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GPS-AIDED INERTIAL NAVIGATION SYSTEM (INS-U)

DILABS®

The DILABS GPS-Aided Inertial Navigation System (INS-U)is an IP67 rated version of the new generation, fully-integrated,combined Inertial Navigation System (INS) + Attitude & Heading Reference System (AHRS) + Air Data Computer (ADC)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-Uutilizes advanced single antenna multi constellation (GPS, GLONASS, GALILEO, QZSS and BEIDOU GNSS) receiver; two Honeywell TruStability®Board Mount Pressure Sensors; a miniature gyro-compensated Fluxgate compass; 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 contains new on-board sensor fusion filter, state of the art navigation and guidance algorithms and calibration software.

KEY FEATURES, BENEFITS AND FUNCTIONALITY

- Commercially exportable GPS-Aided Inertial Navigation System
- 3-in-1 strapdown system: INS + AHRS + ADC (Air Data Computer)
- Embedded in-flight calibration
- Designed for UAV application algorithm
- UBlox ZED-F9P F9 High Precision GNSS Module
- Small size, lightweight & low power: 82 x 40.0 x 26.0 mm, <200-grams, <1 watt
- GPS, GLONASS, GALILEO, BEIDOU, QZSS, RTK supported signals
- Total and Static Pressure Sensors for calculating Indicated Airspeed
- Embedded Gyro-compensated 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
- Full temperature calibration of all sensing elements
- Environmentally sealed (IP67)
- Aiding data: Wind sensor, Air Speed Sensor, Doppler shift from locator (for long-term GPS denied), External position and External Heading

INS-U SPECIFICATIONS

	PARAMETER	UNITS	INS - U
INPUTS & OUTPUT	Input Signals		• External Magnetometer, Wind sensor, Air Speed Sensor, Doppler shift from locator (for long-term GPS denied), External position and External Heading aiding data
	Output Signals		• **IMU Data**: Accelerations, Angular rates; • **AHRS Sata**: Magnetic Field, Heading, Pitch & Roll • **INS Data**: Positions, Velocity, Delta Theta and Delta Velocity, GNSS data, Time • **Air Data Computer Data**: Static Pressure (calibrated), Dynamic Pressure (calibrated), Baro-Corrected Pressure Altitude, Pressure Altitude, Calibrated Airspeed, True Airspeed, Mach-Number, Static Pressure Over Total Pressure, True Angle of Attack, Rate of Climb
	Update Rate	Hz	1 … 200 (user settable)
	Start-up Time	Sec	<1
	POSITIONS, VELOCITY & TIMESTAMPS	**UNITS**	
NAVIGATION	Horizontal position accuracy (SP), CEP	meters	1.5 CEP
	Horizontal position accuracy (RTK), CEP(1)	meters	0.01 + 1 ppm CEP
	Vertical position accuracy (RTK)(1), CEP	meters	0.01 + 1 ppm CEP
	Velocity accuracy, CEP	meters/sec	0.05

GPS-AIDED INERTIAL NAVIGATION SYSTEM

INS-U SPECIFICATIONS

	HEADING	UNITS	INS - U
ORIENTATON	Range	deg	0 to 360
	Angular Resolution	deg	0.01
	Static Accuracy (2)	deg RMS, 1σ	0.6
	Dynamic Accuracy (GNSS) (3)	deg RMS, 1σ	0.3
	PITCH & ROLL	**UNITS**	
	Range: Pitch, Roll	deg	±90, ±180
	Angular Resolution	deg	0.01
	Static Accuracy in Temperature Range	deg, 1σ	0.08
	Dynamic Accuracy (3)	deg RMS, 1σ	0.05
	GNSS RECEIVER	**UNITS**	
GNSS	Type		Single GNSS Antenna
	Supported GNSS signals & corrections		GPS L1C/A L2C, GLO L1OF L2OF, 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	10, 20 (6)
	Accuracy of Time Pulse Signal	Ns	30 (RMS), 60 (99%)
	Frequency of Time Pulse Signal	Hz	0.25 – 10,000 (configurable)
	GNSS Convergence time (4)	Sec	< 10 (GPS+GLO/GAL/BDS); < 30 (GPS)
	Acquisition time (5)	Sec	<30 (cold start), <2 (warm start), <1 (hot start)
	AIR DATA COMPUTER	**UNITS**	
AIR DATA COMPUTER	Static Pressure (calibrated)	hPa, % FS	300 to 1100 hPa, from -2000 ft to 30000 ft, Accuracy: ±0.1% FSS
	Dynamic Pressure (calibrated)	hPa, % FS	0.15 to 25 hPa / 10 to 124 KCAS (600 KCAS is optional), Accuracy: ±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
	GYROSCOPES	**UNITS**	
IMU	Measurement range	deg/sec	±2000
	Bias in-run stability (RMS, Allan Variance)	deg/hr, 1σ	2
	Angular Random Walk (ARW)	deg/√hr, 1σ	0.38
	ACCELEROMETERS	**UNITS**	
	Measurement range	g	±8, ±15, ±40
	Bias in-run stability (RMS, Allan Variance)	mg, 1σ	0.01, 0.03, 0.05
	Velocity Random Walk (VRW)	m/sec/√hr, 1σ	0.02, 0.045, 0.06
	MAGNETOMETERS (EMBEDDED)	**UNITS**	
	Measurement range	gauss, 1σ	±8.0
	Bias in-run stability (Allan Variance)	μgauss, 1σ	8
	Power Spectral Density	μgauss/√hz, 1σ	15
	SF Accuracy	%, 1σ	0.05
	ENVIRONMENT	**UNITS**	
GENERAL	Operating Altitude		Up to 10000 meters / 32800 ft
	Humidity	%	<95
	Operating temperature	deg C	-40 to +85
	Storage temperature	deg C	-50 to +90
	Type of Sealing	-	IP-67
	Sand, Dust, Water, Humidity, Shock, Vibration	-	MIL-STD-810G
	MTBF (GM)	hours	100,000
	ELECTRICAL	**UNITS**	
	Supply voltage	V DC	5-32
	Power consumption	Watts	<1
	Output Interface	-	RS-232or RS-422
	Output data format	-	Binary, NMEA 0183 ASCII characters
	1 PPS Level	V DC	5
	PHYSICAL	**UNITS**	
	Nominal Size	mm	82.0 x 40 x 26
	Weight	Gram	< 200

DILABS®

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