



# olixSense™ X1 Pro IMU / AHRS Sensor

Embedded AI Fusion | Triple Redundant | USB Type-C Interface | ROS 2 Native



Technical Document No. 1777623932 | SKU# OLVX-X1-TIMU-USB-PXX | Revision V0.3 - Apr 2026

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## 1. Product Overview

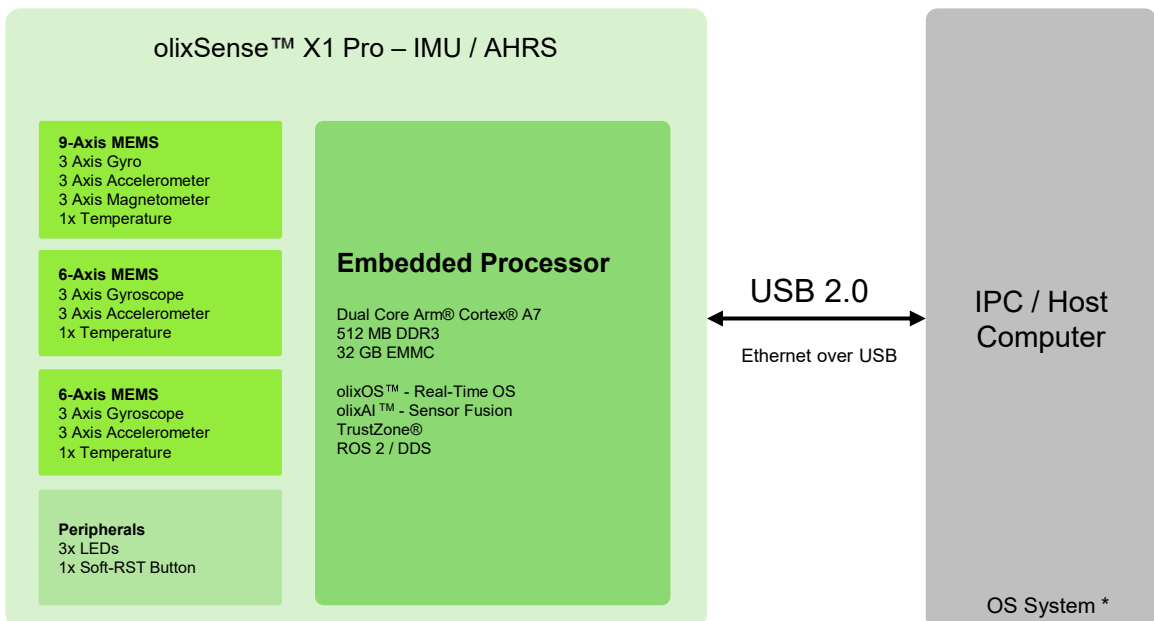
The olixSense™ IMU X1 Pro is a high-performance inertial measurement unit designed for advanced mobile robotics, industrial automation, and autonomous systems. Built with a dual-core embedded processor, real-time Linux kernel (olixOS™), and native ROS 2 integration, it delivers AI-enhanced sensor fusion, robust timing, and low-latency inertial data ideal for high-frequency control and SLAM pipelines.

## 2. Key Features

- 16-DoF Inertial Sensing: Dual 3-axis gyroscopes, accelerometers, and a magnetometer
- Real-Time Embedded AI Fusion: Deep fusion with redundancy and failover
- ROS 2 Native: Direct DDS communication, plug-and-play for robotic middleware
- High-Frequency Output (ODR) : Up to 1000 Hz raw & fused
- Low-Latency Ethernet Over USB: Deterministic, real-time data transport
- Onboard Processing: Dual-core Cortex-A7 + 512MB DDR3 RAM
- Industrial-Grade: Vibration and temperature calibrated, 32g, 40x40x10 mm



## 3. System Architecture



IP Address: **192.168.7.100**

IP Address: **192.168.7.XXX**

\* This device does not require any additional driver installation; please verify Host Computer compatibility before use.

## 4. Applications

- Mobile Robots (AMR, AGV, UAV)
- Industrial Arms & Hands
- Research and SLAM Systems
- Sensor Fusion Systems
- Predictive Maintenance and Vibration Analysis

## 5. Sensor Specifications

### - Sensor Fusion Performance

Parameter / Metric	Value
Roll, Pitch (Stationary, AHRS Mode, ODR 100 Hz)	< 0.1° RMSE
Roll, Pitch (Dynamic, AHRS Mode, ODR 100 Hz)	< 0.5° RMSE
Roll, Pitch (Stationary, IMU Mode, ODR 1 KHz)	< 0.25° RMSE
Roll, Pitch (Dynamic, IMU Mode, ODR 1 KHz)	< 0.5° RMSE
Yaw (Stationary, AHRS Mode, ODR 100 Hz) *	< 0.1° /hr
Yaw (Dynamic, AHRS Mode, ODR 100 Hz) *	< 0.003° /s
Yaw (Stationary, IMU Mode, ODR 1 KHz) *	< 0.3° /hr
Yaw (Dynamic, IMU Mode, ODR 1 KHz) *	< 0.005° /s

### - Physical and Electrical

Weight	36g
Size	40.0 mm x 40.0 mm x 10.0 mm
Power Consumption	0.9 W (Typical), 1.8 W (Max)
Operating Voltage	4.6 to 5.5 VDC (USB PD 2.0 Standard)
Operating Temperature	-10°C to 55°C
Interface LEDs	1x (Heartbeat, User, System)

### - System Performance

Metric	Value
Attitude Accuracy (AHRS)	< 2° RMSE (yaw), < 0.5° RMSE (roll / pitch)
Latency (e2e)	< 1 ms (AI fused output)
Time Sync Error (DDS)	< 200 µs (DDS – ROS 2)
AGV Rotation Test	Yaw RMSE: 1.0°, Std Dev: 0.5°
OptiTrack Ref	Used 8x PrimeX 22 for GT validation
Ingress Rating	IP51
Vibration Resistance	5g RMS, 20-2000 Hz

\* The heading accuracy depends on sensor configuration and calibration. A fully calibrated sensor and ideal tilt compensation are assumed.

**- MEMS Sensor Performance**

Specification	Accelerometer	Gyroscope	Magnetometer
Range	± 2g, 4g, 8g, 16g, ± 4G (AHRS mode)	125, 250, 500, 1000 , 2000 dps	± 1300 µT
Resolution	16-bit or 0.06 mg/LSB	16-bit or 0.004 dps/LSB	16-bit
Sensitivity	2048 LSB/g @ ±16 g	262.1 LSB/dps @ ±125 deg/sec	± 0.3 µT
Sensitivity Tolerance	±4 % @Ta=25°C, gFS2g	±3 % @ Ta=25°C, RFS2000	±0.03% @ After API compensation -40°C ≤ TA ≤ +85°C Nominal VDD supplies
Zero-rate Offset	±20 mg	±0.5 dps	-
Zero-g Offset (x,y,z)	±150 mg @ gFS2g, TA=25°C, nominal VDD supplies, over life-time	+3 dps @ Nominal VDD supplies T A =25°C, Slow and fast offset cancellation off	-
Nonlinearity	0.5 %FS @ TA=25°C, nominal VDD, best fit straight line gFS2g	0.01 %FS @ TA=25°C, nominal VDD, best fit straight line RFS250, RFS2000	1.2 %FS @ best fit straight line
Noise Density	107 µg/√Hz	0.006 dps/√Hz	
Random Walk	VRW: 0.06 m/s/√hr	ARW: 0.43 °/√hr	
Rate Random Walk	0.038 m/s <sup>2</sup> /√hr	0.24 dps/√hr	
Bias Instability	0.00042 m/s <sup>2</sup>	5.68 °/hr	

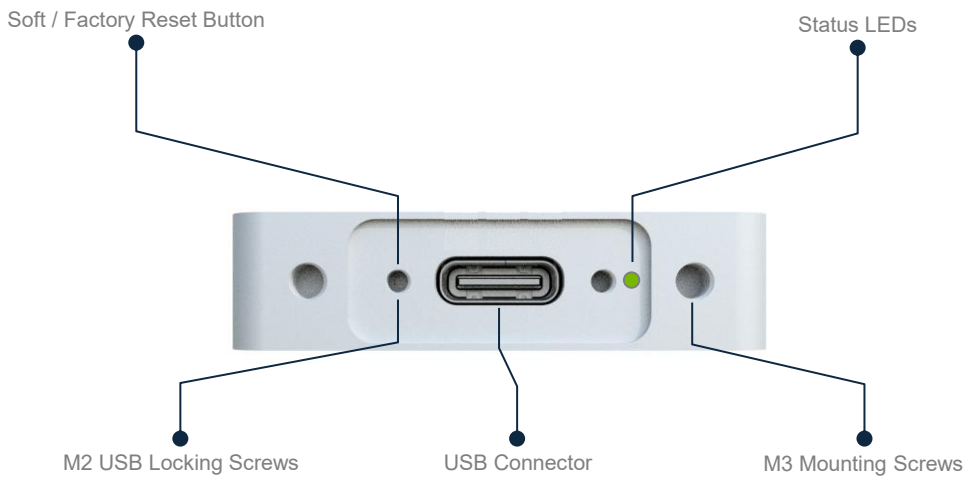
**- Communication Interface / ODR**

Interface Connector	USB Type-C
Communications Protocol	Ethernet over USB 2.0 (RNDIS / ECM)
Output Data Rate (Raw and Fused Data)	1-1000 Hz
Middleware / Protocols (DDS)	- rmw_fastrtps_cpp - rmw_cyclonedds_cpp - rmw_zenoh (Jazzy) - rmw_connext_cpp
ROS 2 Distribution	- Humble - Jazzy

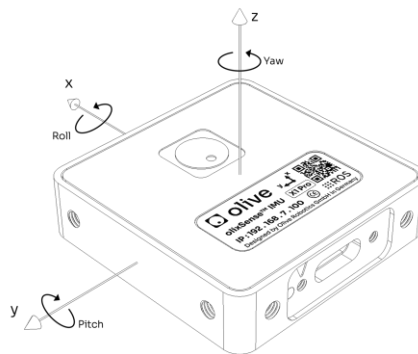
**- ROS 2 Native Messages**

Topic/Service Name	Type	Description
/imu	<a href="#">sensor_msgs/Imu</a>	Acc, Gyro, Quaternion
/acceleration	<a href="#">geometry_msgs/msg/AccelStamped</a>	Gravity Compensated Accel
/magneticfield	<a href="#">sensor_msgs/MagneticField</a>	Magnetic Field
/velocity	<a href="#">geometry_msgs/msg/TwistStamped</a>	Relative Velocity
/temperature	<a href="#">sensor_msgs/msg/Temperature</a>	Sensor Temperature
/status	<a href="#">diagnostic_msgs/msg/DiagnosticStatus</a>	Sensor Status

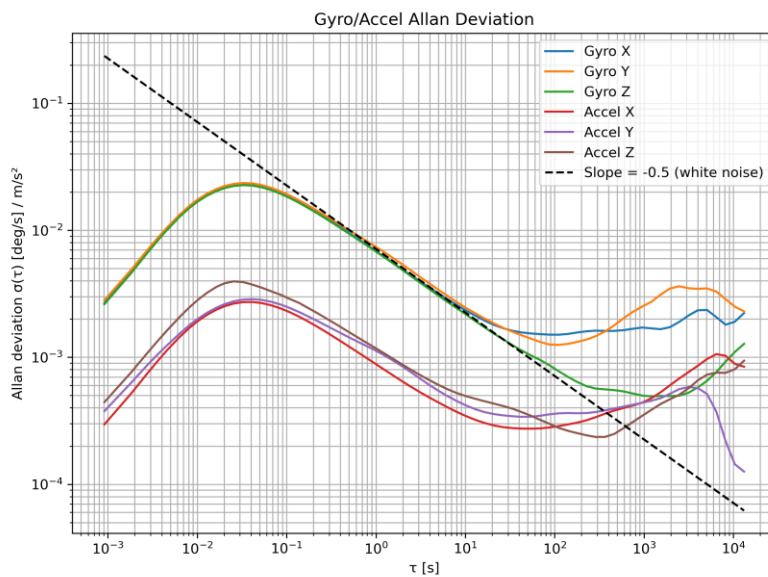
- **Sensor Interface / Peripherals**



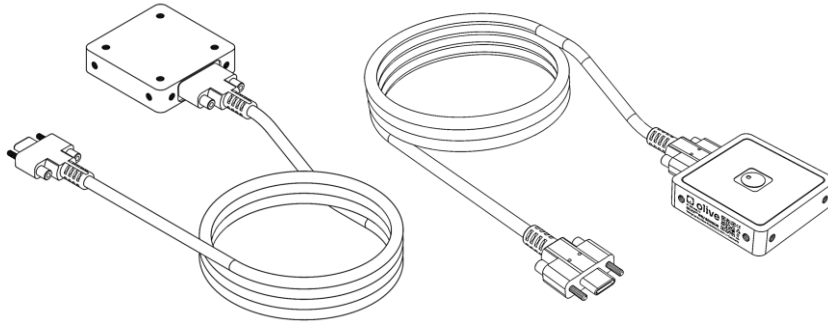
- **Coordinate Frame / Axis**



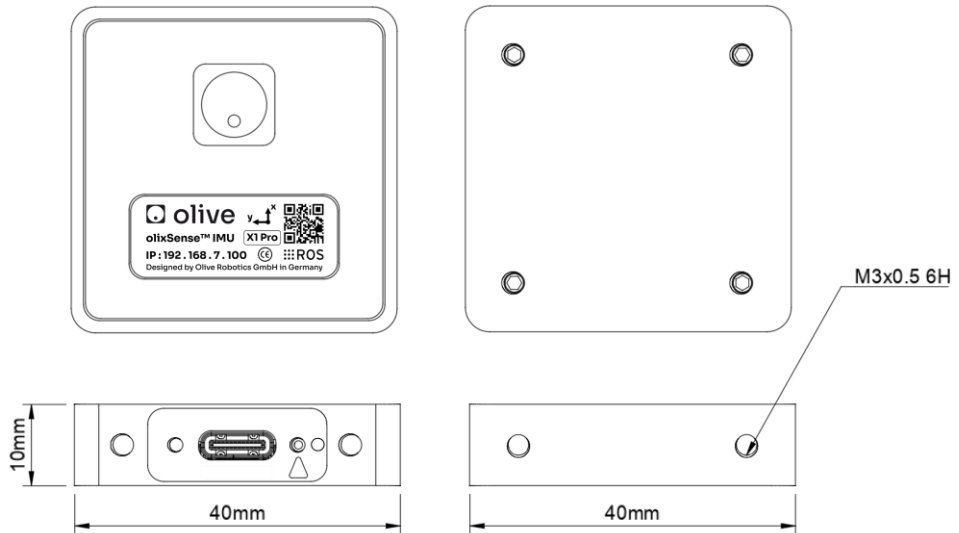
- **Performance Test / Allan Deviation Plot**



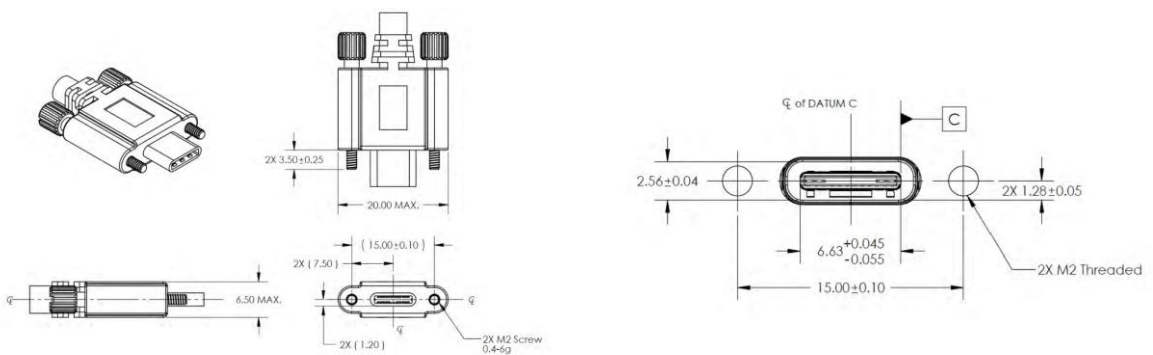
## - Mechanical Overview



## - Physical Dimensions



## - USB Connector Specification





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