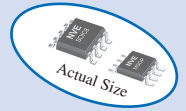


**NEW!**  
**High-Field**  
**Sensors**

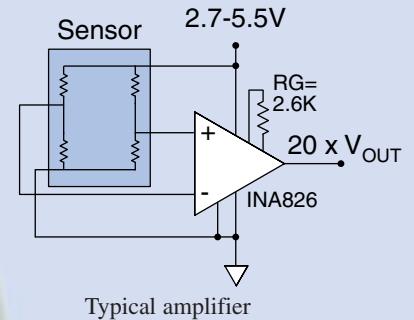
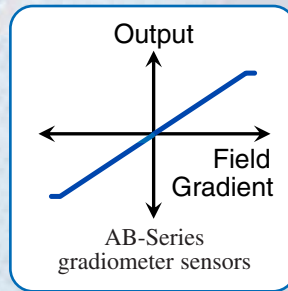
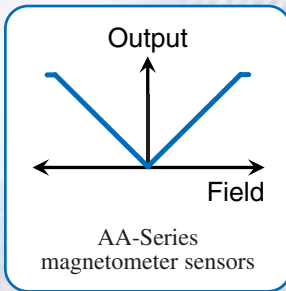
# Magnetic Sensors *Short-Form Catalog*

# AA and AB-Series Analog Sensors

## Versatile, Sensitive, and Accurate



Versatile AA and AB-Series analog GMR sensors are ideal for a wide range of magnetic sensing, including industrial and automotive position, speed, and current sensing. Their Wheatstone bridge configurations inherently compensate for temperature and power supply variations. The devices are available in SOIC8 and MSOP8 packages, as well as 2.5 mm x 2.5 mm TDFN6, and 1.1 mm x 1.1 mm ULLGA4 leadless packages.



AA-Series sensors are magnetometers, sensitive in the plane of the device. The output is omnipolar, providing same output for magnetic fields of either polarity.

AB-Series sensors are differential devices, or gradiometers, with the bipolar linear output characteristics of a differential sensor.

H-subtype magnetometers and gradiometers offer extremely high sensitivity for low-field applications. L-subtype magnetometers use low-hysteresis GMR materials, making them ideal for low fields. The K-subtype is a kiloersted-range high-field magnetometer.

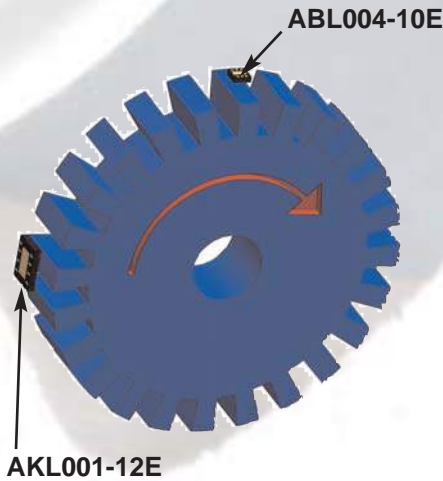
Part Number	Saturation (Oe)	Linear Range ( Oe )		Typical Sensitivity (mV/V-Oe)	Typical Resistance	Feature	Package
		Min.	Max.				
AAH002-02	6	0.6	3	15	2 K $\Omega$	Ultra-high sensitivity	SOIC8
AAL002-02	15	1.5	10.5	3.5	5 K $\Omega$	Low hysteresis	SOIC8
AAL004-10	15	1.5	10.5	3.5	2.2 K $\Omega$	Low hysteresis; small	TDFN6
AA002-02	15	1.5	10.5	3.5	5 K $\Omega$		SOIC8
AA003-02	20	2	14	2.6	5 K $\Omega$		SOIC8
AA004-00	50	5	35	1	5 K $\Omega$		MSOP8
AA004-02	50	5	35	1	5 K $\Omega$		SOIC8
AA005-02	100	10	70	0.5	5 K $\Omega$		SOIC8
AA006-00	50	5	35	1	30 K $\Omega$	High Resistance/ low power	MSOP8
AA006-02	50	5	35	1	30 K $\Omega$		SOIC8
AA007-00	500	50	450	0.1	5 K $\Omega$	High field	MSOP8
AAK001-14	4000	400	2500	0.0033	3.5 K $\Omega$	Very high field; small	ULLGA6

Magnetometer selection guide

Part Number	Saturation (Oe)	Linear Range ( Oe )		Element Spacing (mm)	Typical Resistance	Package
		Min.	Max.			
AB001-02	250	20	200	0.5	2.5 K $\Omega$	SOIC8
AB001-00	250	20	200	0.5	2.5 K $\Omega$	MSOP8
ABH001-00	70	5	40	0.5	1.2 K $\Omega$	MSOP8

Gradiometer selection guide





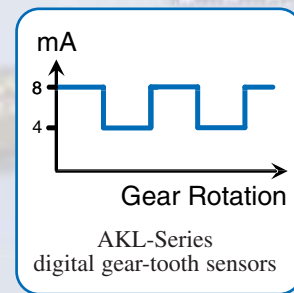
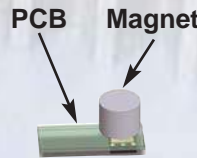
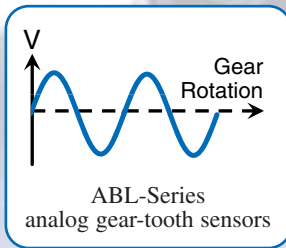
ABL and AKL-Series are versatile, wide airgap gear-tooth sensors. The sensors are used with ferromagnetic gears and bias magnets, or with magnetic encoders.

ABL-Series analog sensors have differential sensor elements that provide sinusoidal outputs. Three standard spacings are available for use with various gear pitches. Single- or double-bridge configurations are available. Double bridges generate sine and cosine outputs to provide direction information.

AKL-Series sensors are digital parts configured as two-wire devices where the supply current indicates a passing tooth. Three AKL-Series parts are available: the AKL001-12 is designed for pitches of 2.5 to 6 mm, the AKL002-12 for 1 to 2.5 mm, and the AKL003-12 for 0.6 to 1.5 mm pitches.

**Features:**

- Large analog peak-to-peak signal
- Immune to airgap variations
- Up to 150°C
- As small as 2.5 mm x 2.5 mm



Part Number	Single or Dual Bridge	Element Spacing (mm)	Package
ABL004-00	Single	1	MSOP8
ABL005-00	Single	0.5	MSOP8
ABL006-00	Single	0.3	MSOP8
ABL014-00	Dual	1	MSOP8
ABL015-00	Dual	0.5	MSOP8
ABL016-00	Dual	0.3	MSOP8
ABL004-10	Single	1	TDFN6
ABL005-10	Single	0.5	TDFN6
ABL006-10	Single	0.3	TDFN6
ABL014-10	Dual	1	TDFN6
ABL015-10	Dual	0.5	TDFN6
ABL016-10	Dual	0.3	TDFN6

*ABL-Series selection guide*

Part Number	Single or Dual Bridge	Element Spacing (mm)	Package
AKL001-12	Single	1	TDFN8
AKL002-12	Single	0.5	TDFN8
AKL003-12	Single	0.3	TDFN8

*AKL-Series selection guide*



# GMR Switch Digital Sensors

## Sensitive and Precise

GMR Switch Precision Digital Sensors provide more precise operate points than Hall-effect or other conventional sensors. Magnetic operate points range from 4 Oe, which are the world's most sensitive magnetic switches, to 80 Oe.

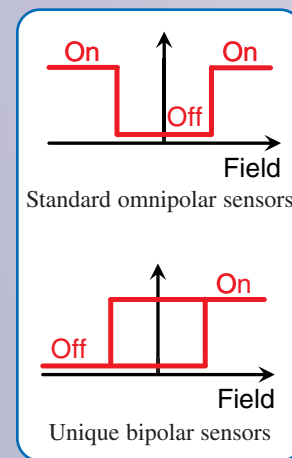
AD-Series digital sensors are available with a variety of switch points and output configurations, and come in TDFN and MSOP packages. The parts have a wide 4.5 to 30 volt supply range.

Standard AD-Series sensors are omnipolar, so a field of either polarity switches the sensor ON, and the sensor turns OFF when the field is removed. However the unique ADV001 sensor is bipolar (south field ON, north field OFF).

AFL-Series sensors have supply voltages ranging from 0.9 to 5.5 volts for low-voltage and battery-powered applications.

Part Number	Typ. Operate Point (Oe)	Supply Voltage Range	Typ. Supply Current (mA)	Output Type	Package
AD004-00	20	4.5 V – 30 V	3.5	Sink	MSOP8
AD005-00	40	4.5 V – 30 V	3.5	Sink	MSOP8
AD006-00	80	4.5 V – 30 V	3.5	Sink	MSOP8
AD021-00	20	4.5 V – 30 V	3.5	Sink	MSOP8
AD022-00	40	4.5 V – 30 V	3.5	Sink	MSOP8
AD024-00	28	4.5 V – 30 V	3.5	Sink	MSOP8
AD024-10	28	4.5 V – 30 V	3.5	Sink	TDFN6
AD621-00	20	4.5 V – 30 V	3.5	Sink+Source	MSOP8
AD824-00	28	4.5 V – 30 V	3.5	2 Sinks+SCP	MSOP8
ADH025-00	11	4.5 V – 30 V	3.5	Sink	MSOP8
ADV001-00	±4	4.5 V – 30 V	3.5	Bipolar; Sink	MSOP8

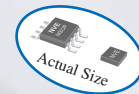
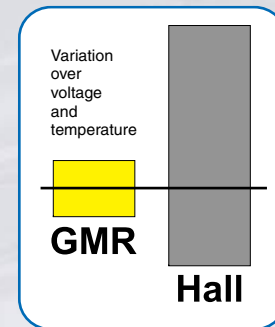
Popular AD-Series digital sensors



Part Number	Typ. Operate Point (Oe)	Supply Voltage Range	Output Type	Package
AFL000-10E	10	0.9 V – 1.3 V	Normally Off, Current Sink	TDFN6
AFL000-01	10	0.9 V – 1.3 V	Normally Off, Current Sink	Die
AFL002-10E	28	0.9 V – 1.3 V	Normally Off, Current Sink	TDFN6
AFL006-10E	4	0.9 V – 1.3 V	Normally Off, Current Sink	TDFN6
AFL020-00E	10	0.9 V – 1.3 V	Normally On, Current Source	MSOP8
AFL030-00E	10	0.9 V – 1.3 V	Normally Off, Current Source	MSOP8
AFL100-00E	10	1.8 V – 2.5 V	Normally Off, Current Sink	MSOP8
AFL100-10E	10	1.8 V – 2.5 V	Normally Off, Current Sink	TDFN6
AFL103-01	40	1.8 V – 2.5 V	Normally Off, Current Sink	Die
AFL200-00E	10	2.7 V – 3.6 V	Normally Off, Current Sink	MSOP8
AFL300-00E	10	4.5 V – 5.5 V	Normally Off, Current Sink	MSOP8

AFL-Series digital sensor selection guide

Benefits:	GMR	Hall	AMR	Reed
Size	Small	Small	Large	Very Large
Signal Level	Large	Small	Medium	Switch
Sensitivity	High	Low	High	Low
Temperature	High	Low	Medium	Medium
Power	Low	Low	High	Switch
Cost	Low	Low	High	Low



Popular digital sensor applications:

- Cylinder position sensors
- Proximity sensors
- End-of-travel sensors

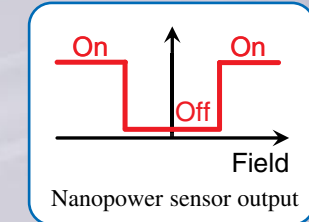
# Nanopower Digital Sensors

## Ultraminiature; Ultralow Power



Small enough to fit on the head of a pin and low enough power to run indefinitely on a button cell, NVE Nanopower Magnetic Switches provide the ultimate in miniaturization and low power. Internally duty-cycled versions reduce power consumption to nanowatts. The sensors are available with a variety of operate points and come in tiny 1.1 mm x 1.1 mm ULLGA packages.

ADL-Series sensors have a 2.4 to 3.6 volt supply range; the AHL-Series uses 0.9 to 2.4 volts.



Part Number	Typ. Operate Point (Oe)	Supply Voltage Range	Typ. Supply Current (µA)	Typ. Update Frequency	Package
ADL021-14E	20	2.4 V – 3.6 V	0.08	55Hz	ULLGA
ADL022-14E	40	2.4 V – 3.6 V	0.08	55Hz	ULLGA
ADL024-14E	28	2.4 V – 3.6 V	0.08	55Hz	ULLGA
ADL121-14E	20	2.4 V – 3.6 V	0.03	30Hz	ULLGA
ADL122-14E	40	2.4 V – 3.6 V	0.03	30Hz	ULLGA
ADL124-14E	28	2.4 V – 3.6 V	0.03	30Hz	ULLGA
ADL921-14E	20	2.4 V – 3.6 V	35	Continuous	ULLGA
ADL922-14E	40	2.4 V – 3.6 V	35	Continuous	ULLGA
ADL924-14E	28	2.4 V – 3.6 V	35	Continuous	ULLGA
AHL021-14E	20	0.9 V – 2.4V	0.095	110Hz	ULLGA
AHL024-14E	28	0.9 V – 2.4V	0.095	110Hz	ULLGA
AHL025-14E	10	0.9 V – 2.4V	0.095	110Hz	ULLGA
AHL921-14E	20	0.9 V – 2.4V	35	Continuous	ULLGA
AHL924-14E	28	0.9 V – 2.4V	35	Continuous	ULLGA
AHL925-14E	10	0.9 V – 2.4V	35	Continuous	ULLGA

Nanopower sensor selection guide

# Angle and Rotation Sensors

## Small, Accurate, and Ultralow Power

AAT and ADT-Series noncontact angle and rotation sensors are based on spintronic Tunneling Magnetoresistance (TMR) elements for small size, large signals, and low power. An external magnet provides a saturating magnetic field in the plane of the sensor. The sensors work with magnetic fields from 15 to 200 Oe. Parts are packaged in NVE's 2.5 x 2.5 x 0.8 mm TDFN6 package.

AAT-Series angle sensors provide sine and cosine signals defining the angle of rotation. Outputs are proportional to the supply voltage and peak-to-peak output voltages are much larger than conventional sensors. AAT00x sensors consist of two half-bridges, while AAT10x sensors have two full bridges with differential outputs. Available bridge resistances range from the AAT009, with a typical device resistance of 6 megohms for ultralow power, to the AAT003 with a 40 kilohm typical device resistance (20 kilohm output impedances) for direct interface to simple microcontrollers.

ADT-Series rotation sensors have two digital, binary outputs. The outputs are 90 degrees out of phase to provide directional information. The ADT001 is high hysteresis for noise immunity in applications such as speed sensing; the ADT002 is low hysteresis to provide accurate, absolute rotational quadrant information.

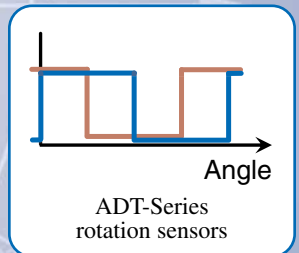
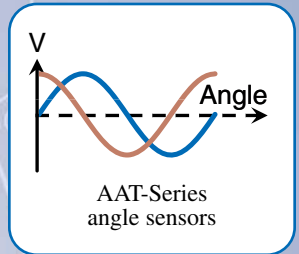
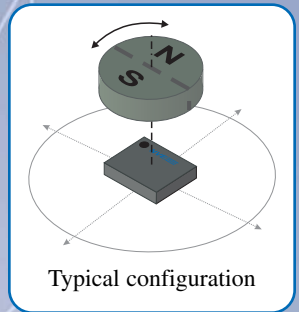
Key features of AAT- and ADT-Series sensors are:

- Extremely low power
- Wide airgap tolerance
- 0.5° repeatability
- Wide supply range
- -40°C to +125°C operating range
- Ultraminiature TDFN6 package

Popular applications include:

- Rotational position sensors
- Rotational speed sensors
- Water meters

**NEW!**  
**Full-Bridge**  
**Sensor**



Part Number	Configuration	Typ. Output (ea. output; p-p)	Required Field	Typ. Device Resistance	Package
AAT001-10E	Half-bridge	200 mV/V	30 Oe	1.25 MΩ	TDFN6
AAT003-10E	Half-bridge	200 mV/V	30 Oe	40 KΩ	TDFN6
AAT006-10E	Half-bridge	200 mV/V	15 Oe	1.5 MΩ	TDFN6
AAT009-10E	Half-bridge	200 mV/V	30 Oe	6 MΩ	TDFN6
AAT101-10E	Full-bridge	400 mV/V	30 Oe	625 KΩ	TDFN6

AAT-Series angle sensor selection guide

Part Number	Max. Error (const. field)	Typ. Hysteresis	Typ. Supply Current	Package
ADT001-10E	0.5°	20°	2.5 μA	TDFN6
ADT002-10E	0.5°	4°	2.5 μA	TDFN6

ADT-Series rotation sensor selection guide

Angle	Output	
	Sin	Cos
0°-90°	H	H
90°-180°	H	L
180°-270°	L	L
270°-360°	L	H

ADT-Series rotation sensor truth table

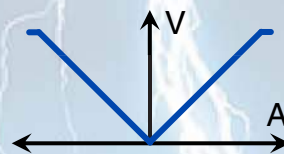
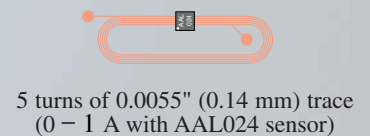
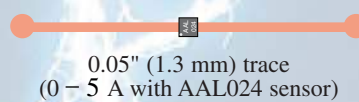
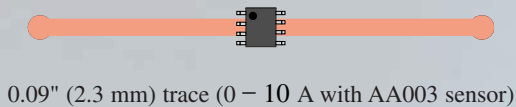
# Current Sensors

## Convenient Noncontact Current Sensing

AA-Series Analog Sensors (see page 2 of this catalog) are often used to measure the current over a circuit board trace, particularly for overcurrent protection where extreme accuracy is not required. The sensor measures the current by detecting the magnetic field generated by the current through the trace.

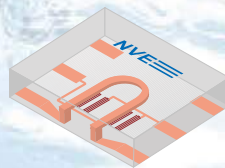
The AAL024 is ideal for current sensing because its cross-axis sensitivity provides sensitivity to a current trace directly under the part, and its low hysteresis provides repeatability. The AA003-02 is also popular for this application, and other AA-Series sensors can be used depending on required sensitivity and hysteresis.

Typical configurations are shown below:

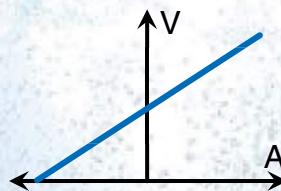


AA-Series current sensing  
over a trace transfer function

NVE also offers the AAV003 dedicated current sensor with an on-chip, low impedance current-sensing strap and a high-sensitivity bridge output with a –80 to +80 milliamp AC or DC measurement range. The part is packaged in a 2.5 mm x 2.5 mm TDFN6 package.



The AAV003  
80 mA current sensor



AAV003 current sensor  
transfer function



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### On the Cover

NVE sensors facilitate the Internet of Things with miniaturization, high sensitivity, low power, and simple interfaces.