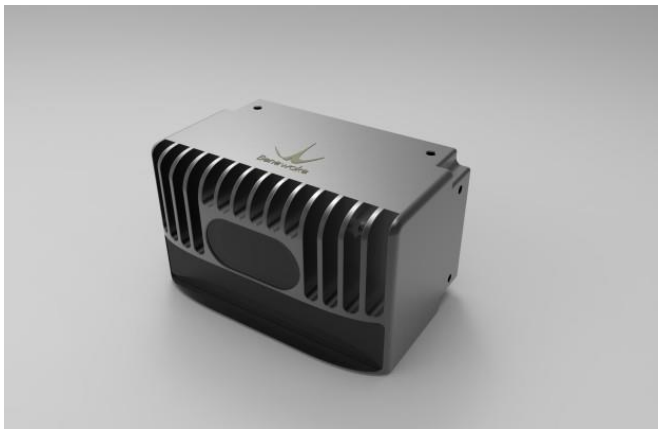
CE30 Solid State Array LiDAR Specification



Benewake (Beijing) Co., Ltd

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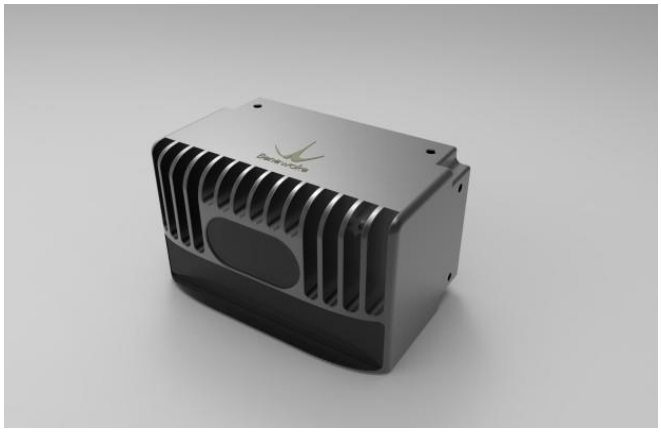
1. Product Overview



Feature

- Complete Solid-state LiDAR
- Area array detecting
- Wide horizontal FoV: >120°
- Vertical FoV: 9°
- Depth and point cloud mode

Table 1CE30-C Specification

Parameter[1]	**Typical Value**
Method	Time of flight
Peak Wave Length	850nm
FoV[2]	132*9 degree (direct output), 102*9 degree (undistorted)
Pixel Resolution	320*24
Frame Rate	20fps
Ranging Resolution	1cm
Detecting Range[3]	0.1-4m
Repeatability (1σ)	≤3cm

[1]Specific parameters may slightly differ due to the test environment and the test mode. Whiteboard with the reflectivity of 90% is used below as default, and the data of the central zone are used for evaluation.

[2]The FoV is open for customization.

[3]Different reflectivities and different angles correspond to different detecting ranges. For details, please refer to the section of 'Principle of Ranging'.

Accuracy	≤7.5cm (1m≤range≤2.5m), ≤5cm (others)
Ambient Light Suppression [4]	60klux
Data Interface	TCP
Operating Temperature	0-50℃
Supply Voltage	DC 12V (≥2A)
Power Consumption	≤4.8W
Dimensions	79*47*50mm
Enclosure Rating	IP65
Eye Safety Class	Meet EN 62471 security level
Weight	219g

2. Principle of Ranging

The ranging principle of CE30 is based on Time of Flight (TOF). The modulated near-infrared light is emitted from CE30, which will be reflected by an object and received by CE30 again. CE30 calculates the phase difference and time difference between the emitted and received light, which will be converted to the clearance of the shot scene.

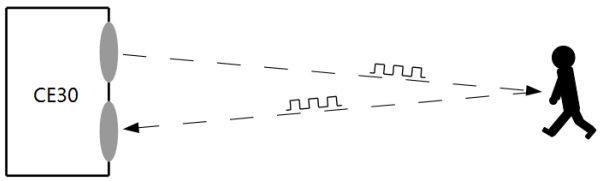


Figure 1 Schematic of CE30 Detecting Range

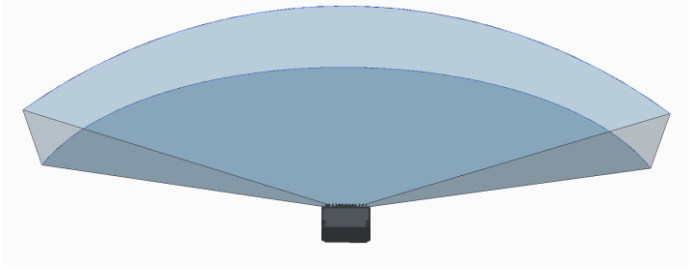


Figure 2 Illustration of CE30 Detection Area. Compared with single-line LiDAR, CE30 has a wider vertical FoV and therefore the obstacles can be better recognized.

[4]In case of usage under strong ambient light, the accuracy may slightly increase. Please refer to user instruction for details.

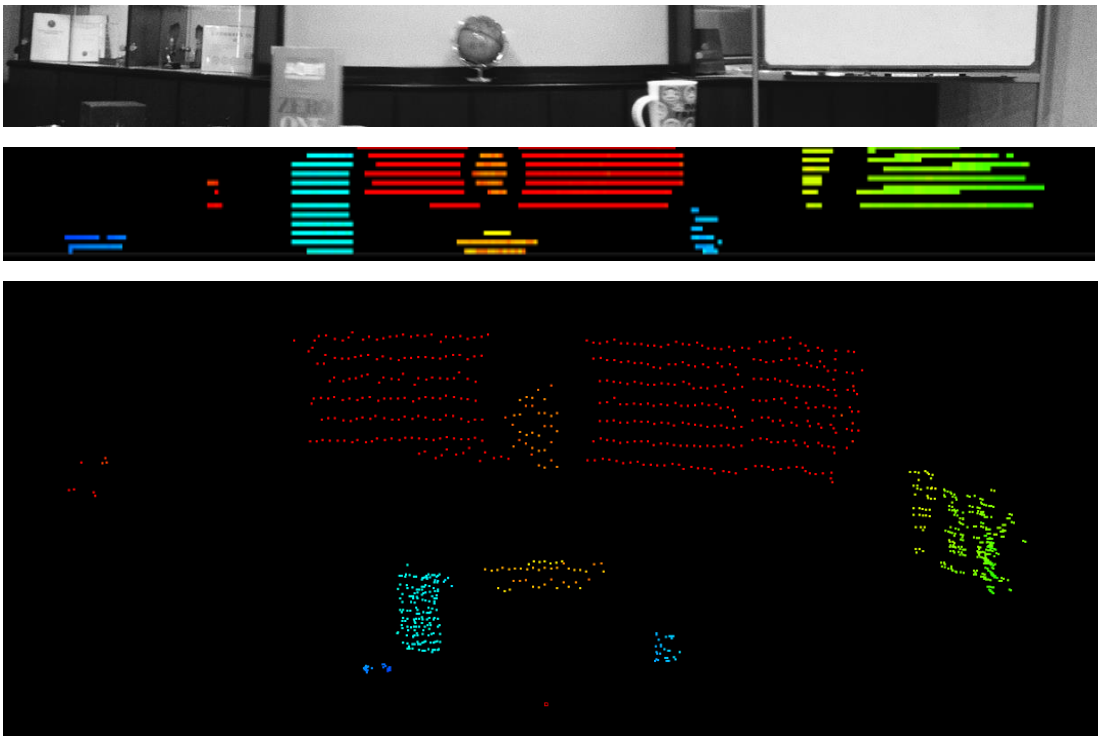
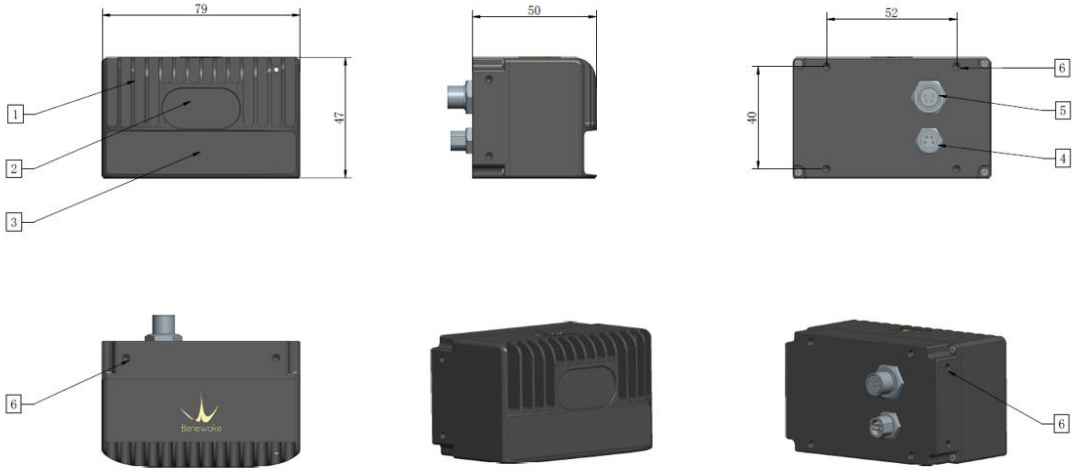


Figure 3 Comparison of real situation (upper, captured by a grey camera), CE30-C's depth image (middle) and CE30-C's cloud points (bottom)

3. Product Dimensions

The following images of the modules and the outline dimensional drawings are the reference design. The customization based on customer demands and different application scenarios is available.



1. Shell
2. Reception panel (working area, cannot be covered)
3. Emitting panel (working area, cannot be covered)
4. Power/CANBUS port (M8 aerial socket)
5. Ethernet port (M8 aerial socket)
6. Equipment installation hole (M3)

Figure 4 CE30 Outline Drawing

4. Aerial Socket Interface Description

Female: Ethernet connector: aerial socket with 8 mm diameter.

Male: Power supply/CANBUS connector: aerial socket with 8 mm diameter.

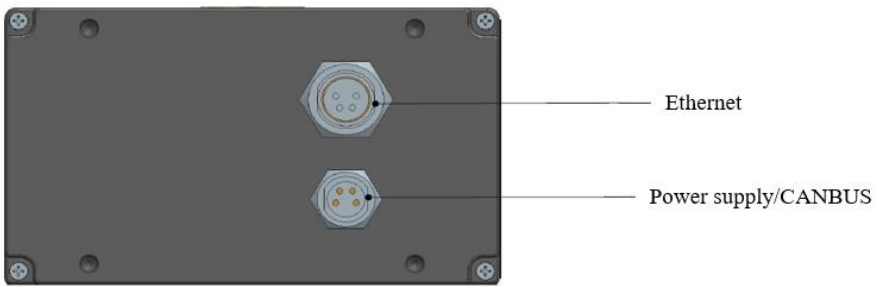
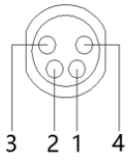


Figure 5 CE30 Aerial Connection Description

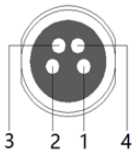
Power supply/CANBUS



Pin Number	Description
1	CAN_L (unavailable)
2	CAN_H (unavailable)
3	GND-
4	12V +

Figure 6 Power Supply/CANBUS Socket Pin Definition

Ethernet



Pin Number	Description
1	ETH_RX_P
2	ETH_RX_N
3	ETH_TX_P
4	ETH_TX_N

Figure 7 Ethernet Socket Pin Definition

5. Output Interface

Ethernet interface is used in this LiDAR with standard TCP protocol. In the mainstream operating systems, no drive is demended.

6. Software Description

6.1. SDK Description

Table 2SDK Description

Software	Description
Operating system	Linux

Programming language	C/C++
Data format	16-bit unsigned short int
Scope of the assignment	0 - 65535
Use method	Shared ObjectFile (.so) or integrate SDK source codes into programs

The LiDAR initialization and start-up, data acquisition and LiDAR turn-off can be achieved through SDK. For the LiDAR application and development on the operating systems besides Linux, please refer to SDK source codes for transplantation and development.

6.2. Output Data

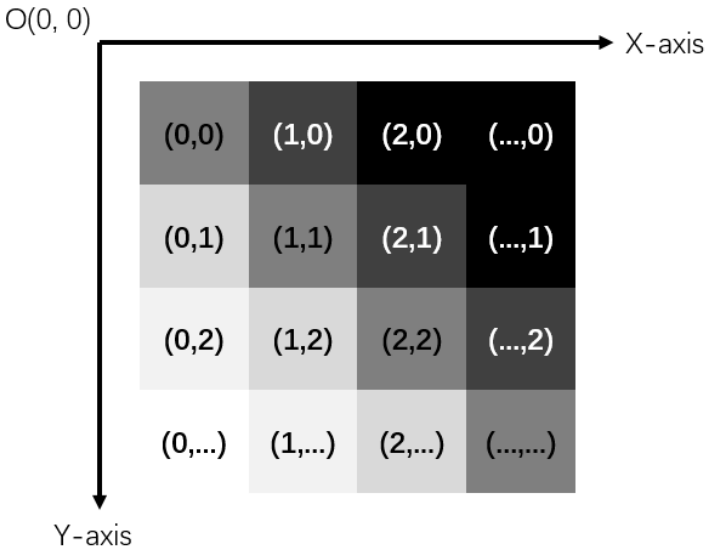


Figure 8 Illustration of Data Sequence

The depth image of 320*24 is outputted from the SDK in unit of frame. The data is arranged in form of one-dimensional array. The sequence is from left to right and top to bottom, with the pixel in the upper left corner of the image as the origin. Output along X axis, then Y axis, the following output sequence will be generated as shown in the figure above:

(X,Y) : (0,0) (1,0) (2,0) (…,0) … (0,1) (1,1) (2,1) (…,1) … (0,2) (1,2) (2,2) (…,2) … (0,…) (1,…) (2,…) (…,…) …

For the distance from detected object to the plane of camera, it is expressed in cm by each pixel through the data format of 16-bit unsigned short int.

Please refer to the Instruction Manual for details