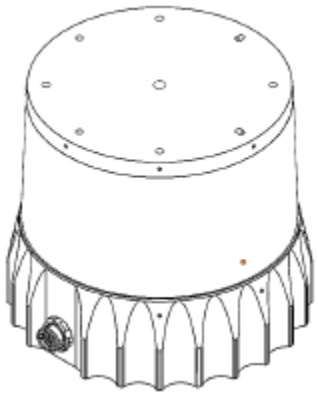
Technical Datasheet

OS2 Long-Range High-Resolution Imaging Lidar

Status: February 2021



FIRMWARE VERSION: v2.0
HARDWARE VERSION: 840-102146-D (Rev D)

Summary

The OS2 offers an industry-leading combination of resolution, range, affordability, performance, reliability, size, weight, and power. It is IP68/69K rated and designed for indoor/outdoor all-weather environments. As the smallest and lightest long-range high-resolution lidar on the market, the OS2 can be directly integrated into machinery, vehicles, 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
- 50+ customization options

Optical Performance

Range (80% Lambertian reflectivity, 2048 @ 10 Hz mode)	210 m @ >90% detection probability, 100 klx sunlight 240 m @ >50% detection probability, 100 klx sunlight
Range (10% Lambertian reflectivity, 2048 @ 10 Hz mode)	80 m @ >90% detection probability, 100 klx sunlight 100 m @ >50% detection probability, 100 klx sunlight
Minimum Range	1 m for point cloud data 0 m - 1 m blockage detection flag to indicate object within 1 m (v2.0 beta feature)
Range Accuracy	±3 cm for lambertian targets ±10 cm for retroreflectors
Precision (10% Lambertian reflectivity, 2048 @ 10 Hz mode, 1 standard deviation)	1 - 30 m: ± 2.5 cm 30 - 60 m: ± 4 cm >60 m: ± 8 cm
Range Resolution	0.3 cm
Vertical Resolution	32, 64, or 128 channels
Horizontal Resolution	512, 1024, or 2048 (configurable)
Field of View	Vertical: 22.5° (+11.25° to -11.25°) 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	19 mm
Beam Divergence	0.09° (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 µs
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 µs
Data Latency	< 10 ms
Additional Details	InvenSense ICM-20948

Control Interface

Connection	TCP and HTTP APIs
Time Synchronization Input sources:	• 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
Time Synchronization Output sources:	Configurable 1 - 60 Hz output pulse
Lidar Operating Modes	Hardware-triggered angle firing (guaranteed fixed resolution per rotation): • 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: • Beam angles • IMU pose correction matrix

Mechanical/Electrical

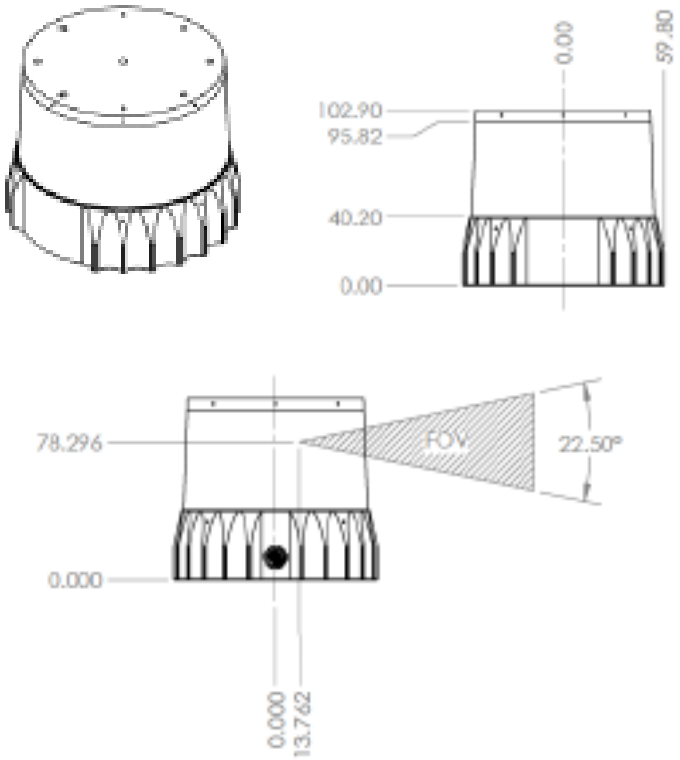
Power Consumption	18 - 24 W (28 W peak at startup, 30 W peak if operating below 10 °C)
Operating Voltage	22 - 26 V, 24 V nominal
Connector	Proprietary pluggable connector (Power + data + DIO)
Dimensions	Diameter: 119.6 mm (4.71 in) Height: 98.9 mm (3.89 in)
Weight	1100 g (38.8 oz)
Mounting	Bottom: 4x M3 screws, 2x locating 2 mm pin holes, 4x M4 screws, 2x locating 3 mm pin holes, 4x M6 screws Top: 4x M4 screws, 4x locating 3mm pin holes, 1x M6 Screw

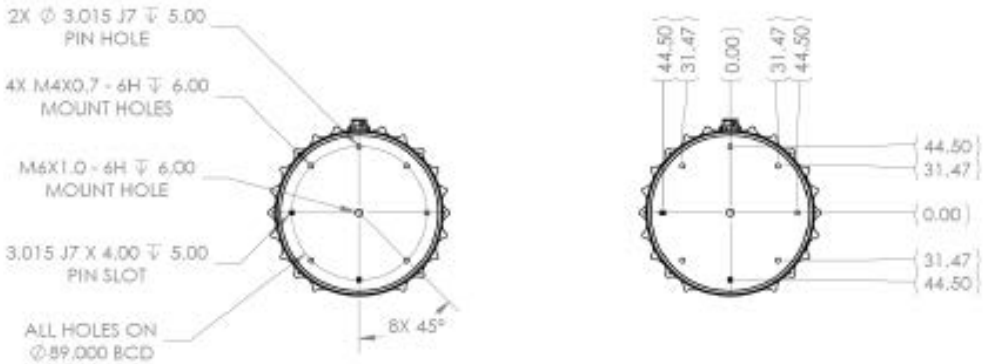
Operational

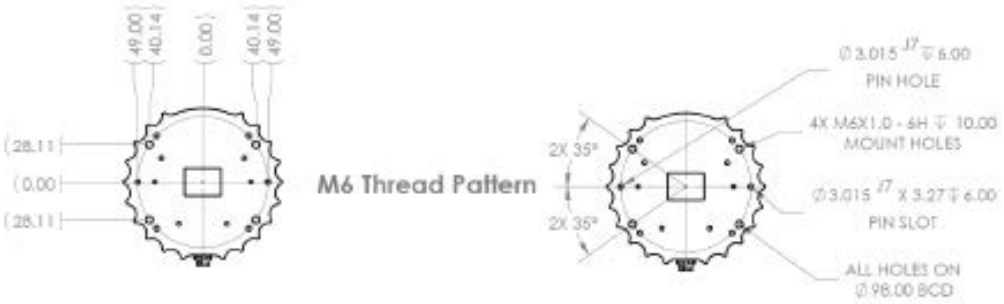
Operating Temperature	-20 °C to +64 °C (-5 °C for start up) Between +56 °C to +64 °C, sensor automatically reduces range (max 20%range reduction)
Storage Temperature	-40 °C to +75 °C
Ingress Protection	IP68 (1m submersion for 1 hour, with I/O cable attached) IP69K (with I/O cable attached)
Shock	IEC 60068-2-27 (Amplitude: 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	**For US** Laser Safety: • IEC/EN 60825-1:2014 Class 1 eye safe • FDA US 21CFR1040 Notice 50 Class 1 Product Safety: • UL 62368-1 • CSA 22.2 No. 62368-1-19 EMC: FCC 47CFR Part 15, Subpart B, Class A
Compliance	**For EU** Laser Safety: • IEC/EN 60825-1:2014 Class 1 eye safe Product Safety: • EN/IEC 62368-1 EMC: • EN 55032:2012/AC 2013; CISPR 32:2015 • EN 55024:2010; CISPR 24:2010 • EN 61000-3-2:2014 • EN 61000-3-3:2013

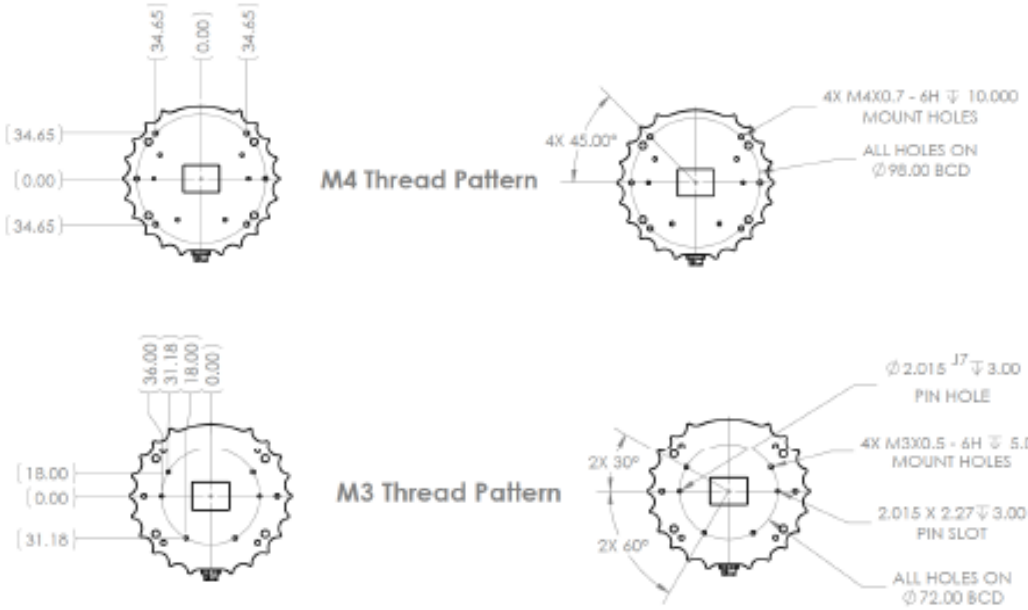
Software

Sample Drivers	ROS, C++


0.00
59.80
102.90
95.82
40.20
0.00
78.296
FOV
22.50°
0.000
0.000
13.762


2X ⌀ 3.015 J7 ↧ 5.00
PIN HOLE
4X M4X0.7 - 6H ↧ 6.00
MOUNT HOLES
M6X1.0 - 6H ↧ 6.00
MOUNT HOLE
3.015 J7 X 4.00 ↧ 5.00
PIN SLOT
ALL HOLES ON
⌀89.000 BCD
8X 45°
44.50
31.47
0.00
31.47
44.50
44.50
31.47
0.00
31.47
44.50


49.00
40.14
0.00
40.14
49.00
28.11
0.00
28.11
M6 Thread Pattern
⌀3.015 J7 ↧ 6.00
PIN HOLE
4X M6X1.0 - 6H ↧ 10.00
MOUNT HOLES
2X 35°
2X 35°
⌀3.015 J7 X 3.27 ↧ 6.00
PIN SLOT
ALL HOLES ON
⌀98.00 BCD


34.65
0.00
34.65
34.65
0.00
34.65
M4 Thread Pattern
4X 45.00°
4X M4X0.7 - 6H ↧ 10.000
MOUNT HOLES
ALL HOLES ON
Ø98.00 BCD
36.00
31.18
18.00
0.00
18.00
0.00
31.18
M3 Thread Pattern
2X 30°
2X 60°
Ø2.015 J7 ↧ 3.00
PIN HOLE
4X M3X0.5 - 6H ↧ 5.00
MOUNT HOLES
2.015 X 2.27 ↧ 3.00
PIN SLOT
ALL HOLES ON
Ø72.00 BCD