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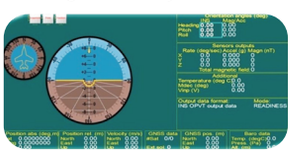
SINGLE & DUAL ANTENNA GPS-AIDED INERTIAL NAVIGATION SYSTEM (INS)

DILABS®

The DILABS Single and Dual Antenna GPS-Aided Inertial Navigation System - INS is a new generation of fully-integrated,combined GPS, GLONASS, GALILEO, QZSS, BEIDOU and L-Band navigation and high-performance strap down 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 DILABS INS utilizes advanced single and dual antenna GNSS receiver, barometer, 3-axes each of calibrated in full operational temperature range precision Fluxgate magnetometers, Accelerometers and Gyroscopes to provide accurate Position, Velocity, Heading, Pitch and Roll of the device under measure. INS contains DILABS new on-board sensors fusion filter, state of the art navigation and guidance algorithms and calibration software.

KEY FEATURES, BENEFITS AND FUNCTIONALITY

- Affordable price
- Excellent accuracy in GPS-Denied environments (up to 0.05 % DT)
- Tactical-grade IMU + Fluxgate compass + Aiding data
- Support: ROS, LabVIEW, Waypoint Inertial Explorer, QINSy
- GPS, GLONASS, GALILEO, BEIDOU, SBAS, DGPS, RTK supported signals
- Tactical-grade IMU (1 deg/hr gyroscopes and 5 micro g accelerometers Bias in-run stability)
- Fluxgate gyro-compensated compass to maintain free-inertial Heading (INS-P model)
- Single and Dual antenna GNSS receivers (NovAtel, uBlox, Hemisphere)
- Compatibility with LiDARs (Velodyne, RIEGL, FARO) and optical cameras
- Odometer, Wheel sensor, Airspeed sensor, Wind sensor, Doppler shift from locator aiding data
- 1 cm + 1 ppm RTK Horizontal Position Accuracy or 2.5 cm TerraStar-C PRO Horizontal Position Accuracy
- 0.05 deg GNSS Heading and <0.4 deg Free-inertial Heading accuracy (3 sigma)
- 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 & Land Vehicles
- Implemented ZUPT, GNSS tracking angle features
- Full temperature calibration, Environmentally sealed (IP67), compact design, MIL-STD-810G/DO-160E

INS SPECIFICATIONS

	PARAMETER	UNITS	INS - B	INS - P	INS - D	INS - DL
GENERAL	Output Signals		• Positions, Heading, Dual antenna Heading (D/DL), Pitch, Roll, Velocity, Accelerations, Angular rates, Barometer, PPS • Direct AT_ITINS message with Position, Heading, Pitch & Roll to COBHAM AVIATOR UAV 200 • Direct Navigation Support for Pixhawk Flight Controllers as NMEA messages			
	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) • All: External Stand-Alone Magnetic Compass (SAMC/AHRS)			
	Main Features		Ideal solution for remote sensing (with LiDAR, Optical Camera)	High performance in long-term GPS-Denied environment	High precision Heading Tactical-grade IMU	Affordable price High precision Heading 1 cm RTK position
	Compatible with		Pixhawk Autopilot; Embention Autopilot; COBHAM AVIATOR UAV 200			
	Data rate	Hz	Up to 200 (INS data); Up to 2000 (IMU data)			Up to 200 (INS) & 2000 (IMU)
	Internal Data Logger (storage) - optional		64 GB			64 GB
	Start-up time	Sec	<1			<1
	POSITIONS AND VELOCITY	**UNITS**	**INS - B**	**INS - P**	**INS - D**	**INS - DL**
NAVIGATION	Horizontal position accuracy (GPS L1)	meters, RMS	1.5			1.5
	Vertical position accuracy (GPS L1)	meters, RMS	<1			<1
	Horizontal position accuracy (GPS L1/L2)	meters, RMS	1.2			1.2
	Horizontal position accuracy (SBAS)(1)	meters, RMS	0.6			0.6

INS SPECIFICATIONS

	POSITIONS AND VELOCITY	UNITS	INS - B	INS - P	INS - D	INS - DL
NAVIGATION	Horizontal position accuracy (DGPS)	meters, RMS	0.4			n/a
	Horizontal position accuracy (TerraStar-L) (2)	meters, RMS	0.4			n/a
	Horizontal position accuracy (TerraStar-C PRO) (2)	meters, RMS	0.025			n/a
	Horizontal position accuracy (TerraStar-X) (2)	meters, RMS	0.02			n/a
	Horizontal position accuracy (post-processing) (3)	meters, RMS	0.005			0.005
	Horizontal position accuracy (RTK)	meters, RMS	0.01 + 1 ppm			0.01 + 1 ppm CEP
	Vertical position accuracy (RTK)	meters, RMS	0.02			0.02 + 1ppm CEP
	Position accuracy (free inertial, land vehicles) (4)	%, DT	0.2% DT (using Tunnel Guide positional aiding references)			0.5% DT (using Tunnel Guide positional aiding references)
	Velocity accuracy, RMS	m/s RMS	0.03			0.05
	HEADING	**UNITS**	**INS - B**	**INS - P**	**INS - D**	**INS - DL**
ORIENTATION	Range	deg	0 to 360	0 to 360	0 to 360	0 to 360
	Static Accuracy (5)	deg RMS	1	0.4	0.15 (1 meter baseline) 0.08 (2 meters baseline)	0.4 (1 meter baseline) 0.2 (2 meters baseline)
	Dynamic Accuracy (GNSS) (8)	deg RMS	0.1	0.1		
	Post processing accuracy (3)	deg RMS	0.03	0.03	0.03	0.1
	PITCH & ROLL	**UNITS**	**INS - B**	**INS - P**	**INS - D**	**INS - DL**
	Range: Pitch, Roll	deg	±90, ±180			±90, ±180
	Angular Resolution	deg	0.01			0.01
	Static Accuracy in whole Temperature Range	deg RMS	0.05			0.08
	Dynamic Accuracy (8)	deg RMS	0.03			0.04
	Post processing accuracy (3)	deg RMS	0.006			0.01
	GYROSCOPES	**UNITS**	**INS - B**	**INS - P**	**INS - D**	**INS - DL**
IMU	Type		Tactical-grade			Tactical-grade
	Measurement range	deg/sec	±450 / ±950			±450 / ±950
	Bias in-run stability (RMS, Allan Variance)	deg/hr	1			3
	Bias error over temperature range (RMS)	deg/hr	<30			<50
	Angular Random Walk	deg/√hr	<0.2 (0.08 optional)			<0.3
	ACCELEROMETERS	**UNITS**	**INS - B**	**INS - P**	**INS - D**	**INS - DL**
	Type		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	0.005 (±8 g) / 0.02 (±15 g) / 0.03 (±40 g)			0.01 / 0.03 / 0.05
	Bias error over temperature range (RMS)	mg	0.5 (±8 g) / 0.7 (±15 g) / 1.2 (±40 g)			0.7 / 1.1 / 1.5
	Bias one-year repeatability	mg	1.0 (±8 g) / 1.3 (±15 g) / 1.5 (±40 g)			1.5 / 2.0 / 2.5
	Velocity Random Walk	m/s/√hr	0.015 (±8 g) / 0.035 (±15 g) / 0.045 (±40 g)			0.02 / 0.045 / 0.06
	MAGNETOMETERS	**UNITS**	**INS - B**	**INS - P**	**INS - D**	**INS - DL**
	Measurement range	Gauss	Optional	±1.6	Optional	Optional
	Bias in-run stability, RMS	nT		0.2		
	Noise density, PSD	nT√Hz		0.3		
	PRESSURE	**UNITS**	**INS - B**	**INS - P**	**INS - D**	**INS - DL**
	Measurement range	hPa	300 - 1100			300 - 1100
	Bias in-run stability (RMS, Allan Variance)	Pa	2			2
	Noise density	Pa/√Hz	0.8			0.8
	ENVIRONMENT	**UNITS**	**INS - B**	**INS - P**	**INS - D**	**INS - DL**
GENERAL	Operating temperature	deg C	-40 to +75			-40 to +70
	Storage temperature	deg C	-50 to +85			-50 to +85
	MTBF (GM @ +65degC)	hours	100,000			100,000
	Shock and Vibration		MIL-STD-810G			MIL-STD-810G
	EMC/EMI		MIL-STD-461F			MIL-STD-461F
	ELECTRICAL	**UNITS**	**INS - B**	**INS - P**	**INS - D**	**INS - DL**
	Supply voltage	V DC	9 to 36	9 to 36	9 to 36	9 to 36
	Power consumption	Watts	2.5 (3.5 with datalogger)	3.5 (4.5 with datalogger)	5 (6 with datalogger)	5 (6 with datalogger)
	Output Interface (options)		RS-232 / RS-422 / CAN / Ethernet / 2 x RS-232 / 2 x RS-422 / RS-232 + CAN + Ethernet / RS-422 + CAN + Ethernet			
	Protection (optional)		MIL-STD-1275			
	Output data format		Binary, NMEA 0183 ASCII characters			
	PHYSICAL	**UNITS**	**INS - B**	**INS - P**	**INS - D**	**INS - DL**
	Size	mm	120 x 50 x 53	120 x 50 x 53	120 x 50 x 53	120 x 50 x 53
	Weight	Gram	220	280	320	320

(1) GPS only
(2) Requires a subscription to a TerraStar data service
(3) RMS, incremental error growth from steady state accuracy. Post-processing results using third party software;
(4) Under ideal conditions that include proper static alignment and in-field dynamic motions during loss of GNSS signal;
(5) calibrated in whole operational temperature range, in homogeneous magnetic environment, for latitude up to ±65 deg;
(7) 50 Hz while tracking up to 20 satellites. 20 Hz position update rate for Basic model of INS;
(8) Dynamic accuracy may depend on type of motion;

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