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LOW COST DUAL ANTENNA GPS-AIDED INERTIAL NAVIGATION SYSTEMS (INS-DU)

DILABS®

The DILABS 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 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.

	RECEIVER OPTIONS AVAILABLE	UNITS	NovAtel OEM7720	uBlox ZED-F9P
SPECIFICATIONS	Available for		INS - DU (Optional)	INS - DU (Default)
	No of GNSS Antennas		Dual	Dual
	GNSS Constellations		GPS L1 C/A, L1C, L2C, L2P, L5; GLONASS L1 C/A, L2 C/A, L2P, L3, L5; BeiDouB1I, B1C, B2I, B2a, B3I; Galileo E1, E5 AltBOC, E5a, E5b, E6; NavIC (IRNSS) L5; QZSS L1 C/A, L1C, L2C, L5, L6; L-Band	GPS L1C/A L2C, GLONASS L1OF L2OF, Galileo E1B/C E5b, BeiDou B1I B2I, QZSS L1C/A L2C
	GNSS Corrections		WAAS; EGNOS; MSAS; GAGAN; SBAS L1, L5; DGPS; RTK; PPP Terrastar	WAAS; EGNOS; MSAS; GAGAN; SBAS L1C/A; DGPS; RTK
	Channel Configuration (1)		555	184
	GNSS Data Rate (1)	Hz	5 / 20 / 100	10, 20 (2)
	RTK Corrections		RTCM 2, RTCM 3	RTCM 3
	Velocity Accuracy	m/s	0.03	0.05
	Initialization Time	s	<39 (cold start), <20 (hot start)	<30 (cold start), <10 (hot start)
	Time Accuracy (clock drift) (3)	Nano sec	20	30

INS-DU SPECIFICATIONS

	PARAMETER	UNITS	INS - DU
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) • All: External Stand-Alone Magnetic Compass (SAMC/AHRS)
	Output Signals		• Horizontal and Vertical Positions, Heading, Pitch, Roll, Velocity, Accelerations, Angular rates, Barometric data, 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
	Main Features		Low Cost, Dual antenna Heading, 1 cm RTK position
	Data Rate (INS)	Hz	Up to 200 (user settable)
	Data Rate (IMU)	Hz	Up to 2000 (user settable)
	Start-up time	Sec	<1
	POSITIONS, VELOCITY AND TIMESTAMPS	**UNITS**	**INS - DU**
NAVIGATION	Horizontal position accuracy (SP1, L1), RMS	meters	1.5
	Horizontal position accuracy (SP1, L1, L2), RMS	meters	1.2
	Horizontal position accuracy (post processing) (1)	meters	0.005
	Horizontal position accuracy (RTK), RMS	meters	0.01 + 1 ppm CEP
	Vertical position accuracy (SP), RMS	meters	<2
	Vertical position accuracy (RTK), RMS	meters	0.02 + 1 ppm CEP
	Position accuracy (Free Inertial land vehicle) (2)	% / DT	1 (Tunnel Guide positional aiding references)
	Velocity accuracy, RMS	meters / sec	0.05
	PPS Timestamp accuracy (RTK), RMS	nano sec	20

INS-DU SPECIFICATIONS

	DUAL ANTENNA GNSS HEADING	UNITS	INS - DU		
ORIENTATION	Range	deg	0 to 360		
	Static / Dynamic Accuracy (INS-DU with Novatel OEM7720 receiver) (3)(6)	deg RMS	0.08 (2m baseline); 0.15 (1m baseline)		
	Static / Dynamic Accuracy (INS-DU with uBlox ZD9P receiver) (3)(6)	deg RMS	0.2 (2m baseline); 0.4 (1m baseline)		
	Post processing accuracy (INS-DU with Novatel OEM7720 receiver) (1)	deg RMS	0.05		
	Post processing accuracy (INS-DU with uBlox ZD9P receiver) (1)	deg RMS	0.1		
	PITCH & ROLL	**UNITS**	**INS - DU**		
	Range: Pitch, Roll	deg	±90, ±180		
	Angular Resolution	deg	0.01		
	Static Accuracy in whole Temperature Range	deg RMS	0.08		
	Dynamic Accuracy (6)	deg RMS	0.05		
	Post processing accuracy (1)	deg RMS	0.03		
	GYROSCOPES	**UNITS**	**INS - DU**		
IMU	Type		Industrial-grade		
	Measurement range	deg/sec	±2000		
	Bias in-run stability (RMS, Allan Variance)	deg/hr	2		
	Bias instability after INS initialization (RMS)	deg/hr	10		
	Bias instability over temperature range (RMS)	deg/hr	72		
	Angular Random Walk	deg/√hr	0.38		
	ACCELEROMETERS	**UNITS**	**INS - DU**		
	Type		Tactical-grade		
	Measurement range	g	±8 g	±15 g	±40 g
	Bias in-run stability (RMS, Allan Variance)	mg	0.01	0.03	0.05
	Bias instability over temperature range (RMS)	mg	0.7	1.1	1.5
	Bias one-year repeatability	mg	1.5	2.0	2.5
	Velocity Random Walk	m/s/√hr	0.02	0.045	0.06
	MAGNETOMETERS	**UNITS**	**INS - DU**		
	Measurement range	Gauss	±8.0		
	Bias in-run stability (Allan Variance)	µGauss	8		
	Power Spectral Density	µGauss /√Hz	15		
	SF Accuracy	%	0.05		
	PRESSURE	**UNITS**	**INS - DU**		
	Measurement range	hPa	300 - 1100		
	Bias in-run stability (RMS, Allan Variance)	Pa	2		
	Noise density	Pa/√Hz	0.8		
	ENVIRONMENT	**UNITS**	**INS - DU**		
ELECTRICAL & PHYSICAL	Operating temperature	deg C	-40 to +85		
	Storage temperature	deg C	-50 to +90		
	Type of Sealing		IP-67		
	MTBF	hours	55,500		
	ELECTRICAL	**UNITS**	**INS - DU**		
	Supply voltage	V DC	9 - 34		
	Power consumption	Watts	5 (6 with datalogger)		
	Output Interface (options)		RS-232 / RS-422 / CAN / Ethernet / Optional		
	Output data format		Binary, NMEA 0183 ASCII		
	PHYSICAL	**UNITS**	**INS - DU**		
	Size	mm	120 x 50 x 53		
	Weight	Gram	320		

(1) RMS, incremental error growth from steady state accuracy. Post-processing results using third party software; (2) Under ideal conditions that include proper static alignment and in-field dynamic motions during loss of GNSS signal; (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, (8 If tracking GPS only.

DILABS®

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