Inertial Labs
a VIAVI Solutions company

ATTITUDE & HEADING REFERENCE SYSTEM

AHRS-II-P

Datasheet

STANDARD MIL-STD 810G

CERTIFIED ISO 9001:2015 COMPANY

MADE IN THE USA

The **Inertial Labs Attitude and Heading Reference Systems (AHRS-II-P)** is a next-generation, high-performance strapdown system designed to determine absolute orientation (Heading, Pitch, and Roll) of the device on which it is mounted. It provides high-accuracy orientation data for both static and dynamic applications.

The AHRS-II-P incorporates a tactical-grade IMU consisting of three-axis precision accelerometers and gyroscopes, along with an ultra-high-precision, gyro-compensated embedded fluxgate compass.

Together, these sensors provide accurate Heading/Yaw, Pitch, and Roll measurements. Gyroscopes deliver high-frequency, real-time rotational data, while accelerometers and fluxgate magnetometers establish absolute Pitch, Roll, and magnetic azimuth during initial alignment and continuously correct gyro drift during operation.

A key factor in the performance of the AHRS-II is the use of Inertial Labs 8 mm fluxgate magnetometers. Compared to commonly used magneto-inductive or magneto-resistive sensors, fluxgate magnetometers offer superior long-term stability, repeatability, and sensitivity—up to two orders of magnitude higher. With over 70 years of proven use as a reliable reference to magnetic North, fluxgate technology remains the most dependable solution for accurate heading determination.

KEY FEATURES AND FUNCTIONALITY

- State-of-the-art Kalman Filter based algorithms for different dynamic motions of UAV, Aircrafts, Helicopters, Vessels, Ships, ROV, UUV, Robots, UGV, AGV, Gimbals and Antennas
- Highly accurate, sensitive, and temperature stable Fluxgate magnetometers (in-house technology)
- Input from External GNSS Receiver
- 0.6 deg Gyro-Stabilized Heading and 0.08 deg Pitch & Roll Dynamic Accuracy over operational temperature range
- 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
- Embedded 2D and 3D magnetic calibration on hard and soft iron
- RS-232, RS-422, and CAN 2.0 interfaces
- Full temperature calibration of all sensing elements
- Up to 200 Hz data update rate (AHRS) and 2000 Hz data rate (IMU)
- Compact design. Environmentally sealed (IP67)

SPECIFICATIONS

	Parameter	Units			
General	Output signals	-	Without GNSS input: Euler angles; Quaternion; Relative Altitude; IMU data (angular rates, accelerations); Magnetic field; Pressure; Delta Theta, Delta Velocity With GNSS input: Horizontal & Vertical Positions (LAT, LONG); Heading, Pitch, Roll, Velocity, PPS time, IMU data (angular rates, accelerations)		
	Input signals	-	External GNSS receiver, External magnetic compass		
	Data rate	Hz	Up to 200 (AHRS data); Up to 2000 (IMU data)		
	Start-up time	sec	<1		
	Full Accuracy Data (Warm-up Time)	sec	10		
Orientation	**Heading**				
	Range	deg	0 to 360		
	Static Accuracy [1]	deg RMS	0.3		
	Dynamic accuracy (without GNSS) [2]	deg RMS	0.6		
	Dynamic Accuracy (with GNSS) [2]	deg RMS	0.1		
	Pitch and Roll				
	Range: Pitch, Roll	deg	±90, ±180		
	Angular Resolution	deg	0.01		
	Static Accuracy in the whole Temperature Range	deg RMS	0.03		
	Dynamic accuracy (without GNSS) [2]	deg RMS	0.05		
	Dynamic Accuracy (with GNSS) [2]	deg RMS	0.03		
	Relative Altitude				
	Measurement range	m	-600 to 9000		
	Resolution	m	0.01		
	Relative accuracy	m	<1		
IMU	**Gyroscopes**				
	Type	-	Tactical-grade		
	Measurement range	deg/sec	±450	±950	±2000
	Bias in-run stability (RMS, Allan Variance)	deg/hr	1		
	Bias error over temperature range (RMS)	deg/hr	<30		
	Angular Random Walk	deg/√hr	<0.2 (0.08 optional)		
	Accelerometers				
	Type	-	Tactical-grade		
	Measurement range	g	±8	±15	±40
	Bias in-run stability (RMS, Allan Variance)	mg	0.005	0.02	0.03
	Bias error over temperature range (RMS)	mg	0.5	0.7	1.2
	Bias one-year repeatability	mg	1.0	1.3	1.5
	Velocity Random Walk	m/s/√hr	0.015	0.035	0.045
	Magnetometer				
	Measurement range	Gauss	±1.6		
	Bias in-run stability (RMS, Allan Variance)	nT	0.2		
	Noise density	nT/√Hz	0.3		
	Pressure				
	Measurement range	hPa	300 – 1100		
	Bias in-run stability (RMS, Allan Variance)	Pa	2		
	Noise density	Pa/√Hz	0.8		
General	**Environment**				
	Operating temperature	deg C	-40 to +75		
	Storage temperature	deg C	-40 to +85		
	MTBF (G_M @ +65degC)	hours	100000		
	Environmental protection	-	MIL-STD-810G		
	EMC/EMI	-	MIL-STD-461		
	Electrical				
	Supply voltage	V DC	9 to 36 (26±10 for MIL-1275 protection)		
	Power consumption	W	1.4 (2.4 with data logger)		
	Protection (optional)	-	MIL-STD-1275		
	Output data format	-	Binary, NMEA 0183 ASCII characters		
	Physical				
	Size [3]	mm	120 x 50 x 53		
	Weight [3]	gram	280		

Specifications subject to change without notice

[1] Calibrated in whole operational temperature range, in homogeneous magnetic environment, for latitude up to ±65 deg.
[2] Dynamic accuracy may depend on the type of motion.
[3] Weight and size are PN dependent. Customers should obtain the most recent 2D/3D files before designing any interface hardware.

PRODUCT CODE STRUCTURE

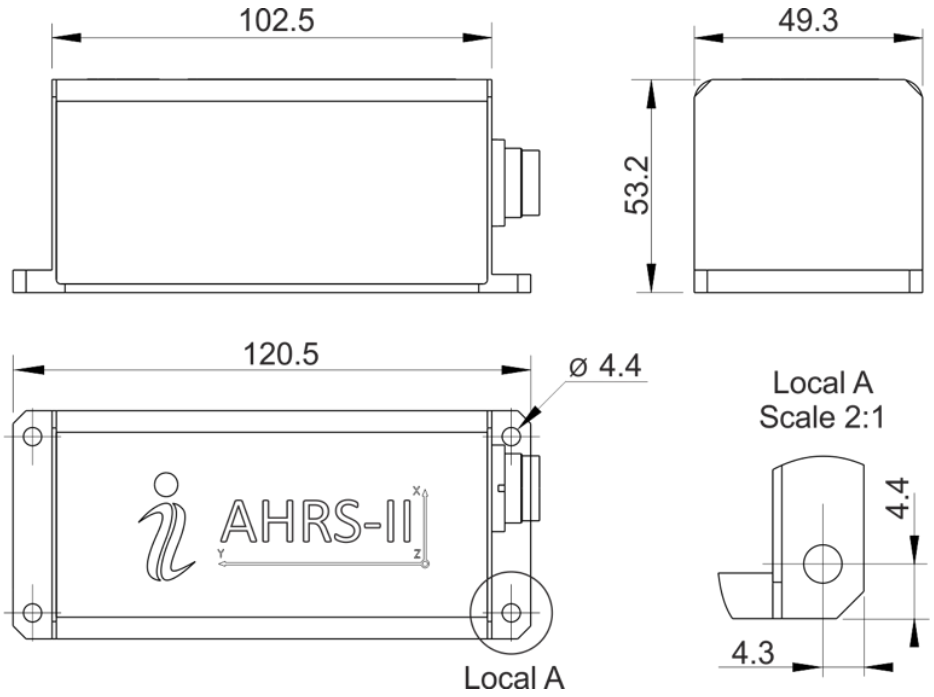
Model	Gyro	Accel	Calibration	Connector & Enclosure	Color	Data Logger	Version	Interface
AHRS-II-P	G450	A8	TMGA	C3 (default)	B	S64 (optional)	V1	124
	G950	A15		C37				1245
	G2000	A40						

Example:
AHRS-II-P-G450-A8-TMGA-C3-B-S64-V1.145

Product code details:

- AHRS-II-P: Professional Version of Attitude and Heading Reference System
- G450: Gyroscopes measurement range = ±450 deg/sec
- G950: Gyroscopes measurement range = ±950 deg/sec
- G2000: Gyroscopes measurement range = ±2000 deg/sec
- A8: Accelerometers measurement range = ±8 g
- A15: Accelerometers measurement range = ±15 g
- A40: Accelerometers measurement range ±40 g
- TMGA: Gyroscopes, Accelerometers and Magnetometers
- C3: Aluminum enclosure with 24-pin connector
- C37: C3 with MIL-STD-1275 Protection
- B: Black color
- S64: 64GB embedded Data Logger (optional)
- V1: Version rate
- .124: RS-232, RS-422, and CAN interface
- .1245: RS-232, RS-422, CAN, and Ethernet interface

MECHANICAL INTERFACES DESCRIPTION (STANDARD CONFIGURATION)



Notes:
1. All dimensions are in millimeters.
2. All dimensions within these drawings are subject to change without notice. Customers should obtain final drawings before designing any interface hardware.
3. Connector type: Binder Series 723. Male receptacle, 24 pin, shielded, rear-mounting