used to glue the magnets to the PCB. For more permanent, temperature-stable gluing for production environment, use a high temperature epoxy, such as 3M Scotch-Weld 2214 or equivalent. The magnets should be cleaned before they are glued to the PCBs.

Magnet position is not critical for the AKL-Series parts, or for ABL-Series parts with a digital output from a DD001-12 signal processing IC. However, perfectly centering the magnet directly behind the IC will result in the best airgap performance. Use the circle on the back of the PCB as a guide. For ABL-Series parts that must provide an analog output, the sensor’s offset and the maximum signal level are strongly influenced by the magnet’s position. For testing, the best procedure is to mount the sensor on the PCB, and then attach the magnet while monitoring the sensor offset. The objective is to position the magnet for zero sensor element offset. This provides optimal performance.

## PCB Information

Nine PCBs are included in the kit, covering a variety of configurations.

Descriptions are as follows:

**AG911-06**—This PCB mounts an ABL sensor in an MSOP8 package and one or two DD001-12 signal processing ICs, for single or dual digital outputs. Space is also available for a 100 ohm resistor (0805 package) and an NPN transistor (SOT-23 package), to configure a 3-wire current-sinking output. For a standard 2-wire output, use “VCC” for input voltage, and “2WIRE\_OUT1” and “2WIRE\_OUT2” as outputs. For a 3-wire output, use “VCC” for the input voltage, “GND” for ground, and “OUT1” and “OUT2” for outputs.

**AG912-06**—The same as the AG911-06, except the sensor is parallel, rather perpendicular, to the PCB long axis.

**AG913-06**—This PCB converts single or dual remote ABL sensor analog outputs to digital signals. VCC1 and VCC2 on the PCB must be connected to the input voltages for the DD001-12 parts on the PCB. “2WOUT1” and “2WOUT2” are the outputs in 2-wire configuration. Two 100 ohm resistors (0805 package) and two NPN transistors (SOT-23 packages) can be added for 3-wire operation. For 3-wire operation, “3WOUT1” and “3WOUT2” are the current sinking outputs, and “3WGND” is ground. Sensor connections are as follows:

ABL004/5 Pin	ABL014/15 Pin	AG913-06 Connection
Pin 4 (Ground)	Pin 1 (Ground1)	SG1
Pin 5 (Out-)	Pin 2 (Out-1)	B1-
Pin 1 (Out+)	Pin 3 (Out+1)	B1+
Pin 8 (VCC)	Pin 4 (VCC1)	VREG1
	Pin 5 (Ground2)	SG2
	Pin 6 (Out-2)	B2-
	Pin 7 (Out+2)	B2+
	Pin 8 (VCC2)	VREG2

**AG914-06**—This PCB is designed to mount an AKL-Series digital output sensor in the SOIC8 package. Four connections are available to the PCB: VCC (Input Voltage, Pin 6), GND (Ground, Pin 5), B+ (Bridge Out +, Pin 4), and B- (Bridge Out -, Pin 5). The bridge outputs are provided for interest only, since this is a digital output sensor. Figure 1 shows the PCB connections.

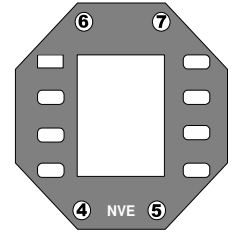


Figure 1.  
AG914-06 PCB

**AG915-06**—This PCB is designed to mount an MSOP8 ABL sensor for use in an M8 housing. Figure 2 shows the connections.

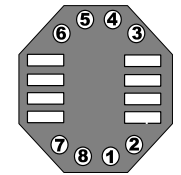


Figure 2.  
AG915-06 PCB

**AG916-06**—This PCB is designed to mount an AKL sensor in the SOIC8 package. The PCB has connections for converting to a 3-wire output by adding a 100 ohm resistor (0805 package) and an NPN output transistor (SOT-23 package). For this PCB, VCC is connected to the input supply voltage and “2W\_GND” is the output for the 2-wire configuration. “3W\_GND” is the ground for the 3-wire configuration, and “3W\_OUT” is the current-sinking output in the 3-wire configuration.

**AG917-06**—This PCB is identical to AG916-06, except the sensor is rotated 90 degrees for sensitivity parallel to the long axis of the board.

**AG918-06/AG919-06**—These two PCBs are designed for MSOP8 sensors with no external components. The AG918-06 and AG919-06 are oriented in different sensitivity directions. The PCB connections are labeled P1 through P8, corresponding to pins 1 through 8 of the MSOP8 package.

# Application Tips

## Overview

GT Sensors™ are designed for detection of gear teeth and magnetic encoder wheels in industrial speed sensing.

GT Sensors are based on Giant Magnetoresistance, which provides high sensitivity and low hysteresis to detect even the smallest gear teeth. GT Sensors provide a 50% duty cycle output with wide air gap and temperature tolerances.

As shown in the diagrams on the next page, GT Sensors have four GMR sensing resistors, which are connected as a Wheatstone bridge.

The direction of sensitivity is parallel to the sensor plane. A biasing magnet provides field, and the flux lines are deflected into the direction of sensitivity by passing metal gear teeth. The sensor produces a sinusoidal output with one cycle per tooth.

## Sensor-to-Magnet Spacing

About 1.5 millimeters between the back of the sensor and the face of the bias magnet keeps flux lines flexible and able to follow teeth. Locating the sensor and magnet on opposite sides of a circuit board often provides good spacing.

You can use a thick circuit board with a milled magnet pocket to precisely position the magnet on a PCB. Most board manufacturers have that capability.

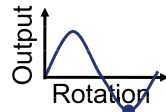
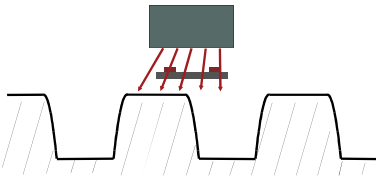
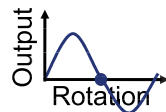
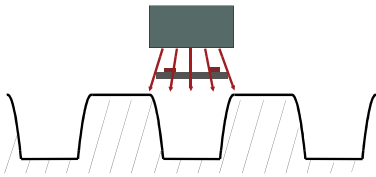
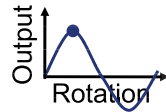
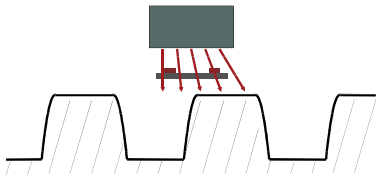
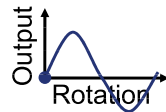
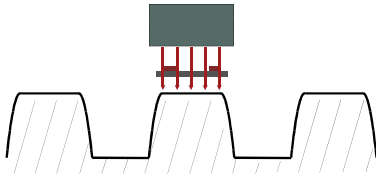
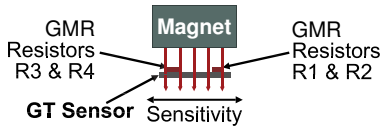
## AC Couple to Eliminate Offset

If zero-speed operation is not needed, the sensor can be AC-coupled to eliminate offset from various imperfections.

## The Right Magnet

The right magnet is important. Ceramic-8 magnets, such as those included in this kit, are recommended for most applications. They are inexpensive and have good field properties. Alnico-8 magnets are well-suited for high-temperature operation. Rare-earth magnets are not recommended because they too easily saturate the sensors.

# GT Sensor Operation



Visit [www.nve.com](http://www.nve.com) for more applications information.

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NVE Corporation  
11409 Valley View Road  
Eden Prairie, MN 55344-3617

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