



# YB27-25CD Lidar Product Specification



CCH Technology & Intelligence Co., Ltd

## Product Introduction

YB series lidar is a single-line lidar based on dTOF ranging principle. It features a compact size, simplicity of use, and high cost-effectiveness, making it suitable for diverse applications such as navigation, obstacle avoidance, and area monitoring.

## Technical Parameters

Table 1 Technical parameters table

| Detection Parameters                   |                                                                                 |                                    |
|----------------------------------------|---------------------------------------------------------------------------------|------------------------------------|
| Scanning radius                        | 25m@70% reflectivity                                                            |                                    |
| Scanning angle                         | 270°                                                                            |                                    |
| Angular resolution                     | default 0.3° @30Hz<br>Support 0.3° @20/25/30Hz/40Hz                             |                                    |
| Distance deviation                     | ±2cm (typical value) ①                                                          |                                    |
| Repeatability                          | ±4mm@1sigma②                                                                    |                                    |
| Scanning plane Angle                   | Pitch ±0.5°; roll ±0.5°                                                         |                                    |
| Electrical and mechanical parameters   |                                                                                 |                                    |
| Working voltage                        | DC 9~28V                                                                        |                                    |
| Power-on startup time                  | Typical 10s                                                                     |                                    |
| Power consumption                      | < 2W (No load at output)                                                        |                                    |
| Output                                 | Ethernet UDP protocol output + PNP/NPN (configurable)                           |                                    |
| Dimensions                             | 52mm×52mm×70mm                                                                  |                                    |
| Cable length                           | Standard 1m                                                                     |                                    |
| Ambient temperature                    | Working: -10℃~50℃ (No frost or condensation on the window)<br>Storage: -40℃~70℃ |                                    |
| Ambient humidity                       | Working: 35%RH~85%RH; storage: 35%RH~95%RH                                      |                                    |
| Anti-optical Interference              | 80000Lux                                                                        |                                    |
| Shock resistance                       | Acceleration 10g; pulse duration: 16ms;                                         |                                    |
|                                        | Number of impacts: three axes, 1000±10 times per axis                           |                                    |
| Vibration Resistance                   | Frequency 10Hz ~ 55Hz; Amplitude: 0.35±0.05mm;                                  |                                    |
|                                        | Scanning cycles: 20 times for each XYZ axis                                     |                                    |
| Protection Rating                      | IP65                                                                            |                                    |
| Electromagnetic compatibility<br>(EMC) | EMI                                                                             | EN61326-1: 2013                    |
|                                        |                                                                                 | EN55011; 2009 + A1: 2010           |
|                                        | EMS                                                                             | EN61326-1: 2013                    |
|                                        |                                                                                 | EN61000-4-2: 2009                  |
|                                        |                                                                                 | EN61000-4-3: 2006+A1: 2009+A2:2010 |
|                                        |                                                                                 | EN61000-4-4: 2004+A1: 2010         |
|                                        |                                                                                 | EN61000-4-6: 2014                  |
|                                        |                                                                                 | EN61000-4-8: 2010                  |
| Configurable Functions                 |                                                                                 |                                    |
| Zone Configuration                     | Users can configure the zone into desired shape via configuration software      |                                    |
| Response Time                          | 67ms (2 scan cycles) ~ 536ms (16 scan cycles), default 67ms                     |                                    |
| Zone Group Switching                   | 4 external input signals (INPUT1, INPUT2, INPUT3, INPUT4) enable                |                                    |

Notice:

- ① The measurement error of different reflectivity materials is controlled at  $\pm 2\text{cm}$  (typical). Factory test method: Three kinds of specimens (black flannels, white paper and reflective stickers) are placed on the automatic tooling of the whole machine at different angles and at the same distance (59cm). The deviation between the center value and the true distance of each material is within  $\pm 2\text{cm}$ , and the maximum difference between the three materials is within 2cm.
- ② Statistical measurement at 600mm position on 10% black velvet.

## Working Principle and Protection Zone Configuration

The YB27-25CD is based on the pulsed laser ranging principle, achieving two-dimensional area detection with a  $270^\circ$  angle and 25m radius through rotational scanning. Users can configure the number and shape of protection zones via configuration software.

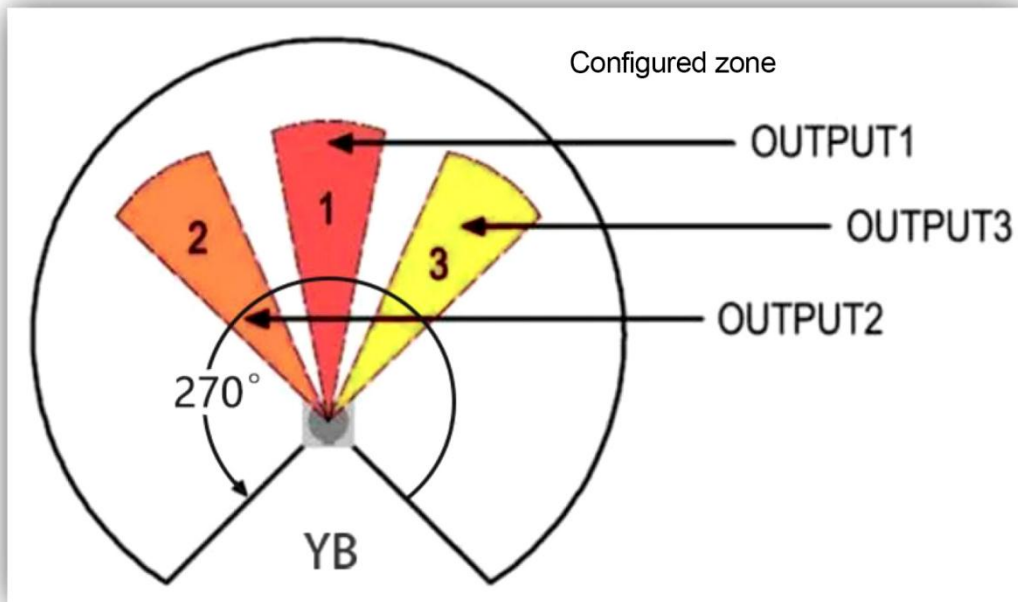


Figure 1 Protection Area Diagram 1

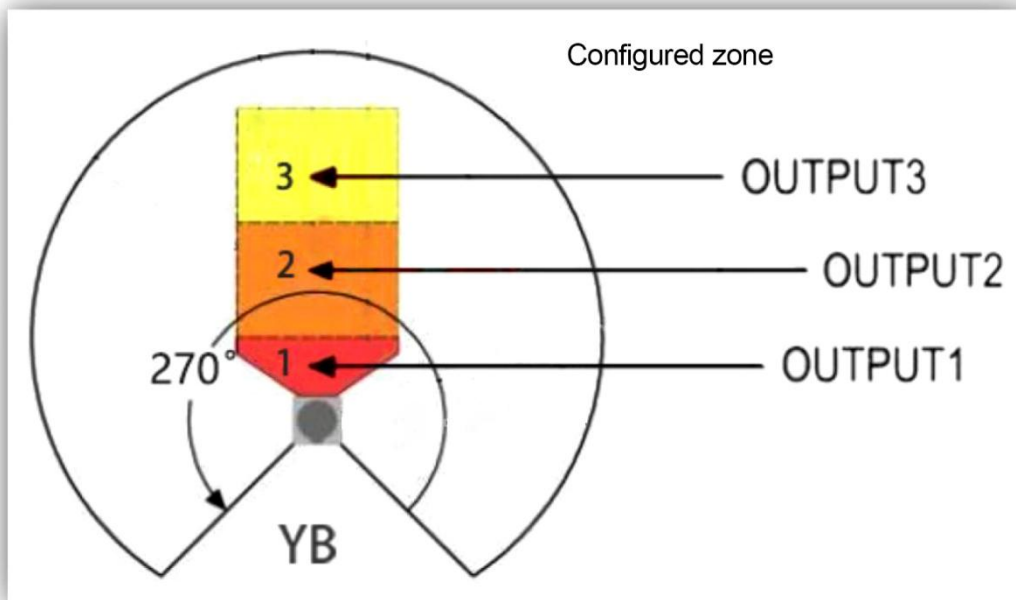


Figure 2 Protection Area Diagram 2

Table 2 Protection Zone Correspondence Table

| NO | Meaning           | Description                                     |
|----|-------------------|-------------------------------------------------|
| 1  | Protection Zone 1 | When an obstacle is detected, OUTPUT1 turns OFF |
| 2  | Protection Zone 2 | When an obstacle is detected, OUTPUT2 turns OFF |
| 3  | Protection Zone 3 | When an obstacle is detected, OUTPUT3 turns OFF |

## Indicator Light



Figure 3 Indicator

OK: After power-on, if no fault, the OK light is steady on; if there is a fault, the OK light flashes.

INPUT(1~4): Lights up when input is ON; turns off when input is OFF.

OUTPUT(1~3): Lights up when no obstacles detected, turns off when obstacles detected.

Note: When the device is first powered on, all indicators will enter a chasing light mode, and the OK light will be off for 10 seconds, indicating the device is starting up. This is normal.

## Cable and Interface

The structures of power signal cable and Ethernet cable are shown in the figure below. Standard cable length is 1 meter. The configuration cable is a standard USB Type-C data cable (optional).

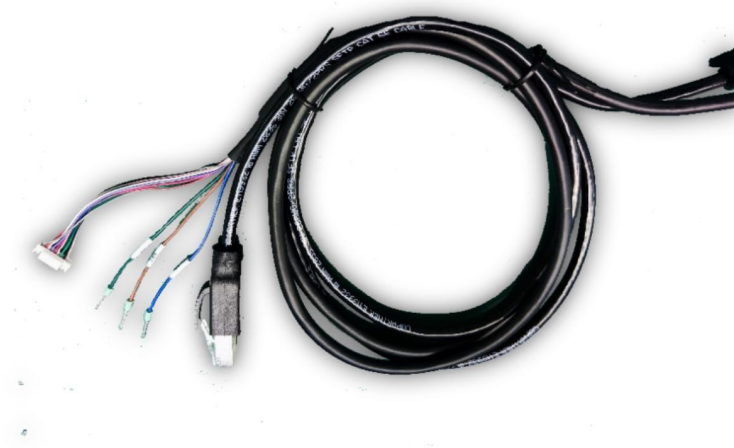


Figure 4 Cables

Table 3 Cable Color Signal Relationship Table

| Color        | Signal  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Blue         | 0V      | Operating Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Brown        | 24V     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Yellow/Green | PE      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Red/Blue     | COM     | Common terminal for zone group switching signal input. When input signal is PNP logic, COM connects to 0V; when input signal is NPN logic, COM connects to 24V.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Pink         | INPUT1  | Zone group selection signals. Switching between zone groups is achieved by changes in the INPUT1, INPUT2, INPUT3, INPUT4 input signals.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Green        | INPUT2  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Gray         | INPUT3  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Red          | INPUT4  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Black        | OUTPUT1 | Three independent PNP (NPN) outputs;<br>PNP transistor output; ON state: load current $\leq 100\text{mA}$ , output voltage $\geq V_{cc}-2\text{V}$ ; OFF state: leakage current $\leq 1\text{mA}$ , residual voltage $\leq 1\text{V}$ (excluding the influence of wire extension);<br>NPN transistor output, ON state: load current $\leq 100\text{mA}$ , output voltage $\leq 2\text{V}$ ; OFF state: leakage current $\leq 1\text{mA}$ , residual voltage $\leq 2\text{V}$ (excluding the influence of wire extension);<br>ON when no object is in the protection zone; OFF when an object is present. |
| White        | OUTPUT2 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Purple       | OUTPUT3 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Gray/Pink    | OK      | Independent PNP (NPN) output, outputs OFF in fault state, ON when no fault.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Cable Wiring Diagram

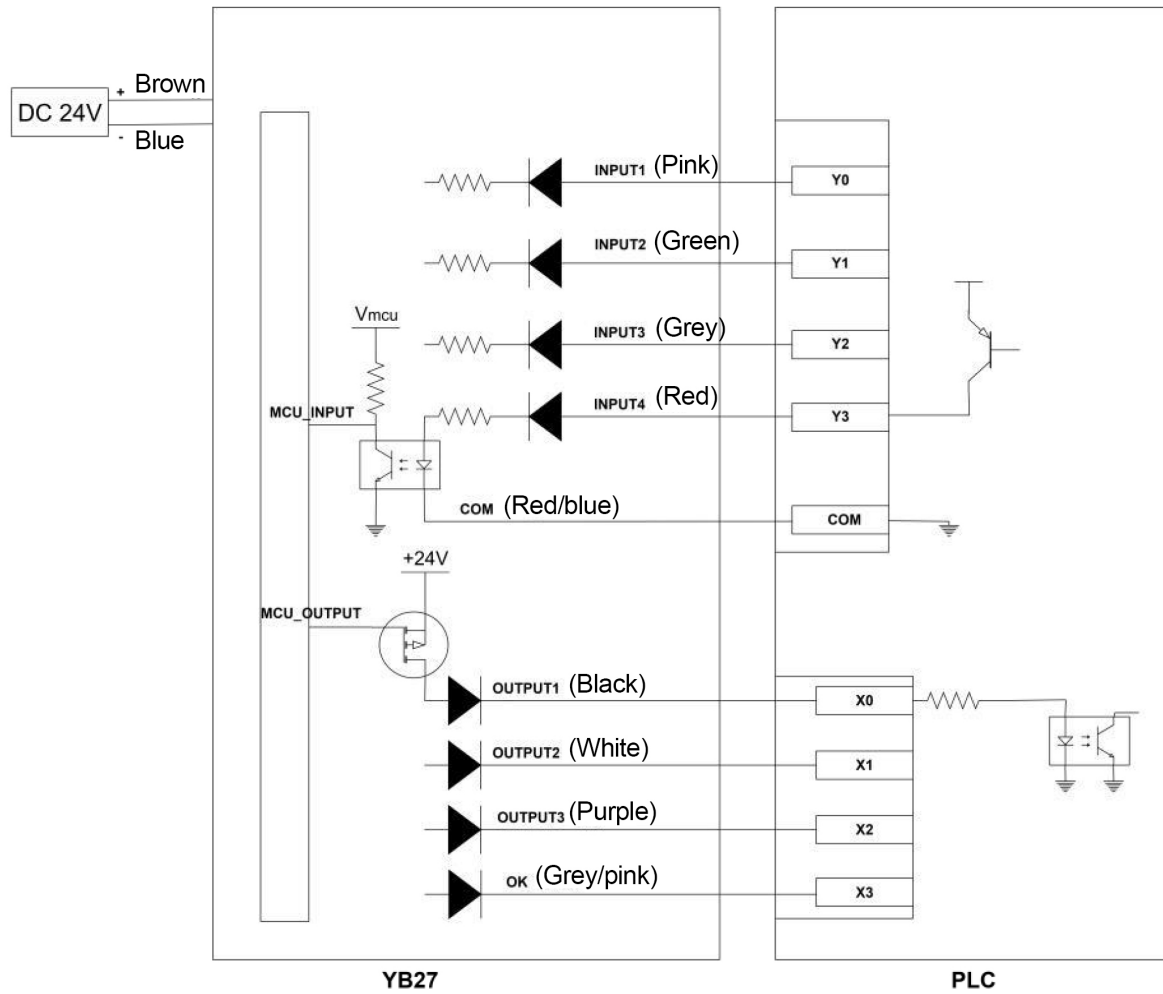


Figure 5 Wiring Diagram under PNP Logic

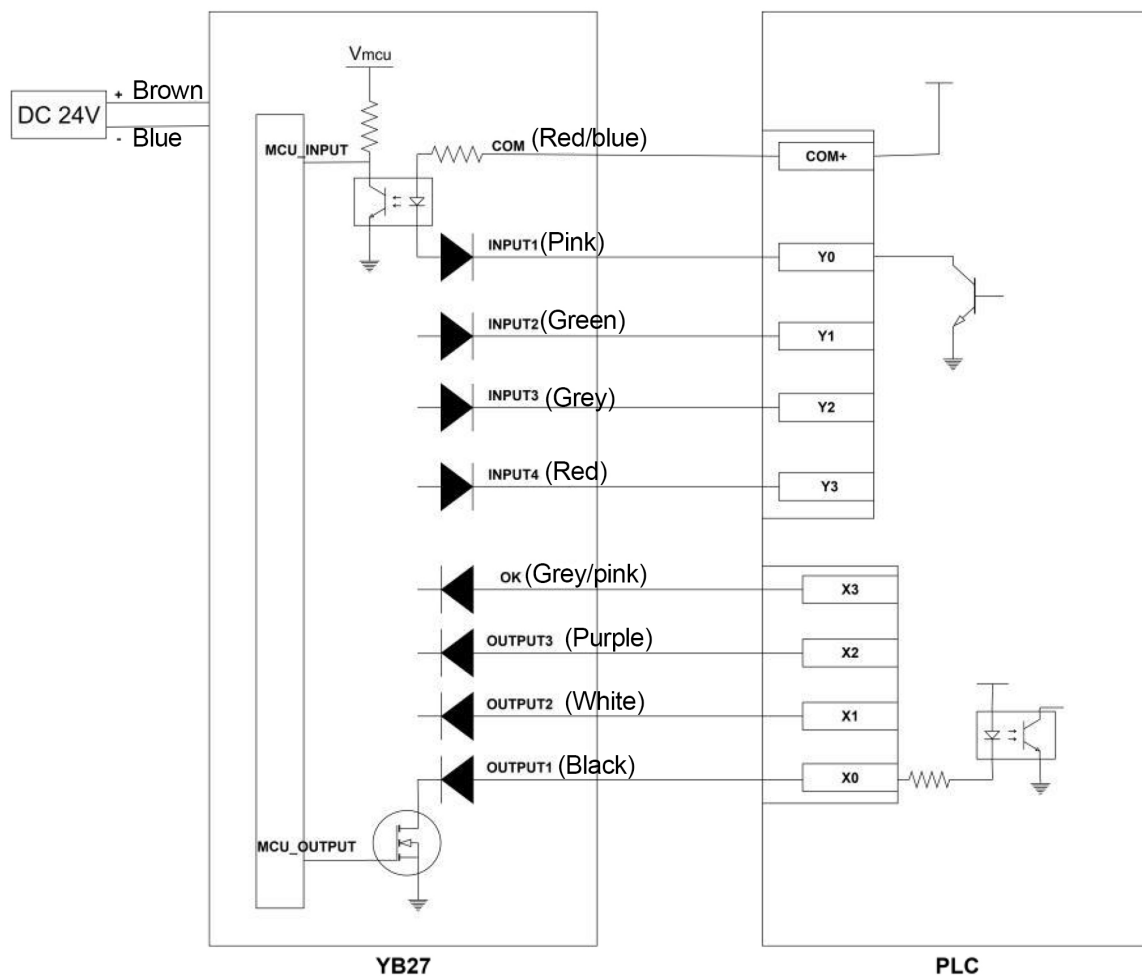


Figure 6 Wiring Diagram under NPN Logic

## Machine Dimension

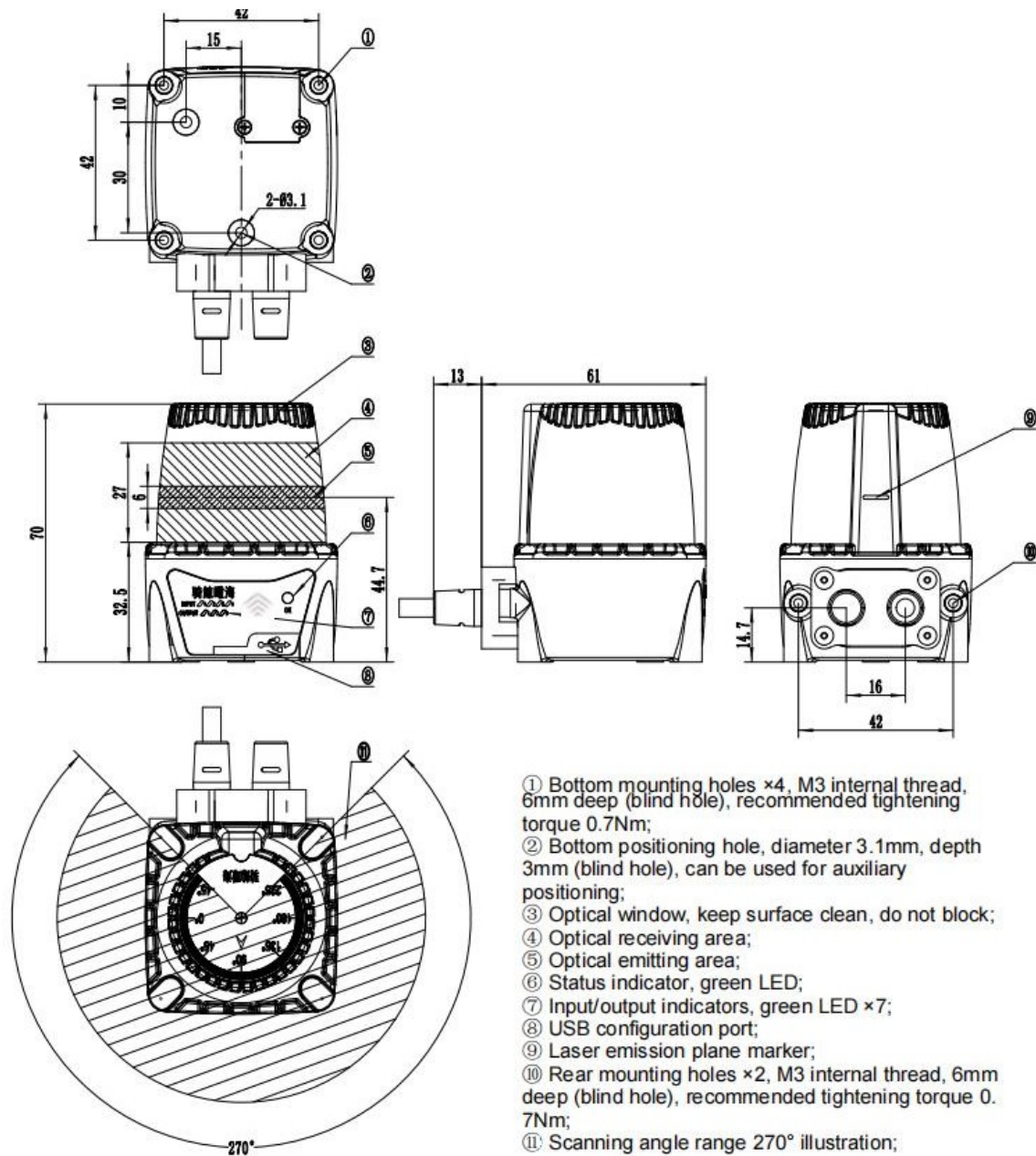


Figure 7 Mechanical dimensions

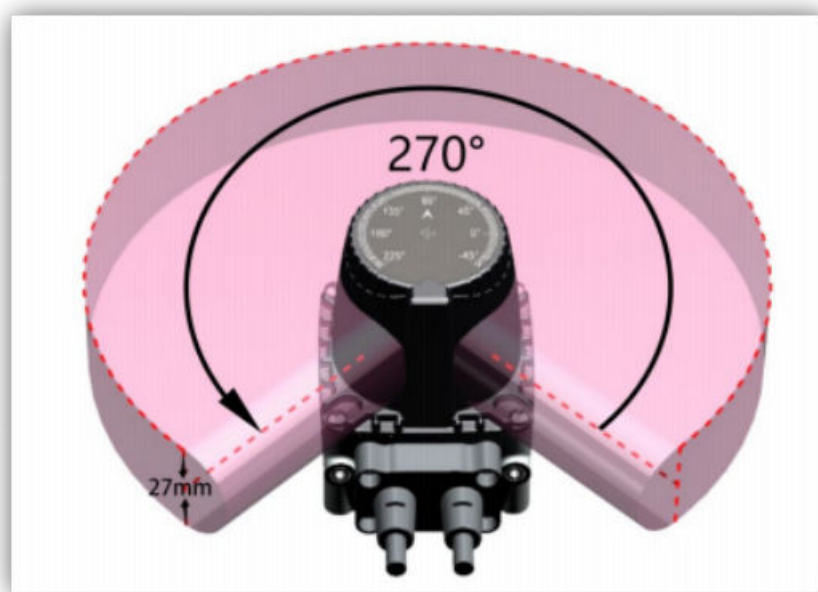


Figure 8 Schematic diagram of scanning range

## Communication Protocol

Table 4: Data Format Summary

| Data Format Description                                                                                                                                          | Summary                                                                                                                                                                                                                                                                                                                                                        |                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <pre>struct cmd_frame { uint8_t    start_code[4]; uint16_t length; uint8_t    check_sum; uint8_t    cmd_type; uint8_t    data[]; }__attribute__((packed));</pre> | <ol style="list-style-type: none"><li>1. This communication protocol uses the UDP communication protocol;</li><li>2. Default IP address 192.168.0.10, port number 2112;</li><li>3. Distance data and echo intensity data use little-endian format;</li><li>4. Except for distance data and echo intensity data, big-endian format is used uniformly;</li></ol> |                                                                                                |
| Name                                                                                                                                                             | Bytes                                                                                                                                                                                                                                                                                                                                                          | Description                                                                                    |
| start_code                                                                                                                                                       | 4                                                                                                                                                                                                                                                                                                                                                              | Sensor start code 0xFE 0x5A 0xA5 0x55                                                          |
| length                                                                                                                                                           | 2                                                                                                                                                                                                                                                                                                                                                              | Data length following the length field, high byte first, low byte last.                        |
| check_sum                                                                                                                                                        | 1                                                                                                                                                                                                                                                                                                                                                              | 1-byte checksum, calculated as the XOR value of all data from cmd_type to the end of the frame |
| cmd_type                                                                                                                                                         | 1                                                                                                                                                                                                                                                                                                                                                              | Command type 0x01: Get lidar real-time data                                                    |
| data[M]                                                                                                                                                          | M                                                                                                                                                                                                                                                                                                                                                              | Command data, detailed data format under each command type, can be empty                       |

The angular resolution of YB27-25CD is 0.3 degrees. After receiving the command to get real-time data, the lidar periodically sends distance and echo intensity data.

Within the range of  $-45^{\circ}$  to  $225^{\circ}$ , which covers 270 degrees, a total of  $270/0.3 + 1 = 901$  sample points are collected. Each sample point occupies 4 bytes of storage (2 bytes for distance data and 2 bytes for echo intensity data, with the distance data unit being 1 mm). The sample point data occupies a total of  $901 * 2$  (distance data) +  $901 * 2$  (echo intensity data) = 3,604 bytes. Additionally, with a 256-byte device information field, the total data size amounts to 3,604 bytes, which exceeds the UDP transmission limit of 1,472 bytes. Therefore, the data is actively split into 4 packets (N=4) at the application layer for transmission.

Table 5: PC-side Real-time Data Command Table

| Type               | start_code[4]       | length    | check_sum | cmd_type |
|--------------------|---------------------|-----------|-----------|----------|
| Get Real-time Data | 0xFE 0x5A 0xA5 0x55 | 0x00 0x02 | 0x01      | 0x01     |

Table 6: Lidar Reply Real-time Data Table (excluding sensor data part)

| Lidar Real-time Data | start_code[4]       | length       | check_sum | cmd_type | sensor data |
|----------------------|---------------------|--------------|-----------|----------|-------------|
| frame_num_1          | 0xFE 0x5A 0xA5 0x55 | 0xxx<br>0xxx | 0xXX      | 0x01     | ...         |
| frame_num_2          | 0xFE 0x5A 0xA5 0x55 | 0xxx<br>0xxx | 0xXX      | 0x01     | ...         |
| ...                  | ...                 | ...          | ...       | ...      | ...         |
| frame_num_N-2        | 0xFE 0x5A 0xA5 0x55 | 0xxx<br>0xxx | 0xXX      | 0x01     | ...         |
| frame_num_N-1        | 0xFE 0x5A 0xA5 0x55 | 0xxx<br>0xxx | 0xXX      | 0x01     | ...         |
| frame_num_N          | 0xFE 0x5A 0xA5 0x55 | 0xxx<br>0xxx | 0xXX      | 0x01     | ...         |

Continued: sensor data part

Table 7: Sensor Data Table

| total_index   | sub_pkg_num | sub_index | sub_data_type | data_len  | data                      |
|---------------|-------------|-----------|---------------|-----------|---------------------------|
| 0xxx 0xxx     | N           | 0         | 0x01          | 0xxx 0xxx | 0xxx 0xxx...<br>0xxx 0xxx |
| Same as above | N           | 1         | 0x01          | 0xxx 0xxx | 0xxx 0xxx...<br>0xxx 0xxx |
| ...           | ...         | ...       | ...           | 0xxx 0xxx | 0xxx 0xxx...<br>0xxx 0xxx |
| Same as above | N           | N-3       | 0x02          | 0xxx 0xxx | 0xxx 0xxx...<br>0xxx 0xxx |
| Same as above | N           | N-2       | 0x02          | 0xxx 0xxx | 0xxx 0xxx...<br>0xxx 0xxx |
| Same as above | N           | N-1       | 0x03          | 0xxx 0xxx | add_info[256]             |

Table 8: Sensor Data Format Description

|                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| total_index:                                                                                                                                                                                                                                                                                                                  |
| Length 2 bytes, used to record the total packet sequence number, incrementing sequentially, range 0-65535, high byte first, low byte last                                                                                                                                                                                     |
| sub_pkg_num:                                                                                                                                                                                                                                                                                                                  |
| Length 1 byte, used to record the number of sub-packets contained under this total packet sequence number.                                                                                                                                                                                                                    |
| sub_index:                                                                                                                                                                                                                                                                                                                    |
| Length 1 byte, used to record the sub-packet sequence number under this total packet number. Sub-packets are merged into one complete frame.                                                                                                                                                                                  |
| sub_data_type:                                                                                                                                                                                                                                                                                                                |
| Length 1 byte, used to record data type.<br>0x01: Distance data; 0x02: Echo data; 0x03: Additional information;                                                                                                                                                                                                               |
| data_len:                                                                                                                                                                                                                                                                                                                     |
| Length 2 bytes, used to record the byte count of the subsequent sample point data or additional information bytes in this field, high byte first, low byte last.                                                                                                                                                              |
| data[ ]:                                                                                                                                                                                                                                                                                                                      |
| Variable length, used to store lidar sample distance data, echo intensity data, or additional information fields. Distance data and echo data are distinguished by the data type field. Each distance data occupies 2 bytes, low byte first, high byte last; each echo data occupies 2 bytes, low byte first, high byte last. |

Additional information details see table below:

Table 9: Additional Information Data Table

| Name                                  | Field Index | Field Length (BYTE) | Description                                                                                                                                               |
|---------------------------------------|-------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| dev_type                              | 0~39        | 40                  | Device Type                                                                                                                                               |
| dev_sn                                | 40~71       | 32                  | Device SN                                                                                                                                                 |
| Angular Resolution                    | 72~75       | 4                   | (20000)--0.2 degrees<br>(25000)--0.25 degrees<br>(30000)--0.3 degrees<br>(33333)--0.33 degrees<br>(50000)--0.5 degrees<br>High byte first, low byte last. |
| Number of Sample Points               | 76~77       | 2                   | High byte first, low byte last. Represents the total number of sample points in the 270° scanning range.                                                  |
| Software Version                      | 78~81       | 4                   | 4-byte version information.                                                                                                                               |
| Hardware Version                      | 82~85       | 4                   | 4-byte version information.                                                                                                                               |
| System Working Status                 | 86          | 1                   | 0x00: Normal operation<br>Other: Fault status<br>0x01: Storage fault<br>0x02: Measurement fault<br>0x03: Motor fault<br>0x04: Self-test fault             |
| Angular Resolution Multiple           | 87~90       | 4                   | Angular resolution multiple (corresponding to the angular resolution above): 100000                                                                       |
| Scan Time<br>scan_time                | 91~94       | 4                   | 4 bytes, full circle time (unit 0.1us).<br>High byte first, low byte last.                                                                                |
| rev                                   | 95~96       | 2                   | rev                                                                                                                                                       |
| Sample Point Timestamp<br>sample_time | 97~100      | 4                   | 4-byte timestamp, (unit 1ms).<br>High byte first, low byte last.                                                                                          |
| rev                                   | 101~255     | xx                  | rev                                                                                                                                                       |