

02 Key Features

- AdaptCal™ provides continuous 3D adaptive in-field calibration with hard and soft magnetic interference compensation
- Integrated AdaptNav™ provides real-time noise characterization and active gyro drift compensation for superior heading, pitch, and roll performance in electrically and mechanically noisy environments
- Small form factor, weighs 6.7g
- Low power consumption, 80 mW
- Powerful user programmable sensor customization apps via NorthTek™ Forth interpreter
- Advanced sensing technology (tri-axial magnetometers and MEMS accelerometers and gyroscopes)
- Magnetic and True North heading, pitch, and roll measurement
- Full 360° rollover capability using quaternions or rotation matrix
- “Figure of Merit” real time heading error indicator
- In-field calibration point distribution indicator
- Quality of in-field calibration indicator
- Centripetal acceleration correction
- Supports multiple communication protocols

01

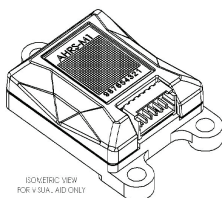
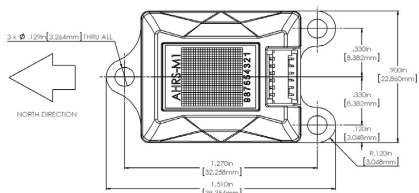
Description

The AHRS-M1 is the first micro-sized, light weight, low power Attitude Heading Reference System (AHRS) product with a revolutionary built-in adaptive-calibration mode. It utilizes a proprietary calibration algorithm that provides continuous, adaptive calibration without the need to perform a traditional and complex “12-point” calibration. Instead, the AHRS-M1 learns on the fly, using the natural motion of the application platform to continuously calibrate the platform’s magnetic properties – eliminating hard and soft iron distortions. Ideal for SWaP-C improvements, the system weighs 6.7 grams in a very small form factor. Leveraging market-leading, on-board tri-axial magnetometers and MEMS accelerometers and gyroscopes, the AHRS-M1 delivers temperature compensation, lower heading drift, and superior system performance even in the presence of platform vibration.

Sparton’s proprietary state-of-the-art AdaptNav™ sensor fusion algorithms allow the system to provide accurate attitude and heading outputs, including full 360° tilt compensation even when subject to highly dynamic operating environments and transient magnetic interference. The AHRS-M1 also includes Sparton’s NorthTek™ on-board programming environment, making it the world’s only micro-sized, programmable, and configurable AHRS – providing users virtually limitless product customization and integration flexibility.

03 Typical Applications

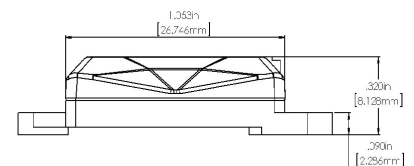
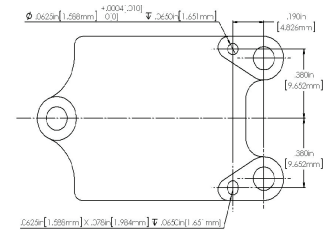
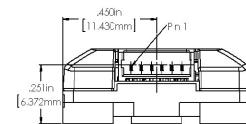
- Optical sighting systems
- Pan and tilt
- 3-D geospatial surveying
- Antenna positioning
- Towed acoustic arrays/streamers
- Unmanned vehicle navigation
- Platform stabilization and orientation
- Accurate attitude, position, and orientation sensing
- Other platforms with motors/electrical noise, and mechanical vibration



Specifications

Static Heading Accuracy	1.5° RMS
Dynamic Pitch/Roll Accuracy	1.0° RMS1
Static Pitch/Roll Accuracy	0.2° RMS
Pitch/Roll Repeatability	0.1° RMS
Pitch/Roll Range	± 90°, ± 180°
Accelerometer Range	± 4g (± 1g)2
Accelerometer Noise Density	250 µg/√Hz
Accelerometer Bias Stability	0.07441 mg
Accelerometer Velocity Random Walk (VRW)	0.09123 (m/s)/√Hz
Gyro Dynamic Range	± 500°/sec (± 300°/sec)3
Gyro Noise Density (RMS)	0.04°/sec
Gyro Bias Stability	6.415°/Hr
Gyro Angular Random Walk (ARW)	0.2546°/√Hr
Magnetic Range	±16 Gauss (±900 mGauss)3
Maximum Magnetic Inclination (Dip)	± 80°4
Update Rate	100 Hz
Baud Rate	1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6, 115.2 kbaud
Dimensions L x W x H	38.4 x 22.9 x 8.1 mm (1.51 x 0.90 x 0.32 inches)
Mass	6.7g
Encapsulated or Enclosure	Yes
Operating and Storage Temperature	-40° to +85° C
Humidity Resistance	95%, 70Å° C, 24 hrs Meets MIL-STD-202G â€” Method 103B, Test Condition B
Shock Resistance	5000g, 1ms Pulse, Half-Sine Wave
Vibration Resistance	0.02 dB Power Spectral Density, 5.35 G RMS Meets MIL-STD-202G â€” Method 214A, Test Condition I/C
Power Supply Input (Unregulated Voltage)	+4 to +10V DC
Input Power, Operating Mode (Typical @ 4V)	80 mW
3.3V Logic UART Interface	Yes
3D and Automatic In-Field Calibration	Yes
Able To Maintain Function When Inverted	Yes
Quaternion/Rotation Matrix Output	Yes
True North Heading Output	Yes
NorthTekâ„¢ User Programmable Customiza- tion	Yes
Includes World Magnetic Model	Yes
RoHS Compliant	Yes
Fully Temperature Compensated	Yes
RoHS Compliant	Yes
Fully Temperature Compensated	Yes

Pin #	Pin Name	I/O	Function
P1-1	GND	O	System Ground
P1-2	USER_TXD	O	3.3V logic TXD output from User Com Port
P1-3	USER_RXD	I	3.3V logic RXD input to User Com Port
P1-4	V+	I	+4 to +10 DC power supply input
P1-5	#EINT0	I	3.3V logic, active-low interrupt input (the pin has a weak pull-up) Used for programming purposes
P1-6	#RESET	I	3.3V logic, active-low reset input (the pin has a weak pull-up)



1. Dynamic heading accuracy derived from Scorsby table set for 7 RPM, 30° of inclination.
2. Note selection of the high range mode for the accelerometers results in decreased sensitivity, but also offers increased dynamic range. Consequently, optimal mode selection is dependent upon the intended application and associated linear accelerations present.
3. Specifications in parentheses represent current limits of calibration methodology.
4. Performance at maximum dip angle will be degraded. Specifications subject to change without notice. Performance data applies to 23°C, 0° for Pitch/Roll unless otherwise specified.