**INERTIAL LABS**

SUBMINIATURE
3D ORIENTATION SENSOR
OS3DM

The **Inertial Labs™ OS3DM** is a multi-purpose sub-miniature 3D orientation sensor designed for use in real-time orientation tracking applications. It includes three types of sensing elements: tri-axial MEMS Gyroscopes, tri-axial MEMS Accelerometers, and tri-axial magneto-resistive Magnetometers. The **OS3DM** also comes equipped with an onboard processor and embedded orientation algorithms allowing for direct integration into systems without interfacing a PC. Additionally, for PC-based integrations, the system comes with a set of libraries that allow the customer to modify algorithm and/or sensor parameters on-the-fly to more closely match the needs of individual applications.
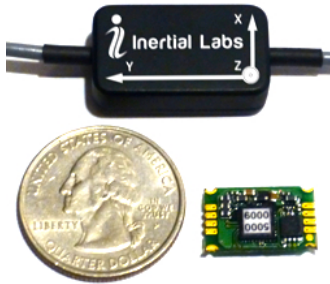
Applications

- Motion Capture Systems
- Military Training and Head Tracking Systems
- Helmets Orientation Systems
- micro UAV
- mini Electro Optical Systems

KEY FEATURES AND FUNCTIONALITY

- Real-time Heading, Pitch and Roll orientation information
- Sub-miniature size, lightweight and low power consumption (16×10×3.5mm; 2 gram; 0.07W)
- Static Accuracy better than 0.2 deg in Pitch/Roll and 1 deg in Heading
- No export restrictions. Export Classification: Commerce ECCN7A994
- State-of-the-art algorithms for different dynamic motions of Motion Capture, Training, Head Traking and Helmets Orientation Systems, micro UAV and small Electro Optical System
- Ideal solution for Virtual Reality Systems
- Gyro-Stabilized Slaved Magnetic Heading
- Embedded 2D and 3D magnetic calibration on hard and soft iron
- Up to 500Hz data update rate
- Environmentally sealed (IP67)

Data from the Gyroscopes, Accelerometers, and Magnetometers, as well as the internal temperature sensor are gathered and processed by the on-board digital signal processor (DSP). The fusion algorithm processes these data and outputs the final orientation solution directly from the sensor. Data of the following types can be requested: raw inertial sensors data and/or quaternion data.

Each **OS3DM** module is individually calibrated in a special non-magnetic laboratory where reference accelerations, angular rates, and magnetic fields are applied to the device and measured at constant temperature. Additionally, temperature cycling is performed to obtain temperature calibration parameters for the gyro and accelerometer elements. Once fielded, **OS3DM** is able to be customer calibrated against soft- and hard-iron interference present in the end application.

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OS3DM Specifications

Parameter	Units	Value
Output signals		Accelerations, Angular rates, Magnetic field, Quaternion
Internal update rate	Hz	500
Output update rate (auto transmit)	Hz	20-2000
Start-up time	sec	<1
Latency	msec	2
Heading		
Range	deg	0 to 360
Angular Resolution	deg	0.01
Static accuracy at constant temperature [1]	deg	1
Static accuracy in whole Temperature Range [1]	deg	1.5
Dynamic Accuracy [2]	deg, RMS	<2
Attitude		
Range: Pitch, Roll	deg	0 to 360
Angular Resolution	deg	0.01
Static accuracy at constant temperature	deg	0.2
Static Accuracy in whole Temperature Range	deg	0.5
Dynamic Accuracy [2]	deg, RMS	1
Noise (@100 Hz)	deg, RMS	0.05
Gyroscopes		
Gyroscopes measurement range [3]	deg/s	±2000
In-run Bias Stability at Constant Temperature	deg/s, RMS	0.1
Bias stability in whole Temperature Range	deg/s, RMS	1
Scale Factor Accuracy	%	0.5
Gyroscopes noise	deg/sec√Hz	0.03
Axis misalignment	deg	0.1
Resolution	deg/sec	0.07
Bandwidth	Hz	50
Accelerometers		
Accelerometers measurement range [4]	g	±2
In-run Bias Stability at Constant Temperature	mg, RMS	1
Bias Stability in whole Temperature Range	mg, RMS	3
Scale Factor Accuracy	%	0.15
Accelerometers noise	mg√Hz	0.2
Axis misalignment	deg	0.1
Resolution	mg	0.2
Bandwidth	Hz	22
Magnetometers		
Magnetometers measurement range	Gauss	±2.0
Noise	μG/√Hz	150
Scale Factor Accuracy	%	0.1
Axis misalignment	deg	0.1
Bandwidth	Hz	20
Environment		
Operating and storage temperature range	deg C	-40 to +85
Non-operating vibration	g, Hz	10 g, 20 – 2000 Hz
Non-operating shock	g, ms	3000 g, 0.1 msec
MTBF	hours	35,000 (MIL-STD-217F, notice 2, AIC environment, 40degC)
Environmentally sealed		IP67
Electrical		
Supply voltage	V DC	3.5 to 5.5
Power Consumption	W	0.3
Connector type	-	Binder 0931117104
Output Interface [5]	-	TIA/EIA-485A (half-duplex)
Baud Rate [6]	bps	1000000
Byte Size	bits	8
Stop Bites	bits	1
Parity	-	No
Physical		
Size [7]	mm	16 × 10 × 3.5
Weight	gram	2

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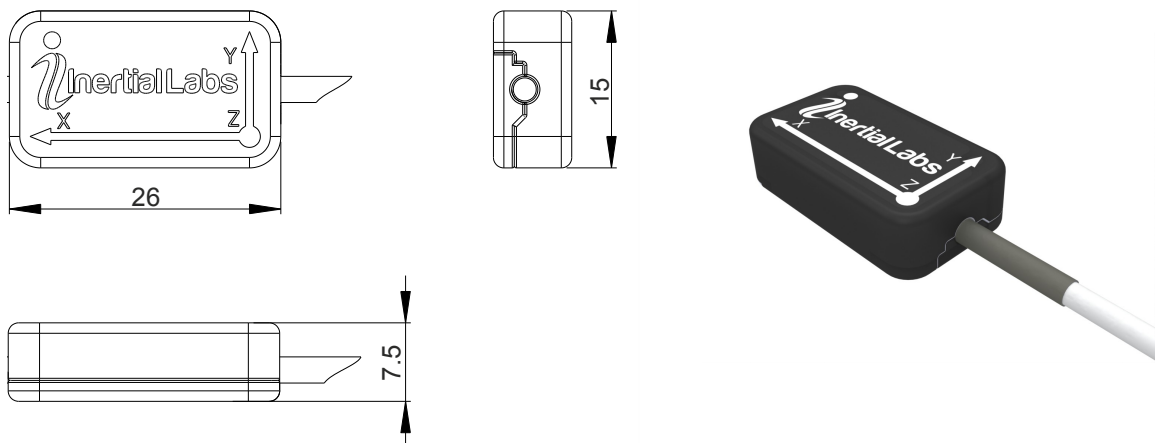
Specifications Notes:
[1] in homogeneous magnetic environment, for latitude up to ±65 deg
[2] dynamic accuracy may depend on type of motion
[3] OS3Dm modifications with different gyroscopes measurement ranges are also available
[4] OS3Dm modifications with ±4 g, ±8 g and ±16 g accelerometers measurement range are also available
[5] Direct TTL UART output also supported
[6] Standard baud rates also available with TTL UART data communication
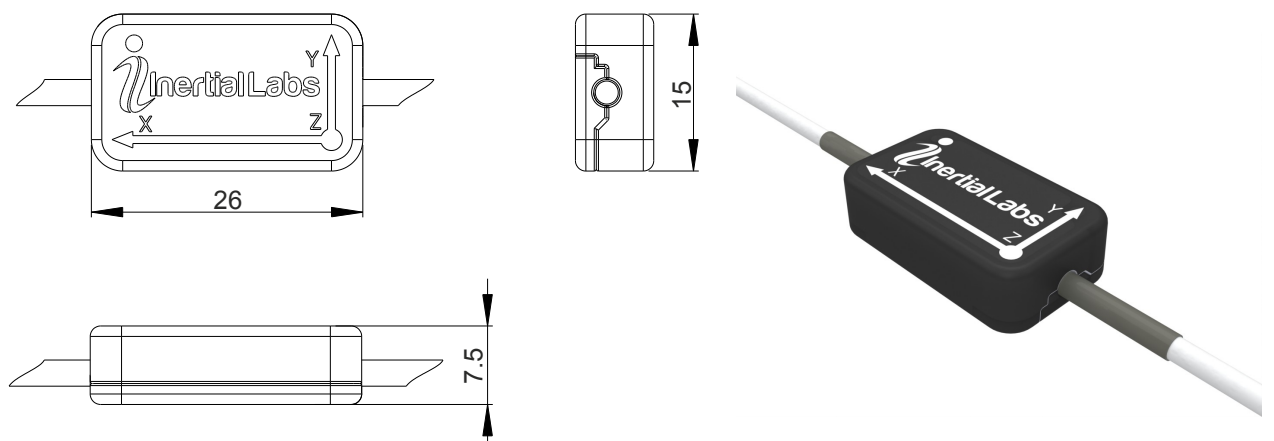[7] OS3Dm OEM modification is also available

OS3DM available versions (different part numbers)

Type of sensor	Temperature calibration	Type of case	Accelerometers measurement range	Connector	Interface type
OS3DM OEM	Temperature calibrated Temperature non-calibrated	Plastic Without case	±2 g ±4 g ±8 g ±16 g	Single-ended Double-ended	RS-485 UART

## OS3DM with single-ended connector mechanical interface drawing (mm)

OS3DM with double-ended connector mechanical interface drawing (mm)

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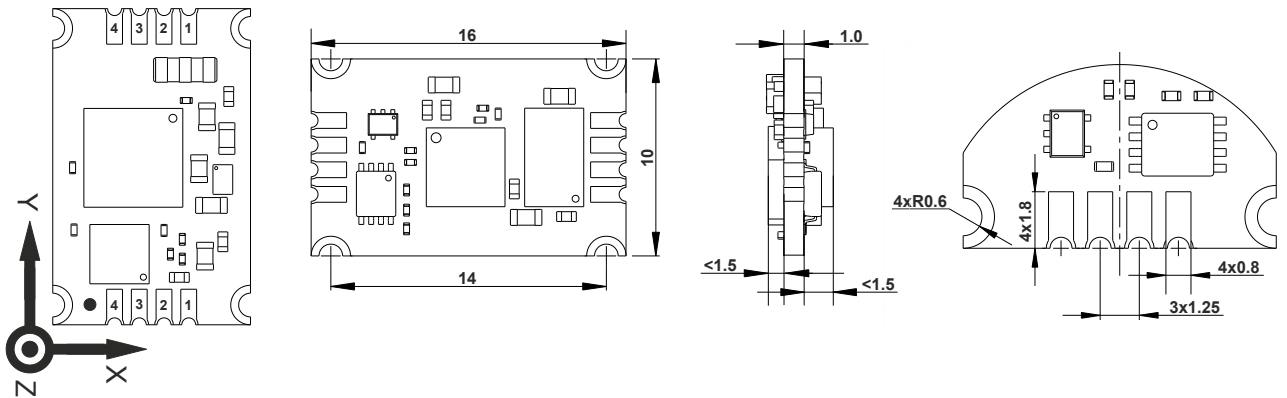Tel: +1 (703) 880-4222, Fax: +1 (703) 935-8377 Website: www.inertiallabs.com

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OS3DM mounting holes mechanical interface drawing (mm)

These two holes can be used to mount the sensor to an obje
The ISO M2x5 (or longer) brass screws are recommended
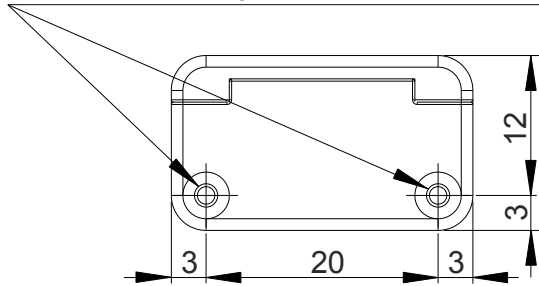
OS3DM OEM mechanical interface drawing (mm)

OS3DM (all versions) electrical interface description 0931117104)

No.	Name	Value	Parameters
1	PWR	supply voltage	3.2V to 5.5V
2	GND	ground, shield	-
3	A	A RS-485	1 Mbps, 120 Ohm
4	B	B RS-485	1 Mbps, 120 Ohm

OS3DM Connector (Binder