

Optically Enhanced Weapon Orientation Module OptoWOM



Preliminary Datasheet

Revision 1.9

The **Inertial Labs™**, Optically enhanced **Weapon Orientation Module - OptoWOM**, combines technologies of inertial sensors with optical image tracking resulting in a robust and reliable 3DOF orientation module capable of operation in virtually any environment. With the addition of optical image tracking the system is now able to mount directly to a device under measure, and with one known reference direction, can be turned on and operated immediately without any magnetic calibration whatsoever. During operation, the device's magnetometer calibrations are able to be derived on-the-fly allowing for the device to operate with both optical and magnetic heading determination.



OptoWOM works through the use of reference images. A reference image is literally a picture of the horizon in a given direction. Within the reference image the system identifies a constellation of identifiable features. Then, from any subsequent image collected by the camera, heading is determined by comparing those images back to the most appropriate reference. As long as the system can identify 20% of the features of a previously collected reference, it can provide an accurate assessment of the change in heading.

Additionally, when the system is operating with good optical data, it uses the information it collects to continuously check results against magnetic heading information and dynamically calibrates the device against magnetic interferences present in the application.

KEY FEATURES AND FUNCTIONALITY

- Hybrid Inertial Orientation System
- Real-time optical and inertial sensors weapon orientation tracking
- Highly accurate, sensitive, and temperature stable Fluxgate magnetometers (in-house technology)
- Gyro-Stabilized Slaved Magnetic Heading
- Advanced, extendable, embedded Kalman Filter based sensor fusion algorithms
- Embedded 2D and 3D magnetic calibration on hard and soft iron
- All solid state components (no moving parts)
- Full temperature calibration of all sensing elements
- Up to 100Hz data update rate
- Tested to MIL-STD-810F, MIL-STD-461D and DO-160D standards
- Environmentally sealed (IP67)



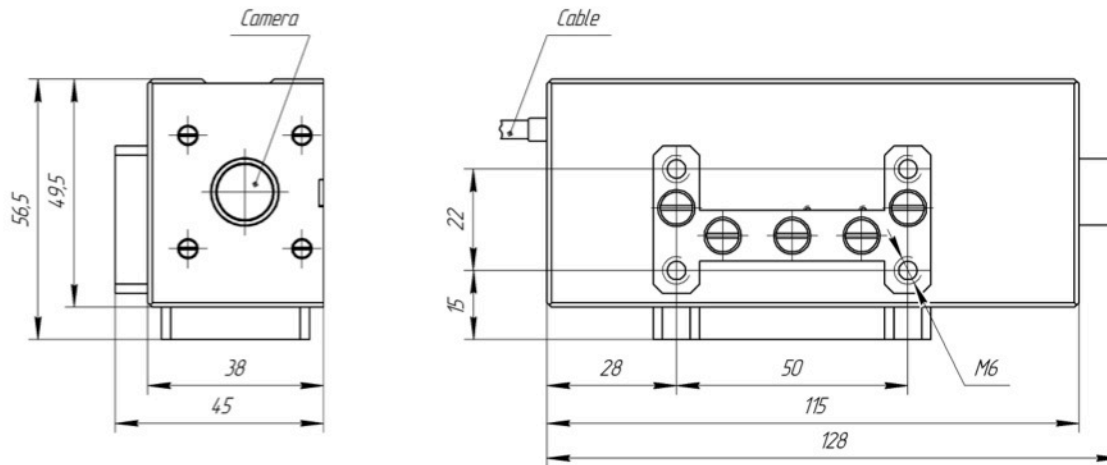
OptoWOM specifications

Parameter	Units	
Output signals		Azimuth, Pitch, Roll, Euler angles, Quaternion
Update rate	Hz	1 ... 100 (user settable)
Start-up time	sec	10
Full Accuracy Data (Warm-up Time) ⁽¹⁾	sec	30
Heading		
Range (autonomous)	deg	0 to 360
Range (optical)	deg	0 to 360
Angular Resolution	deg	0.05
Static Accuracy 0 to 360 deg, from a single reference ⁽²⁾	deg	0.2
Noise (at 100 Hz output)	deg RMS	0.02
Attitude		
Range: Pitch, Roll (autonomous)	deg	0 to 360
Range: Pitch, Roll (optical)	deg	±22.5
Angular Resolution	deg	0.01
Static Accuracy in whole Temperature Range	deg	0.1
Noise (@100 Hz)	deg RMS	0.02
Angular Rate		
Gyroscopes measurement range	deg/s	±300
In-run Bias Stability at Constant Temperature	deg/s RMS	0.02
Bias stability in whole Temperature Range	deg/s RMS	0.2
Scale Factor Accuracy	%	0.1
Gyroscopes noise	deg/sec/Hz	0.035
Axis misalignment	mrad	0.15
Resolution	deg/sec	0.01
Bandwidth	Hz	50
Linear Acceleration		
Accelerometers measurement range	g	±2
In-run Bias Stability at Constant Temperature	mg RMS	0.05
Bias Stability in whole Temperature Range	mg RMS	1
Bias turn-on, turn-on repeatability	mg RMS	0.1
Scale Factor Accuracy	%	0.1
Accelerometers noise	mg/√Hz	0.04
Axis misalignment	mrad	0.15
Resolution	mg	0.1
Bandwidth	Hz	50
Environment		
Operating temperature	deg C	0 to +45
Storage temperature	deg C	-20 to +60
Non-operating vibration ⁽³⁾	g, Hz	10-50Hz, 0.15mm/55-500Hz 2.0g
Non-operating shock ⁽⁴⁾	g, ms	50g, 11ms, half sine wave
MTBF	hours	55500
Electrical		
Supply voltage	V DC	9 to 36
Power consumption	W	3.5
Interface		
Standard	-	USB
Rate	Mbit/sec	480
Physical		
Size	mm	128 × 38 × 49.5
Weight	gram	360

OptoWOM specifications notes

- (1) including time of initial alignment, it may be decreased on request
- (2) in homogeneous magnetic environment, for latitude up to ± 65 deg
- (3) MIL-STD 810F. Method 514.5. Procedure I
- (4) MIL-STD 810F. Method 516.5. Procedure I

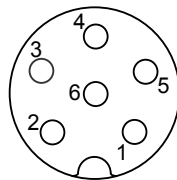
OptoWOM mechanical interface drawing



Notes:

1. All dimensions are in millimeters.
2. All dimensions within this drawing are subject to change without notice. Customers should obtain final drawings before designing any interface hardware.

OptoWOM electrical interface description



Inertial Labs OptoWOM
Binder Series 718 Female 6-Pin Connector Pin Out

Pin	Signal
1	Do not connect
2	Tx
3	Rx
4	GND
5	V _{DD}
6	Do not connect

For electrical connection of Inertial Labs OptoWOM to the host system, a Binder Series 718 male 6 pins cable connector (cordset), part # 79-3465-52-06 or compatible, should be used