



# OS2

## Long-Range High-Resolution Imaging Lidar

FIRMWARE VERSION: v2.5.x

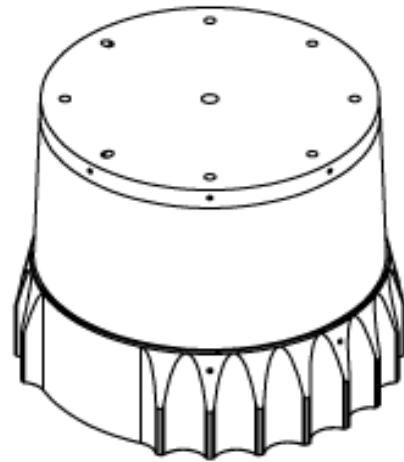
HARDWARE VERSION: REV7

### SUMMARY

The long-range OS2 features 200 m of range on a dark 10% target and a maximum range of over 400 m. The OS2's high resolution combined with range delivers superior object detection capabilities for autonomous vehicles and long-range industrial applications. Rated IP68/69K for all weather conditions.

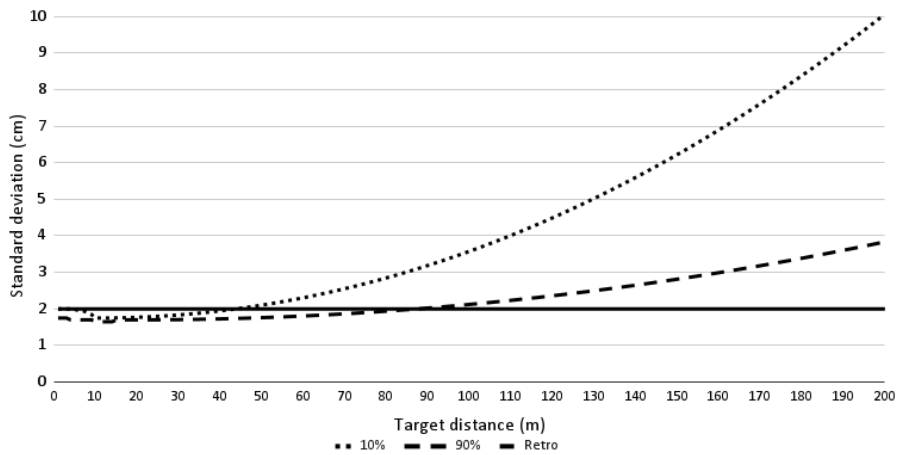
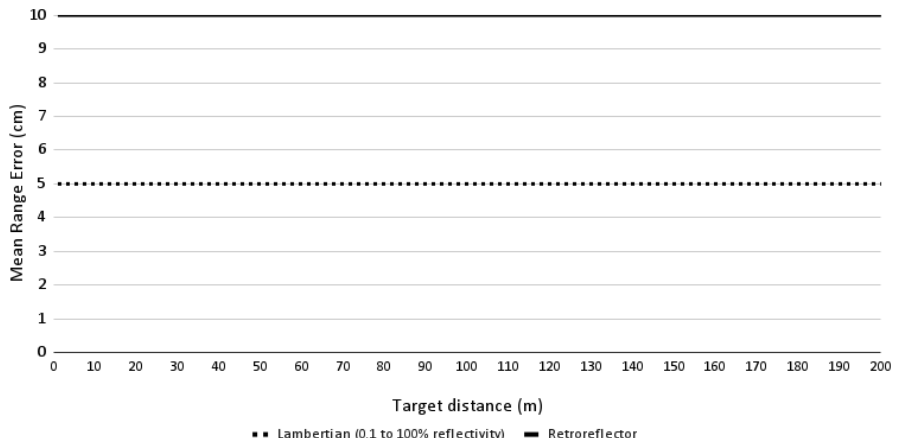
### HIGHLIGHTS

- 100% increase in range with the new L3 Chip
- Dual Return mode
- Fixed resolution per frame
- Camera-grade near-infrared and signal data
- Multi-sensor crosstalk suppression
- Open source ROS and C++ drivers
- Ouster SDK for software development



### OPTICAL PERFORMANCE

|  |   |
|--|---|
| Range<br>(80% Lambertian reflectivity,<br>1024 @ 10 Hz mode) | 350 m @ >90% detection probability, 100 klx sunlight                          |
| Range<br>(10% Lambertian reflectivity,<br>1024 @ 10 Hz mode) | 200 m @ >90% detection probability, 100 klx sunlight                          |
| Minimum Range  | 0.8 m   |
| Vertical Resolution  | 32, 64, or 128 channels   |
| Horizontal Resolution  | 512, 1024, or 2048 (configurable)   |
| Rotation Rate  | 10 or 20 Hz (configurable)  |
| Field of View  | Vertical: 22.5° (+11.25° to -11.25°)<br>Horizontal: 360°                      |
| Angular Sampling Accuracy                                    | Vertical: $\pm 0.01^\circ$ / Horizontal: $\pm 0.01^\circ$                     |
| False Positive Rate  | 1/10,000  |
| Range Resolution   | 0.1 cm<br><b>Note:</b> For Low Data Rate Profile the Range Resolution = 0.8cm |
| # of Returns   | 2 (strongest, second strongest)   |

|  |   |
|--|---|
| <p>Precision<br/>(Lambertian and Retro reflective, 1024 @ 10 Hz mode, 1 standard deviation)</p>  | <p>Min: <math>\pm 2.0\text{cm}</math>, Max: <math>\pm 10</math></p>  <p>Standard deviation (cm)</p> <p>Target distance (m)</p> <p>10% 90% Retro</p> |
| <p>Range Accuracy<br/><b>Note:</b> "Accuracy is calculated based on the error between the mean of 100 measurements on static target at a given range and the true range"</p> |  <p>Mean Range Error (cm)</p> <p>Target distance (m)</p> <p>Lambertian (0.1 to 100% reflectivity) Retroreflector</p>                               |

## LASER

|                              |   |
|------------------------------|---|
| Laser Product Class          | Class 1 eye-safe per IEC/EN 60825-1: 2014 |
| Laser Wavelength             | 865 nm                                    |
| Beam Diameter Exiting Sensor | 19 mm                                     |
| Beam Divergence              | 0.09° (FWHM)                              |

## LIDAR OUTPUT

|  |  |
|--|--|
| Connection   | UDP over gigabit Ethernet  |
| Points Per Second  | 655,360 (32 channel)<br>1,310,720 (64 channel)<br>2,621,440 (128 channel)                      |
| Data Rate (Megabits Per Second)<br>(Legacy Mode) 2048x10   | 66 Mbps (32 channel)<br>129 Mbps (64 channel)<br>254 Mbps (128 channel)                        |
| Data Rate (Megabits per second)<br>(Dual Return Profile)<br>Not applicable for 1024x20 & 2048x10 Modes | up to 43.6 Mbps (32 channel)<br>up to 85.6 Mbps (64 channel)<br>up to 169.4 Mbps (128 channel) |

|  |   |
|--|---|
| Data Rate (Megabits per second)<br>(Low Data Rate Profile) | up to 11.83 Mbps (32 channel)<br>up to 22.32 Mbps (64 channel)<br>up to 43.29 Mbps (128 channel)  |
| Data Rate (Megabits per second)<br>(Single Return Profile) | up to 32.81 Mbps (32 channel)<br>up to 64.26 Mbps (64 channel)<br>up to 127.18 Mbps (128 channel) |
| Data Per Point   | Range, signal, reflectivity, near-infrared, channel, azimuth angle, timestamp                     |
| Timestamp Resolution                                       | < 1 $\mu$ s   |
| Data Latency   | < 10 ms   |

## IMU OUTPUT

|                      |  |
|----------------------|--|
| Connection           | UDP over 1000Base-T  |
| Samples Per Second   | 100  |
| Data Per Sample      | 3 axis gyro, 3 axis accelerometer  |
| Timestamp Resolution | < 1 $\mu$ s  |
| Data Latency         | < 10 ms  |
| Details:             | InvenSense ICM-20948; datasheet for more details:<br><a href="https://www.invensense.com/products/motion-tracking/9-axis/icm-20948/">https://www.invensense.com/products/motion-tracking/9-axis/icm-20948/</a> |

## CONTROL INTERFACE

|                            |   |
|----------------------------|---|
| Connection                 | TCP and HTTP APIs   |
| Time Synchronization       | Input sources: <ul style="list-style-type: none"> <li>• IEEE1588 Precision Time Protocol (PTP); Accuracy: &lt;1 ms error</li> <li>• gPTP; Accuracy: &lt;1 ms error</li> <li>• NMEA \$GPRMC UART message support</li> <li>• External PPS; Accuracy: &lt;1 ms error</li> <li>• Internal 10 ppm drift clock; Accuracy: &lt;20 ppm error</li> </ul> Output sources: <ul style="list-style-type: none"> <li>• Configurable 1 - 60 Hz output pulse</li> </ul> |
| Lidar Operating Modes      | Hardware-triggered angle firing (guaranteed fixed resolution per rotation): <ul style="list-style-type: none"> <li>• x 512 @ 10 Hz or 20 Hz</li> <li>• x 1024 @ 10 Hz or 20 Hz</li> <li>• x 2048 @ 10 Hz</li> </ul>   |
| Additional Programmability | Multi-sensor Phase Lock<br>Azimuth Masking<br>Low-power Standby Mode<br>Queryable intrinsic calibration information: <ul style="list-style-type: none"> <li>• Beam angles</li> <li>• IMU pose correction matrix</li> </ul>  |




## MECHANICAL/ELECTRICAL

|                     |   |
|---------------------|---|
| Power Consumption** | 18 - 24 W (28 W peak at startup, 30 W peak if operating below -10 °C)** |
| Connector           | Proprietary pluggable connector (Power + data + DIO)                    |

**\*\*Note:** Ouster recommends use of a power brick (no less than 30 W) if using in extreme outdoor conditions.

|                   |   |
|-------------------|---|
| Operating Voltage | 9V - 34 V, 12 V or 24 V nominal   |
| Dimensions        | Diameter: 119.6 mm (4.71 in)<br>Height: 102.9 mm (4.05 in)  |
| Weight            | 1100 g (38.8 oz)  |
| Mounting          | Bottom: 4x M3 screws, 2x locating 2 mm pin holes, 4x M4 screws, 2x locating 3 mm pin holes, 4x M6 screws<br>Top: 4x M4 screws, 4x locating 3mm pin holes, 1x M6 Screw |

## OPERATIONAL

|                       |   |
|-----------------------|---|
| Operating Temperature | -20 °C to +60 °C<br>Between +52 °C to +60 °C, sensor automatically reduces range (max 20% range reduction)  |
| Storage Temperature   | -40 °C to +105 °C   |
| Ingress Protection    | IP68 (1m submersion for 1 hour, with I/O cable attached)<br>IP69K (with I/O cable attached)   |
| Shock                 | IEC 60068-2-27 (Amplitude: 25 g, Shape: 10 ms half-sine, 400 shocks x 6 directions)   |
| Vibration             | IEC 60068-2-64 (Amplitude: 2 G-rms, Shape: 10 - 1000 Hz, Mounting: sprung masses, 3 axes w/ 8 hr duration each)   |
| Compliance            | <p><b>For US</b><br/>Laser Safety:<br/> <ul style="list-style-type: none"> <li>• IEC 60825-1:2014</li> <li>• FDA US 21CFR1040 Notice 56 Class 1</li> </ul> Product Safety:<br/> <ul style="list-style-type: none"> <li>• UL 62368-1</li> <li>• CSA 22.2 No. 62368-1-19</li> </ul> EMC: FCC 47CFR Part 15, Subpart B, Class A</p> <p><b>For EU</b><br/>Laser Safety: EN 60825-1:2014/A11:2021<br/>Product Safety: EN/IEC 62368-1<br/>EMC:<br/> <ul style="list-style-type: none"> <li>• EN 55032:2012/AC 2013; CISPR 32:2015</li> <li>• EN 55024:2010; CISPR 24:2010</li> <li>• EN 61000-3-2:2014</li> <li>• EN 61000-3-3:2013</li> </ul> </p> <p><b>Note:</b> Ouster UK (Ltd): 125 Princes Street, Edinburgh EH2 4AD, Scotland, United Kingdom<br/>Contact: Neil Calder, Phone Number: +44(0).131.563.9078</p> <div>    </div> |

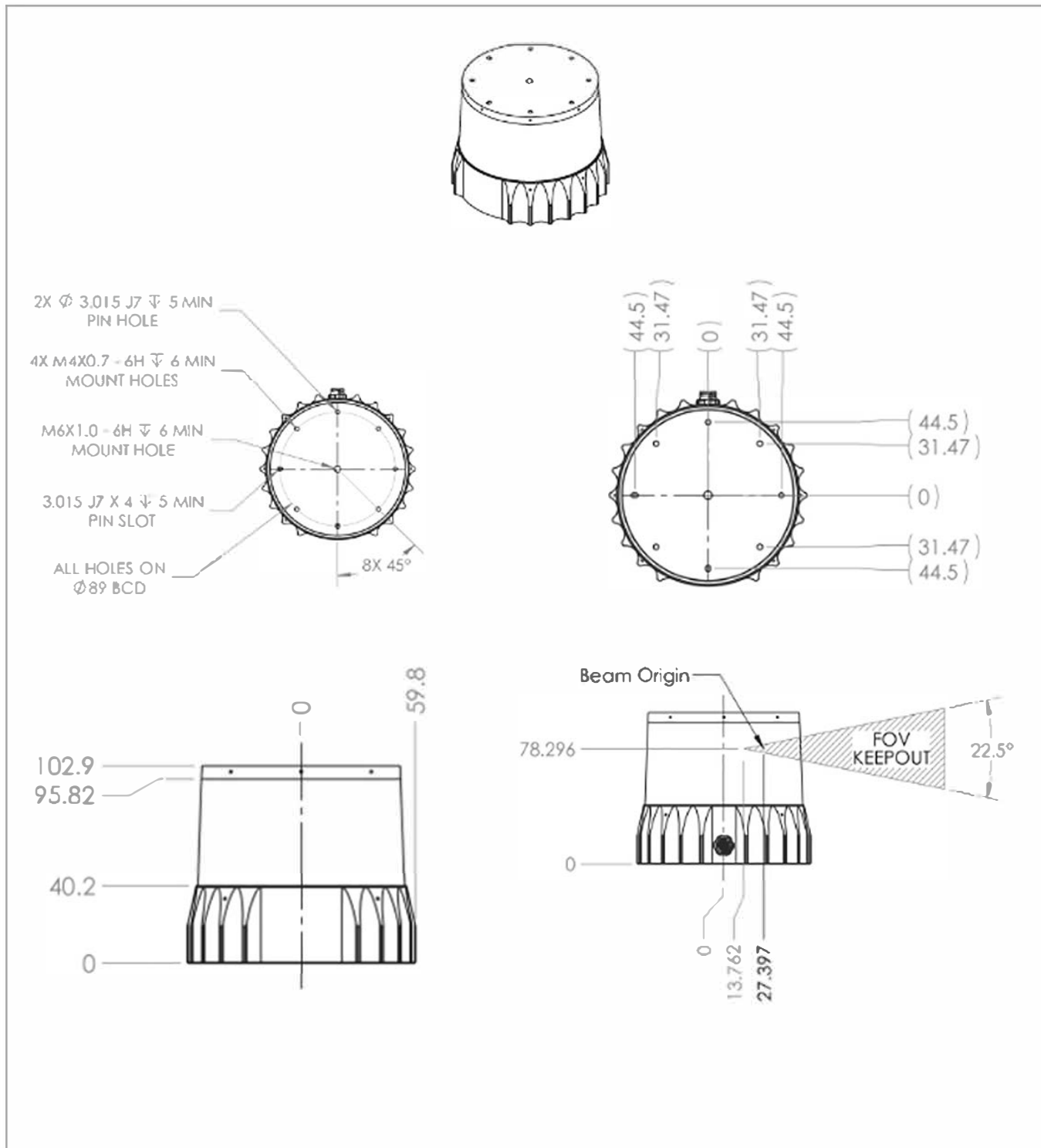
## ACCESSORIES

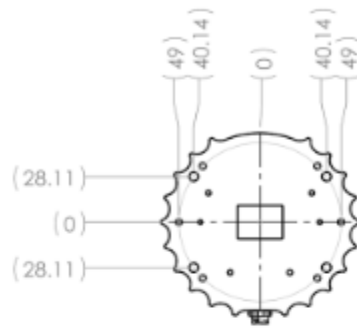
|                        |  |
|------------------------|--|
| Included Interface Box | Polycarb/FR4, 100 g, 75 mm x 50 mm x 25 mm (LxWxH), 2 m CAT6 cable, 24 V power adapter, 5 m sensor cable |
|------------------------|--|

## SOFTWARE

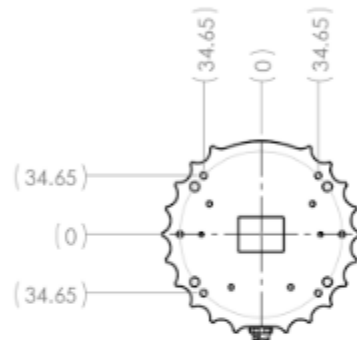
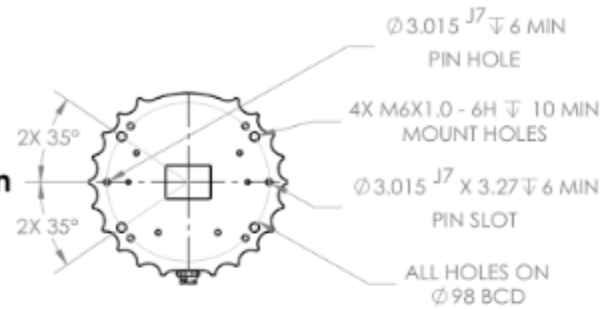
|                |                      |
|----------------|----------------------|
| Sample Drivers | Ouster SDK, ROS, C++ |
|----------------|----------------------|

## EXTERIOR DIMENSIONS

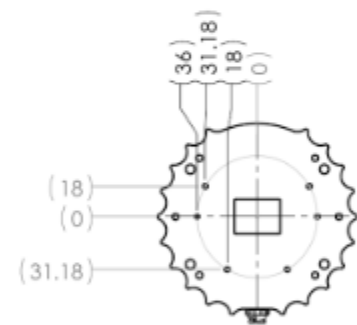
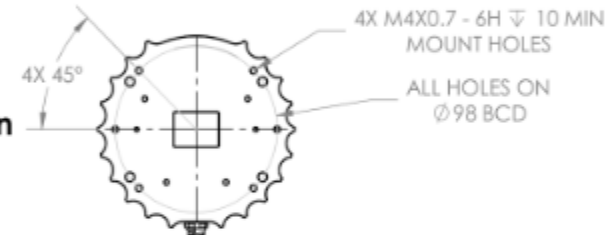




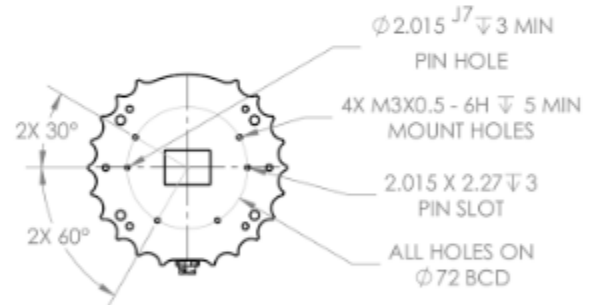
**M6 Thread Pattern**



**M4 Thread Pattern**



**M3 Thread Pattern**



\*Specifications are subject to change without notice.

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