



Revision: 12/18/21

FIRMWARE VERSION: v2.2.x

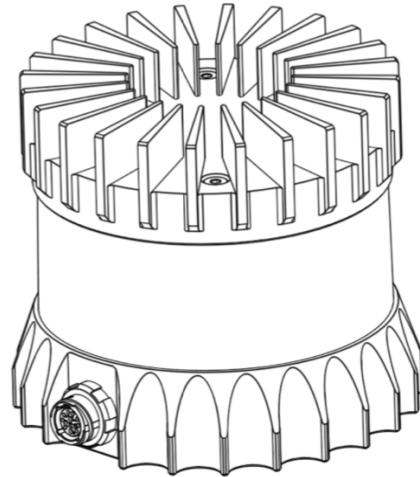
HARDWARE VERSION: 840-102xxx-06 (Rev 06)

SUMMARY

The OS1 offers an industry-leading combination of price, performance, reliability, size, weight, and power. It is designed for indoor/outdoor all-weather environments and long lifetime. As the smallest high performance lidar on the market, the OS1 can be directly integrated into robots, drones, and fixed infrastructure.

HIGHLIGHTS

- Fixed resolution per frame
- Camera-grade near-infrared and intensity data
- Multi-sensor crosstalk immunity
- Fixed intrinsic calibration
- Open source drivers
- 2x signal processing power and 2x data output per pixel with the new L2X Chip
- Introducing Dual Return Mode



OPTICAL PERFORMANCE

| | |
|---|--|
| Range (80% Lambertian reflectivity, 1024 @ 10 Hz mode) | 100 m @ >90% detection probability, 100 klx sunlight 120 m @ >50% detection probability, 100 klx sunlight |
| Range (10% Lambertian reflectivity, 1024 @ 10 Hz mode) | 45 m @ >90% detection probability, 100 klx sunlight 55 m @ >50% detection probability, 100 klx sunlight |
| Minimum Range | 0.3 m for point cloud data |
| Range Accuracy | ±3 cm for lambertian targets, ±10 cm for retroreflectors |
| Precision (10% Lambertian reflectivity, 1024 @ 10 Hz mode, 1 standard deviation) | 0.3 - 1 m: ± 0.7 cm 1 - 20 m: ± 1 cm 20 - 50 m ± 2 cm >50 m: ± 5 cm |
| Range Resolution | 0.3 cm |
| Vertical Resolution | 32, 64, or 128 channels |
| Horizontal Resolution | 512, 1024, or 2048 (configurable) |
| Field of View | Vertical: 45° (+22.5° to -22.5°) Horizontal: 360° |
| Angular Sampling Accuracy | Vertical: ±0.01° / Horizontal: ±0.01° |
| False Positive Rate | 1/10,000 |
| Rotation Rate | 10 or 20 Hz (configurable) |
| # of Returns | 2 (strongest, second strongest) |

LASER

| | |
|------------------------------|---|
| Laser Product Class | Class 1 eye-safe per IEC/EN 60825-1: 2014 |
| Laser Wavelength | 865 nm |
| Beam Diameter Exiting Sensor | 9.5 mm |
| Beam Divergence | 0.18° (FWHM) |

LIDAR OUTPUT

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|--|--|
| Connection | UDP over gigabit Ethernet |
| Points Per Second | up to 655,360 (32 channel) up to 1,310,720 (64 channel) up to 2,621,440 (128 channel) |
| Data Rate (Megabits Per Second) (Legacy Mode) | up to 66 Mbps (32 channel) up to 129 Mbps (64 channel) up to 254 Mbps (128 channel) |
| Data Rate (Megabits per second) (Dual Return Mode) Not applicable for 1024x20 & 2048x10 Modes | up to 43.6 Mbps (32 channel) up to 85.6 Mbps (64 channel) up to 169.4 Mbps (128 channel) |
| Data Per Point | Range, signal, reflectivity, near-infrared, channel, azimuth angle, timestamp |
| Timestamp Resolution | < 1 μ s |
| Data Latency | < 10 ms |

IMU OUTPUT

| | |
|----------------------|--|
| Connection | UDP over gigabit Ethernet |
| Samples Per Second | 100 |
| Data Per Sample | 3 axis gyro, 3 axis accelerometer |
| Timestamp Resolution | < 1 μ s |
| Data Latency | < 10 ms |
| Additional Details | InvenSense ICM-20948; datasheet for more details: https://www.invensense.com/products/motion-tracking/9-axis/icm-20948/ |


CONTROL INTERFACE

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

MECHANICAL/ELECTRICAL

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|-------------------|--|
| Power Consumption | 14 - 20 W (23 W peak at startup, 28 W peak if operating below -40 °C) |
| Operating Voltage | 9V - 34 V, 12 V or 24 V nominal |
| Connector | Proprietary pluggable connector (Power + data + DIO) |
| Dimensions | Diameter: 85 mm (3.34 in) Height: <ul style="list-style-type: none">• Without cap: 58.35 mm (2.3 in)• With thermal cap: 73.5 mm (2.9 in) |
| Weight | Without cap: 377 g (13.3 oz) With radial cap: 447 g (15.8 oz) |
| Mounting | Bottom: 4x M3 screws, 2x locating 2 mm pin holes Top: 4x M3 screws, 4x locating 2 mm pin holes, 1x M6 screw |

OPERATIONAL

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|-----------------------|--|
| Operating Temperature | -40 °C to +60 °C (with mount) Between +53 °C and +60 °C, sensor automatically reduces range (max 20% range reduction) |
| Storage Temperature | -40 °C to +75 °C |
| Ingress Protection | IP68 (1m submersion for 1 hour, with I/O cable attached) IP69K (with I/O cable attached) |
| Shock | IEC 60068-2-27 (Amplitude: 100 g, Shape: 11 ms half-sine, 3 shocks x 6 directions) |
| Vibration | IEC 60068-2-64 (Amplitude: 3 G-rms, Shape: 10 - 1000 Hz, Mounting: sprung masses, 3 axes w/ 8 hr duration each) |
| Compliance | For US Laser Safety: <ul style="list-style-type: none">• IEC/EN 60825-1:2014 Class 1 eye safe• FDA US 21CFR 1040 Laser Notice 56 Product Safety: <ul style="list-style-type: none">• UL 62368-1• CSA 22.2 No. 62368-1-19 EMC: FCC 47CFR Part 15, Subpart B, Class A For EU Laser Safety: IEC/EN 60825-1:2014 Class 1 eye safe Product Safety: EN/IEC 62368-1 EMC: <ul style="list-style-type: none">• EN 55032:2012/AC 2013; CISPR 32:2015• EN 55024:2010; CISPR 24:2010• EN 61000-3-2:2014• EN 61000-3-3:2013  |

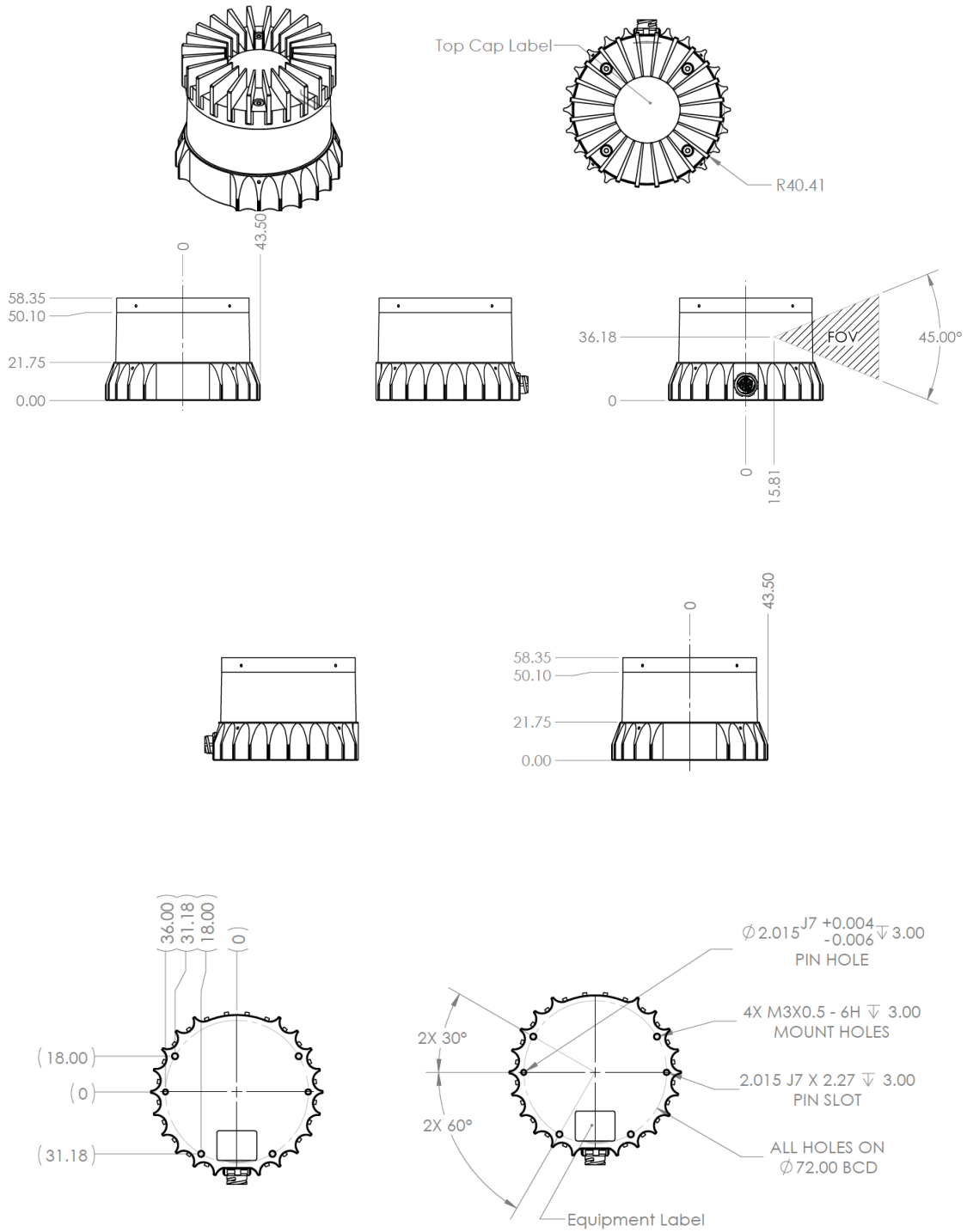
ACCESSORIES

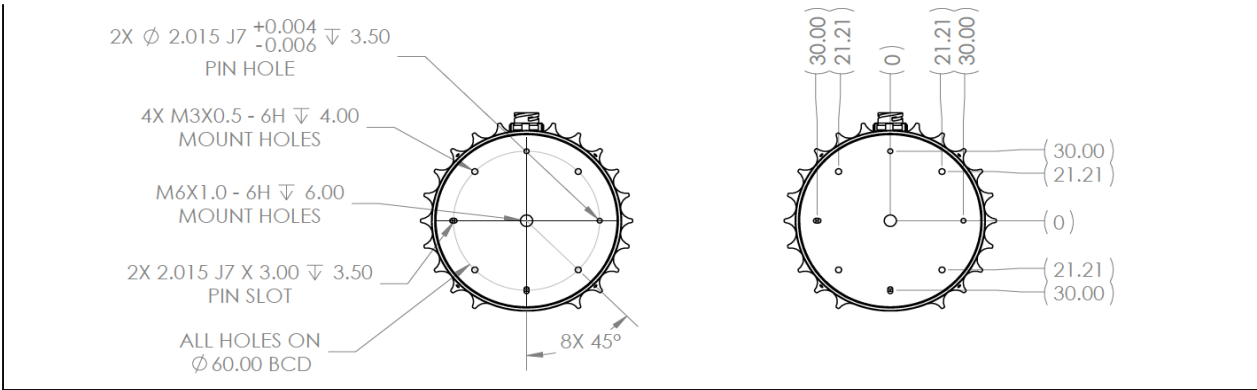
| | |
|------------------------|--|
| Included Interface Box | Polycarb/FR4, 100 g, 75 mm x 50 mm x 25 mm (LxWxH), 2 m CAT6 cable, 24 V power adapter, 5 m sensor cable |
| Optional Mount | Aluminum, 530 g, 110 mm x 110 mm x 20.5 mm (LxWxH), 4 x M8 thru holes |

SOFTWARE

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|----------------|------------------|
| Sample Drivers | ROS, C++, Python |
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EXTERIOR DIMENSIONS





*Specifications are subject to change without notice and based on engineering targets. Specs are not guaranteed to have passed full validation at the time of publication.

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