



Dual Antenna, GPS-Aided Inertial Navigation Systems

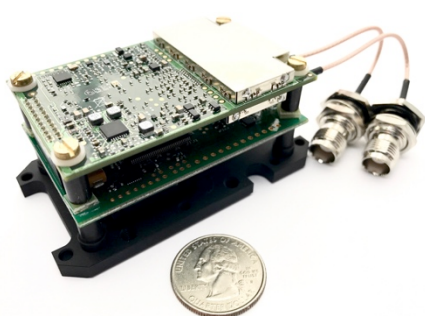
INS-D-OEM

INS-DL-OEM

- ITAR-free
- Small size
- Affordable price
- 1 deg/hr level IMU
- 0.08 deg Attitude accuracy
- High precision Dual Antenna GNSS receiver



The **Inertial Labs GPS-Aided Inertial Navigation System (INS-D/DL-OEM)** is OEM version of new generation, 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.



The Inertial Labs **INS-D/DL-OEM** utilizes advanced dual antenna GNSS receiver, 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-D/DL-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
- 85 x 47 x 36 mm size and 115 gram weight
- Industrial & Tactical-grade IMU (1 – 3 deg/hr gyroscopes Bias in-run stability)
- GPS, GLONASS, BEIDOU, SBAS, DGPS, RTK supported signals
- 0.08 deg Heading and 0.1 deg Pitch & Roll accuracy
- Compatibility with LiDARs and optical cameras for remote sensing applications
- Up to 200 Hz IMU, 50 Hz GNSS positions and 20 Hz GNSS measurements data rate
- 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
- Implemented ZUPT, GNSS tracking angle features
- Full temperature calibration of all sensing elements

INS-D-OEM performance during GNSS outages

Outage duration	Positioning mode	Position accuracy (meters, RMS)		Velocity accuracy (meters/sec, RMS)		Attitude accuracy (degree, RMS)	
		Horizontal	Vertical	Horizontal	Vertical	Pitch, Roll	Heading*
0 sec	RTK	0.01 + 1ppm	0.02 + 1ppm	0.02	0.01	0.015	0.05
	SP	1.2	1.0	0.03	0.02	0.1	0.08
	PP	0.005	0.01	0.02	0.01	0.006	0.03
60 sec	RTK	7	2	0.3	0.1	0.05	0.08
	SP	8	3	0.3	0.1	0.05	0.1
	PP	0.3	0.2	0.03	0.05	0.01	0.05

* 2 meters baseline

INS-D-OEM & INS-DL-OEM Specifications

	Parameter	Units	INS-DL-OEM Low cost dual antenna			INS-D-OEM High precision dual antenna			
General	Output signals		Positions, Dual Antenna Heading, Pitch, Roll, Velocity, Accelerations, Angular rates, Time (PPS)						
	Input signals		Odometer, Wheel sensor, DMI, Air Speed Sensor						
	Main features		Affordable price Dual antenna Heading 1 cm RTK position			High precision dual antenna Heading, 1 cm RTK position, Tactical-grade IMU			
	Update rate	Hz	1 ... 200 (user settable)			1 ... 200 (user settable)			
	Start-up time	sec	<1			<1			
	Positions, Velocity and Timestamps	Units	INS-DL-OEM			INS-D-OEM			
Navigation	Horizontal position accuracy (SP, L1), RMS	meters	1.5			1.5			
	Horizontal position accuracy (SP, L1/L2), RMS	meters	1.2			1.2			
	Horizontal position accuracy (SBAS), RMS ⁽¹⁾	meters	0.6			0.6			
	Horizontal position accuracy (DGPS), RMS	meters	0.4			0.4			
	Horizontal position accuracy (post processing) ⁽²⁾	meters	0.005			0.005			
	Horizontal position accuracy (RTK), RMS	meters	0.01 + 1 ppm			0.01 + 1 ppm			
	Vertical position accuracy (SP), RMS	meters	<2			<1			
	Vertical position accuracy (RTK), RMS	meters	0.02 + 1 ppm			0.02 + 1 ppm			
	Velocity accuracy, RMS	meters/sec	0.03			0.03			
	PPS timestamps accuracy	nano sec	20			20			
	Heading	Units	INS-DL-OEM			INS-D-OEM			
Orientation	Range	deg	0 to 360			0 to 360			
	Static Accuracy ⁽³⁾	deg RMS	0.15 (1 meter base line)			0.15 (1 meter base line)			
	Dynamic accuracy (GNSS) ⁽⁶⁾	deg RMS	0.08 (2 meters baseline)			0.08 (2 meters baseline)			
	Post processing accuracy ⁽²⁾	deg RMS	0.03			0.03			
	Pitch and Roll	Units	INS-DL-OEM			INS-D-OEM			
	Range: Pitch, Roll	deg	±90, ±180			±90, ±180			
	Angular Resolution	deg	0.01			0.01			
	Static Accuracy in whole Temperature Range	deg	0.08			0.05			
	Dynamic Accuracy ⁽⁶⁾	deg RMS	0.1			0.1			
	Post processing accuracy ⁽²⁾	deg RMS	0.006			0.006			
	GNSS receiver	Units	INS-DL-OEM			INS-D-OEM			
GNSS	Number of GNSS Antennas		Dual			Dual			
	Supported GNSS signals & corrections (optional)		GPS L1/L2, GLONASS L1/L2, BEIDOU B1/B2, GALILEO E1/E5, QZSS L1/L5, SBAS, DGPS, RTK			GPS L1/L2; GLONASS L1/L2; BeiDou B1/B2; SBAS; DGPS; RTK			
	Channel configuration ⁽⁴⁾		435 Channels			555 Channels			
	GNSS Positions data rate ⁽⁵⁾	Hz	20			20, 50			
	RTK corrections		RTCM 2.3/3.0/3.2			RTCM 2.1/2.3/3.0/3.1			
	GNSS Measurements (raw) data rate	Hz	20			20			
	Velocity accuracy, RMS	meters/sec	<0.03			<0.03			
	Initialization time	Sec	<50 (cold start), <30 (hot start)			<50 (cold start), <30 (hot start)			
	Time accuracy (clock drift) ⁽⁷⁾	nano sec	20			20			
	Gyroscopes	Units	INS-DL-OEM			INS-D-OEM			
IMU	Type		Industrial-grade			Tactical-grade			
	Measurement range	deg/sec	±450 / ±950			±450 / ±950			
	Bias in-run stability (RMS, Allan Variance)	deg/hr	3			1			
	Bias error over temperature range (RMS)	deg/hr	<50			<30			
	Angular Random Walk	deg/√hr	<0.3			<0.2			
	Accelerometers	Units	INS-DL-OEM			INS-D-OEM			
	Type		Industrial-grade			Tactical-grade			
	Measurement range	g	±8 g	±15 g	±40 g	±8 g	±15 g	±40 g	
	Bias in-run stability (RMS, Allan Variance)	mg	0.01	0.03	0.05	0.005	0.02	0.03	
	Bias error over temperature range (RMS)	mg	0.7	1.1	1.5	0.5	0.7	1.2	
	Bias one-year repeatability	mg	1.5	2.0	2.5	1.0	1.3	1.5	
	Velocity Random Walk	m/s/√hr	0.02	0.045	0.06	0.015	0.035	0.045	
		Environment	Units	INS-DL-OEM			INS-D-OEM		
	Electrical and Physical	Operating temperature	deg C	-40 to +75			-40 to +75		
Storage temperature		deg C	-50 to +85			-50 to +85			
MTBF		hours	55,500			55,500			
Electrical		Units	INS-DL-OEM			INS-D-OEM			
Supply voltage		V DC	9 - 36			9 - 36			
Power consumption		Watts	3			3			
Output Interface (options)			RS-232 or RS-422, CAN Ethernet (optional)			RS-232 or RS-422, CAN Ethernet (optional)			
Output data format		-	Binary, TSS-1, NMEA 0183 ASCII			Binary, TSS-1, NMEA 0183 ASCII			
Physical		Units	INS-DL-OEM			INS-D-OEM			
Size		mm	85 x 47 x 36			85 x 47 x 36			
Weight		gram	115			115			

⁽¹⁾ GPS only; ⁽²⁾ RMS, incremental error growth from steady state accuracy. Post-processing results using third party software; ⁽³⁾ 2 meters base line between two GNSS antennas; ⁽⁴⁾ tracks up to 60 L1/L2 satellites;

⁽⁵⁾ 50 Hz while tracking up to 20 satellites. 20 Hz position update rate for Basic model of INS; ⁽⁶⁾ dynamic accuracy may depend on type of motion; ⁽⁷⁾ time accuracy does not include biases due to RF or antenna delay

INS-D/DL-OEM electrical and mechanical interface drawing
