Opsys
Technologies

ALTOS
Datasheet

Prepared by Opsys Tech Ltd.

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1. Abbreviations

Abbreviations	Description
ALTOS	Advanced LiDAR Technology Opsys Sensors
CDRH	Center for Devices and Radiological Health
CPU	Central Processing Unit
FDA	Food and Drug Administration
FOV	Field of View
FPS	Frames per Second
Hz	Hertz
LiDAR	Light Detection and Ranging
MFT	Micro-Flash Technology
OEM	Original Equipment Manufacturer
POD	Probability of Detection
ROI	Region of Interest
SNR	Signal to Noise Ratio
SPAD	Single-Photon Avalanche Diode
TRX	Opsys' opto-electronic base module
UDP	User Datagram Protocol - connectionless communication protocol for transporting packets across networks
VCSEL	Vertical-Cavity Surface-Emitting Laser - a type of semiconductor laser diode with laser beam emission perpendicular from the top surface

Table 1: Abbreviations

2. Executive Summary

Opsys' Industrial LiDAR sensor, ALTOS, is a pure solid-state LiDAR without any moving parts based on fully addressable 2D VCSELs and a SPAD detector. The ALTOS (Advanced LiDAR Technology Opsys Sensors) is based on electrical scanning of the VCEL, which allows the sensor to work 24/7 without limitations. The VCEL and SPAD cells are individually controlled at each scan for a very short period of time. The field of view (FOV) and angular resolution of the sensor is defined only by the optics. This modular approach makes the system very scalable and cost-effective. The ALTOS can therefore be supplied with different FOVs and angular resolutions to match each use case, while keeping the system cost low.

Opsys' LiDAR sensors are based on Micro Flash Technology (MFT), which allows for very fast point-by-point scanning of the FOV (as opposed to flash or row-/ column-scanning techniques) without any scanning degradation across the entire FOV. This technology enables the LiDAR to scan the entire FOV at a very high rate to improve the SNR of each point in the point cloud and achieve a very high POD (probability of detection), even for low reflectivity targets at longer distances. The entire FOV is scanned 1000 times per second.
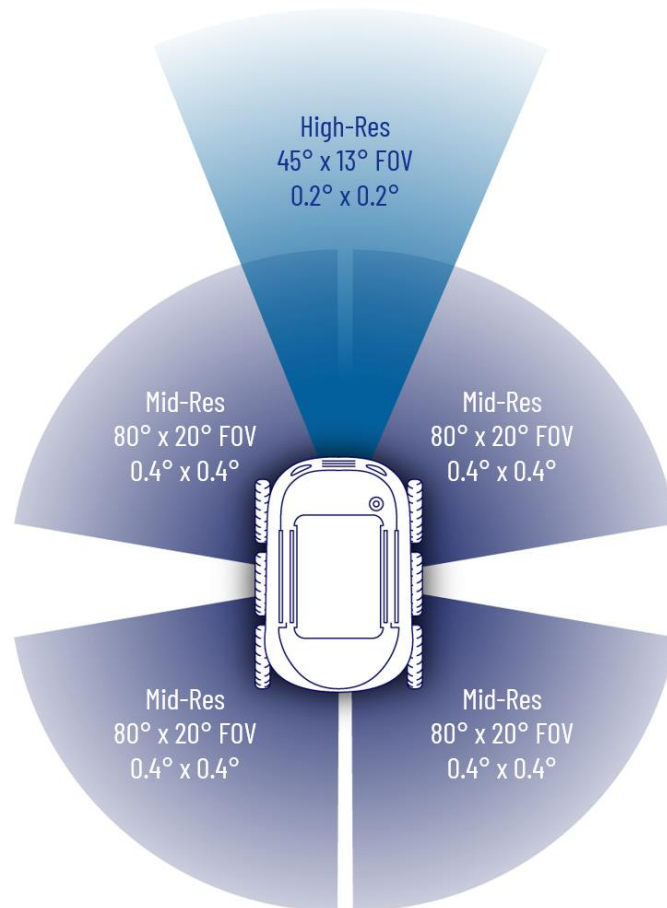
3. Ordering Information

Part number	Field of View	Wavelength	Angular Resolution	Window Type
IMUXSP3HFL3-000	22.5° x 6.5°	940nm	0.1° x 0.1°	Glass
IMUXSP3HSL3-000	22.5° x 6.5°	905nm	0.1° x 0.1°	Glass
IMUXSP3LFL3-000	45° x 13°	940nm	0.2° x 0.2°	Glass
IMUXSP3LSL3-000	45° x 13°	905nm	0.2° x 0.2°	Glass
IMUXSP3AFL3-000	80° x 22°	940nm	0.4° x 0.4°	Glass
IMUXSP3ASL3-000	80° x 22°	905nm	0.4° x 0.4°	Glass
IMUXSP3HFL3-003	22.5° x 6.5°	940nm	0.1° x 0.1°	Plastic
IMUXSP3HSL3-003	22.5° x 6.5°	905nm	0.1° x 0.1°	Plastic
IMUXSP3LFL3-003	45° x 13°	940nm	0.2° x 0.2°	Plastic
IMUXSP3LSL3-003	45° x 13°	905nm	0.2° x 0.2°	Plastic
IMUXSP3AFL3-003	80° x 22°	940nm	0.4° x 0.4°	Plastic
IMUXSP3ASL3-003	80° x 22°	905nm	0.4° x 0.4°	Plastic
1286528	5m combined power and data cable			

Table 2: Ordering information

4. Specifications

4.1. Typical Operating Conditions

Parameter	Minimum	Typical	Maximum	Unit
Supply voltage*	9	12	20	V
Power consumption		9.5	10.5	W
Operating temperature	–20		65	°C
Storage temperature	–25		85	°C

Table 3: Typical operating conditions

* According to LV124 standard

4.2. Performance Specifications

Parameter	ALTOS 300	ALTOS 150	ALTOS 70
Field of view (horizontal x vertical)	22.5° x 6.5°	45° x 13°	80° x 22°
Typical range, 10% reflective Lambertian target, 90klux	200m	100m	55m
Typical range, 70% reflective Lambertian target, 90klux	300m	150m	70m
Maximum observable range	300m	150m	70m
Minimum range	0.4m	0.4m	0.4m
Range measurement accuracy	±0.1m <100m	±0.1m <100m	±0.05m <100m
Range measurement precision	±0.1m	±0.1m	±0.05m
Horizontal angular resolution	0.1°	0.2°	0.4°
Vertical angular resolution	0.1°	0.2°	0.4°
Number of returns per pixel	2	2	2
Frame rate	Up to 30Hz	Up to 30Hz	Up to 30Hz

Table 4: Performance specifications

Illumination Specifications	
Wavelength	905nm, 940nm
Laser safety	Class 1 Eye-safe per IEC/EN 60825-1: 2014

Table 5: Illumination specifications

Mechanical Specifications	
Dimensions	109 x 68 x 100 mm
Weight	750g
Ingress protection	IP65
Physical interfaces	1000Base-T

Table 6: Mechanical specifications

Data Specifications	
LiDAR data	X, Y, Z coordinates and intensity per echo; Timestamp per pixel
Time synchronization protocol	PTP

Table 7: Sensor output

5. Mechanical Specifications
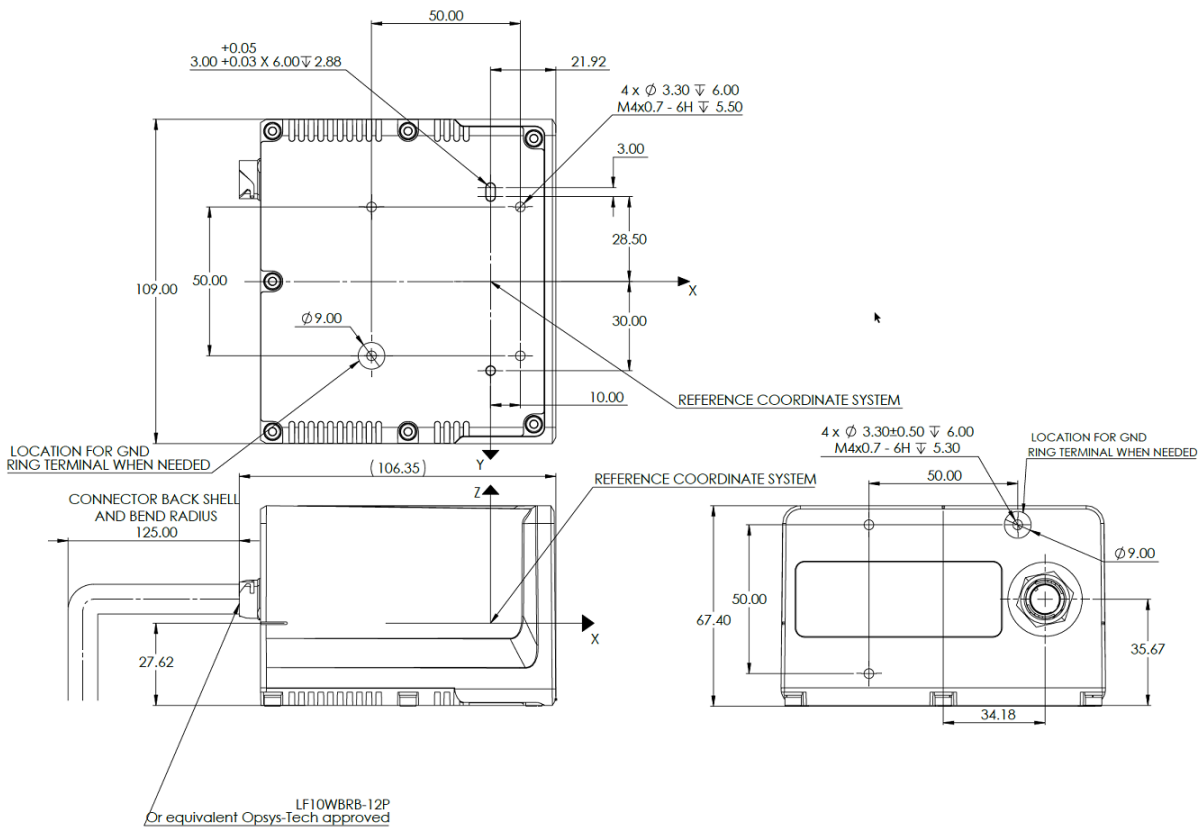
5.1. Dimensions
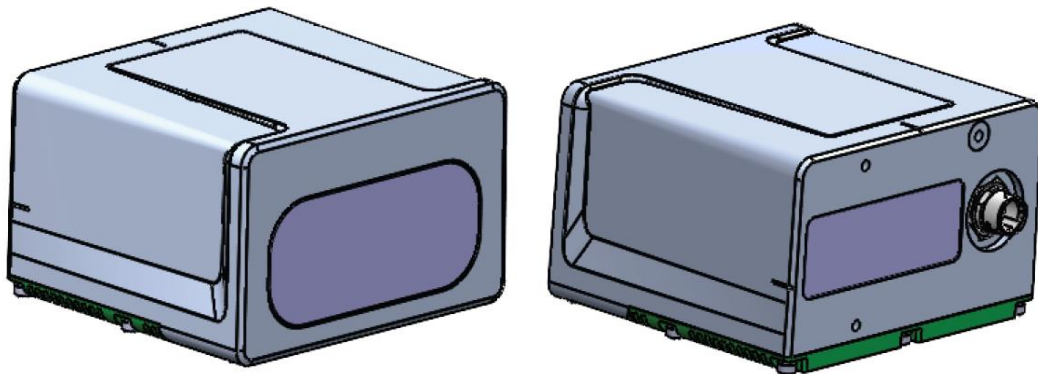

Figure 1: ALTOS dimensions

Figure 2: ALTOS front and rear view

The mounting holes of the ALTOS are located at the bottom of the unit. The four M4 holes are arranged in a 50mm x 50mm square on the bottom and the backside of the sensor.

5.2. Connector Specifications

The connector for the ALTOS is the Hirose LF10WBRB-12P. Different mating options are available. See the table below.

Manufacturer	Type	Angle	Cable Assembly
Hirose	LF10WBP-12S(31)	Straight	Solder
Hirose	LF10WBP-12SA(31)	Right angle	Solder
Hirose	LF10WBP-12SC HR12-SC-111 / HR12-SC-211	Straight	Crimp 26-30AWG wires

Table 8: Hirose LF10WBRB-12P mating options

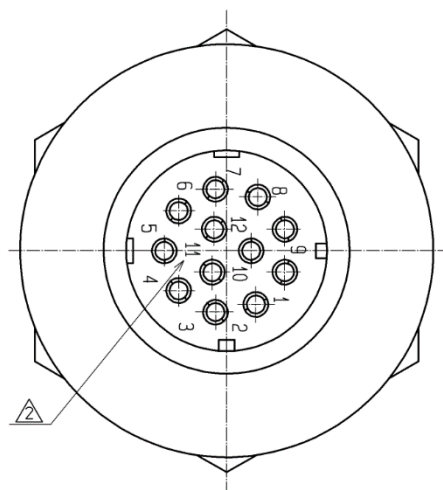| Pin	Function
1	Ethernet TP1-
2	Ethernet TP1+
3	Ethernet TP2-
4	Ethernet TP2+
5	Ethernet TP3-
6	Ethernet TP3+
7	Ethernet TP4-
8	Ethernet TP4+
9	GND
10	GND
11	12V
12	12V

Table 9: LF10WBRB-12P Pinout

Figure 3: LF10WBRB-12P drawing

5.3. Cable Specifications

The power / data cable can be acquired from Opsys. The ordering code can be found in Table 2 above. Figure 4 below shows the combined data and power cable that connects to the ALTOS. The data output of the combined cable has an RJ-45 connector. The power output is an Amphenol AT04-2P connector.
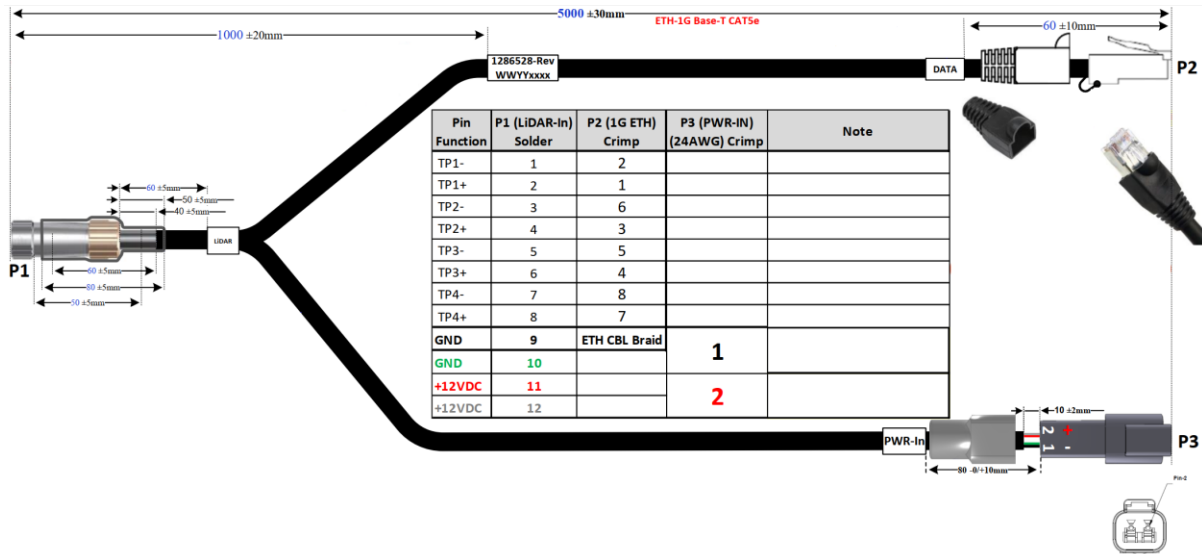

Pin Function	P1 (LiDAR-In) Solder	P2 (1G ETH) Crimp	P3 (PWR-IN) (24AWG) Crimp	Note
TP1-	1	2		
TP1+	2	1		
TP2-	3	6		
TP2+	4	3		
TP3-	5	5		
TP3+	6	4		
TP4-	7	8		
TP4+	8	7		
GND	9	ETH CBL Braid		
GND	10		1	
+12VDC	11		2	
+12VDC	12			

Figure 4: ALTOS combined cable

5.4. Cable Removal Instructions

In order not to damage the supplied power and data cable it must be handled in the correct way when withdrawing the cable. Figure 5 below shows the proper instructions how to remove the cable. The cable must be turned and pulled at the ribbons and not at the heat shrink tube to avoid damage.
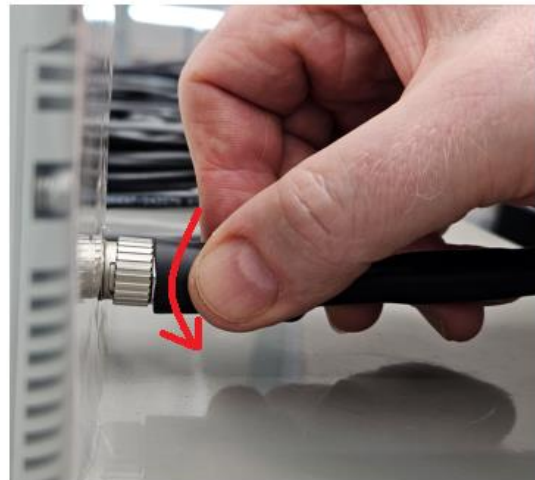

Figure 5: Power and data cable withdrawal instructions

6. System Description

6.1. Sampling

The ALTOS can be operated at framerates up to 30FPS. The high point-by-point scan rate enables the use of additional averaging for each pixel to improve the detection range and the probability of detection. Lower framerates allow for higher averaging in each pixel.

6.2. Functions

Occlusion and dirt detection

The ALTOS includes the function to detect dirt and occlusion. The occlusion detection will report when there are objects close to the sensor obstructing the field of view of the sensor.

For this purpose, the sensor field of view is divided into 12 segments. A blockage value will be provided for each of the 12 segments with every frame. Additional information will be provided periodically. This additional information consists of the percentage of the area blocked in each of the 12 segments.

The occlusion functionality is currently under development and will be available in a later algorithm release. The dirt detection function needs customization for each different system and is only available upon request.

6.3. Communication Interface

The ALTOS provides its data over a 1000 Base-T interface in UDP packets using IPv4. The UDP payload has a big-endian format and is using the ISO 23150 protocol for its data structure. Each packet consists of a header and pixel data. Additional health information is available in a dedicated package.

The specifications of the data structure of the different packets can be found in a dedicated application note. Please contact your Opsys representative for more information or info@opsys-tech.com.

7. Certifications

Certificate	Certificate number	Certificate Provider
Laser Class 1 Safety	7412303618	The Standards Institution of Israel
CDRH Laser Certification	2410390-000	FDA (U.S Food & Drug Administration

Table 10: Certifications

8. About Opsys Tech Ltd.

Opsys has developed the world's most advanced solid-state scanning LiDAR sensor. Opsys technology uses fully addressable VCSEL arrays, combined with a single chip addressable CMOS SPAD array. No moving parts allows for 24/7 operation. This gives the benefit of ensuring there are no mechanical failures over time, which increases the LiDAR's lifetime expectancy well beyond any other solution on the market today.

The patented technology provides a 5D point cloud in real time. Opsys sensors provide major cost savings as they are semiconductor-based, and the solution is scalable. The high-performance sensor is already in mass production.

Opsys technology is designed as a Lego brick system to enable complete customization at an affordable price. The ALTOS provides a fully integrated solution to meet the myriad of demands of industry across numerous different sectors, such as Smart Cities, Intelligent Traffic Systems (ITS), Robotics, Smart Factories, AGV and Security (for example in Perimeter Security, Public Safety, Healthcare and Education).

Founded in 2016, the company has major investment, is headquartered in Israel, with offices in USA, APAC, and Europe.

For more info: www.opsys-tech.com

9. Revision History

Date	Version	Description
02/11/2023	Version 1.0	Document creation
22/12/2023	Version 1.1	Added ordering codes
03/01/2024	Version 1.2	Added long range option
26/01/2024	Version 1.3	Corrected maximum distance specification Updated mechanical drawing
06/03/2024	Version 1.4	Added cable options and description
25/04/2024	Version 1.5	Added certifications, updated optical specs and updated naming convention
14/05/2024	Version 1.6	Updated "About Opsys Tech LTD" Corrected Laser Class 1 Safety certificate number
27/05/2024	Version 1.7	Corrected ALTOS 150 distance specification Updated mechanical drawings

Table 11: Revision history