

PRELIMINARY SERIES PRODUCTION UNITS

INNOVIZTWO (Automotive Ethernet) High-Performance Automotive-Grade LiDAR

InnovizTwo is a high-performance, automotive-grade LiDAR sensor with unsurpassed 3D perception performance that is targeted at mass-production of Level 2 to Level 5 autonomous vehicles.

The rugged, reliable, functionally safe, and cost-effective LiDAR is lightweight, low-power, and resilient to sunlight and weather conditions. The sensor delivers a dense, highly accurate, 3D point cloud with unrivaled angular resolution at a high frame rate for distances up to 300m.

InnovizTwo's firmware is delivered with pre-configured functionality according to the scanning configuration. Two scanning configurations are available: Osprey and Hawk. Both configurations support pre-configured Field of View (FOV); frame rate; and one or two reflections.

Osprey is ideal for front-facing consumer vehicle applications which require higher resolution and a longer detection range in the Region of Interest (ROI). The Hawk is ideal for robotaxi and non-automotive applications that require a high, uniform FOV.

KEY PERFORMANCE METRICS

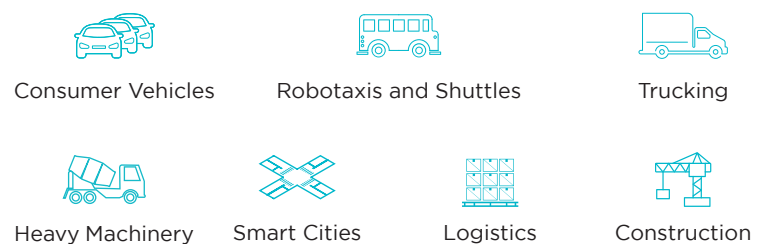
0.3m - 300m Detection Range	0.05°x 0.05° Maximum Angular Resolution (HxV)	120°x 43° Maximum Field of View (HxV)	10, 15, or 20 FPS Pre-Configured Frame Rate
6M Pixels/Second Maximum Pixel Rate	IP6K6K, IP6K9K, IP6K7 Ingress Protection	46x152x123.5mm Dimensions (HxWxD)	-40°C to 85°C Operating Temperature

Maximum configuration values are subject to overall design considerations and constraints.

UNIQUE FEATURES

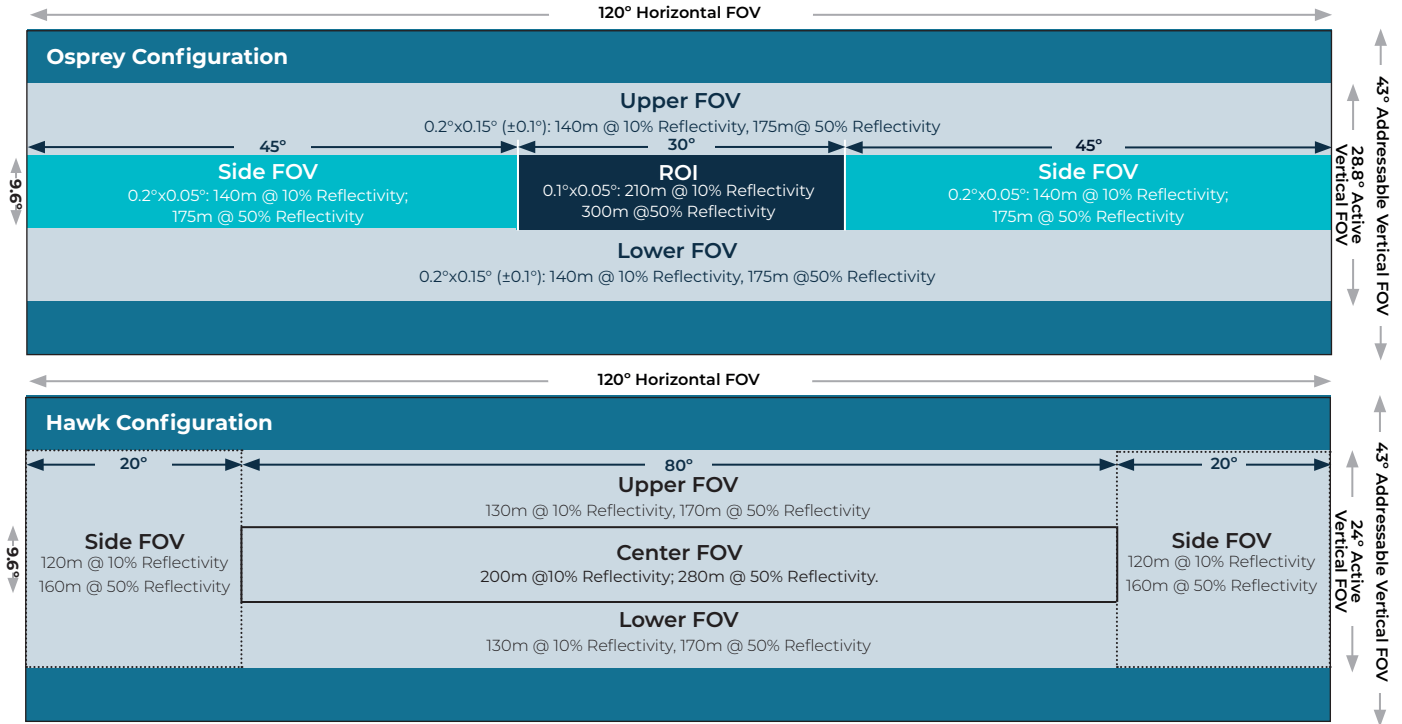
- Regions of Interest
- Pre-configured, Customer-Defined Vertical FOV
- Up to Two Reflections per Pixel
- Resilient to Sunlight & Weather Conditions
- Automotive Ethernet Interface
- IEEE 1588v2/802.1AS Time Synchronization
- ISO/SAE 21434 Automotive Cybersecurity

MARKET APPLICATIONS



SCANNING CONFIGURATIONS

The InnovizTwo scanning configuration is determined by the customer's requirements and design trade-offs.



SPECIFICATIONS

	Osprey Configuration	Hawk Configuration
Maximum Angular Resolution (HxV) ¹	0.2°x0.15° (±0.1°) in Upper and Lower FOV; 0.2°x0.05° in Side FOV; 0.1°x0.05° in ROI.	0.1°x0.05° resolution over the whole FOV.
Active Field of View (HxV)	120°x28.8°	120°x24°
Addressable Vertical Field of View ²	120°x43°	120°x43°
Region of Interest (HxV)	30°x9.6° (center ROI)	None
Scanned Lines within FOV	320	480
Frame Rate ³	10FPS	
Detection Range	0.3m-300m	
Range Resolution ⁴	1cm	
Long-Range Accuracy (Bias) ⁵	10cm	
Range Precision	<70% of maximum range: 5cm @1σ >70% of maximum range: 5cm + (Ground Truth - 70% of maximum range)*0.1 @1σ	
Angular Resolution Accuracy ⁴	0.5 x Angular Resolution (in nominal conditions ¹)	
Angular Resolution Precision ⁴	0.5 x Angular Resolution @1σ (in nominal conditions ¹)	
Pixel Latency ⁶	<30 msec	
Time Stamp	10 μsec accuracy for every pixel (with GPS input)	
Wavelength	905nm	
Laser Product Class	Class 1, Eye-safe (IEC-60825-1)	
Time Synchronization	IEEE 1588v2/802.1AS	

NOTES:

- ¹ Maximum resolution of 0.05°x0.05° can be configured across the entire FOV based on trade-offs between frame rate, FOV, range, and power consumption.
- ² Optional 15 and 20 FPS (specifications will differ from those included here).
- ³ Panning enables the active FOV to float within the boundaries of the addressable FOV. Degraded range performance is expected at the edges of the panning range.
- ⁴ 25°C ambient temperature; 10% Lambertian target. 100Klux ambient lighting; defined scanning configuration; native VFOV setting; 0° LiDAR roll/pitch; clear weather; no blockage on window; LiDAR is operating in Normal power mode. True Positives = 90% per pixel and False Positives = 1% per pixel based on the above configuration for long-range detection. False positives are pre-configured in the firmware from 0.01% to more than 10%.
- ⁵ Based on a normal target with Lambertian reflectivity up to 100%.
- ⁶ From first laser pulse of the pixel until pixel data is sent over the data interface.



OUTPUTS AND INTERFACES

	Osprey Configuration	Hawk Configuration
Points Returned per Second for Full FOV @ Single Reflection ¹	2.496M	5.760M
Points Returned per Second for Full FOV @ 1 and 2 Reflections ²	2.65M	6.912M
Point Cloud Reflections	Up to 2	
Point Cloud Attributes	Per-reflection: Distance, reflectivity, confidence, and intensity Per-pixel: Timestamp, number of reflections, blockage indication, and pixel coordinates Per-frame: Window blockage and glare detection (by segment); frame sequence number	
Automotive Ethernet Interface (two-wire 1000BASE-T1) ³	Aggregates Data, Command/Control, Diagnostics, and Firmware Upgrade	

NOTES

- ¹ Summation (PSM) pixels are included only in the ROI Summation segment.
- ² Assumes 20% of the pixels (including summation pixels for Hawk) have two reflections.
- ³ Main hybrid connector includes Automotive Ethernet and power connectors and boot Enable~ pin.

MECHANICAL/ELECTRICAL

Power Consumption ¹	25W (typical)/33W (maximum)	
Operating Voltage	Continuous	8.5VDC to 17VDC
	Transient	6.5VDC to 32VDC
Dimensions (HxWxD)	46x152x123.5mm	
Weight	1kg	
Temperature	Operating ²	-40°C to 85°C
	Storage	-40°C to 105°C
Main Hybrid Connector	Rosenberger 99S11T-40MT5-Y (Power, data, and control)	
Window Heater	Included	
Lifetime	15 years or 300,000km	
Total Operating Hours	8500	

NOTES

- ¹ Normal Power mode @20°C and 10FPS. Depends on environmental temperature. Up to additional 20W when window heater is operating.
- ² Optional airflow/cooling solution (depending on configuration, mounting position, and environment).

REGULATORY COMPLIANCE

	Standard
Component-Level Safety and Reliability	ASIC: AEC-Q100 (Grade 2) Laser: AEC-Q102 Detector: AEC-Q101 and AEC-Q102 Scanner: AEC-Q101 Window: EN/ISO 20567-1, Test method B – Stone chip test
Laser Safety	IEC 60825-1 – Safety of laser products FDA 21CFR1040.10 (Laser products) and FDA 21CFR1040.11 (Specific purpose laser products): Comply except for conformance with IEC60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.
System-Level Safety, Reliability and Cybersecurity	ASPICE V3.1 (Level 2) ISO/PAS 21448:2019 Road vehicles – Safety of the intended functionality (SOTIF) ISO/SAE 21434 Road vehicles – Cybersecurity engineering ISO 26262:2018 Road vehicles – Functional safety: ASIL B(D)
Electromagnetic Compatibility (EMC)	EN 55035; EN 55032; FCC 47 CFR Part 15, Subpart B; EU Directive 2014/30/EU; CISPR/KN 32; CISPR/KN 35
Environmental	DIN/EN/IEC 60068-2; ISO 16750; ISO 20653 (IP6K6K, IP6K9K & IP6K7); EN 61326-1; EN 62368-1; DIN 75220; Directive 2011/65/EU (RoHS 2); Directive (EU) 2015/863 (RoHS Appendix); REACH (EC 1907/2006-Art. 33); ISO14001 Environmental Management Systems (EMS)

INNOVIZTWO

- The LiDAR's data output is transmitted over Ethernet interface.
- Innoviz's LiDAR Manager software runs on the OEM's Electronic Control Unit (ECU) and enables command and control of the LiDAR.
- When the LiDAR is connected to a 3rd party perception software, the OEM's ECU converts the LiDAR data packets to the format used by the perception software.

SYSTEM ARCHITECTURE

INNOVIZTWO AUTOMOTIVE ETHERNET CONNECTION TO ECU

