

OEM Version of GPS-Aided Inertial Navigation System

INS-U-OEM



- INS, AHRS and ADC (Air Data Computer) output data
- Multi frequency and Multi constellations GNSS Receiver
- GPS, GLONASS, GALILEO, QZSS and BEIDOU GNSS
- Designed for fixed-wing and multi-rotor Aerial Platforms
- Two Barometers for Indicated Airspeed
- Position accuracy = 1 cm (RTK)
- Heading accuracy = 0.3 deg (RTK, Dynamic)
- Pitch & Roll accuracy = 0.1 deg (RTK, Dynamic)
- Gyro-compensated, embedded Fluxgate magnetic compass
- Optional external Stand-Alone Magnetic Compass
- Small Size, light weight, low power
- Affordable price

The **Inertial Labs GPS-Aided Inertial Navigation System (INS-U-OEM)** is OEM version of new generation, fully-integrated, combined GPS, GLONASS, GALILEO, QZSS 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 and Orientation are determined with high accuracy for both motionless and dynamic applications.



The Inertial Labs **INS-U-OEM** utilizes advanced single antenna GNSS receiver, two barometers, magnetometers, 3-axes each of calibrated in full operational temperature range Advanced MEMS Accelerometers and Gyroscopes to provide accurate Position, Velocity, Heading, Pitch and Roll of the device under measure.

INS-U-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 GPS-Aided Inertial Navigation System
- 3-in-1 strapdown system: INS + AHRS + ADC (Air Data Computer)
- Embedded in-flight calibration
- Ublox ZED-F9P F9 High Precision GNSS Module
- Small size & light weight & low power
- GPS, GLONASS, GALILEO, BEIDOU, QZSS, RTK supported signals
- Total and static pressure sensors for calculating Indicated Airspeed
- Embedded or External Inertial Labs Magneto-Inductive and Mini-Fluxgate magnetometers (compass)
- 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 Helicopters, and UAV



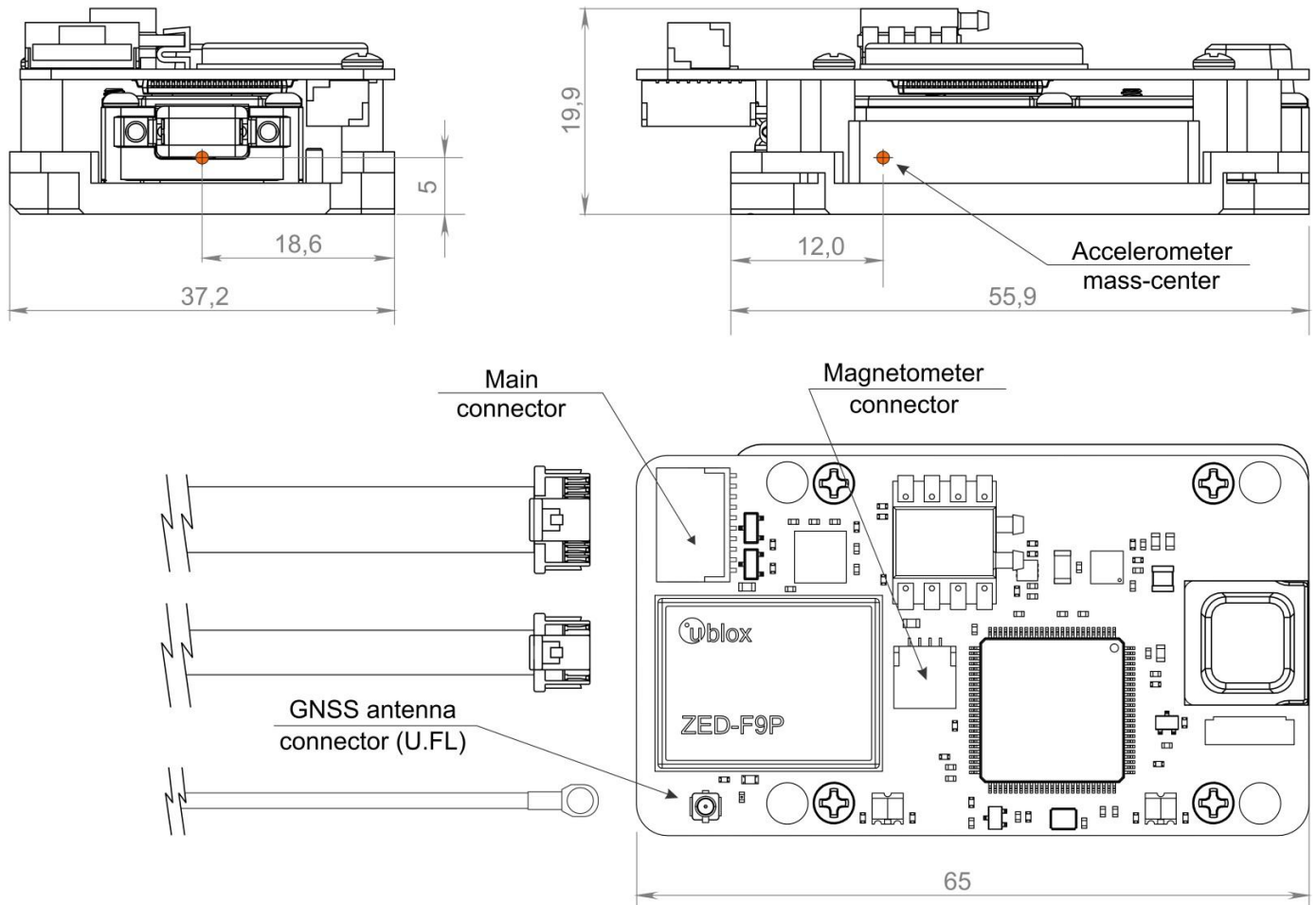
INS-U-OEM Specifications

	Parameter	Units	INS-U-OEM
Inputs & Outputs	Input signals		<ul style="list-style-type: none"> External Magnetometer, Air Speed Sensor, Doppler shift from locator (for long-term GPS denied)
	Output signals		<ul style="list-style-type: none"> Positions, Heading, Pitch & Roll, Velocity, Accelerations, Angular rates, Barometric data, Magnetic Field, Delta Theta and Delta Velocity
	Update rate	Hz	1 ... 200 (user settable)
	Start-up time	sec	<1
Navigation	Positions, Velocity, and Timestamps	Units	INS-U-OEM
	Horizontal position accuracy (SP), RMS	meters	1.5 CEP
	Horizontal position accuracy (RTK), RMS ⁽¹⁾	meters	0.01 + 1 ppm CEP
	Vertical position accuracy (RTK) ⁽¹⁾ , RMS	meters	0.01 + 1 ppm CEP
	Velocity accuracy, RMS	meters/sec	0.05
Orientation	Heading	Units	INS-U-OEM
	Range	deg	0 to 360
	Angular Resolution	Deg	0.01
	Static Accuracy ⁽³⁾	deg, 1 σ	0.3
	Dynamic accuracy (GNSS) ⁽⁴⁾	deg RMS, 1 σ	0.6
	Pitch and Roll	Units	INS-U-OEM
	Range: Pitch, Roll	deg	± 90 , ± 180
	Angular Resolution	deg	0.01
GNSS	GNSS receiver	Units	INS-U-OEM
	Number of GNSS Antennas		Single
	Supported GNSS signals & corrections		GPS L1C/A L2C, GLO L10F L20F, GAL E1B/C E5b, BDS B1I B2I, QZSS L1C/A L2C SBAS L1C/A: WAAS, EGNOS, MSAS, GAGAN
	Channel configuration		184 Channels – F9 Engine
	Raw GNSS data rate	Hz	20 (GPS+GLO+GAL+BDS or GPS+GLO+GAL) 25 (GPS only or GPS+GAL/GLO/BDS)
	Accuracy of Time Pulse Signal	ns	30 (RMS), 60 (99%)
	Frequency of Time Pulse Signal	Hz	0.25 – 10,000 (configurable)
	GNSS Convergence time ⁽⁶⁾	sec	< 10 (GPS+GLO/GAL/BDS); < 30 (GPS)
	Acquisition time ⁽⁷⁾	sec	<30 (cold start), <2 (warm start), <1 (hot start)
	Air Data Computer	Units	INS-U-OEM
	Static Pressure (calibrated)	hPa, % FS	300 to 1100 hPa, from -2000 ft to 30000 ft, Accuracy: $\pm 0.1\%$ FSS
	Dynamic Pressure (calibrated)	hPa, % FS	0.15 to 25 hPa / 10 to 124 KCAS (600 KCAS is optional), Accuracy: $\pm 0.25\%$ FSS
	Baro-Corrected Pressure Altitude	meters	-500 to 9000 meters; Accuracy: 1
	Pressure Altitude	meters	-500 to 9000 meters; Accuracy: 1
	Calibrated Airspeed	meters/sec	5 to 64 meters/sec (310 meters/sec is optional); Accuracy: 0.5
True Airspeed	meters/sec	5 to 64 meters/sec (310 meters/sec is optional); Accuracy: 0.5	
Mach-Number	M	0.01 to 0.2 M, Accuracy: 0.001 M	
Static Pressure Over Total Pressure		0.97 to 1, Resolution 0.000001	
True Angle of Attack	deg	-50 to 50 deg; Accuracy ± 0.25	
Rate of Climb	meters/sec	± 515 meters/sec; Accuracy 0.05	
Air Density	kg/m ³	0.3 to 1.6 kg/m ³ ; Accuracy 0.002	
Outside Air Temperature (OAT)	degC	-40 to +85 degC; Resolution 0.01	
Wind Speed	meters/sec	± 200 meters/sec; Accuracy: 0.1	
IMU	Gyroscopes	Units	INS-U-OEM
	Measurement range	deg/sec	± 2000
	Bias in-run stability (RMS, Allan Variance)	deg/hr, 1 σ	2
	Angular Random Walk (ARW)	deg/ $\sqrt{\text{hr}}$, 1 σ	0.38
	Accelerometers	Units	INS-U-OEM
	Measurement range	g	± 8 , ± 15 , ± 40
	Bias in-run stability (RMS, Allan Variance)	mg, 1 σ	0.01, 0.03, 0.05
	Velocity Random Walk (VRW)	m/sec/ $\sqrt{\text{hr}}$, 1 σ	0.02, 0.045, 0.06
	Magnetometers (embedded)	Units	INS-U-OEM
	Measurement range	Gauss	± 8.0
	Bias in-run stability (Allan Variance)	μGauss , 1 σ	8
Power Spectral Density	$\mu\text{Gauss}/\sqrt{\text{Hz}}$, 1 σ	15	
SF Accuracy	%, 1 σ	0.05	
General	Environment	Units	INS-U-OEM
	Operating temperature	deg C	-40 to +85
	Storage temperature	deg C	-50 to +90
	Shock & Vibration		MIL-STD-810G
	MTBF (GM)	hours	100,000
	Electrical	Units	INS-U-OEM
	Supply voltage	V DC	5 – 32
	Power consumption	Watts	<1
	Output Interface (options)	-	RS-232, RS-422 – Under Development
	Output data format	-	Binary, NMEA 0183 ASCII characters
	IPPS Level	V DC	5
	Physical	Units	INS-U-OEM
	Size	mm	65.0 x 37.20 x 19.90
Weight	gram	< 100	

1 σ specifications are manufactured to a controlled 3 σ standard.

⁽¹⁾ Measured using 1 km baseline and patch antennas with good ground planes. Does not account for possible antenna phase center offset errors. ppm limited to baselines up to 20 km
⁽²⁾ RMS, incremental error growth from steady state accuracy. Post-processing results using third party software; ⁽³⁾ in homogeneous magnetic environment, for latitude up to ± 65 deg; calibrated in whole operational temperature range; ⁽⁴⁾ 50% @ 30 m/s dynamic operation, accuracy may depend on type of motion; ⁽⁵⁾ depends on atmospheric conditions, baseline length, GNSS antenna, multipath conditions, satellite visibility and geometry. ⁽⁶⁾ Commanded start. All satellites at -130 dBm.

INS-U-OEM mechanical & electrical interfaces description



INS-U-OEM Part Numbers Structure

Model	Gyros	Accelerometers	Calibration	Connector	Pressure Ports	Stand Alone Magnetic Compass	GNSS receiver	Version	Interface
INS-U-OEM	G2000	A8	TMGA	C6W	2P	SAMC (optional)	ZF9P	V1	.13
		A15							
		A40							

Example: INS-U-OEM-G2000-A15-TMGA-C6W-2P-SAMC-ZF9P-V1.13

- INS-U-OEM: OEM Version of the Single Antenna GPS-Aided Inertial Navigation System
- 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: Calibration of IMU (Magnetometers, Gyroscopes and Accelerometers) in operational temperature range
- C6W: Wing profile-based Aluminum Base Plate - 9 pin SM09B-NSHSS (JST) latch-lock connector
- 2P: Two Airspeed Pressure Ports (Total/Static)
- SAMC: Support external, Stand-Alone Magnetic Compass (optional)
- ZF9P: uBlox ZED-F9P, Dual-Frequency, Multi-Constellation, RTK Capable GNSS Receiver
- V1: Version 1
- VX.13: RS-232 interfaces and RS-485 interface (RS-485 for Stand Alone Magnetic Compass only)