

The **Inertial Labs Attitude and Heading Reference Systems, AHRS-II** is the next generation of enhanced, high-performance strapdown systems that determines absolute orientation (**Heading, Pitch and Roll**) for any device on which it is mounted. Orientation is determined with high accuracy for both motionless and dynamic applications.



The Inertial Labs AHRS-II utilizes 3-axes each of precision accelerometers, magnetometers and gyroscopes to provide accurate Heave, Heading, Pitch and Roll of the device under measure.

Integration of gyroscopes' output provides high frequency, real-time measurement of the device rotation about all three rotational axes. Accelerometers and Fluxgate magnetometer measure absolute Pitch, Roll and magnetic Azimuth at AHRS initial alignment as well as providing ongoing corrections to gyroscopes during operation.

KEY FEATURES AND FUNCTIONALITY




- State-of-the-art algorithms for different dynamic motions of Vessels, Ships, ROV, UUV, Robots, UAV, UGV, AGV, Gimbals and Antennas
- Highly accurate, sensitive, and temperature stable Fluxgate magnetometers (in-house technology)
- 0.3 deg Gyro-Stabilized Slaved Magnetic Heading and 0.1 deg Pitch & Roll accuracy
- 1 deg/hr gyroscopes Bias in-run stability
- 5 µg accelerometers Bias in-run stability
- Suitable for Primary Attitude Reference and as Motion Control System for marine applications
- Advanced, extendable, embedded Kalman Filter based sensor fusion algorithms
- Embedded 2D and 3D magnetic calibration on hard and soft iron
- RS-232, RS-422, USB and CAN 2.0 interfaces
- Full temperature calibration of all sensing elements
- Up to 200Hz data update rate
- Environmentally sealed (IP67)
- Compact design

One of the key elements to the success of Inertial Labs AHRS-II is its use of **Inertial Labs 8mm Fluxgate Magnetometers**, which have distinct advantages over commonly used magneto-inductive or magneto-resistive magnetometers. In operation over time and temperature fluxgate magnetometers have superior stability and repeatability. In terms of sensitivity, fluxgate magnetometers provide up to two orders of magnitude increased sensitivity.



In addition to the performance advantages, unlike the chip-level magnetometer technology, fluxgate magnetometer technology has been depended on for over 70 years to provide an accurate reference to North. It remains the most reliable magnetic sensor technology for determining an object's heading.

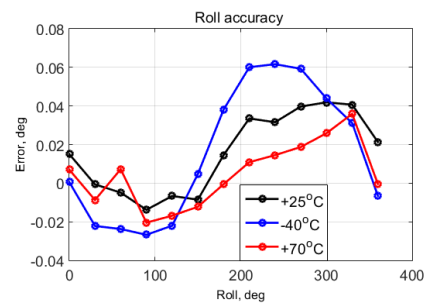
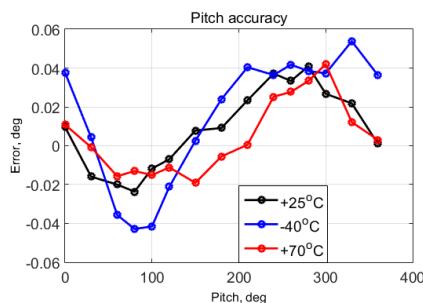
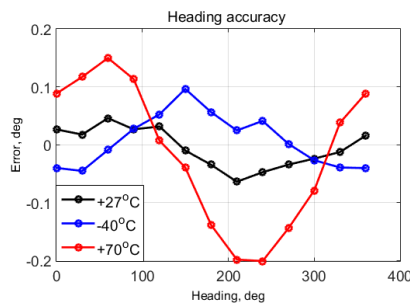
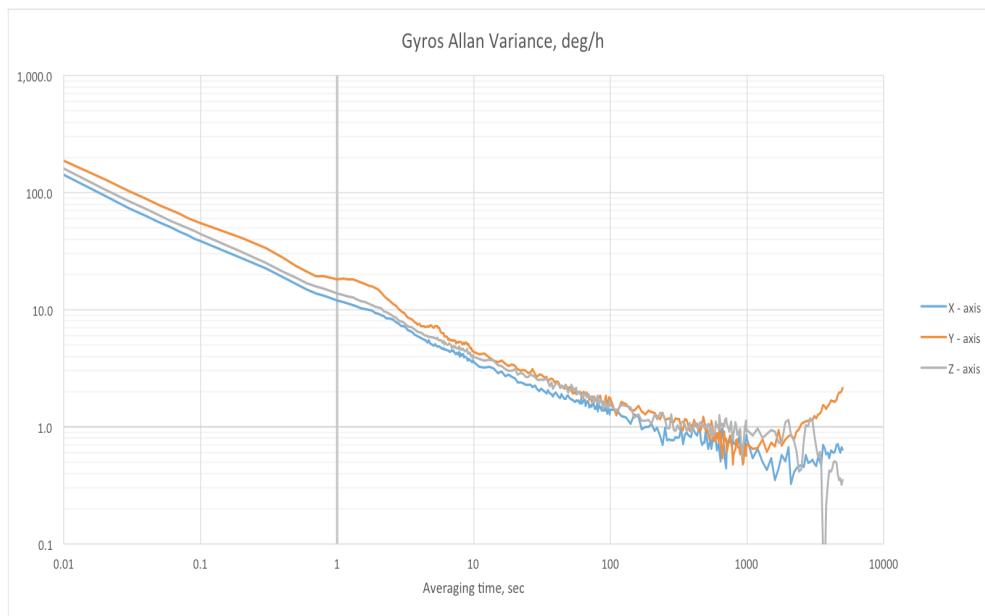
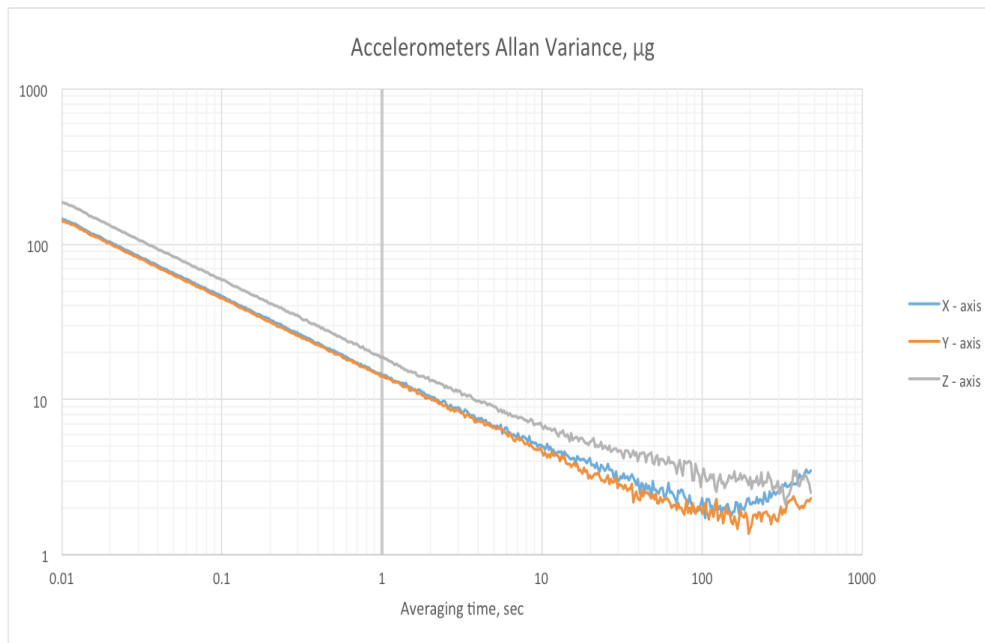
AHRS-II models and specifications summary

Parameter	Units	AHRS-II-B «Basic»	AHRS-II-E «Enhanced»	AHRS-II-P «Professional»
				
Status		OBSOLETE	OBSOLETE	in production
Heading static accuracy	deg	1	1	0.3
Heading dynamic accuracy	deg	1.5	1.5	0.6
Pitch & Roll static accuracy	deg	0.2	0.1	0.1
Pitch & Roll dynamic accuracy	deg	0.5	0.3	0.3
Gyroscopes Bias in-run stability	deg/hr	1	1	1
Accelerometers Bias in-run stability	mg	0.02	0.005	0.005
Magnetometers Bias in-run stability	nT	4	4	0.2

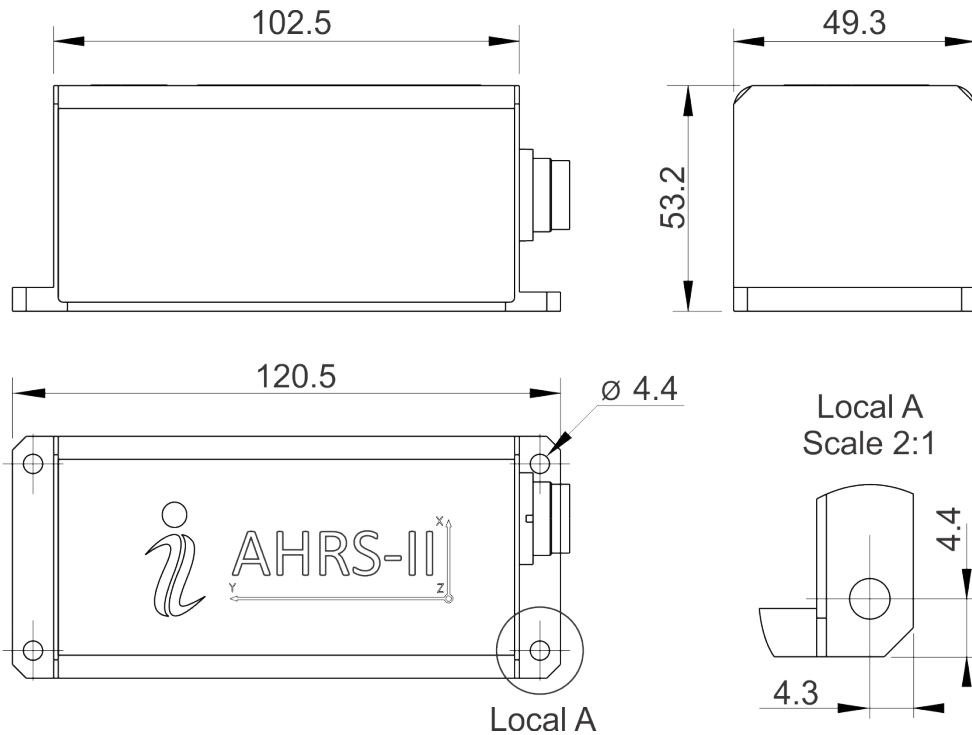
AHRS-II Specifications

Parameter	Units	AHRS-II-B Basic	AHRS-II-E Enhanced	AHRS-II-P Professional
Status		OBSOLETE	OBSOLETE	In production
Output signals		Euler angles; Quaternion; Relative Altitude; Accelerations; Angular rates; Magnetic field; Pressure; Delta Theta and Delta Velocity		
Update rate	Hz	1 ... 200 (user settable)		
Start-up time	sec	< 1		
Full Accuracy Data (Warm-up Time)	sec	10		
Heading	Units	AHRS-II-B	AHRS-II-E	AHRS-II-P
Range	deg	0 to 360		
Angular Resolution	deg	0.01		0.01
Static Accuracy in whole Temperature Range	deg	1.0		0.3
Dynamic Accuracy	deg RMS	1.5		0.6
Pitch and Roll	Units	AHRS-II-B	AHRS-II-E	AHRS-II-P
Range: Pitch, Roll	deg	±90, ±180		
Angular Resolution	deg	0.01	0.01	
Static Accuracy in whole Temperature Range	deg	0.2	0.1	
Dynamic Accuracy	deg RMS	0.5	0.3	
Relative altitude	Units	AHRS-II-B	AHRS-II-E	AHRS-II-P
Measurement range	meters	-600 to 9000		
Resolution	meters	0.01		
Relative accuracy	meters	<1		
Gyroscopes	Units	AHRS-II-B	AHRS-II-E	AHRS-II-P
Measurement range	deg/sec	±450		
Bandwidth	Hz	50		
Bias in-run stability (RMS, Allan Variance)	deg/hr	1		
Bias residual error in temperature range, RMS	deg/hr	<30		
SF accuracy	%	0.05		
Noise density	deg/sec/Hz	0.004		
Non-linearity	%	0.01		
Axis misalignment	mrad	0.15		
Accelerometers	Units	AHRS-II-B	AHRS-II-E	AHRS-II-P
Measurement range	g	±10	±8	
Bandwidth	Hz	50	50	
Bias in-run stability (RMS, Allan Variance)	mg	0.02	0.005	
Bias residual error in temperature range, RMS	mg	<2	<0.5	
SF accuracy	%	0.2	0.01	
Noise density	mg/Hz	0.2	0.025	
Non-linearity	%	0.2	0.05	
Axis misalignment	mrad	0.15 mrad	0.1 mrad	
Magnetometers	Units	AHRS-II-B	AHRS-II-E	AHRS-II-P
Measurement range	Gauss	±2		
Bias in-run stability, RMS	nT	4		
Noise density, PSD	nT/Hz	10		
SF accuracy	%	0.1		
Bandwidth	Hz	50		
Pressure	Units	AHRS-II-B	AHRS-II-E	AHRS-II-P
Measurement range	hPa	300 – 1100		
Bandwidth	Hz	50		
Resolution	Pa	2		
Bias in-run stability (RMS, Allan Variance)	Pa	0.8		
Noise density	Pa/√Hz	1		
Environment	Units	AHRS-II-B	AHRS-II-E	AHRS-II-P
Operating temperature	deg C	-40 to +70		
Storage temperature	deg C	-50 to +85		
MTBF	hours	55,500		
Electrical	Units	AHRS-II-B	AHRS-II-E	AHRS-II-P
Supply voltage	V DC	9 to 36		
Power consumption	Watts	1		1.4
Output Interface	-	RS-232, RS-422, CAN 2.0 and USB (with external converter)		
Output data format	-	Binary, TSS-1, NMEA 0183 ASCII characters		
Physical	Units	AHRS-II-B	AHRS-II-E	AHRS-II-P
Size	mm	120 x 50 x 53		
Weight	gram	220		280

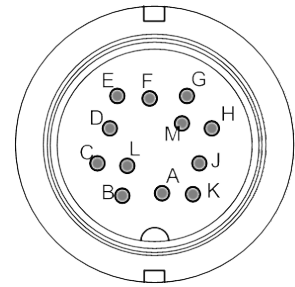
Inertial Labs AHRS-II key performance



AHRS-II mechanical interface drawing



AHRS-II electrical interface description



Pin	Signal
A	RS422 – A
B	RS422 – B
C	RS422 – Y
D	RS422 – Z
E	Power
F	Ground
G	RS232 – RX
H	RS232 – TX
J	PPS
K	GPIO
L	Do not connect
M	Do not connect

Notes:

1. All dimensions are in millimeters.
2. All dimensions within this drawing are subject to change without notice. Customers should obtain final drawings before designing any interface hardware.

Connector type: Binder Series 723. Male receptacle, 12 pin, shielded, rear-mounting