Inertial Labs
Attitude is Everything

MEMS
Inertial Measurement Unit
KERNEL-201

Datasheet

The **Inertial Labs MEMS Inertial Measurement Unit**, model **KERNEL-201** is the latest addition to the Inertial Labs Advanced Miniature MEMS sensor-based IMU family. Revolutionary due to its very compact, self-contained strapdown, industrial-grade Inertial Measurement Systems that measures linear accelerations and angular rates with three-axis MEMS accelerometers and three-axis MEMS gyroscopes. Angular rates and accelerations are determined with low noise and very good repeatability for both motionless and dynamic applications.

The **Inertial Labs KERNEL-201** is a breakthrough, fully integrated inertial solution that combines the latest MEMS sensor technologies. Fully calibrated, temperature compensated, mathematically aligned to an orthogonal coordinate system, the IMU contains up to 0.65 deg/hr Bias in-run stability gyroscopes and 0.015 mg Bias in-run stability accelerometers with ±40 g dynamic range, very low noise and high reliability.

Continuous Built-in Test (BIT), configurable communications protocols and flexible input power requirements make the **Inertial Labs KERNEL-201** easy to use in a wide range of higher order integrated system applications.



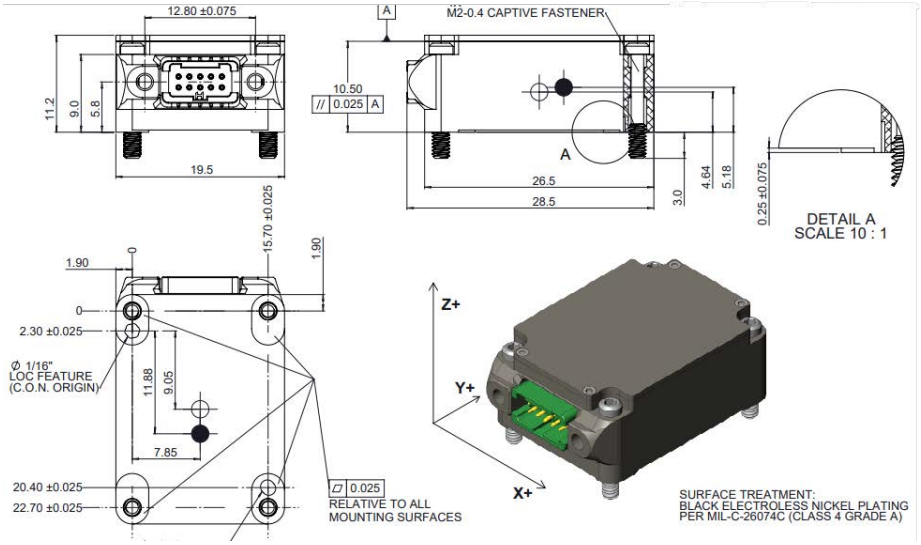
The **Inertial Labs KERNEL-201** models were designed for applications, like:

- Autonomous vehicles
- Antenna and Line of Sight Stabilization Systems
- Passengers trains acceleration / deceleration and jerking systems
- Motion Reference Units (MRU) and 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

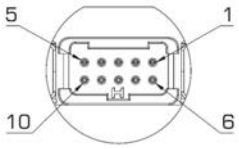
Parameter	KERNEL-201
GYROSCOPES	
Measurement range	±450 deg/sec (optionally ±4000 deg/sec)
Gyroscopes Bias in-run stability	0.7 deg/hr
Gyroscopes Bias instability (over temperature range)	<40 deg/hr
Gyroscopes Noise - Angular Random Walk	0.065 deg/√hr
ACCELEROMETERS	
Measurement range	±8g
Accelerometers Bias in-run stability	0.015 mg
Accelerometers Bias instability (over temperature range)	0.7 mg
Accelerometers Noise - Velocity Random Walk	0.015 m/sec/√hr

	Parameter	Units	KERNEL-201
GENERAL	Output signals		Accelerations, Angular Rates, Temperature, Synch
	Color of Enclosure		Black
	Update rate and data rate	Hz	4000
	Start-up time	milli sec	<1.5
	Full Accuracy Data (Warm-up Time)	sec	<0.5
	Latency	milli sec	<1.1
	Gyroscopes	**Units**	**KERNEL-201**
PERFORMANCE	Measurement range	deg/sec	±450 (optionally ±4000 deg/sec)
	Bandwidth (-3dB)	Hz	500
	Data update rate	Hz	4000
	Bias in-run stability (Allan Variance)	deg/hr, 1σ	0.7
	Bias residual error (over temperature range)	deg/hr, 1σ	30
	SF accuracy (over temperature range)	ppm, 1σ	200
	Noise. Angular Random Walk (ARW)	deg/√hr	0.065
	Non-linearity	ppm	<200
	Axis misalignment	mrad	0.5
	Accelerometers	**Units**	**KERNEL-201**
	Measurement range	g	±8 / ±40
	Bandwidth (-3dB)	Hz	1000
	Data update rate	Hz	4000
	Bias in-run stability (RMS, Allan Variance)	mg, 1σ	0.005 / 0.025
	Bias residual error (over temperature range)	mg, 1σ	0.7 / 1.1
	Bias one-year repeatability	mg, 1σ	1.5 / 2.0
	SF accuracy (over temperature range)	ppm, 1σ	500 / 700
	SF one-year repeatability	ppm, 1σ	800 / 1400
	Noise. Velocity Random Walk (VRW)	m/sec/√hr	0.015 / 0.045
	Non-linearity	ppm	340 / 800
	Axis misalignment	mrad	0.5
	Environment	**Units**	**KERNEL-201**
ELECTRICAL & MECHANICAL	Mechanical shock (MIL-STD-810G)	g, msec	400 g, 0.1 ms
	Vibration (MIL-STD-810G)	g RMS, Hz	8, 10 – 2000
	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	**Units**	**KERNEL-201**
	Supply voltage	V DC	5 to 25
	Power consumption	Watts	0.22 @ 5V
	Output Interface	-	RS-422
	Output data format	-	Binary, ASCII, KERNEL-100
	Physical	**Units**	**KERNEL-201**
	Size	mm	28.5 x 19.5 x 11.2
	Weight	grams	10

KERNEL-201 Mechanical Interface Descriptions



Electrical Interface Descriptions



1	POWER	POWER SUPPLY INPUT
2	BOOT	DO NOT CONNECT
3	1PPS	1PPS INPUT
4	RS422-A	RS-422 NON-INVERTING INPUT
5	RS422-B	RS-422 INVERTING INPUT
6	GROUND	POWER SUPPLY RETURN
7	TOV	TIME OF VALIDITY OUTPUT
8	EXTRIG	EXTERNAL TRIGGER INPUT
9	RS422-Y	RS-422 NON-INVERTING INPUT
10	RS422-Z	RS-422 INVERTING INPUT

KERNEL-201 Part Numbers Description

Model	Gyroscope	Accel	Calibration	Connector	Color	Version	Interface
KERNEL-201	G450 (default)	A8	TGA	C12	B	V1	2
	G4000 (option)	A40					

- G450: Gyroscopes measurement range = ±450 deg/sec (default)
- G4000: Gyroscopes measurement range = ±4000 deg/sec (option)
- A8: Accelerometers measurement range = ±8 g
- A40: Accelerometers measurement range = ±40 g
- TGA: Gyroscopes and Accelerometers are calibrated over temperature range
- C12: Aluminum case (with captive screws)
- B: Color – Black
- V1: Version 1
- VX.2: RS-422 interface

Example: KERNEL-201-G450-A40-TGA-C12-B-V1.2