olive™ Inertial Measurement Unit

OLV-IMU01-13D

PRODUCT DATASHEET

THE ROS-READY IMU: OLIVE ROBOTICS OLV-IMU01-13D

The OLV-IMU01-13D is an IMU sensor designed for use in robotics and other applications that require precise attitude and heading information. It uses a redundant 15 degree-of-freedom (DOF) sensor array, which provides accurate and stable measurements of orientation and angular velocity with a 3-axis gyroscope, 3-axis accelerometer, and 3-axis magnetometer. It furthermore provides air pressure, temperature, humidity, and gas detection measurements.

KEY FEATURES

- 9-degree-of-freedom orientation and acceleration measurements
- 4-measurement environmental sensing
- Maximum data rate of 1000 Hz
- Attitude and heading reference system (AHRS)
- Compact and lightweight design
- USB Type-C and Ethernet over USB communication options
- Out-of-the-box ROS1 & ROS2 communication

COMPONENTS

- 3-axis gyroscope: The IMU module features a 3-axis gyroscope that provides accurate and reliable angular rate data in all three dimensions (x, y, z). This allows you to measure the orientation of the IMU module with respect to a fixed reference frame, and to track the changes in orientation over time.
- 3-axis accelerometer: The IMU module also features a 3-axis accelerometer that provides accurate and reliable acceleration data in all three dimensions (x, y, z). This allows you to measure the linear acceleration of the IMU module with respect to a fixed reference frame, and to track the changes in linear acceleration over time.
- 3-axis magnetometer: The IMU module furthermore features a 3-axis magnetometer that provides accurate and reliable magnetic field data in all three dimensions (x, y, z). This allows you to measure the magnetic field of the IMU module with respect to a fixed reference frame, and to track the changes in magnetic field over time.

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- 4-measurements environmental sensor: The device further features a gas sensor measuring relative humidity, barometric pressure, ambient temperature, and gas (VOC).
- ARM-based mobile processing unit for data processing and communication via ROS and ROS2 based on Linux Debian 11 featuring Ethernet over USB-C connectivity.
- Full-body industry grade aluminum frame (Aluminum 6082 | AlSi1MgMn)

SPECIFICATIONS

- Integrated real-time Linux Debian 11 operating system for data processing, communication, and modular programming.
- Preconfigured onboard embedded processing for ROS Noetic and ROS2 Humble Hawksbill message handling
- Native Virtual Ethernet over USB-C connections interfaces
- Embedded virtual Ethernet communication protocol. The format of the actual networking data encapsulated in each packet is based on IEEE802.3-2008.
- Integrated embedded data logging
- Integrated web graphical user interface for sensor parameter settings, calibration, and data logging.
- Integrated firmware and software updates over the air (OTA) using the web-based user interface.
- Embedded Integrated Development Environment (IDE) for programming on the sensor using Python and/or C/C++.
- Integrated time synchronization using the Network Time Protocol (NTP)
- Integrated ESC protection.
- Full-body industry grade aluminum frame (Aluminum 6082 | AlSi1MgMn)

INSTALLATION & USE

For detailed instructions on how to install and use this product please visit the online documentation. You can find code samples and further instructions at https://github.com/olive-robotics. For complaints and feedback please reach out to support@olive-robotics.com.

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TECHNICAL SPECIFICATIONS

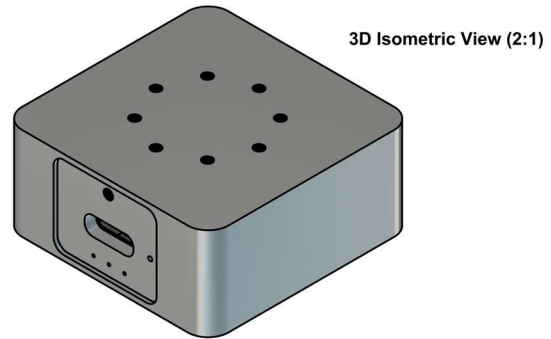|	
Dimensions	40x40x18mm
Weight	62 grams
Operational Voltage	5V
Max. Current	300mA
Power Consumption	Typical: <1W Max: 1.5W
Temperature Range	Commercial: 0° … 55°C Industrial: -40° … 85°C
Hardware Connector	USB Type-C
Application Processor	Dual Cortex-A7 up to 800MHz
Real-Time Processor	Cortex-M4 MPU up to 200MHz
Memory On Chip (SoC)	512 MB RAM
EEPROM Memory	512 Bytes x 8
On SOM Flash Memory	Default: 64 GB SD Max Expansion: 512 GB
Connectivity	1x Virtual Ethernet over USB-C (up to 0.5 Gbps) 1x USB 2.0 Host

Software Specs

Linux Kernel	Linux 5.10.8 RT24
Base OS	Debian 11 Bullseye
Communication Middleware	Apache Cyclone DDS
Communication Interface	ROS, ROS2, ssh, https
Default IP Address	10.42.0.7
Web GUI address	https://10.42.0.7
Default User	olive
Default Password	one
ROS 1 Version	Noetic Ninjemys
ROS 2 Version	Humble Hawksbill

All units are in mm
Drawing and tolerances standard ISO 2768-1

3D Isometric View (2:1)

Bottom   Top   Side

Front

40
20
R4
Ø20
20
40
8x M2x0.4 6H x 5

28
20
Ø20
20
28
8x M2x0.4 6H x 3

M2x0.4 6H x 8
20
12
16
8
18
3
40
6.75
20

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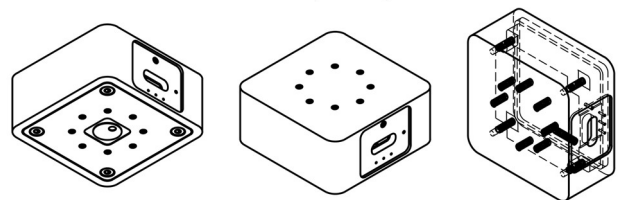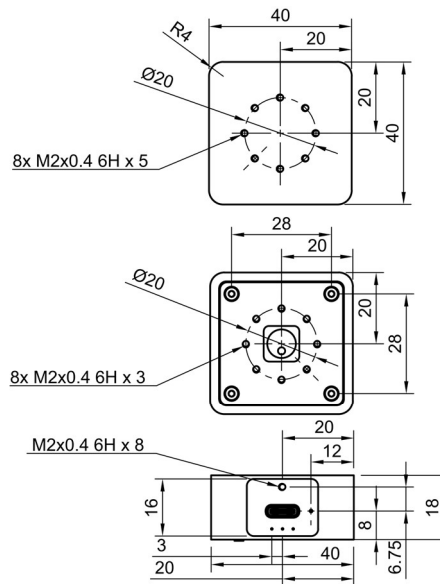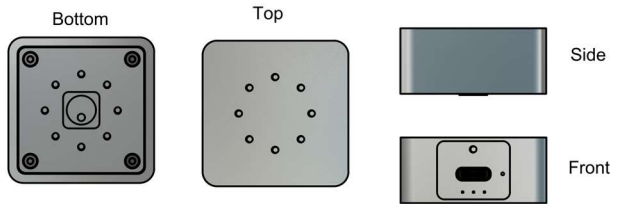
Gyroscopes & Accelerometers

Gyroscope Range Accuracy	+/– 2000 deg/sec +/- 0.05 deg/sec
Accelerometer Range Accuracy	+/– 16 g +/- 0.1 g
Magnetometer Range Accuracy	+/– 4 gauss +/- 0.2 gauss
ROS Messages	sensor_msgs/Imu
Sample rate	1000 Hz

Environmental Sensing

Operation range (full accuracy) Pressure Humidity Temperature	300 ... 1100 hPa 0 ... 100% -40 ... 85°C
Gas sensor Response time (τ 33-63%) Sensor-to-sensor deviation Power consumption	< 1 s (for new sensors) +/- 15% +/- 15 < 0.1 mA in ultra-low power mode
Humidity sensor Response time (τ 0-63%) Accuracy tolerance Hysteresis	8 s ± 3 % relative humidity ≤ 1.5 % relative humidity
Pressure sensor RMS Noise Sensitivity Error Temperature coefficient offset	0.12 Pa (equiv. to 1.7 cm) ± 0.25 % (equiv. to 1 m at 400 m height change) ±1.3 Pa/K (equiv. to ±10.9 cm at 1°C temperature change)
ROS Messages	sensor_msgs/Temperature sensor_msgs/RelativeHumidity sensor_msgs/FluidPressure std_msgs/UInt16
Sample Rate	1000 Hz

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USB CONNECTOR SPECIFICATIONS
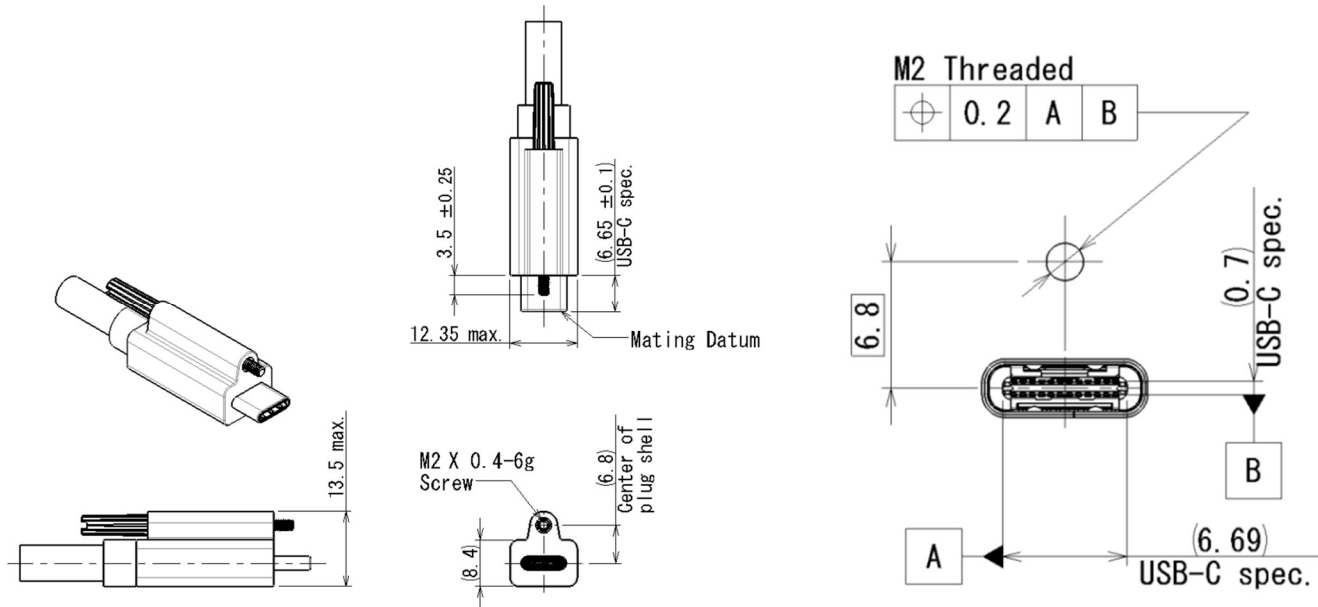
The USB-C hardware connector on the OLV-IMU01-13D is designed to be compatible with the standard single screw USB Type-C locking plug revision 1.0 as elaborated by the USB-IF Device Working Group in 2016. Please find further details in the figure above and here.

SAFETY INSTRUCTIONS

Do not operate the device in or near liquids. This device is designed to be used indoors; outdoor use is not recommended. Do not open the device unless you are a trained professional in electrical engineering or similar. Opening the device will void any warranty. Do not use these components to build devices that are capable of harming humans. During operation, a human must always monitor the device. Only connect to third-party devices (computers, power supplies, etc.) that are CE certified under IEC 62368.

DISPOSAL

In general, electrical and electronic equipment (EEE) should not be disposed of along with household waste. EEE may contain hazardous substances which, if exposed, could cause a serious detrimental effect on the environment, wildlife, and human health.

For more information about the disposal of electronic waste, please refer to the EU directive for Waste from Electrical and Electronic Equipment (WEEE).

If you would like to dispose of this product or parts of it, we recommend that you:

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- Reach out to contact@olive-robotics.com for instructions on how to return the product to the vendor.
- Donate the unwanted item to a charitable organization.
- Take it to an authorized recycling collection point run by your local authority. For information about collection points, visit https://erp-recycling.org/en-de/where-to-recycle.

OLIVE ROBOTICS GMBH

Based in Munich, Germany, Olive Robotics GmbH is a leading provider of advanced software-defined robot hardware components. The sensors and actuators in our product portfolio are designed to be re-programmable and easy to integrate, allowing users to build their own custom robots or extend existing systems with ease. We design, engineer, and assemble the entirety of our product's hardware and software here in Munich. Our plug and play design allows for quick and effortless installation, making it possible for anyone to create their own robot solutions in an fast and intuitive manner. You can find more information about our company on our website. Furthermore, you can find a dedicated overview of our products here.

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