

# Single Antenna, GPS-Aided Inertial Navigation Systems INS-BU-OEM

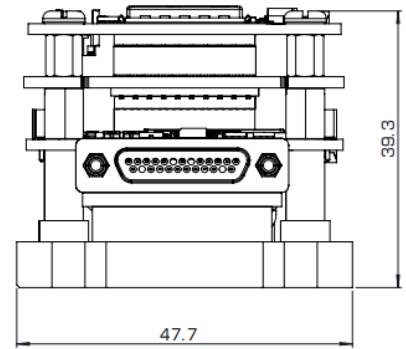
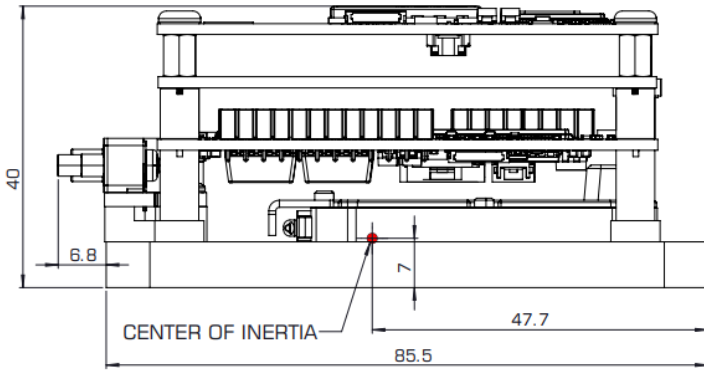


**INS-BU-OEM Specifications**

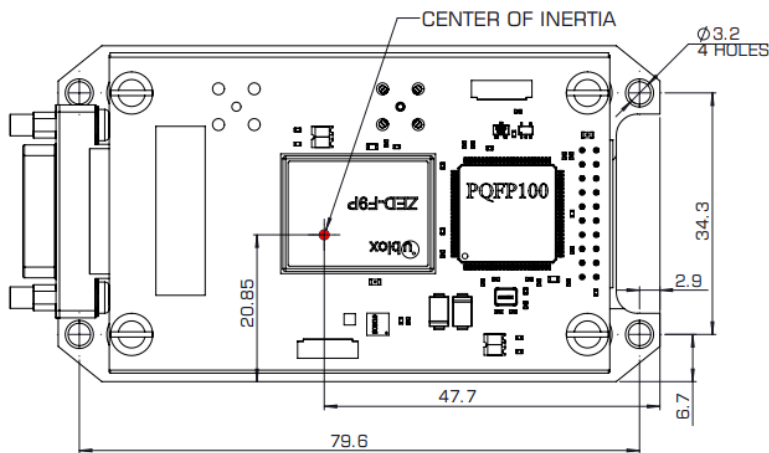
	Parameter	Units	INS-BU-OEM		
<b>General</b>	Input signals		<ul style="list-style-type: none"> <li>Marine application: DVL (Doppler Velocity Log)</li> <li>Land application: Odometer, Wheel sensor, Encoder, DMI</li> <li>Aerial application: Wind sensor, Air Speed Sensor, Doppler shift from locator (for long-term GPS denied)</li> <li>All: External Stand-Alone Magnetic Compass (SAMC/AHRS)</li> </ul>		
	Output signals		<ul style="list-style-type: none"> <li>Horizontal and Vertical Positions, Heading, Pitch &amp; Roll, Velocity, Accelerations, Angular rates, Barometric data, PPS</li> <li>Direct AT_ITINS message with Position, Heading, Pitch &amp; Roll to COBHAM AVIATOR UAV 200</li> </ul>		
	Main features		Low Cost, 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		
<b>Navigation</b>	<b>Positions, Velocity and Timestamps</b>		<b>INS-BU-OEM</b>		
	Horizontal position accuracy (SP, L1), RMS	meters	1.5		
	Horizontal position accuracy (SP, L1/L2), RMS	meters	1.2		
	Horizontal position accuracy (post processing) <sup>(2)</sup>	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		
	Velocity accuracy, RMS	meters/sec	0.05		
PPS timestamps accuracy	nano sec	20			
<b>Orientation</b>	<b>Heading</b>		<b>INS-BU-OEM</b>		
	Range	deg	0 to 360		
	Static Accuracy <sup>(3)</sup>	deg RMS, 1 $\sigma$	0.6		
	Dynamic accuracy (GNSS) <sup>(6)</sup>	deg RMS, 1 $\sigma$	0.3		
	Post processing accuracy <sup>(2)</sup>	deg RMS, 1 $\sigma$	0.1		
	<b>Pitch and Roll</b>		<b>INS-BU-OEM</b>		
	Range: Pitch, Roll	Deg	$\pm 90, \pm 180$		
	Angular Resolution	Deg	0.01		
	Static Accuracy in whole Temperature Range	deg, 1 $\sigma$	0.08		
	Dynamic Accuracy <sup>(6)</sup>	deg RMS, 1 $\sigma$	0.05		
Post processing accuracy <sup>(2)</sup>	deg RMS, 1 $\sigma$	0.03			
<b>GNSS receiver</b>	<b>GNSS receiver</b>		<b>INS-BU-OEM</b>		
	Number of GNSS Antennas		Single		
	Supported GNSS signals & corrections (optional)		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 <sup>(4)</sup>		184 Channels – F9 Engine		
	GNSS Positions data rate <sup>(5)</sup>	Hz	10, 20 <sup>(9)</sup>		
	RTK corrections		RTCM 3		
	GNSS Measurements (raw) data rate	Hz	20 <sup>(9)</sup>		
	Velocity accuracy, RMS	meters/sec	0.05		
Initialization time	Sec	<29 (cold start), <1 (hot start)			
Time accuracy (clock drift) <sup>(7)</sup>	nano sec	30			
<b>IMU</b>	<b>Gyroscopes</b>		<b>INS-BU-OEM</b>		
	Type		Industrial-grade		
	Measurement range	deg/sec	$\pm 2000$		
	Bias in-run stability (RMS, Allan Variance)	deg/hr, 1 $\sigma$	2		
	Bias instability after INS initialization (RMS)	deg/hr	10		
	Bias instability over temperature range (RMS)	deg/hr, 1 $\sigma$	72		
	Angular Random Walk	deg/ $\sqrt{\text{hr}}$ , 1 $\sigma$	0.38		
	<b>Accelerometers</b>		<b>INS-BU-OEM</b>		
	Type		Tactical-grade		
	Measurement range	g	$\pm 8$ g	$\pm 15$ g	$\pm 40$ g
	Bias in-run stability (RMS, Allan Variance)	mg, 1 $\sigma$	0.01	0.03	0.05
	Bias instability over temperature range (RMS)	mg, 1 $\sigma$	0.7	1.1	1.5
	Bias one-year repeatability	mg, 1 $\sigma$	1.5	2.0	2.5
	Velocity Random Walk	m/s/ $\sqrt{\text{hr}}$ , 1 $\sigma$	0.02	0.045	0.06
	<b>Magnetometers</b>		<b>INS-BU-OEM</b>		
	Measurement Rate	Gauss	$\pm 8.0$		
	Bias in-run stability (Allan Variance)	$\mu\text{Gauss}$ , 1 $\sigma$	8		
	Power Spectral Density	$\mu\text{Gauss}/\sqrt{\text{Hz}}$ , 1 $\sigma$	15		
	SF Accuracy	%, 1 $\sigma$	0.05		
	<b>Pressure</b>		<b>INS-BU-OEM</b>		
Measurement Rate	hPa	300 – 1100			
Bias in-run stability (RMS, Allan Variance)	Pa	2			
Noise Density	Pa/ $\sqrt{\text{Hz}}$	0.8			
<b>Electrical and Physical</b>	<b>Environment</b>		<b>INS-BU-OEM</b>		
	Operating temperature	deg C	-40 to +85		
	Storage temperature	deg C	-50 to +90		
	MTBF	hours	55,500		
	<b>Electrical</b>		<b>INS-BU-OEM</b>		
	Supply voltage	V DC	9 - 34		
	Power consumption	Watts	5 (6 with data logger)		
	Output Interface (options)		RS-232 or RS-422, CAN Ethernet (optional)		
	Output data format		Binary, NMEA 0183 ASCII		
	<b>Physical</b>		<b>INS-BU-OEM</b>		
Size	mm	85.5 x 47.7 x 39.3			
Weight	gram	174			

<sup>(2)</sup> RMS, incremental error growth from steady state accuracy. Post-processing results using third party software; <sup>(3)</sup> With converged Inertial filter; <sup>(4)</sup> tracks up to 60 L1/L2 satellites; <sup>(5)</sup> 50 Hz while tracking up to 20 satellites. 10 Hz position update rate for Basic model of INS; <sup>(6)</sup> dynamic accuracy may depend on type of motion; <sup>(7)</sup> time accuracy does not include biases due to RF or antenna delay, <sup>(8)</sup> 10 (GPS+GLO+GAL+BDS or GPS+GLO+GAL) and 20 (GPS only or GPS+GAL/GLO/BDS); <sup>(9)</sup> If tracking GPS only; 1 $\sigma$  specifications are manufactured to a controlled 3 $\sigma$  standard.

**INS-BU-OEM mechanical interface drawing (standard configuration)**



Device side: 25-pin connector  
MDSM-25PE-Z10-VR17



**Notes:**

1. All dimensions are in millimeters.
2. All dimensions within this drawing are subject to change without notice.
3. Weight and size are PN dependent. Customers should obtain the most recent 2D/3D files before designing any interface hardware.
4. Please contact Inertial Labs, Inc. if you need the INS unit to be delivered in a custom configuration with customized connector and output data.

**Product Code Structure:**

Model	Gyroscope	Accel	Calibration	Connector	Encoder	Stand Alone Magnetic Compass	Datalogger	GNSS receiver	Version	Interface
INS-BU-OEM	G2000	A8	TGA	C4	E (option)	SAMC	S64 (option)	ZF9P	V9	1
		A15	TMGA	C6						2
		A40		C8						4
										5
										11
										22
										124
										145
										245
										1245

Example: INS-BU-OEM-G2000-A15-TMGA-C8-S64-ZF9P-VD9.1245

**Product code details:**

- INS-BU-OEM: Low Cost Ublox Based GPS-Aided Inertial Navigation System Utilizing MiniAHRS
- G2000: Gyroscopes measurement range = ±2000 deg/sec
- A8: Accelerometers measurement range = ±8 g -> recommended for applications with low level of operational vibrations
- A15: Accelerometers measurement range ±15 g -> recommended for applications with medium level of operational vibrations
- A40: Accelerometers measurement range ±40 g -> recommended for high dynamic applications or/and with high level of vibration
- TGA: Gyroscopes and Accelerometers
- TMGA: Magnetometers, Gyroscopes and Accelerometers
- C4: Aluminum Base Plate - 26 pin header and ribbon cable (20021121-00026T4LF by Amphenol)
- C6: Aluminum Base Plate - 14 pin screw-lock connector (M80-5401442 by Harwin)
- C8: Aluminum Base Plate - 25-pin micro D-SUB connector with screw lock (MDSM-25PE-Z10-VR17 by ITT Cannon)
- E: Encoder support
- SAMC: Supports external Stand-Alone Magnetic Compass (optional; only supports interfaces .124)
- S64: 64GB embedded Data Logger (optional)
- ZF9P: uBlox ZED-F9P, Dual-Frequency, Multi-Constellation, RTK Capable GNSS Receiver
- V9: GPS L1/L2, GLO L1/L2, BDS B1/B2, GAL E1/E5, QZSS L1/L5, SBAS, RTK, Single GNSS Heading, GNSS measurements, GNSS positions (Single Antenna GNSS Receiver only)
- VX.1: RS-232 interface
- VX.2: RS-422 interface
- VX.4: CAN interface
- VX.5: Ethernet interface
- VX.11: two RS-232 interfaces
- VX.22: two RS-422 interfaces
- VX.124: RS-232, RS-422 and CAN interfaces
- VX.145: RS-232, CAN and Ethernet interfaces (with optional Encoder support)
- VX.245: RS-422, CAN and Ethernet interfaces (without Encoder support)
- VX.1245: RS-232, RS-422, CAN and Ethernet interfaces