



Compact 360° 3D Camera

PAL Mini is an ultra-compact, single sensor omnidirectional 3D vision system providing 360° stereoscopic sensing with depth information. PAL Mini enables visual intelligence with an unparalleled field of view that eliminates blind spots and combines full color video with depth information in a single video stream. The easy-to-use system has no moving parts, making it ideal for manufacturers and operators in robotics, factory, and warehouse automation where efficiency and reliability are critical.

Key Features

- 360° Horizontal and 89° Vertical Field-of-View
- RGB and depth provided
- Single CMOS sensor with no moving parts
- USB interface – power and data

Use Cases

- Obstacle detection in autonomous robots
- Floor and cliff detection in commercial cleaning robots
- Proximity sensor replacement
- Human presence detection with tracking

Availability

- PAL Mini
- PAL Mini Starter Kit
- PAL Mini Obstacle Detection Starter Kit

Additional Documents

- PAL Mini Starter Kit Guide

Camera Specifications

Stereo Image Performance	Stereo Image Output	3440 x 1019 @ 10 fps 2304 x 684 @ 20 fps 1720 x 512 @ 40 fps 860 x 256 @ 100 fps per image
	Maximum Field of View	See Figure 1
	Minimum Angular Resolution	0.11° (H) x 0.09° (V) / pixel
	Shutter Type	Rolling Shutter
Depth Performance	Depth Map	3440 x 1019 @ 10 fps 2304 x 684 @ 20 fps 1720 x 512 @ 40 fps 860 x 256 @ 100 fps
	Maximum Field of View	See Figure 1
	Minimum Angular Resolution	0.11° (H) x 0.09° (V) / pixel
	Minimum Range	0 cm
	Range Accuracy	See Range Performance Graph
	Range Resolution	0.2 cm at 5 cm and 4.4 cm at 300 cm (at 45 cm mounting height)
	Latency	See Performance Benchmarking Table
	Timestamp Accuracy	5 ms
Point Cloud Performance	Number of Points	Up to 35M points/second
	Formats	2.5D, 3D
Software Compatibility	Operating System	Ubuntu 16.04, 18.04
	Available RAM	2 GB
	Library Dependencies	OpenCV 3.4.4, ROS Melodic
Interfaces	Communication Interface	USB 3.0 (Data & Power)
Electrical data	Operating Voltage	5V ± 0.25V
	Maximum Power Usage	2.54 W

Mechanical Data	Weight	70 g
	Dimensions (See Figure 1)	Bottom Diameter: 45.5 mm
		Top Diameter: 21.35 mm
		Height: 71.8 mm
	Materials	ABS, PC, Aluminum & Glass
	Housing Color	Matte Black (Top & Bottom)
Mounting (See Figures 2 and 3)	UNC 1/4"-20, Top & Bottom	

Environmental Conditions	Ambient Temperature	-30° to +55°C
	Storage Temperature	-40° to +85°C
	Ambient Lighting	5 Lux to 25,000 Lux
	IP Rating	IP64
	Humidity	RH-95% Non Condensing @ 55°C

Resistance	Shock Resistance	Up to 25g in all directions
	Vibration Resistance	5 Hz to 500 Hz: 2g, 10 sweep cycles ± X, Y, Z axes tested for 9 hours

Accessories (included)	USB 3.0 Type C to Type A cable
	Microfiber Cloth

Important Notes	Fingerprints and other buildup on the transparent housing may degrade performance. Routine cleaning is recommended
	A clean dry microfiber cloth should be used for cleaning the polycarbonate dome. Only plain water is safe for dried on or stubborn dirt.

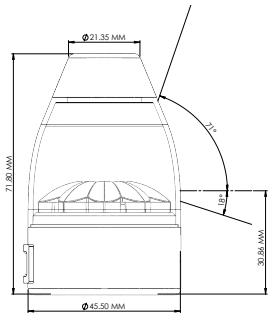


Figure 1

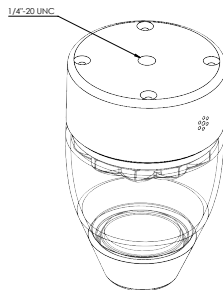


Figure 2

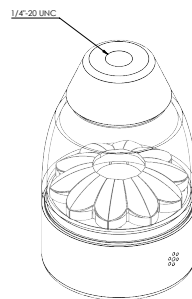


Figure 3

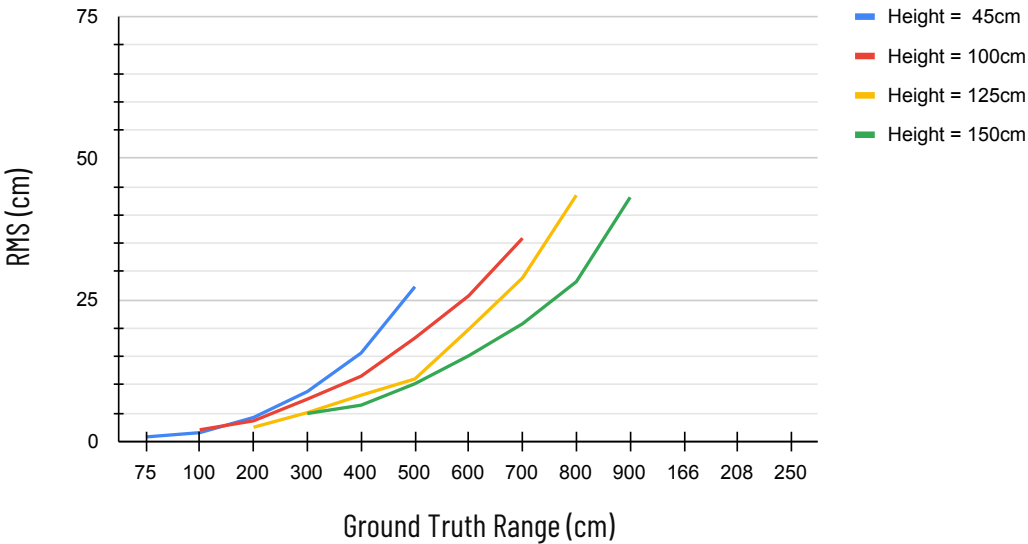
Performance Benchmarking

	Jetson Nano	Jetson NX	Jetson AGX	Intel NUC11PAHI5
Refresh Rate	10 FPS	20 FPS	20 FPS	20 FPS
Latency	300 ms	200 ms	200 ms	200 ms
Available RAM Required	2GB	2.9GB	2.9GB	1.6GB
Compute Requirement	72% of 1.4Ghz, Quad-core ARM Cortex-A57 MPCore processor, 99%	67% of 1.4Ghz, 6-core NVIDIA Carmel ARM v8.2 64-bit CPU, 79% GPU	44% of 1.1Ghz, 8-core ARM v8.2 64-bit CPU, 8MB L2 + 4MB L3, 59% GPU	70% of i5-1135G7 @ 2.40GHz x 8
Power Mode	MAXN	15W 6core	30W ALL	-

Performance on Reference Hardware with 1x PAL Mini at maximum of 360° Field of View. Higher performance is expected with the reduced Field of View.

Range Performance

PAL Mini Range Accuracy vs Mounting Height (Inverted Orientation)



Certifications

