



High Performance Advanced MEMS Inertial Measurement Units

IMU-P A



- Designed for Guidance and Navigation
- ITAR free (ECCN 7A994 - No License Required)
- 1 deg/hr Gyro Bias in-run stability
- 0.2 deg/vhr Angular Random Walk
- up to ± 90 g accelerometers dynamic range
- 5 μ g Accelerometers Bias in-run stability
- 0.015 m/s/vhr Velocity Random Walk
- 0.05 deg Pitch & Roll accuracy
- Optional input from external GNSS
- Affordable price

Datasheet



The **Inertial Labs Inertial Measurement Unit (IMU-P)** is an Advanced MEMS sensor-based, compact, self-contained strapdown, industrial and tactical grade Inertial Measurement Systems and Digital Tilt Sensor that measures linear accelerations, angular rates, Pitch & Roll with three-axis high-grade MEMS accelerometers and three-axis tactical grade MEMS gyroscopes. Angular rates and accelerations get accurately determined for both motionless and dynamic applications. The Inertial Labs IMU-P is a breakthrough, fully integrated inertial solution that combines the latest MEMS sensors technology.



Fully calibrated, temperature compensated, and mathematically aligned to an orthogonal coordinate system, IMU demonstrates less than 1 deg/hr gyroscopes and 0.005 mg accelerometers bias in-run stability with very low noise and high reliability.

Continuous Built-in Test (BIT), configurable communications protocols, electromagnetic interference (EMI) protection, and flexible input power requirements make the **Inertial Labs IMU-P** easy to use in a wide range of higher-order integrated system applications.

The **Inertial Labs IMU-P** models can get aiding data from an external source of GNSS and then output a full spectrum of INS data (Positions, Attitude, Velocity, and Time).

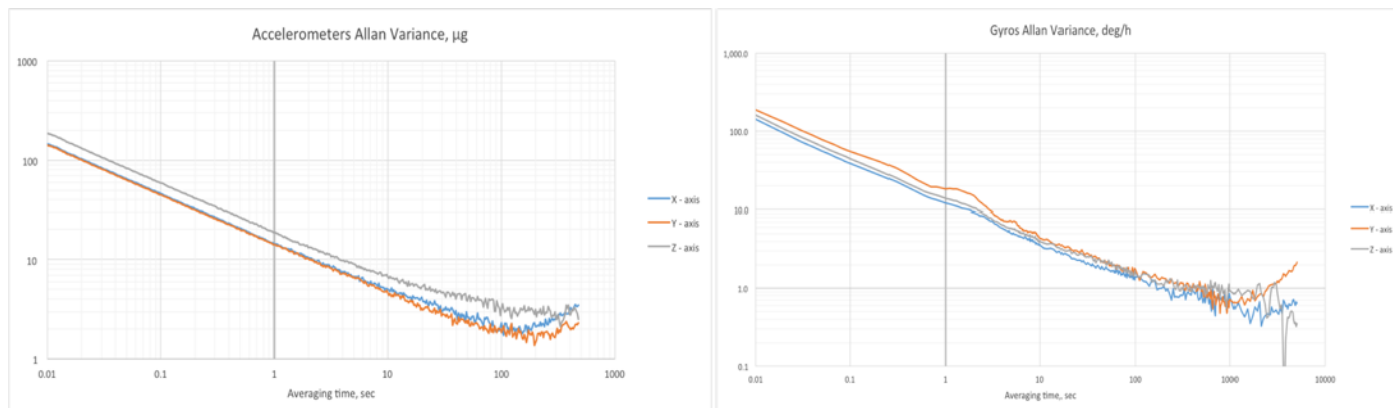
The **Inertial Labs IMU-P** was designed for applications, like:

- ❖ Antenna and Line of Sight Stabilization Systems
- ❖ Passenger's trains acceleration / deceleration and jerking systems
- ❖ Motion Reference Units (MRU)
- ❖ Motion Control Sensors (MCS)
- ❖ Gimbals, EOC/IR, platforms orientation and stabilization
- ❖ GPS-Aided Inertial Navigation Systems (INS)
- ❖ Attitude and Heading Reference Systems (AHRS)
- ❖ Land vehicles navigation and motion analysis
- ❖ Buoy or Racing Boat Motion Monitoring
- ❖ UAV & AUV/ROV navigation and control



Parameter	IMU-P Tactical A
GYROSCOPES	
Gyroscopes Bias in-run stability	1 deg/hr
Gyroscopes Bias residual error	30 deg/hr
Gyroscopes Angular Random Walk	0.2 deg/√hr
ACCELEROMETERS (±8 g range)	
Accelerometers Bias in-run stability	0.005 mg
Accelerometers Bias residual error	0.5 mg
Accelerometers Velocity Random Walk	0.015 m/sec/√hr
PITCH & ROLL	
Pitch & Roll static accuracy, RMS	0.05 deg
Pitch & Roll dynamic accuracy, RMS	0.08 deg

IMU-P Gyroscopes & Accelerometers Key Performance



Inertial Labs IMU-P key applications



UAV, Loitering Munitions, Glide Bombs



Remote Weapon Stations, EOS stabilization



Aerospace



Autonomous vehicles



Land vehicles navigation systems



Remote sensing (mapping, photogrammetry)



Construction equipment motion control



Antenna stabilization



Precision Agriculture

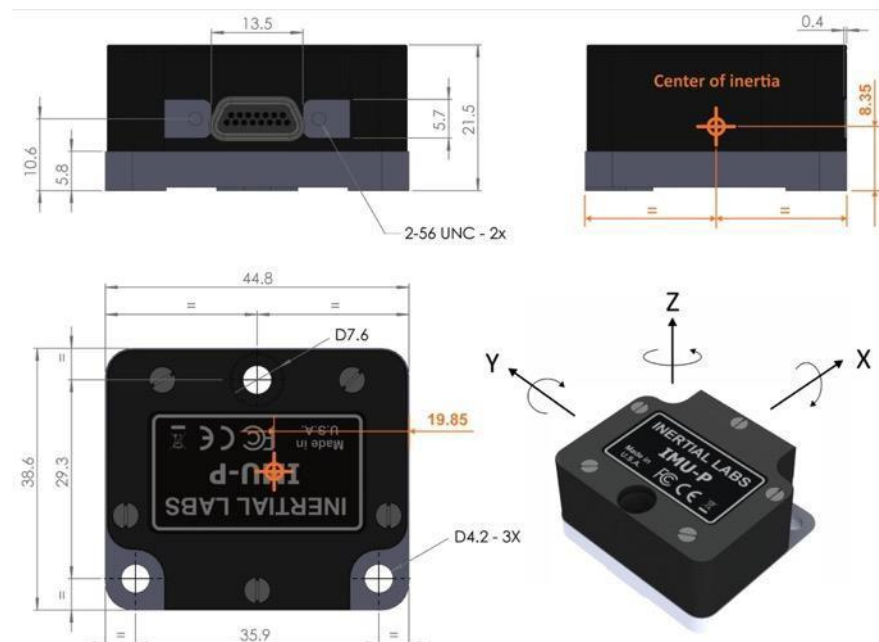
Parameter	Units	IMU-P TACTICAL A	IMU-P INDUSTRIAL A						
									
Output signals		Accelerations, Angular rates, Pitch, Roll, Relative Heading, Temperature Synchronization output							
Available colors of enclosure		Black, Desert Tan or Green							
Data update rate	Hz	2000 Hz	2000 Hz						
Start-up time	sec	< 1	< 1						
Full Accuracy Data (Warm-up Time)	sec	<5 (max)	<5 (max)						
Gyroscopes		IMU-P Tactical A	IMU-P Industrial A						
Measurement range	deg/sec	±450 / ±950 / ±2000							
Bandwidth (-3dB)	Hz	260	260						
Data update rate	Hz	2000	2000						
Bias in-run stability (Allan Variance, RMS)	deg/hr	1	3						
Bias repeatability (turn-on to turn-on, RMS)	deg/hr	15	30						
Bias instability (over temperature range, RMS)	deg/hr	30	50						
SF accuracy (over temperature range)	ppm	1000	4000						
Noise. Angular Random Walk (ARW)	deg/√hr	0.2	0.3						
Non-linearity	ppm	100	200						
Axis misalignment	mrad	0.5	0.5						
Accelerometers		IMU-P Tactical A	IMU-P Industrial A						
Measurement range	g	±8	±15	±40	±90				
Bandwidth (-3dB)	Hz	260	260	260	260				
Bias in-run stability (RMS, Allan Variance)	mg	0.005	0.02	0.03	1	0.01	0.03	0.05	1
Bias instability (in temperature range, RMS)	mg	0.5	0.7	1.2	200	0.7	1.1	1.5	200
Bias one-year repeatability	mg	1.0	1.3	1.5	200	1.5	2.0	2.5	200
SF accuracy (over temperature range)	ppm	150	300	500	2000	500	700	850	2000
SF one-year repeatability	ppm	500	1300	1500	2000	800	1400	1700	2000
Noise. Velocity Random Walk (VRW)	m/sec/√hr	0.015	0.035	0.045	15	0.02	0.045	0.06	15
Non-linearity	ppm	150	150	150	3000	340	800	1000	3000
Axis misalignment	mrad	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Inclinometer		IMU-P Tactical A	IMU-P Industrial A						
Measurement range, Pitch / Roll	deg	±90 / ±180							
Resolution	deg	0.01							
Static accuracy, RMS	deg	0.05							
Dynamic accuracy, RMS	deg	0.08							
Environment		IMU-P Tactical A	IMU-P Industrial A						
Mechanical shock	g, s	40, 0.011 half-sine pulse							
Vibration	g, Hz	7, 20 – 2000							
Environmental Protection	-	IP67							
Operating temperature	deg C	-40 to +85							
Storage temperature	deg C	-50 to +90							
Low pressure	Pa, min	1750, 30							
Humidity	%	up to 95							
MTBF (G _M @+65degC, operational)	hours	100,000							
Life time (operational)	years	10							
Life time (storage)	years	17							
Electrical		IMU-P Tactical A	IMU-P Industrial A						
Supply voltage	V DC	5 to 30							
Power consumption	Watts	0.8 @ 5V							
Output Interface	-	RS-422/RS-232/RS-485							
Output data format	-	Binary, ASCII characters							
EMC/EMI/ESD		STD-461G							
Mechanical		IMU-P Tactical A	IMU-P Industrial A						
Size	mm	39 x 45 x 22							
Weight	gram	70							
Custom enclosure and connector	custom	Available							

Additional output parameters in case of input from external GNSS aiding* data:

Parameters with GNSS aiding data			IMU-P Tactical A	IMU-P Industrial A
Horizontal Positions (GPS denied, land vehicles, % of Distance Traveled)	%, DT		0.2	0.75
Output parameters	-	Horizontal & Vertical Positions (LAT, LONG); Heading, Pitch, Roll, Velocity, PPS time, IMU data		
Horizontal Positions (GNSS enable), RMS	meters	1.5 (SP, L1) / 1.2 (SP, L1/L2)/ 0.6 (SBAS) / 0.4 (DGPS) / 0.01 (RTK)		
Vertical Positions (GNSS enable), RMS	meters	1.5 (SP) / 0.02 (RTK)		
Velocity accuracy, RMS	m/sec	0.03	0.03	
Heading (dynamic, aiding data from single GNSS antenna receiver)	deg	0.2	0.2	
Heading (dynamic & static, aiding data from dual GNSS antenna receiver)	deg	0.08 (2 meters baseline)	0.08 (2 meters baseline)	
Heading (dynamic, GNSS denied), RMS	deg/sec	0.008	0.01	
Pitch & Roll (dynamic, GNSS enable), RMS	deg	0.03	0.05	
Pitch & Roll (dynamic, GNSS denied), RMS	deg	0.08	0.08	

* According Inertial labs ICD (Interface Control Document)

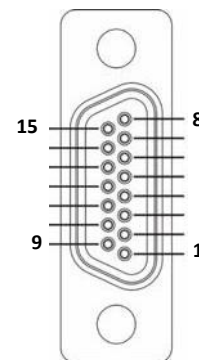
IMU-P mechanical interface description



Notes:

- All dimensions are in millimeters
- All dimensions within this drawing are subject to change without notice
- Customers should obtain final drawings before designing any interface hardware
- Please contact Inertial Labs, Inc. if you need IMU-P to be delivered in a custom enclosure/case with customized connector and output data

IMU-P Electrical interface description



Pin	Name	Description
1	STxD-	RS422 inverted output
2	SRxD-	RS422 inverted input
3	NC	Do not connect
4	TOV	Time of Validity output. Leave floating if not used. Open drain output pulled up to VDD via 10K.
5	RESET	Reset input. Leave floating if not used. Active low input, pulled up to VDD.
6	NC	Do not connect
7	NC	Do not connect
8	VDD	Power input
9	STxD+	RS422 non-inverted output
10	SRxD+	RS422 non-inverted input
11	EXTRIG	External trigger input. Pulled up to VDD via 10K, leave floating if not used.
12	Rx232	RS-232
13	Tx232	RS-232
14	NC	Do not connect
15	GND	Supply and signal ground

IMU-P part number description

IMU-P	-	G450	-	A8	-	TGA	-	C1	-	B	-	V1A	.12
		G950		A15						G		V2A	.13
		G2000		A40						D			
				A8A90									
				A15A90									
				A40A90									

Model	IMU-P	Inertial Measurement Unit, Professional version
Gyroscopes dynamic range	G450	±450 deg/sec measurement range (Tactical "A" and Tactical "S")
	G950	±950 deg/sec measurement range (Tactical "A" only)
	G2000	±2000 deg/sec measurement range (Tactical "A" only)
Accelerometers dynamic range	A8	±8 g measurement range
	A15	±15 g measurement range
	A40	±40 g measurement range
	A8A90	±8 g and ±90 g measurement range (all models except Tactical, model S)
	A15A90	±15 g and ±90 g measurement range (all models except Tactical, model S)
	A40A90	±40 g and ±90 g measurement range (all models except Tactical, model S)
Temperature calibration	TGA	Gyroscopes & Accelerometers are calibrated
Enclosure	C1	Aluminum Enclosure
Color of enclosure	B	Black (default)
	G	Green
	D	Desert tan
Grade	V1A	Tactical grade. Model A: guidance & navigation
	V2S	Industrial grade
Interface	.12	RS-232 and RS-422
	.13	RS-232 and RS-485