

OS0

Ultra-Wide View High-Resolution Imaging Lidar

Revision: 12/7/2020

FIRMWARE VERSION: v2.0

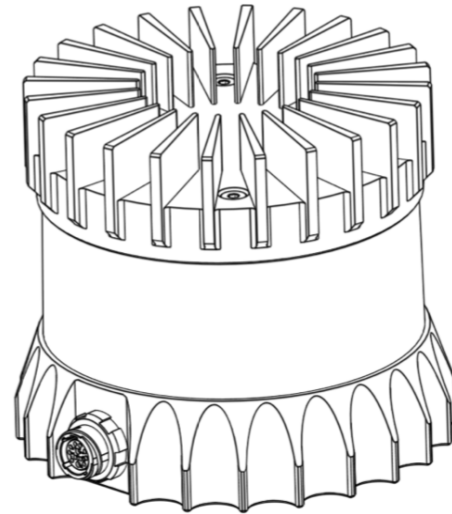
HARDWARE VERSION: Rev C

SUMMARY

The OS0 offers an ultra-wide 90° vertical field-of-view with 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 OS0 can be easily integrated into autonomous vehicles, heavy machinery, robots, drones, and mapping solutions.

HIGHLIGHTS

- Fixed resolution per frame
- Camera-grade near-infrared and intensity data
- Multi-sensor crosstalk immunity
- Fixed intrinsic calibration
- Open source drivers



OPTICAL PERFORMANCE

Range (80% Lambertian Reflectivity)	45 m @ 100 klx sunlight, >90% detection probability 50 m @ 100 klx sunlight, >50% detection probability
Range (10% Lambertian Reflectivity)	15 m @ 100 klx sunlight, >90% detection probability 20 m @ 100 klx sunlight, >50% detection probability
Minimum Range	0.3 m for point cloud data 0 m - 0.3 m blockage detection (flag to indicate object within 0.3 m)
Range Accuracy	±3 cm for lambertian targets, ±10 cm for retroreflectors
Precision (10% Lambertian Reflectivity; 1 standard deviation)	0.3 - 1 m: ±2 cm 1 - 10 m: ±1 cm 10 - 15 m: ±1.5 cm >15 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: 90° (+45° to -45°) 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	1 (strongest)

LASER

Laser Product Class	Class 1 eye-safe per IEC/EN 60825-1: 2014
Laser Wavelength	865 nm
Beam Diameter Exiting Sensor	5 mm
Beam Divergence	0.35° (FWHM)

LIDAR OUTPUT

Connection	UDP over gigabit Ethernet
Points Per Second	655,360 (32 channel) 1,310,720 (64 channel) 2,621,440 (128 channel)
Data Rate	66 Mbps (32 channel) 129 Mbps (64 channel) 254 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


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
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MECHANICAL/ELECTRICAL

Power Consumption	14 - 20 W (22 W peak at startup) OS0 Cold Start: 14 - 20 W (28 W peak if operating below -40 °C)
Operating Voltage	22 - 26 V, 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: 375 g (13.3 oz) With radial cap: 455 g (16.0 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

Operating Temperature	OS0: -20 °C to +55 °C (with mount) OS0 Cold Start: -40 °C to +55 °C (with mount) Between +47 °C and +55 °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)
Compliance	<p>For US</p> Laser Safety: <ul style="list-style-type: none"> • IEC/EN 60825-1:2014 Class 1 eye safe • FDA US 21CFR1040 Notice 50 Class 1 • CSA 22.2 No. 62368-1-19 Product Safety: UL 62368-1 EMC: FCC 47CFR Part 15, Subpart B, Class A <p>For EU</p> 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 

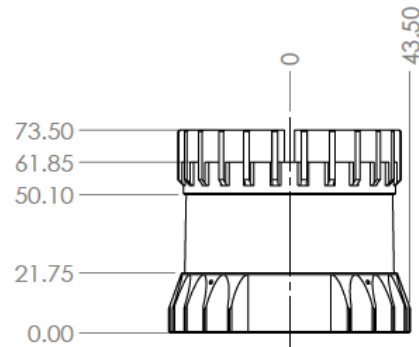
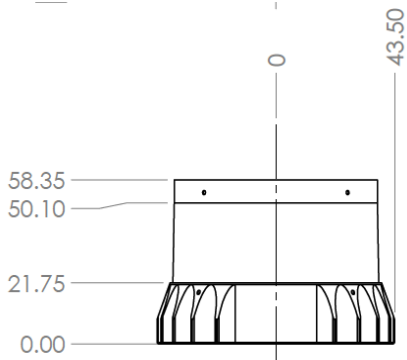
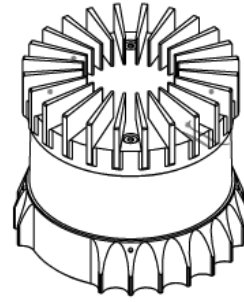
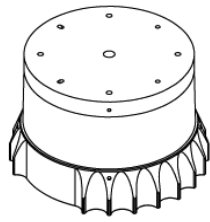
ACCESSORIES

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

Sample Drivers	ROS, C++
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EXTERIOR DIMENSIONS



2X $\varnothing 2.02 \text{ J7 } \begin{matrix} +0.00 \\ -0.01 \end{matrix} \nabla 3.50$

PIN HOLE

4X $\varnothing 2.50 \nabla 5.00$

M3X0.5 - 6H $\nabla 4.00$

MOUNT HOLES

$\varnothing 5.00 \nabla 7.00$

M6X1.0 - 6H $\nabla 6.00$

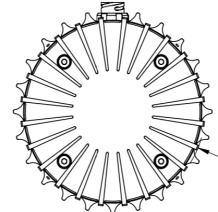
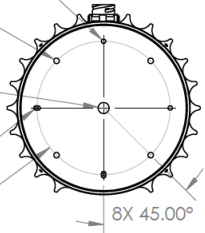
MOUNT HOLE

2X 2.02 X 3.00 $\nabla 3.50$

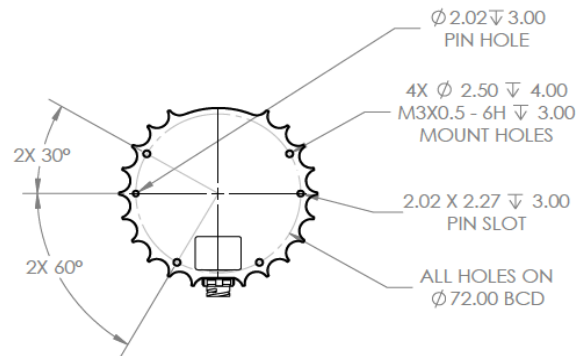
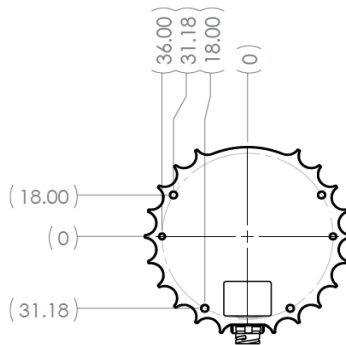
PIN SLOT

ALL HOLES ON

$\varnothing 60.00$ BCD



(Sensor Bottom)



*Specifications are subject to change without notice.