Akusense

AS-31C User Manual

V1.1

Contents

1. Product description

AS-31C is a single-line LiDAR launched by Akusense, using the pulsed time-of-flight principle (Pulsed ToF) for distance measurement. Through internal high-speed rotating mirror in lidar, the invisible infrared laser emitted by the ranging module is deflected to different angle, so as to scan and measure environmental profiles within 270°of the same horizontal plane. Compared with similar products, AS-31C has the following characteristics:

- **Long measuring distance:** With the principle of Pulsed ToF and the optimized optoelectronic design, AS-31C series has a longer measuring distance (≥20 m@70% reflectivity) for targets with the same reflectivity, which is very suitable for large space scenarios;
- **Good reliability:** The rotating mirror design minimizes the moving parts inside the lidar, improves the service life and greatly reduces the impact of mechanical vibration on operation. In addition, the Ethernet interface has better performance than other communication methods.
- **Small size:** the height of the lidar body does not exceed 9 cm and the side length of the base is only 6 cm, which is convenient for installation in limited space.

Based on the above characteristics, this series of lidars can be widely used in various scenarios that require distance scanning measurement, such as mapping, positioning and navigation of mobile robot platforms. measurement of environmental profiles within 270° of the same horizontal plane. Compared with similar products, AS-31C series has the following characteristics:

2. Specification

Model	AS-31C
Measuring principle	Pulsed ToF
Light source	Laser 905nm
Max. sensing range	≥20 m （70%reflectivity） ≥10 m （10%reflectivity） [1]
HFOV	270°
Sampling frequency	30 kHz [2]
Scanning frequency	10 Hz/15 Hz/20 Hz/25 Hz/30 Hz
Angle resolution	0.12°/0.18°/0.23°/0.35°/0.35°
Range resolution	1cm
Measurement error	±2 cm [3]
Communication interface	Ethernet/RJ45
Operating voltage	12 V DC
Power consumption	<5W/Peak <2 W /Typical value [4]
Working temperature	–20℃~60℃ [5]
Storage temperature	IP65
Weight	About 250g
Dimension	Refer to "Dimension"

[1] Typical value at 10% reflectivity

[2] Equivalent data sampling frequency calculated at 360− horizontal field of view

[3] Typical values in 10 meters at 10% to 70% reflectivity

[4] The power consumption peaks for a short time (<10 s) when the lidar starts up and then drops to typical values

[5] It can be started at −25℃, but normal operation requires the ambient temperature to reach at least −20℃.

3. Installation

3.1 Installation environment

Lidar is a kind of precise photoelectric sensors. Please keep the light−emitting area of the infrared cover clean during installation to avoid contamination and scratches, so as not to block the field of view or generate noise.

The laser emission and reception area of AS−31C in the vertical direction is shown in Figure 1. When installing, please refer to the area marked with slashes in Figure 1 as the benchmark, and reserve at least 5 mm of vertical open space up and down to ensure that the laser emission and reception are not blocked.
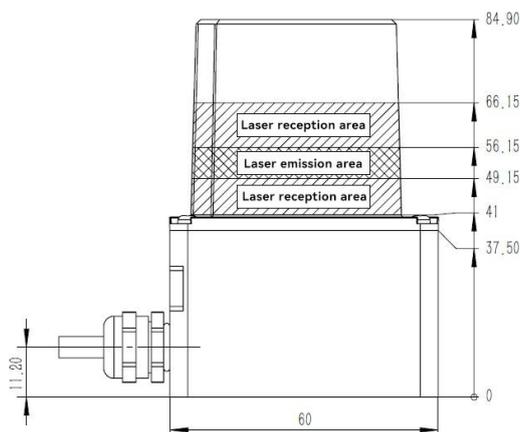

Figure 1. Position of laser emission and reception area

The working area of AS−31C in the horizontal direction is 270°, that means 135° on the left and right in front of the body, as shown in Figure 2.
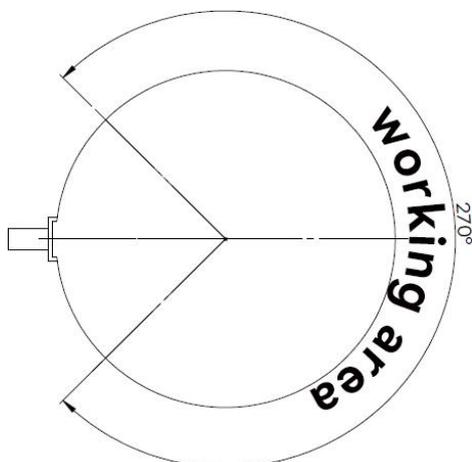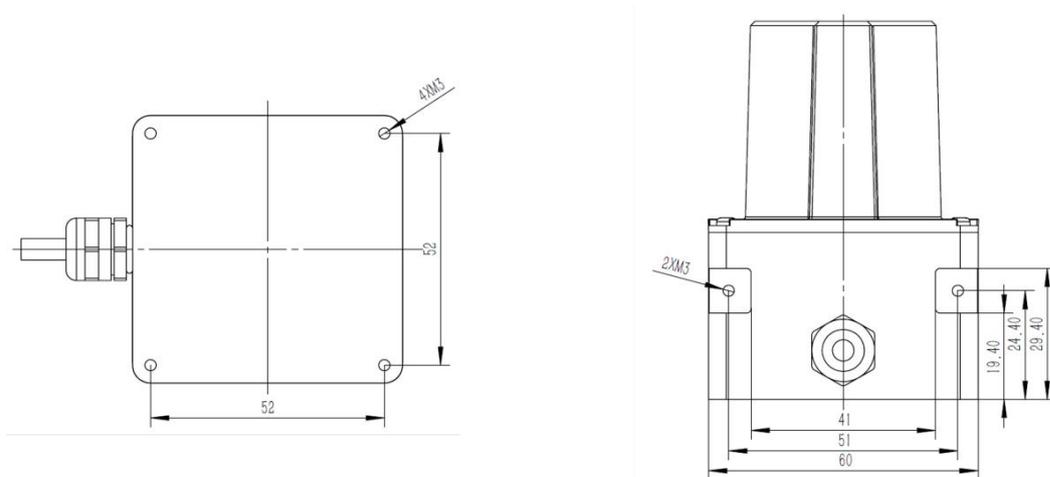

Figure 2. Lidar's FOV range (top view)

3.2 Mounting

There are threaded mounting holes at the bottom and the rear of the housing. The specific dimensions are shown in Figure 3.


3.3 Electrical connection

There are power supply and communication interfaces at the end of data cable, including a DC5521 female power socket (5.5 mm/2.1 mm) and an RJ45 Ethernet male connector (as shown in Figure 4). 1A (or higher) power adapter should be used to power the AS-31C. After the power is on and connected to the computer/ switch via the LAN cable,data communication with the AS-31C can be performed.

> **Caution:**1.AS-31C does not support PoE power supply, please do not connect it to any type of PoE network devices,otherwise it may cause damage to the lidar's chip protection circuit for Ethernet interface.
> 2.Please keep the input voltage bet ween DC9 ~ 28V,the ripple is less than 5%, as the excessive voltage will damage the lidar.
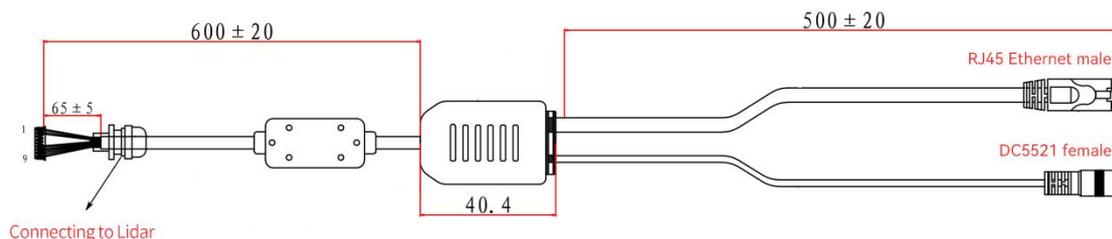
4. Operation instruction

4.1 System configuration

AS-31C uses the TCP for communication, and the system running the client software can read the scanned data as long as it has the standard TCP/IP protocol stack.

In addition, AS-31C allows users to modify network parameters such as the lidar's IP address. To facilitate locating the lidar devices that are connected to the Internet but with unknown IP addresses , AS-31C supports mDNS/DNS-SD protocol. In order to use this function, service components that support this protocol need to be installed on the computer:

- Windows systems do not provide native support for the mDNS/DNS-SD protocol. The system can be made to support this protocol by installing bonjoursdksetup.exe provided with the LVS2D software;
- Under Linux system, the system component used to support mDNS/DNS-SD protocol is Avahi. Most Linux distributions have this component installed by default; if it is not installed, it can be installed through the distribution's package manager.

4.2 Network configuration

The AS-31C uses Ethernet to transmit scan data. In the factory default settings, the lidar's IP address is 192.168.10.160 and the subnet mask is 255.255.255.0. In order to connect with lidar, the user needs to modify the network settings of the computer by changing the IP address to 192.168.10.X (Generally X is an integer between 2 and 254, as long as it does not conflict with other computers on the local area network), and at the same time changing the subnet mask to 255.255.255.0. Or keep the existing network settings unchanged, and add a new IP address. The specific setting method is the same as above, so as to avoid affecting the existing network applications of the system.

In addition, if the user uses the LVS2D software to view the real-time scan image output by lidar (see "4.3 Viewing the Scanned Image"), the user should also modify the firewall settings of the computer to add the software to the list of allowed software. For details, please refer to the operating system or User Manual of Firewall Software.

4.3 Viewing scanned image

Once the AS-31C is connected to a computer and the system is properly set up, the LVS2D software can be used to view the live scanned image. The main interface of LVS2D software is shown in Figure 5:
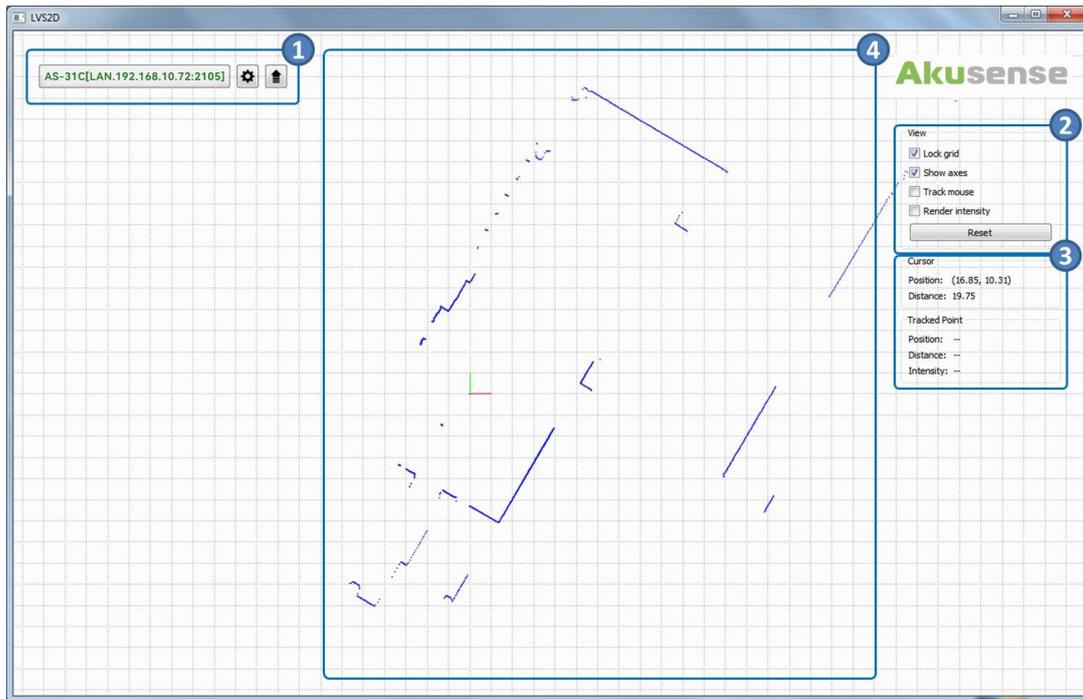
Figure 5. Main interface of LVS2D software

It contains the following functional areas:

1 Device list area, used to display all AS-31C lidars connected to the computer. LVS2D supports mDNS/DNS-SD, which can automatically detect the connected lidars and display them in the list. Users can choose to view the scanned image of specific lidar by clicking each item in the list, and the name of the selected lidar will be displayed in green bold.

2 View control area, used to control how the scanned image is displayed. Control options include:

● Lock grid: If this option is checked, when the user rotates the scanned image by clicking and dragging the mouse, the background grid lines will not be rotated with horizontal/vertical orientation unchanged. This option is turned on by default;

●Show axis: If this option is selected, the two-dimensional coordinate system of the current lidar will be displayed in the scanned image, and its X/Y axis will be displayed in red/green respectively. This option is turned on by default;

●Track mouse: If this option is selected, points from the coordinate origin to the mouse pointer in the scanned image will be highlighted in red. This option is off by default;

●Render intensity: If this option is selected, each measurement point in the scanned image will be shown in different colors. The color of each point depends on the strength of the echo signal received when the point is measured. The stronger the signal is, the redder of the points will be. Otherwise, the points will be bluer with weaker signal. This option is off by default;

●Reset : It is used to restore the view of the scanned image to its original state, and all previous rotation, panning, and zooming operations are reset.
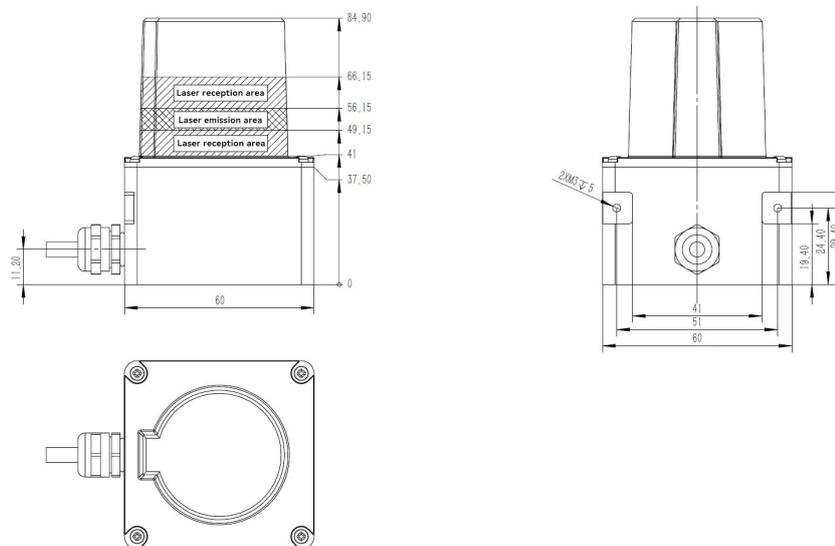
3 Coordinate display area is used to display the current mouse pointer, as well as the coordinate position and distance information of the current highlighted scan point. The reference coordinate system is the AS-31C device coordinate system, and all values are in meters.

4 Scanned image area is used to display the real-time scanned image of the currently selected device. User can interact with the mouse by this area, which includes:

●Rotate: left-click and drag;

●Panning: Left-click and drag while pressing the Shift key, or click the mouse wheel (middle button) and drag;

●Zoom: Scroll the mouse wheel forward (zoom in the scanned image) or backward (zoom out/zoom out the scanned image).

5. Dimensions

5.1 Body of lidar

5.2 Interface box