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

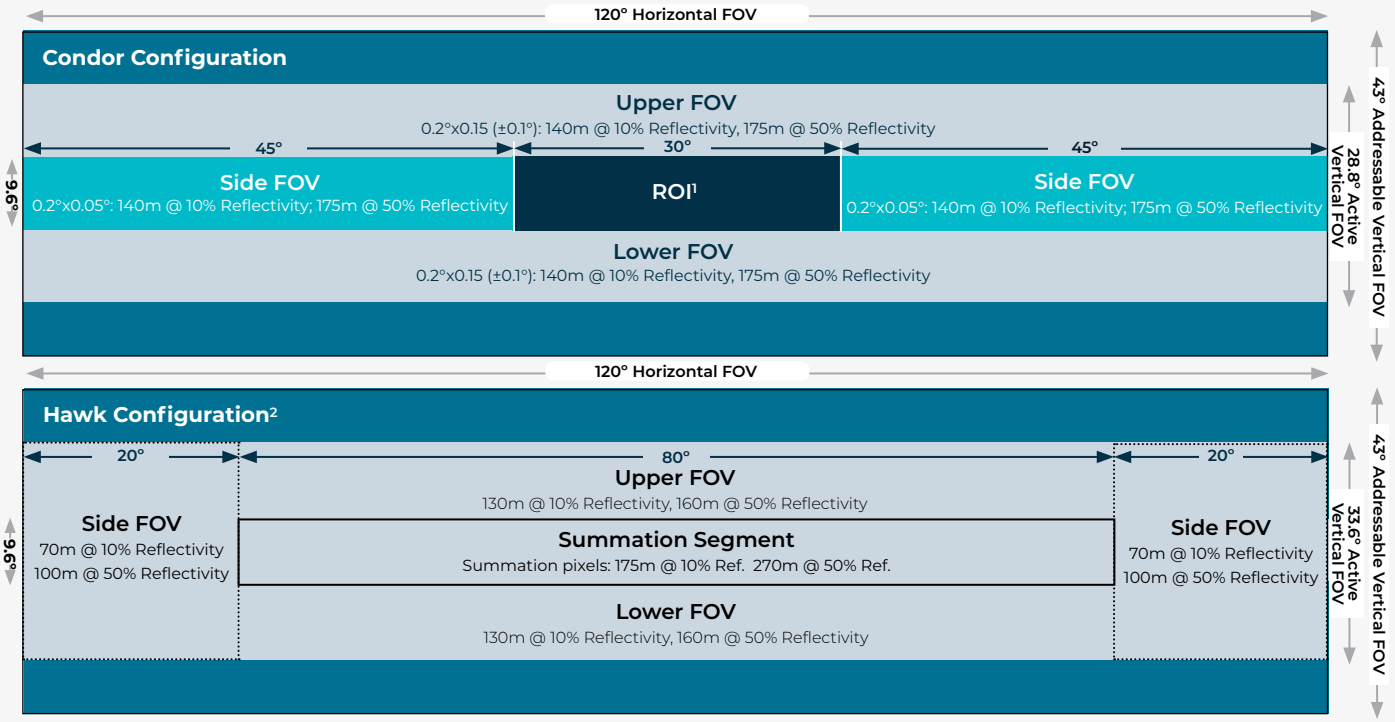
Logistics

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.

INNOVIZ™ TECHNOLOGIES

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)

INNOVIZ™ TECHNOLOGIES

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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