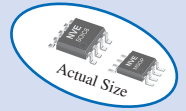


NEW!
High-Field
Sensors

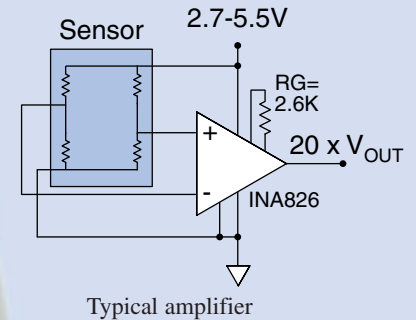
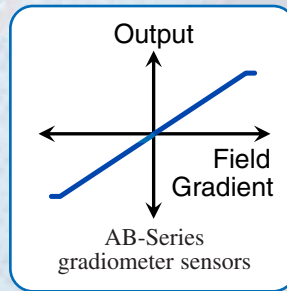
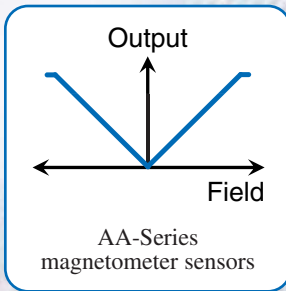
Magnetic Sensors *Short-Form Catalog*

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.

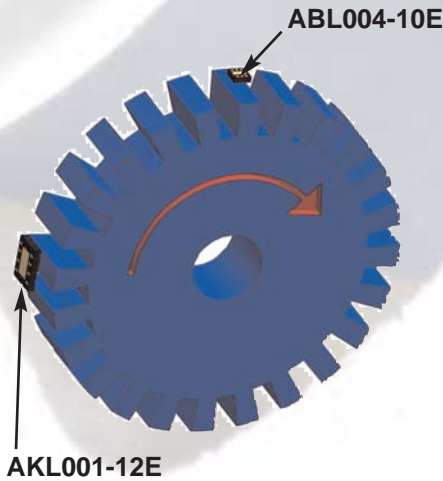
| Part Number | Saturation (Oe) | Linear Range (Oe) | | Typical Sensitivity (mV/V-Oe) | Typical Resistance | Feature | Package |
|-------------|-----------------|---------------------|------|-------------------------------|--------------------|------------------------|-------------------------------|
| | | Min. | Max. | | | | |
| AAH002-02 | 6 | 0.6 | 3 | 15 | 2 K Ω | Ultra-high sensitivity | SOIC8 |
| AAL002-02 | 15 | 1.5 | 10.5 | 3.5 | 5 K Ω | Low hysteresis | SOIC8 |
| AAL004-10 | 15 | 1.5 | 10.5 | 3.5 | 2.2 K Ω | Low hysteresis; small | TDFN6 |
| AA002-02 | 15 | 1.5 | 10.5 | 3.5 | 5 K Ω | | SOIC8 |
| AA003-02 | 20 | 2 | 14 | 2.6 | 5 K Ω | | SOIC8 |
| AA004-00 | 50 | 5 | 35 | 1 | 5 K Ω | | MSOP8 |
| AA004-02 | 50 | 5 | 35 | 1 | 5 K Ω | | SOIC8 |
| AA005-02 | 100 | 10 | 70 | 0.5 | 5 K Ω | | SOIC8 |
| AA006-00 | 50 | 5 | 35 | 1 | 30 K Ω | | High Resistance/ low power |
| AA006-02 | 50 | 5 | 35 | 1 | 30 K Ω | SOIC8 | |
| AA007-00 | 500 | 50 | 450 | 0.1 | 5 K Ω | High field | MSOP8 |
| AAK001-14 | 4000 | 400 | 2500 | 0.0033 | 3.5 K Ω | 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 Ω | SOIC8 |
| AB001-00 | 250 | 20 | 200 | 0.5 | 2.5 K Ω | MSOP8 |
| ABH001-00 | 70 | 5 | 40 | 0.5 | 1.2 K Ω | MSOP8 |

Gradiometer selection guide





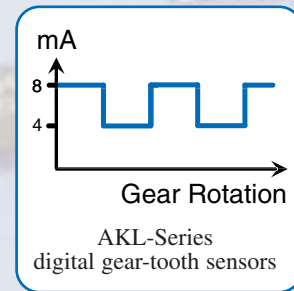
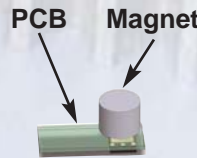
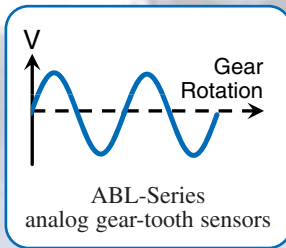
ABL and AKL-Series are versatile, wide airgap gear-tooth sensors. The sensors are used with ferromagnetic gears and bias magnets, or with magnetic encoders.

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.

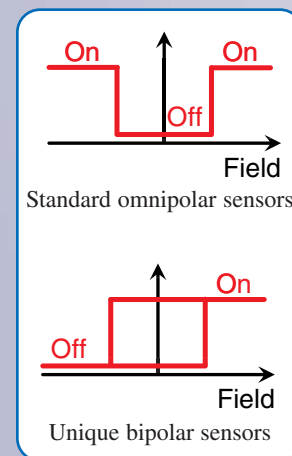
AD-Series digital sensors are available with a variety of switch points and output configurations, and come in TDFN and MSOP packages. The parts have a wide 4.5 to 30 volt supply range.

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 |

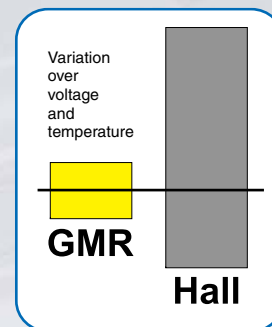
Popular AD-Series digital sensors



| 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

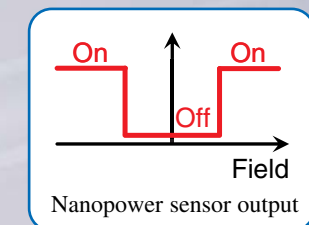
Nanopower Digital Sensors

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.

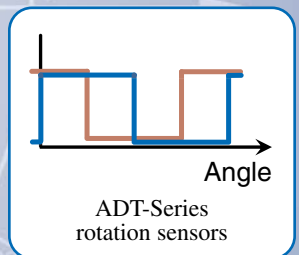
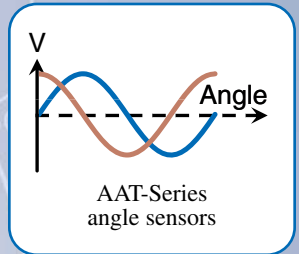
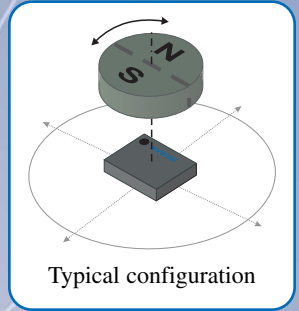
Key features of AAT- and ADT-Series sensors are:

- 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

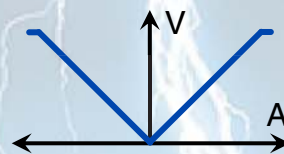
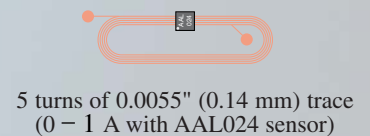
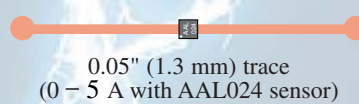
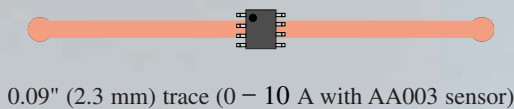
Current Sensors

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.

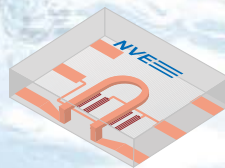
The AAL024 is ideal for current sensing because its cross-axis sensitivity provides sensitivity to a current trace directly under the part, and its low hysteresis provides repeatability. The AA003-02 is also popular for this application, and other AA-Series sensors can be used depending on required sensitivity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

Typical configurations are shown below:

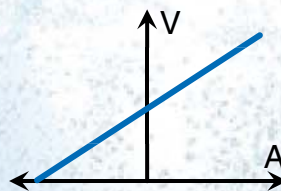


AA-Series current sensing
over a trace transfer function

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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An ISO 9001 Certified Company

NVE Corporation
11409 Valley View Road
Eden Prairie, MN 55344-3617 USA
(800) GMR-7141
www.nve.com
sensor-info@nve.com

On the Cover

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