MEMS avanzati con alte prestazioni per utilizzo tattico e industriale Unità di misura inerziali

IMU-P

- ITAR free (ECCN 7A994 – Nessuna licenza richiesta)
- Per stabilizzazione (S) e guida (A)
- Stabilità in corsa di 1 deg/hr Gyro Bias
- 0.08 deg/√hr Random Walk Angolare
- Range dinamico accelerometri ±40 g
- Stabilità Diagonale accelerometri 5 µg in corsa
- 0.015 m/s/√hr Velocità Random Walk
- 0.05 deg accuratezza Pitch & Roll

Datasheet
Rev. 3.0

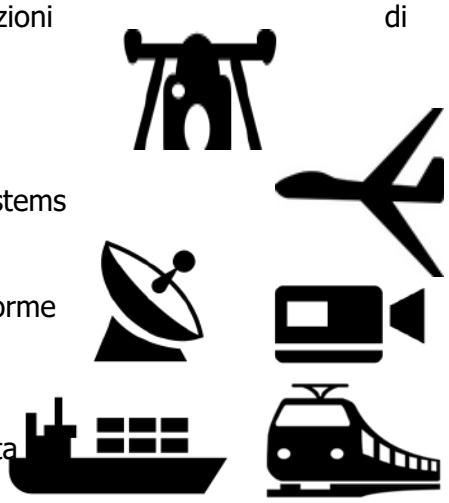
MILANO SYSTEMS
ADVANCED TECHNOLOGICAL SYSTEMS

L'Inertial Labs Inertial Measurement Unit (IMU-P) è un sistema di misurazione inerziale di livello industriale e tattico basato su sensori MEMS, strapdown compatto, autonomo e sensore di inclinazione digitale, che misura accelerazioni lineari, velocità angolari, Pitch & Roll con tre - accelerometri MEMS di alta qualità e giroscopi MEMS di grado tattico a tre assi. Le velocità angolari e le accelerazioni sono determinate con elevata precisione sia per applicazioni immobili che dinamiche.

Inertial Labs IMU-P è una soluzione inerziale completamente integrata che combinana la più recente tecnologia dei sensori MEMS.

Completamente calibrato, compensato in temperatura, allineato matematicamente a un sistema di coordinate ortogonali, IMU sfrutta giroscopi a meno di 1 grado / ora e accelerometri da 0,005 mg dalla stabilità in-run con rumore molto basso e alta affidabilità.

Il Continuous Built-in Test (BIT), i protocolli di comunicazione configurabili, la protezione dalle interferenze elettromagnetiche (EMI) e i requisiti di alimentazione in ingresso dedicati rendono gli Inertial Labs IMU-P facili da usare in una vasta gamma di applicazioni di sistemi integrati di ordine superiore.



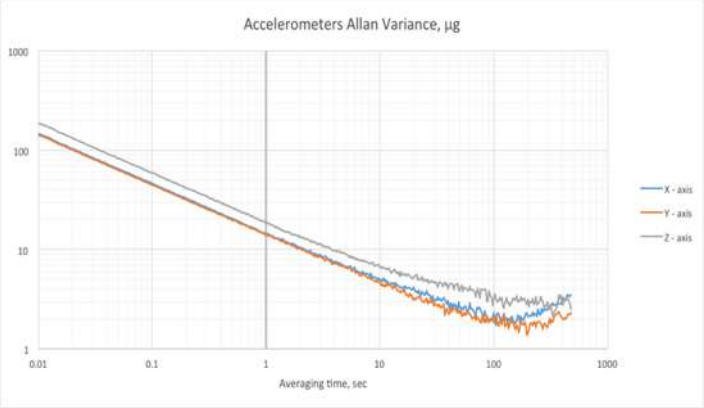
Inertial Labs IMU-P è stato progettato per applicazioni come:

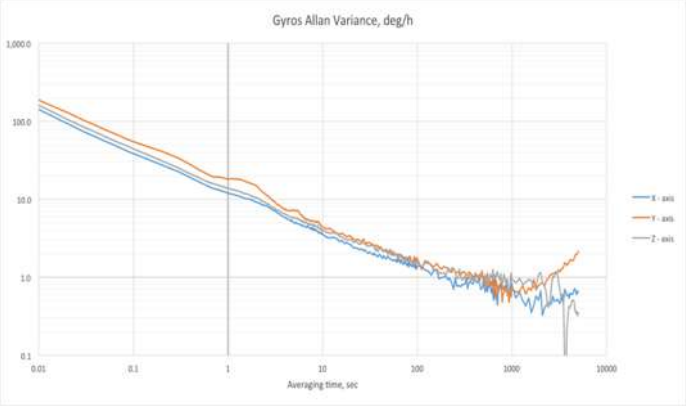
- Antenne e sistemi di stabilizzazione della linea di tiro
- accelerazione / decelerazione di treni passeggeri e jerking systems
- Motion Reference Units (MRU)
- Motion Control Sensors (MCS)
- Gimbals, EOC/IR, orientamento e stabilizzazione delle piattaforme
- Sistemi di navigazione inerziale con GPS (INS)
- Attitude and Heading Reference Systems (AHRS)
- Navigazione di veicoli terrestri e analisi di movimento
- Monitoraggio del movimento della boa o della barca da regatta
- Navigazione e controllo di UAV & AUV/ROV

Parameter	IMU-P "Tactical" Standard A	IMU-P "Tactical" Stabilization S	IMU-P "Industrial"
GYROSCOPES (±450 deg/sec range)			
Gyroscopes Bias in-run stability	1 deg/hr	2 deg/hr	3 deg/hr
Gyroscopes Noise - Angular Random Walk	0.2 deg/√hr	0.08 deg/√hr	0.3 deg/√hr
ACCELEROMETERS (±8 g range)			
Accelerometers Bias in-run stability	0.005 mg	0.01 mg	0.01 mg
Accelerometers Noise - Velocity Random Walk	0.015 m/sec/√hr	0.018 m/sec/√hr	0.018 m/sec/√hr
PITCH & ROLL			

Pitch & Roll static accuracy, RMS	0.05 deg	0.05 deg	0.05 deg
Pitch & Roll dynamic accuracy, RMS	0.08 deg	0.08 deg	0.08 deg

Giroscopi e accelerometri IMU-P Prestazioni chiave





Applicazioni chiave IMU-P di Inertial Labs

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

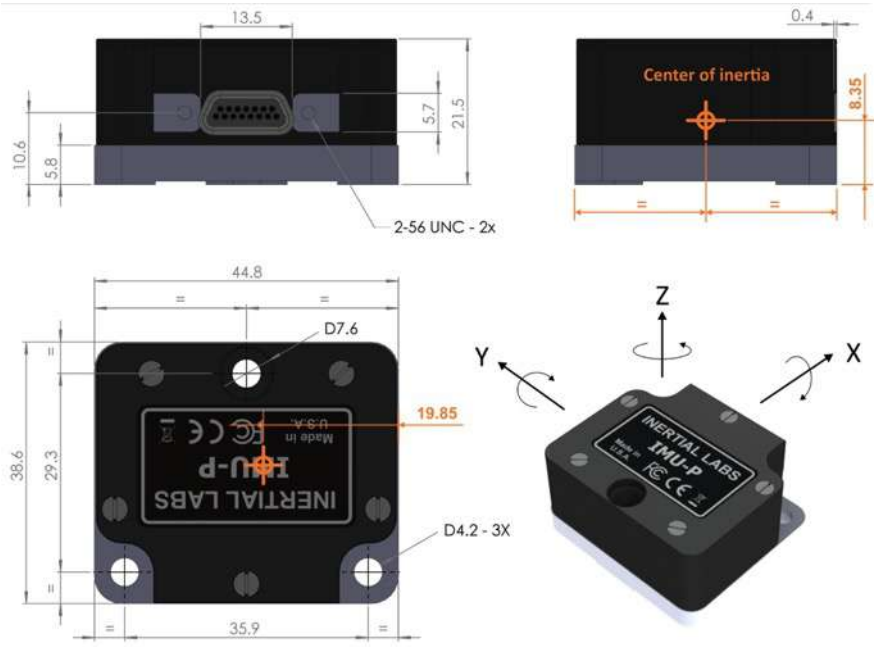
Antenna stabilization

Precision Agriculture

Parameter	Units	IMU-P TACTICAL			IMU-P INDUSTRIAL		
							
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)**			**IMU-P**		
		Standard A	**Stabilization S**		**Industrial**		
Measurement range	deg/sec	±450; ±950	±450; ±950		±450; ±950		
Bandwidth (-3dB)	Hz	260	260		260		
Data update rate	Hz	2000	2000		2000		
Bias in-run stability (Allan Variance, RMS)	deg/hr	1	2		3		
Bias repeatability (turn-on to turn-on, RMS)	deg/hr	15	20		30		
Bias instability (over temperature range, RMS)	deg/hr	30	35		50		
SF accuracy (over temperature range)	%	0.1	0.3		0.4		
Noise. Angular Random Walk (ARW)	deg/√hr	0.2	0.08		0.3		
Non-linearity	ppm	100	200		200		
Axis misalignment	mrad	0.15	0.15		0.15		
Accelerometers		**IMU-P (Tactical)**			**IMU-P (Industrial)**		
Measurement range	g	±8	±15	±40	±8	±15	±40
Bandwidth (-3dB)	Hz	260	260	260	260	260	260
Bias in-run stability (RMS, Allan Variance)	mg	0.005	0.02	0.03	0.01	0.03	0.05
Bias instability (in temperature range*, RMS)	mg	0.5	0.7	1.2	0.7	1.1	1.5
Bias one-year repeatability	mg	1.0	1.3	1.5	1.5	2.0	2.5
SF accuracy (over temperature range)	ppm	150	300	500	500	700	850
SF one-year repeatability	ppm	500	1300	1500	800	1400	1700
Noise. Velocity Random Walk (VRW)	m/sec/√hr	0.015	0.035	0.045	0.02	0.045	0.06
Non-linearity	%	0.015	0.015	0.015	0.034	0.08	0.1
Axis misalignment	mrad	0.1	0.1	0.15	0.15	0.15	0.2
Inclinometer		**IMU-P (Tactical)**			**IMU-P (Industrial)**		
Measurement range, Pitch / Roll	deg	±90 / ±180			±90 / ±180		
Resolution	deg	0.01			0.01		
Static accuracy, RMS	deg	0.05			0.05		
Dynamic accuracy, RMS	deg	0.08			0.08		
Environment		**IMU-P (Tactical)**			**IMU-P (Industrial)**		
Mechanical shock (MIL-STD-810G)	g	1500			1500		
Vibration (MIL-STD-810G)	g, Hz	7, 5 – 2000			7, 5 – 2000		
Operating temperature	deg C	-40 to +85			-40 to +85		
Storage temperature	deg C	-50 to +90			-50 to +90		
MTBF (G_M @+65degC, operational)	hours	100,000			100,000		
Electrical		**IMU-P (Tactical)**			**IMU-P (Industrial)**		
Supply voltage	V DC	5 to 30			5 to 30		
Power consumption	Watts	0.8 @ 5V			0.8 @ 5V		
Output Interface	-	RS-422/RS-232			RS-422/RS-232		
Output data format	-	Binary, ASCII characters, STIM-300 output format			Binary, ASCII characters, STIM-300 output format		
EMC/EMI/ESD		MIL-STD-461G			MIL-STD-461G		
Mechanical		**IMU-P (Tactical)**			**IMU-P (Industrial)**		
Size	mm	39 x 45 x 22			39 x 45 x 22		
Weight	gram	70			70		

IMU version using customized case & connector	custom	Available	Available

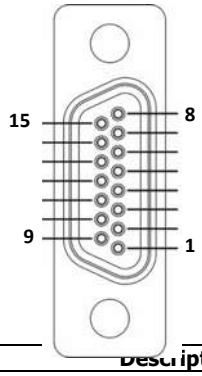
IMU-P mechanical interface description



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

Tactical	IMU-P	-	G450	-	A8	-	TGA	-	C1	-	B	-	V1A.X	VY.1
Industrial			G950		A15						G		V1S.X	VY.2
					A40						D		V2.X	VY.12

Model	IMU-P	Inertial Measurement Unit, Professional version
Gyroscopes dynamic range	G450	±450 deg/sec measurement range
	G950	±950 deg/sec measurement range
Accelerometers dynamic range	A8	±8 g measurement range
	A15	±15 g measurement range
	A40	±40 g measurement range
Temperature calibration	TGA	Gyroscopes & Accelerometers are calibrated
Enclosure	C1	Aluminum Enclosure
Color of enclosure	B	Black (default)
	G	Green
	D	Desert tan
Grade	V1A.X	Tactical grade. Standard A: guidance & navigation
	V1S.X	Tactical grade. Stabilization S: stabilization & pointing
	V2.X	Industrial grade
Interface	VY.1	RS-232
	VY.2	RS-422
	VY.12	RS-232 and RS-422