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Description

The AHRS-M2 is a next generation Attitude Heading Reference System (AHRS) that delivers industry leading static heading accuracy of 0.2° RMS. The AHRS-M2 is a fully temperature compensated, micro-sized, light weight, low power 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-M2 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 12.3 grams in a very small form factor. Leveraging market-leading, on-board tri-axial magnetometers and MEMS accelerometers and gyroscopes, the AHRS-M2 delivers temperature compensation, lower heading drift, and superior system performance even in the presence of platform vibration.

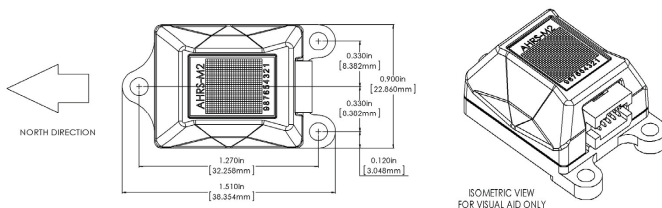
Sparton's proprietary state-of-the-art AdaptNav™ sensor fusion algorithms allow the system to provide accurate attitude and heading outputs, including full 360° tilt compensation even when subject to highly dynamic operating environments and transient magnetic interference. The AHRS-M2 also includes 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

- Hand-held and mounted optical targeting systems
- Pan and tilt
- 3-D geospatial surveying
- Antenna positioning
- Towed acoustic arrays/streamers
- Precision unmanned vehicle navigation
- Platform stabilization and orientation
- Accurate attitude, position, and orientation sensing
- Other platforms with motors/electrical noise, and mechanical vibration

02 Key Features

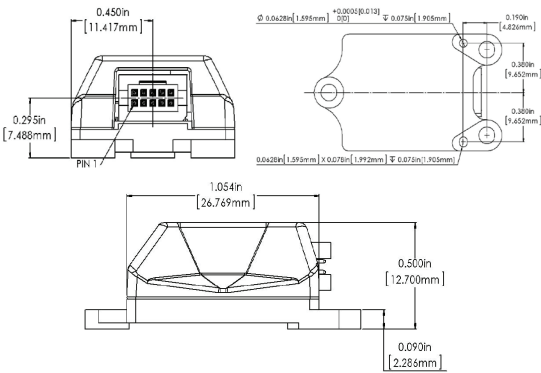
- AdaptCal™ provides continuous 3D adaptive in-field calibration with hard and soft magnetic interference compensation
- Integrated AdaptNav™ provides real-time noise characterization and active gyro drift compensation for superior heading, pitch, and roll performance in electrically and mechanically noisy environments
- Static Heading Accuracy, 0.2° RMS
- Small form factor, weighs 12.3g
- Very low power consumption, 60 mW, and Sleep Mode functionality, 16 mW
- Powerful user programmable sensor customization apps via NorthTek™ Forth interpreter
- High resolution, low noise magnetometers
- 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 selection and distribution indicator
- Quality of in-field calibration indicator
- Centripetal acceleration correction
- Supports multiple communication protocols



Specifications

Dynamic Heading Accuracy	1.0° RMS ¹
Static Heading Accuracy	0.2° RMS (<1.0° RMS from -40° to +70° C) ²
Dynamic Pitch/Roll Accuracy	1.0° RMS ¹
Static Pitch/Roll Accuracy	0.2° RMS
Pitch/Roll Repeatability	0.1° RMS
Pitch/Roll Range	± 90°, ± 180°
Accelerometer Range	± 4g (± 1g) ³
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) ⁴
Gyro Noise Density (RMS)	0.04°/sec/√Hr
Gyro Bias Stability	6.415°/Hr
Gyro Angular Random Walk (ARW)	0.2546°/√Hr
Magnetic Range	±1.2 Gauss (±900 mGauss) ⁴
Maximum Magnetic Inclination (Dip)	± 80° ⁵
Update Rate	10 or 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 9.1 mm (1.51 x 0.90 x 0.36 inches)
Mass	12.3g
Encapsulated or Enclosure	Yes
Operating and Storage Temperature	-40° to +85° C
Humidity Resistance	95%, 70° C, 24 hrs Meets MIL-STD-202G – Method 103A, Test Condition A
Shock Resistance	5000g, 1ms Pulse, Half-Sine Wave
Vibration Resistance	.02 dB Power Spectral Density, 5.35 G RMS Meets MIL-STD-202G – Method 214A, Test Condition I/C
Power Supply Input (Unregulated Voltage)	+4 to +10V DC
Input Power, Operating Mode (Typical @ 4V)	60 mW
Input Power, Sleep Mode (Typical @ 4v)	16 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
NorthTek™ User Programmable Customization	Yes
Includes World Magnetic Model	Yes
RoHS Compliant	Yes
Fully Temperature Compensated	Yes

Pin #	Pin Name	I/O	Function
P1	GND	O	System Ground
P2	GPIO1	I/O	RESERVED
P3	USER_TXD	O	3.3V logic TXD output from User Com Port
P4	GPIO2	I/O	RESERVED
P5	USER_RXD	I	3.3V logic RXD input to User Com Port
P6	#RESET	I	3.3V logic, active-low reset input (the pin has a weak pull-up)
P7	V+		+4 to +10 DC power supply input
P8	UART1_TXD	O	RESERVED
P9	#EINT0	I	3.3V logic, active-low interrupt input (the pin has a weak pull-up) Used for programming purposes
P10	UART1_RXD	I	RESERVED



- 1. Dynamic heading accuracy derived from Scorsby table set for 7 RPM, 30° of inclination.
- 2. Performance data applies under the following conditions unless otherwise specified: 23°C, 0° Pitch/Roll, 300mGauss Horizontal and 0mGauss Vertical Magnetic Field.
- 3. Note selection of the high range mode for the accelerometers results in decreased sensitivity, but also offers increased dynamic range.
- 4. Consequently, optimal mode selection is dependent upon the intended application and associated linear accelerations present.
- 5. Specifications in parentheses represent current limits of calibration methodology.
- 6. Performance at maximum dip angle will be degraded.
- 7. Specifications subject to change without notice.