INNOVIZTWO

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 including Regions of Interest (ROI); Field of View (FOV); pixel summation; frame rate; and one or two reflections. Two scanning configurations are available: Condor and Hawk. The Condor is ideal for front-facing consumer vehicle applications which require higher resolution and a longer detection range in the center ROI. The Hawk is ideal for robotaxi and non-automotive applications that require a high, uniform FOV. Condor and Hawk support Summation pixels, which are a combination of adjacent pixels that increases detection range. The LiDAR simultaneously transmits all pixels over the data interface.

KEY PERFORMANCE METRICS

0.1m - 300m	0.05°x 0.05°	120°x43°	10, 15, or 20 FPS
Detection Range	Maximum Angular Resolution (HxV)	Maximum Field of View (HxV)	Pre-Configured Frame Rate
10.6M Pixels/Second	IP6K6K, IP6K9K, IP6K7	46x137x132mm	-40°C to 85°C
Maximum Pixel Rate	Ingress Protection	Dimensions (HxWxD)	Operating Temperature

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

UNIQUE FEATURES

- Regions of Interest
- Pre-configured, customer-defined Vertical FOV
- One or Two Reflections per Pixel
- Pixel Summation for Increased Detection Range
- Resilient to Sunlight & Weather Conditions
- GMSL Interface
- Supports PPS TIme Synchronization
- ISO/SAE 21434 Automotive Cybersecurity

MARKET APPLICATIONS

Consumer Vehicles

Robotaxis and Shuttles

Trucking

Heavy Machinery

Smart Cities

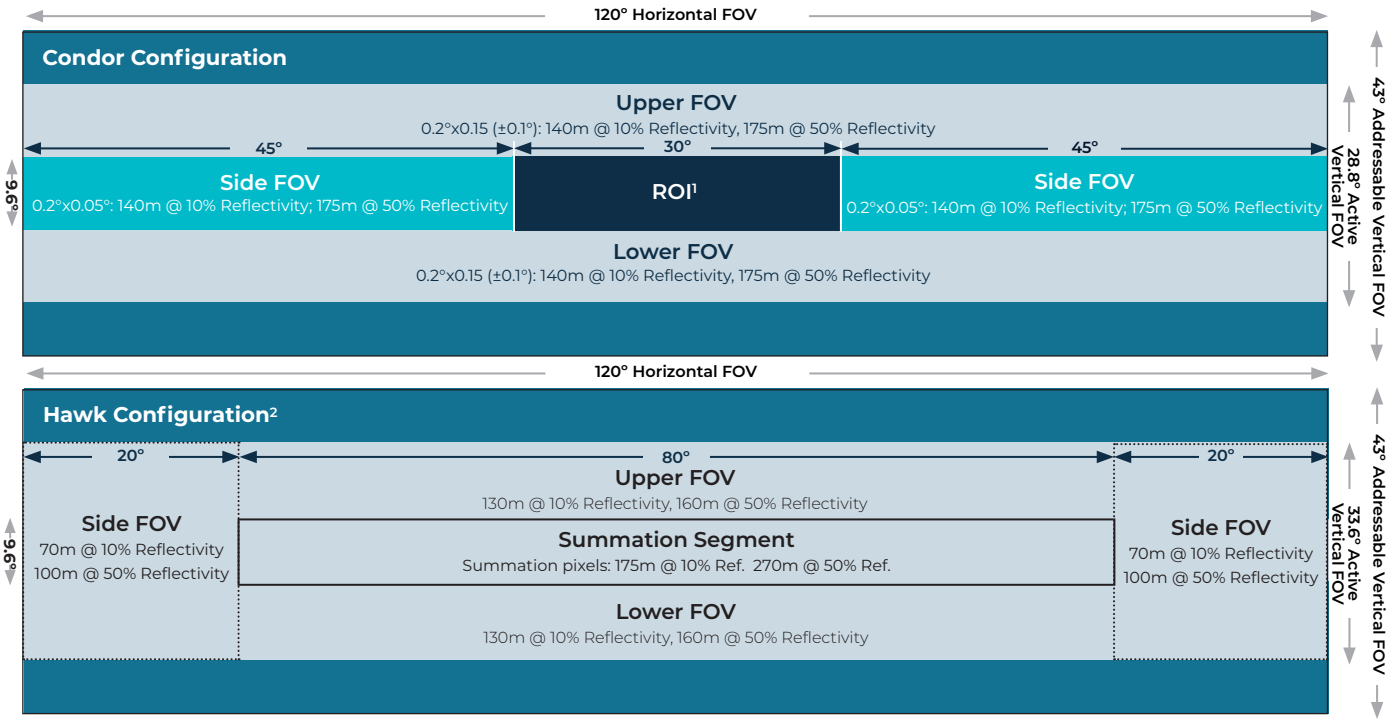
Logistics

Construction

INNOVIZ™ TECHNOLOGIES

SCANNING CONFIGURATIONS

The InnovizTwo scanning configuration is determined by the customer's requirements and design trade-offs. Following are the two most common configurations.



NOTES:

1 0.1°x0.05°: 210m @ 10% Reflectivity; 300m @ 50% Reflectivity. 0.1°x0.1° (Summation pixels): 245m @ 10% Reflectivity; 300m @ 50% Reflectivity.

2 Hawk has uniform 0.1°x0.05° point cloud pixel resolution 0.1°x0.1° Summation pixel resolution is employed only in the Summation segment.

SPECIFICATIONS

	Condor Configuration	Hawk Configuration
Maximum Angular Resolution (HxV)[1]	0.1°x0.05° over the ROI	0.1°x0.05° uniform resolution over the entire FOV
Active Field of View (HxV)	120°x28.8°	120°x33.6°
Region of Interest (HxV)	30°x9.6° (center ROI)	
Vertical Panning[2]	43°	
Frame Rate[3]	20FPS	10FPS
Scanned Lines within FOV	320	672
Detection Range	0.1m-300m	
Range Resolution[4]	1cm	
Long-Range Accuracy (Bias)[5]	Up to 50m distance: Maximum of 0.12% of distance or 1cm; Above 50m distance: 6cm	
Range Precision[6]	3cm @1σ	
Angular Resolution Accuracy	0.025° (in nominal conditions[1])	
Angular Resolution Precision	0.025°@1σ (in nominal conditions)	
Pixel Latency[7]	<25 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	PPS TIme Synchronization	

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 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.

3 Optional 15 FPS (specifications will differ from those included here).

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 Up to 70% of long range detection as detailed above.

7 From first laser pulse of the pixel until pixel data is sent over the data interface.

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OUTPUTS AND INTERFACES

	Condor Configuration	Hawk Configuration
Points Returned per Second for Full FOV @ Single Reflection	4.992M[1]	8.832M[1]
Points Returned per Second for Full FOV @ 1 and 2 Reflections	5.990M[2]	10.598M[2]
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 detection (by region); frame sequence number	
Data, Command and Control Interface	MIPI CSI-2 interface, SPI slave interface, and GPIO signals aggregated over a two-wire GMSL (1.8 Gbps data rate) high-speed LVDS interface.	
Power Connector[3]	12VDC	
Diagnostics and Firmware Upgrade Interface	CAN-FD	
Fan Interface[4]	Controls and powers the fan	

NOTES

[1] Summation pixels are included only in the ROI for Condor and Hawk Summation segment.
[2] Assumes 20% of the pixels (including Summation pixels) have two reflections.
[3] Main Hybrid connector includes GMSL and power connectors and boot Enable pin.
[4] Dedicated fan connector. Usage of fans depends on LiDAR location in vehicle.

MECHANICAL/ELECTRICAL

Power Consumption[1]		19W (typical)/29W (maximum)
Operating Voltage	Continuous	8.5VDC to 17VDC
	Transient	6.5VDC to 32VDC
Dimensions (HxWxD)		46x137x132mm
Weight		1.0kg
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		8,000

NOTES

[1] Normal Power mode @ 20°C and 20FPS. 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)

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- The LiDAR's data output is transmitted over GMSL interface.
- The diagnostics information and firmware upgrade are transmitted over CAN-FD 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 GMSL CONNECTION TO ECU