Livox Mid-360

Quick Start Guide

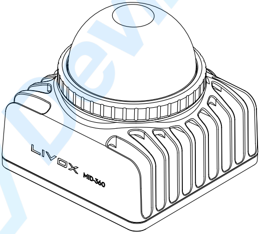
快速入门指南

クイックスタートガイド

퀵 스타트 가이드

Kurzanleitung

v1.8


LIVOX
MID-360

LIVOX

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This product is NOT a toy and is not suitable for children under the age of 16. Adults should keep the product out of the reach of children and exercise caution when operating this product in the presence of children.

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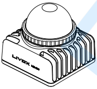
Warnings

1. Be careful when using Livox Mid™-360 in conditions with low visibility such as foggy or stormy weather. The detection range may be reduced in such conditions.
2. Make sure to mount the Livox Mid-360 on a metal plate with good thermal conductivity such as aluminum alloy. Allow a space of at least 10 mm around the LiDAR sensor to avoid poor air flow affecting heat dissipation.
3. DO NOT touch the optical window of the Livox Mid-360. Dust and stains on the optical window can negatively affect the performance. Use compressed air or a lens cloth to clean the optical window correctly. Refer to the Livox Mid-360 User Manual for more information on how to clean optical windows.
4. In order to avoid electric shocks or radiation exposure, DO NOT disassemble the Livox Mid-360. Contact Livox if an accessory or product part needs to be replaced.
5. The Livox Mid-360 is classified as a Class 1 laser product (IEC/EN 60825-1:2014) and is safe under all normal conditions of use.
6. Liquid damage is not covered under warranty.
7. DO NOT drop the Livox Mid-360.
8. The Livox Mid-360 Quick Start Guide contains important information. Make sure to read before using for the first time and keep for reference.

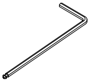
In the Box

Livox Mid-360 × 1



Optical Window Cleaning Cloth × 1

L-Shaped Hex Screwdriver × 1



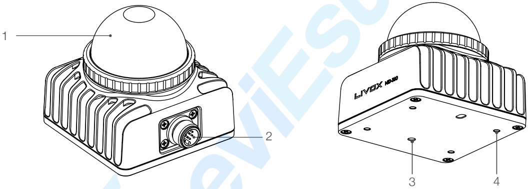
M3 Screws Package × 1

1. Introduction

The Livox Mid-360 is a high-performance LiDAR sensor that can be used for multiple applications including robotics, smart cities, and other fields, and supports the realization of mapping, positioning, recognition, obstacle avoidance, and other functions. The Livox Mid-360 features a field of view (FOV) of up to 360° and it can detect objects as close as 0.1 meters away. [1] With an advanced opto-mechanical system design, the Livox Mid-360 has an increased detection range and higher point cloud density and coverage, can accurately capture every detail in the FOV, and has a stronger adaptability. Users can check the real-time point cloud data using Livox Viewer 2 and a software development kit (SDK) is provided to help develop customizable applications using the data acquired from the point cloud.

The Livox Mid-360 has a detection range of up to 100 meters.

Livox Mid-360



1. Optical Window
2. M12 Aviation Connector
3. Locating Hole
4. M3 Mounting Holes

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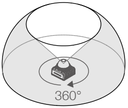
[1] Refer to the Specifications section for more information on the detection precision.

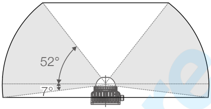
2. Installation and Connection

Effective FOV Range

The FOV of Livox Mid-360 is 360° horizontally and 59° vertically. [1] When mounting the sensor, make sure that the FOV is not blocked by any objects.



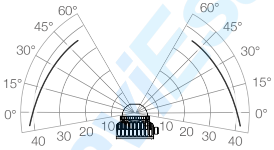
Horizontal



Vertical

[1] Refer to the Livox Mid-360 User Manual for more information.

Note that the effective detecting distance of the Livox Mid-360 varies based on where the object is within the FOV. Refer to the diagram below:



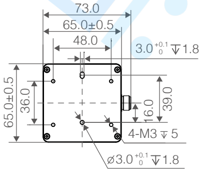
Reflectivity: 10%
Unit: m

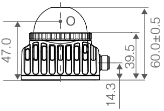
Pay attention to the effective detection range when in use.

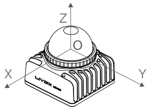
⚠ • Overlapping with other Lidar FOVs should be avoided. If the laser beams are pointed right at each other, irreversible damage may be caused to the Mid-360.

Mounting the Livox Mid-360

Refer to the dimensions and the mounting holes in the diagrams below to mount or embed the Livox Mid-360 to or in an appropriate place on the target base. Point O represents the origin and O-YXZ represents the point cloud coordinates of Livox Mid-360.







Unit: mm

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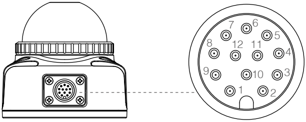
Connectors

The Livox Mid-360 uses the high-reliability M12 A-Code aviation connector (male).



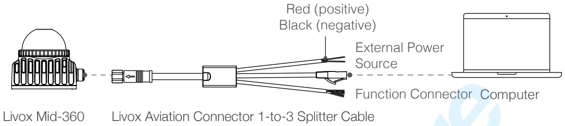
Below is more information on the Livox Mid-360 M12 aviation connector.

M12 Aviation Connector Pin	Signal	Type	Description
1	Power+	Power	DC 9 V-27 V
2	Ground	Power	Ground
3	Ground	Power	Ground
4	Ethernet-TX+	Output	Ethernet-TX+
5	Ethernet-TX-	Output	Ethernet-TX-
6	Ethernet-RX+	Input	Ethernet-RX+
7	Ethernet-RX-	Input	Ethernet-RX-
8	LVTTL_IN	Input 3.3V LVTTL	Pulse per second
9	Power+	Power	DC 9 V-27 V
10	LVTTL_IN	Input 3.3V LVTTL	GPS input
11	LVTTL_OUT	Output 3.3V LVTTL	Reserved output IO
12	LVTTL_OUT	Output 3.3V LVTTL	Reserved output IO

Connection

The Livox Mid-360 supports only the static IP address mode. All Livox Mid-360 LiDAR sensors are set to static IP address mode by default with an IP address of 192.168.1.1XX (XX stands for the last two digits of the Livox Mid-360 LiDAR sensor's serial number). The default subnet masks of the Livox Mid-360 LiDAR sensors are all 255.255.255.0 and their default gateways are 192.168.1.1. Directly connect the Livox Mid-360 to the computer when using for the first time.

1. Before connecting, set the IP address of the computer to static IP address mode. Set the IP address of the computer to 192.168.1.50, and the subnet mask of the computer to 255.255.255.0.
2. Connect the Mid-360 as shown below.



   a. Connect the M12 aviation connector (female) on the Livox Aviation Connector 1-to-3 Splitter Cable with the M12 aviation connector (male) on the Livox Mid-360. The lock nut of the M12 aviation connector (female) should be tightened with a wrench to ensure there is a secure connection with the end face of the M12 aviation connector (male). Make sure there is no gap between them.

   b. Connect the RJ45 network connector on the Livox Aviation Connector 1-to-3 Splitter Cable to the computer.

   c. If GPS time synchronization is required, connect the function connector on the Livox Aviation Connector 1-to-3 Splitter Cable to the corresponding synchronization source. Refer to the table of the function connector for more information.

   d. Connect the external power connector on the Livox Aviation Connector 1-to-3 Splitter Cable to the external power source. Pay attention to the input voltage range and polarity.

Below is more information on the function connector.

Color	Signal	Function
Gray/White	LVTTL_IN	GPS input
Gray	LVTTL_OUT	Reserved output IO
Purple/White	LVTTL_IN	Pulse per second
Purple	LVTTL_OUT	Reserved output IO
Black	Ground	

- The Livox Aviation Connector 1-to-3 Splitter Cable must be purchased separately.

- When connecting the power cable and the function cable, pay attention to their respective voltage ranges and polarities. DO NOT connect any PoE device to the RJ-45 network connector. Incorrect connection can lead to irreversible damage to the LiDAR.
- Refer to the Livox Mid-360 User Manual on how to set the IP address of the computer.
- When multiple Livox Mid-360 LiDAR sensors are connected to one computer in static IP address mode, make sure all sensors connected have different static IP addresses. Refer to Livox Mid-360 User Manual for more information on how to set the IP address for each LiDAR sensor.

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3. Downloading and Using Livox Viewer 2

Visit http://www.livoxtech.com and download the latest Livox Viewer 2 to check the point cloud data. Livox Viewer 2 supports WINDOWS® 10 (64 bit) and UBUNTU™ 18.04 (64 bit).

a. Download the file named "Livox Viewer 2."

b. Unzip the Livox Viewer 2 file and click to open the .exe file named "Livox Viewer 2". For Ubuntu users, unzip the Livox Viewer 2 file and click to open the "./livox_viewer_2.sh" file under the root directory.

c. If a system window with network authorization pops up when opening Livox Viewer 2, allow Livox Viewer 2 to access network.

d. The device manager window is on the left side of Livox Viewer 2 and the main interface is on the right side. Click ◎ to display or hide the device manager window. In this device manager window, users can check all Livox LiDAR sensors in the local area network (LAN).

e. Click "LiDAR" on the top of the device manager window.

f. Select the Livox Mid-360 you want to check and click ● to connect. Alternatively, select the Livox Mid-360 you want to check, right click, and click "Connect."

g. After connecting, click ▶ or press the space key on the keyboard to view the point cloud data.

⚠
- For Windows users, Livox Viewer 2 may fail to detect LiDAR sensors if Windows Firewall is turned on. In this situation, go to the Control Panel to turn off Windows Firewall and restart Livox Viewer 2.
- Download and read the Livox Viewer 2 User Manual for more information on how to use Livox Viewer 2.

Specifications

Model	MID-360
Laser Wavelength	905 nm
Laser Safety [1]	Class 1 (IEC 60825-1:2014) (safe for eyes)
Detection Range (@ 100 klx)	40 m @ 10% reflectivity 70 m @ 80% reflectivity
Close Proximity Blind Zone [2]	0.1 m
FOV	Horizontal: 360°, Vertical: -7°~52°
Distance Random Error (1σ) [3]	≤ 2 cm (@ 10 m) [4] ≤ 3 cm (@ 0.2 m) [5]
Angular Random Error (1σ)	≤ 0.15°
Point Rate	200,000 points/s
Frame Rate	10 Hz (typical)
Data Port	100 BASE-TX Ethernet

Data Synchronization	IEEE 1588-2008 (PTP v2), GPS
Anti-Interference Function	Available
False Alarm Ratio (@100 klx) [6]	< 0.01%
IMU	Built-in IMU: ICM40609
Operating Temperature	-20° to 55° C (-4° to 131° F) [7]
Storage Temperature	-40° to 70° C (-40° to 158° F)
IP Rating	IP67
Power [8]	6.5 W (ambient temperature 25° C (77° F))
Power Supply Voltage Range	9~27 V DC
Dimensions	65 (width) × 65 (depth) × 60 (height) mm
Weight	Approx. 265 g

[1] The divergence of the embedded laser is 25.2° (horizontal) × 8° (vertical), which was measured at full width at half maximum. The maximum power of the embedded laser may exceed 70 W. In order to avoid being injured by the laser, DO NOT disassemble Livox Mid-360.

[2] Target objects within 0.1 to 0.2 m from Livox Mid-360 can be detected, and point cloud data can be recorded. However, since the detection precision cannot be guaranteed, the data should be taken as a reference only.

[3] To detect objects having different reflectivities within the detection range, the accuracy of point cloud data of very few positions might decrease slightly.

[4] Tested in an environment at a temperature of 25° C (77° F) with a target object that has a reflectivity of 80% and is 10 meters away from Livox Mid-360.

[5] Tested in an environment at a temperature of 25° C (77° F) with a target object that has a reflectivity of 80% and is 0.2 meters away from Livox Mid-360. For target objects within 0.1 to 1 m away from Livox Mid-360, if they have a low reflectivity or are thin and tiny, the detection effect cannot be guaranteed. These objects include but are not limited to black foam and the surface of water or objects that have been polished, have a matte finish, thin lines, etc.

[6] The false alarm ratio of the noise created by the stray light in a test environment of 100 klx at a temperature of 25° C (77° F).

[7] The performance of Livox Mid-360 might slightly decrease in high-temperature or low-temperature environments, or environments with strong vibrations or heavy fog, etc. Besides, operating at a high temperature for an extended period of time may negatively affect performance and may lead to permanent damage to the product. It is recommended to apply extra heat dissipation measures to ensure that the temperature of the shell does not exceed 80° C (176° F). A high temperature will trigger the high-temperature protection mechanism, and Livox Mid-360 will issue a high-temperature warning. Livox Mid-360 will stop operating automatically if the temperature is too high.

[8] For the stable power and peak power in different environments, refer to the user manual to design the power supply reasonably.