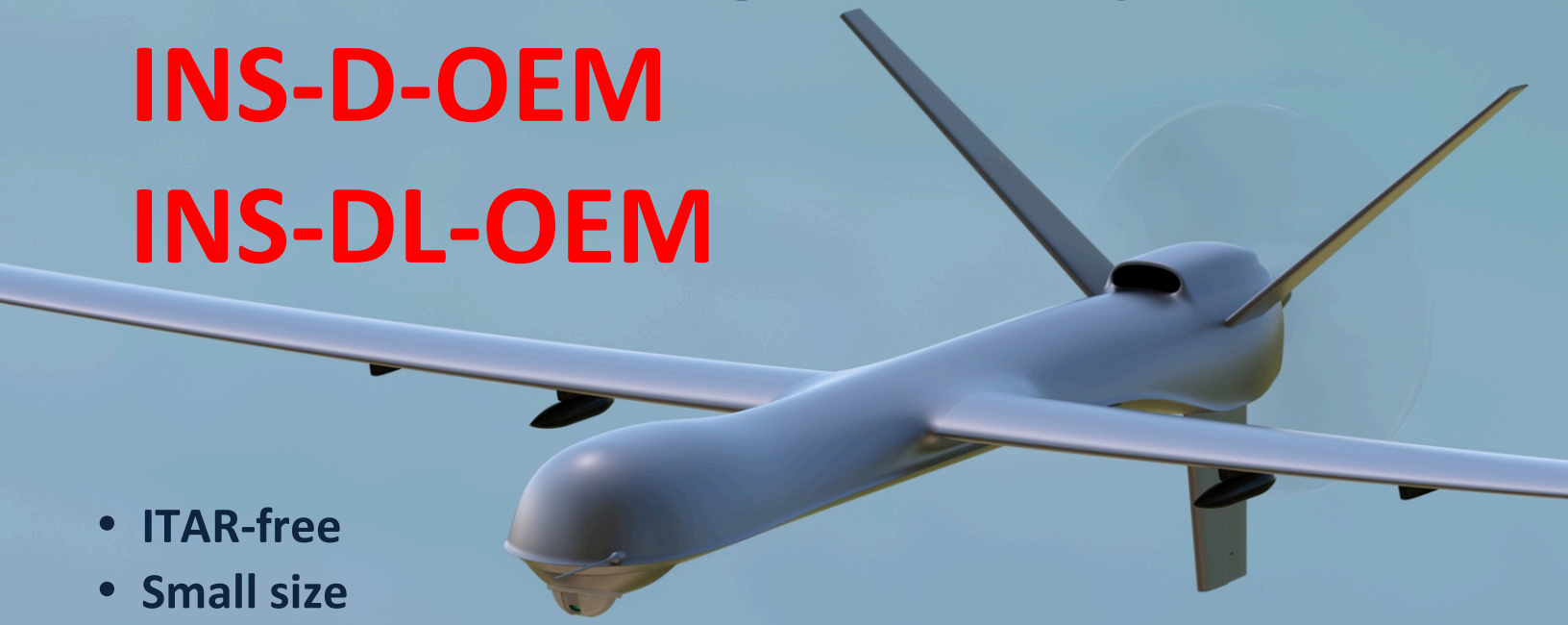
Inertial Labs
Attitude is Everything

Dual Antenna, GPS-Aided Inertial Navigation Systems

INS-D-OEM

INS-DL-OEM

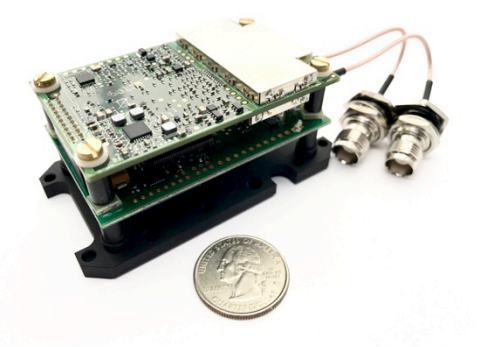


- ITAR-free
- Small size
- Affordable price
- 1 deg/hr level IMU
- 0.08 deg Attitude accuracy
- High precision Dual Antenna GNSS receiver

CERTIFIED ISO 9001:2015 COMPANY

MADE IN THE USA

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 INS, up to 2000 Hz IMU, 50 Hz GNSS positions, 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	Input signals		• Marine application: DVL (Doppler Velocity Log) • Land application: Odometer, Wheel sensor, Encoder, DMI • Aerial application: Wind sensor, Air Speed Sensor, Doppler shift from locator (for long-term GPS denied)					
	Output signals		Positions, Heading, Pitch & Roll, Velocity, Accelerations, Angular rates, Barometric data, PPS					
	Main features		Affordable price Dual antenna Heading 1 cm RTK position			High precision dual antenna Heading, 1 cm RTK position, Tactical-grade IMU		
	Data rate (INS)	Hz	Up to 200 (user settable)			Up to 200 (user settable)		
	Data rate (IMU)	Hz	Up to 2000 (user settable)			Up to 2000 (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) 0.08 (2 meters baseline)			0.15 (1 meter base line) 0.08 (2 meters baseline)		
	Dynamic accuracy (GNSS) [6]	deg RMS						
	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, NMEA 0183 ASCII			Binary, 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