

# Dual Antenna, GPS-Aided Inertial Navigation System

## INS-DH-OEM

- Fully Integrated Honeywell HG4930 IMU
- Commercial ECCN 7A994 (No License Required) Export Status
- Precision Real time (RTK) & Post Processing (PPK)
- High Precision NovAtel Dual Antenna GNSS Receiver
- Honeywell HG4930 Tactical-grade IMU
- Position accuracy = 60 cm SBAS / 40 cm DGPS / 1 cm RTK / 2.5 cm PPP / 0.5 cm PPK
- Heading accuracy = 0.05 deg RTK / 0.015 deg PPK
- Pitch & Roll accuracy = 0.015 deg RTK / 0.003 deg PPK
- Small Size, light weight
- Compatible with LIDAR, Optical camera
- Applications: flight control, remote sensing, photogrammetry



The **Inertial Labs GPS-Aided Inertial Navigation System (INS-DH-OEM)** is an OEM version of the new generation of dual GNSS antenna, fully-integrated, combined GPS, GLONASS, GALILEO and BEIDOU GNSS and high-performance strapdown system, that determines position, velocity and absolute orientation (Heading, Pitch and Roll) for any device on which it is mounted. Horizontal and Vertical Position, Velocity, Dual Antenna Heading, Pitch & Roll are determined with high accuracy for both motionless and dynamic applications with IMU input from the Honeywell HG4930 aided by the NovAtel Dual Antenna Receiver.



The Inertial Labs **INS-DH-OEM** utilizes an advanced dual antenna GNSS receiver, a Honeywell HG4930 IMU which has 3-axes each of calibrated in full operational temperature range Advanced MEMS Accelerometers and new generation of tactical grade MEMS Gyroscopes to provide accurate Position, Velocity, Heading, Pitch and Roll of the device under measure. **INS-DH-OEM** contains Inertial Labs new on-board sensors fusion filter, state of the art navigation and guidance algorithms and calibration software.



## KEY FEATURES, BENEFITS & FUNCTIONALITY

- Commercially exportable Dual Antenna GPS-Aided Inertial Navigation System
- Small size & light weight: 85.5 x 67.5 x 52.0 mm size and 280-gram weight
- Honeywell HG4930-CA51 IMU
- Dual Antenna NovAtel GNSS Receiver for Highly Accurate Heading & Position
- GPS, GLONASS, GALILEO, BEIDOU and QZSS constellations
- SBAS, DGPS, RTK and PPP correction signals
- Compatibility with most commercially available LiDARs (Velodyne, RIEGL, FARO etc.)
- High precision trigger for optical cameras
- Up to 600 Hz IMU; 200 Hz INS and up to 100 Hz GNSS data rate
- GNSS measurements and IMU raw data for post processing
- Advanced, extendable, embedded Kalman Filter based sensor fusion algorithms
- State-of-the-art algorithms for different dynamic motions of Vessels, Ships, Helicopters, UAV, UUV, UGV, AGV, ROV, Gimbals and Land Vehicles
- Full temperature calibration of all sensing elements

**INS-DH-OEM Specifications**

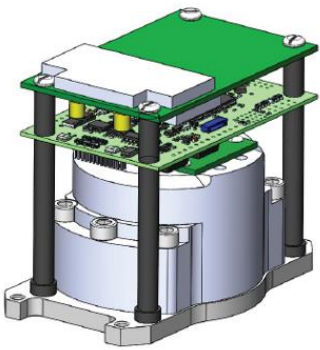
	Parameter	Units	INS-DH-OEM	
<b>Inputs &amp; Outputs</b>	Input signals		<ul style="list-style-type: none"> <li>Marine application: DVL (Doppler Velocity Log)</li> <li>Land application: Odometer, Wheel sensor, Encoder, DMI</li> <li>Aerial application: Wind sensor, Air Speed Sensor, Doppler shift from locator (for long-term GPS denied)</li> <li>Optional External Stand-Alone Magnetic Compass (SAMC)</li> </ul>	
	Output signals		Positions, Heading, Pitch & Roll, Velocity, Accelerations, Angular rates, Barometric data, 1PPS	
	Main feature		Ideal solution for weight restricted applications, which need highly accurate real-time orientation and position data utilizing accurate dual antenna heading.	
	Update rate (INS data)	Hz	1 ... 200 (user settable)	
	Update rate (IMU data)	Hz	100 / 600 (user settable)	
	Start-up time	sec	<1	
<b>Positions, Velocity &amp; Time</b>		<b>Units</b>	<b>INS-DH-OEM</b>	
<b>Navigation</b>	Horizontal position accuracy (GPS L1/L2), RMS	meters	1.2	
	Horizontal position accuracy (SBAS), RMS	meters	0.6	
	Horizontal position accuracy (DGPS), RMS	meters	0.4	
	Horizontal position accuracy (TerraStar-C PRO), RMS	meters	0.025	
	Horizontal position accuracy (RTK), RMS	meters	0.01 + 1 ppm	
	Horizontal position accuracy (Post Processing)	meters	0.005	
	Horizontal position accuracy (GNSS outage, free inertial, land vehicles), RMS	meters	<0.2% (DT)	
	Vertical position accuracy (SP), RMS	meters	<1	
	Vertical position accuracy (RTK), RMS	meters	0.02 + 1 ppm	
	Velocity accuracy, RMS	meters/sec	0.03	
PPS timestamps accuracy	nano sec	20		
<b>Heading</b>		<b>Units</b>	<b>INS-DH-OEM</b>	
<b>Orientation</b>	Range	deg	0 to 360	
	1-Meter Baseline Accuracy	deg RMS	0.08	
	2-Meter Baseline Accuracy	deg RMS	0.05	
	Post Processing accuracy	deg RMS	0.015	
	<b>Pitch and Roll</b>		<b>Units</b>	<b>INS-DH-OEM</b>
	Range: Pitch, Roll	deg	±90, ±180	
	Angular resolution	deg	0.005	
	Static Accuracy over temperature range	deg	0.02	
	Dynamic accuracy	deg RMS	0.01	
	Post processing accuracy	deg RMS	0.002	
<b>GNSS receiver</b>		<b>Units</b>	<b>INS-DH-OEM</b>	
<b>GNSS</b>	GNSS Receiver		Dual Antenna Novatel OEM7	
	Supported GNSS constellations & corrections (varies by configuration of GNSS receiver)		GPS L1 C/A, L1C, L2C, L2P, L5; GLONASS L1 C/A, L2 C/A, L2P, L3, L5; BeiDou B1, B2; Galileo E1, E5 AltBOC, E5a, E5b; NavIC (IRNSS) L5; SBAS L1, L5 QZSS L1 C/A, L1C, L2C, L5; L-Band up to 5 channels; DGPS	
	Channel configuration		555 Channels	
	GNSS Positions data rate	Hz	Up to 100	
	GNSS Measurements (raw) data rate	Hz	Up to 100	
	RTK corrections		RTCM 2.1/2.3/3.0/3.1	
	Velocity accuracy, RMS	meters/sec	<0.03	
	Initialization time	Sec	<39 (cold start), <20 (hot start)	
Time accuracy (clock drift)	nano sec	20		
<b>Gyroscopes</b>		<b>Units</b>	<b>INS-DH-OEM</b>	
<b>IMU HG4930-CA51</b>	Measurement range	deg/sec	±240	
	Bias in-run stability @25 deg C, Allan Variance (1σ)	deg/hr	0.25	
	Bias Repeatability over temperature range (1σ)	deg/hr	7	
	Angular Random Walk (ARW)	deg/√hr	0.04	
	<b>Accelerometers</b>		<b>Units</b>	<b>INS-DH-OEM</b>
Measurement range	g	±15		
Bias in-run stability @25 deg C, Allan Variance (1σ)	mg	0.025		
Bias Repeatability over temperature range (1σ)	mg	1.7		
Velocity Random Walk (VRW), Maximum	m/sec/√hr	0.03		
<b>Environment</b>		<b>Units</b>	<b>INS-DH-OEM</b>	
<b>General</b>	Operating temperature	deg C	-40 to +75	
	Storage temperature	deg C	-50 to +85	
	MTBF (Gw @ +65degC)	hours	100,000	
	<b>Electrical</b>		<b>Units</b>	<b>INS-DH-OEM</b>
	Supply voltage	V DC	9 - 34	
	Power consumption	Watts	3.9	
	Output Interface (options)	-	RS-232, RS-422, Ethernet, CAN	
	Output data format	-	Binary, TSS-1, NMEA 0183 ASCII characters	
	<b>Physical</b>		<b>Units</b>	<b>INS-DH-OEM</b>
	Size	mm	85.5 x 67.5 x 52.0	
Weight	gram	280		

### INS-DH-OEM Electrical and Mechanical Interface Drawing

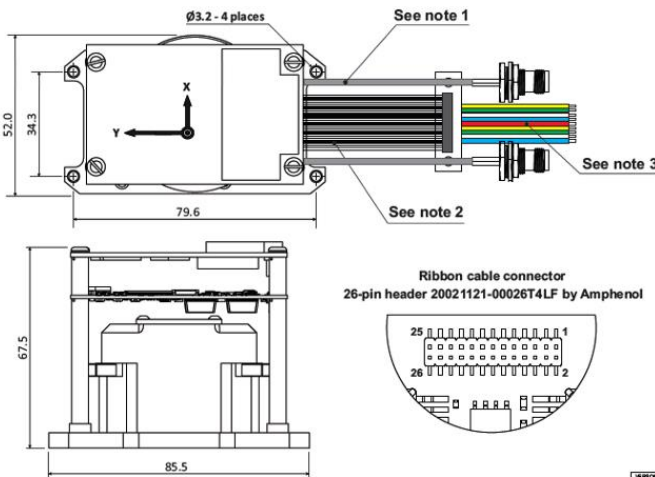
Interface harness		RS422 version		Ethernet version	
1,2	POWER IN RED	21	RS422-A BLUE	23	ETHTX+ BLUE
3,4	GROUND BLACK	22	RS422-B ORANGE	24	ETHTX- ORANGE
16	Rs232 - Rx1 BLUE	19	RS422-Y WT/GREEN	25	ETHRX+ WT/GREEN
18	Rs232 - Tx1 ORANGE	20	RS422-Z YL/GREEN	26	ETHRX- YL/GREEN
12	Rs232 - Rx2 WHITE	<b>4 ports version</b>		<b>CAN bus version</b>	
14	Rs232 - Tx2 GREEN	11	RS232-RX4 WT/GREEN	11	CAN_L WT/GREEN
15	Rs232 - Rx3 YELLOW	13	RS232-TX4 YL/GREEN	13	CAN_H YL/GREEN
17	Rs232 - Tx3 BROWN	The names of the signals are given relative to the device. I.e. the Rx pin is the input pin of the INS, Tx is the output one. RS422-A and RS422-B pair is used by device for data receive RS422-Y and RS422-Z pair is used by device for data transmit			
10	PPS PURPLE				
8	GNSS EV2 WT/RED				

Aux. signals	
5	LED 1 (connect anode here)
6	LED 2 (connect anode here)

Main electrical parameters	
Supply voltage	9 to 34 VDC
Power consumption	5000 mW
Output interface	RS-232, RS422, Ethernet, CAN
Output data format	Binary, TSS-1, NMEA 0183 ASCII characters

**Note 1:** TNC Female Bulkhead to MMCX Plug Right Angle Cables  
150mm length RG174 Coax

**Note 2:** 26 lines ribbon cable (can be converted to open end wires)

**Note 3:** Optional connection - 26 AWG stranded wires by Alpha Wire (250mm)

**Note 4:** Weight 280g

### INS-DH-OEM Part Numbers Structure

Model	Gyroscope	Accel	Calibration	Connector	Encoder	Data Logger	GNSS receiver	Version	Interface
INS-DH-OEM	G240	A15	TGA	C4	E (optional)	S64 (optional)	O7720	VD4	1
							O718D	VD43	2
							WOR	VD49	4
								VD42	5
								VD9	11
									12
									145
									245

**Example:** INS-DH-OEM-G240-A15-TGA-C4-E-S64-O7720-VD4.1

Part number details:

INS-DH-OEM: Dual Antenna Model of GPS-Aided Inertial Navigation System

G240: Gyroscopes measurement range = ±240 deg/sec

A15: Accelerometers measurement range = ±15 g

TGA: Gyroscopes and Accelerometers

C4: Aluminum Base Plate – 26 Lines Ribbon Cable with 20021121-00026T4LF Connector by Amphenol (with available interfaces of: RS-232, RS-422, Ethernet and CAN)

E: Encoder Support (optional)

S64: 64GB embedded Data Logger (optional)

O7720: Novatel OEM7720 dual antenna GNSS receiver

O718: Novatel OEM718D dual antenna GNSS receiver (China only)

WOR: without GNSS receiver

VD4: GPS L1/L2, Dual antenna Heading, SBAS, DGPS, 20 Hz positions

VD43: GPS L1/L2, GLONASS L1/L2, Dual antenna Heading, SBAS, DGPS, 20 Hz positions

VD49: GPS L1/L2, GLONASS L1/L2, NavIC (IRNSS), Dual antenna Heading, SBAS, DGPS, 20 Hz positions; 20 Hz GNSS measurements

VD42: GPS L1/L2, GLONASS L1/L2, Dual antenna Heading, SBAS, DGPS, RTK, 20 Hz measurements, 20 Hz positions

VD9: GPS L1/L2, GLONASS L1/L2, BEIDOU B1/B2, GALILEO E1/E5, QZSS L1/L5, DGPS, RTK, Dual GNSS Heading, 20 Hz measurements, 20 Hz positions

VX.1: RS-232 interface

VX.2: RS-422 interface

VX.4: CAN interface

VX.5: Ethernet interface

VX.11: two RS-232 interfaces

VX.22: two RS-422 interfaces

VX.145: RS-232, CAN and Ethernet interfaces (with optional Encoder support)

VX.245: RS-422, CAN and Ethernet interfaces (without Encoder support)

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