TF03 Single-Point Long-Distance LiDAR

Product Specification

Specified Product

Product model: TF03
Product name: Single-Point Long-Distance LiDAR

Manufacturer

Company name: Benewake (Beijing) Co., Ltd.
Address: No. 28, Xinxi Road, Haidian District, Beijing, PRC

Copyright

Note: This product currently is a prototype for research and development, with some parameters to be determined, and any change shall never be subject to any prior notice.

Content

1   Product Overview

TF03, as a single-point long distance LiDAR in accordance with the industrial level, mainly targets the intelligent transportation system, industrial UAV, automotive and other industrial applications.

To maximize different requirements in different applications and scenarios, TF03 can be compatible with a variety of communication interfaces, featuring IP67 high-intensity bodywork and the measurement frequency as high as 10KHz. It not only has powerful performance and rich interfaces, but also is small in volume, so that it could be integrated more easily in applications.

In addition, TF03 contains a compensation algorithm targeting outdoor highlight environment, so that it could still work normally in highlight environment. Besides, it also has a variety of measurement models and parameters for custom configurations, so as to meet the ranging needs of different customers.

2   Key Features

- Wide range, as far as 180m
- Multi-interface compatibility, able to be used in many fields
- IP67 high-strength bodywork and high reliability
- Small in volume and easy to be integrated
- High-speed measuring up to 10KHz, high repeated accuracy
- Excellent highlight interference, able to be used outdoors

3   Ranging Principle

TF03 uses the pulse method to range the distance based on TOF (Time-of-Flight). Specifically, TF03 emits a beam of light pulse which will reflected by the object and received by TF03 again.TF03 calculate the time of flight in the course of the round trip and thus obtain the relative distance between TF03 and the measured object.. As shown in Figure 1.
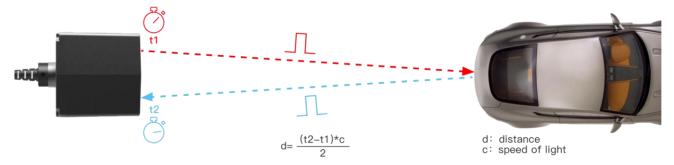
$$d= \frac{(t2-t1)*c}{2}$$

d: distance
c: speed of light

Figure 1 Schematic of TF03 ranging principle

4   Application Areas

- Vehicle Classification recognition and vehicle counting

- UAV altitude holding and auxiliary landing

- Car collision avoidance

- Civil/industrial material level monitoring

- Safety warning

5   Performance Parameters

Range[1]	180m@90% reflectivity , 70m@10% reflectivity
Blind Zone	10cm
Distance resolution	1cm
Accuracy	±10cm (within10m) ， 1% (beyond 10m)
Repeatability	1σ： 3cm
Output frame rate[2]	100Hz-1000Hz (Default 100Hz)
Multi echo	4 times
Ambient Light Resistance	100Klux
Over range output	180m （Default）

6   Optical Parameters

Light source	LD
Wavelength of light source	905nm
Detection angle [I]	0.5°

---

[1] The parameters (range, distance accuracy and repeated accuracy) are measured in white object (90% reflectivity) and will be somewhat different in case of different reflectivity or light sensitivity conditions.

[2] The highest frame rate can be customized for 10KHz.

Spot size$^{\text{II}}$	100m: 100cm*28cm (horizontal * vertical)
Laser safety level	CLASS 1 (IEC 60825)

7 Communication and Interface

Output data form	Hexadecimal distance value; Character string; Switching value;
Communication interface	UART；CAN
Baud rate	UART：115200；CAN：1M

8 Mechanical/Electrical Parameters

Power supply voltage	DC 5V (≥200mA)
Power consumption	≤0.9W
Size$^{\text{III}}$	44mm*43mm*32mm (length*width*height)
Weight	77g
Enclosure material	Aluminum alloy
Installation specification	6 mounting holes at the bottom, in accordance with the specification of M3*3.5mm

9 Operation/working Performance

Working temperature	-25~60℃
Storage temperature	-40~85℃
Protection level$^{\text{IV}}$	IP67
Certification	CE，FCC，RoHS，FDA

10 Function Introduction

Remote firmware upgrade	Built-in Boot Loader function, able to use **tf03_setup** software to upgrade TF03 firmware automatically
Custom frame rate	The corresponding code can be used to configure the required detection frame rate, 1-1000Hz continuously adjustable.
Custom baud rate	a) The serial port baud rate can be customized b) The CAN port baud rate can be modified; CAN ID can be modified (standard and extended frames)
Measurement mode	a) Continuous detection mode (default) b) External command trigger mode c) Multi-echo measurement mode

Restore factory settings	TF03 **tf03_setup** software can be restored to its factory state through upper computers.
Configuration parameters storage during blackout	After the configuration parameters have been modified, you can send the corresponding instruction to select "Save Configurations Permanently", so that the parameters will not lose due after power off.

www.benewake.com

End notes

Ⅰ Detection Angle Descriptions

TF03 has a 0.5-degree detection angle and rectangular light spots; see Table 1 for simulated diagrams of the light spots. Therefore, at different distances, the spot size, namely detecting range, is different as shown in Figure 2.

Note: The side length of common objects detected should be greater than that of the detection range of TF03; When the side length of the detected object is less than that of the detection range, the LiDAR effective range will be reduced.
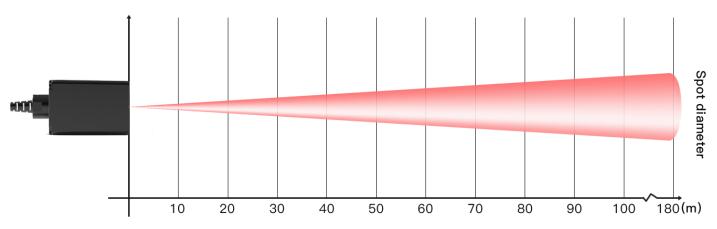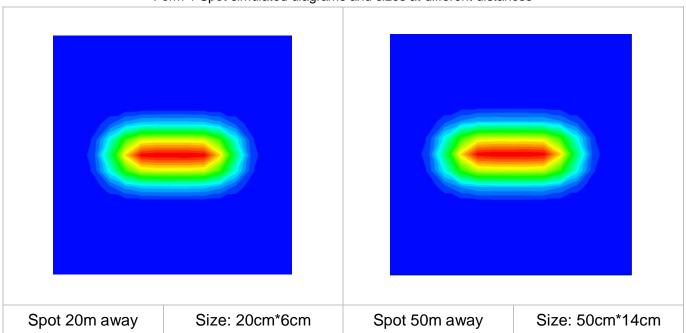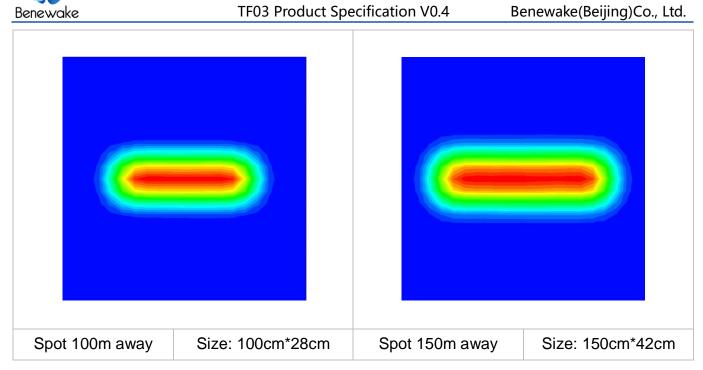

Figure 2 Detection angle schematic of TF03

Ⅱ Spot Size

Form 1 Spot simulated diagrams and sizes at different distances

| Spot 20m away | Size: 20cm*6cm | Spot 50m away | Size: 50cm*14cm |

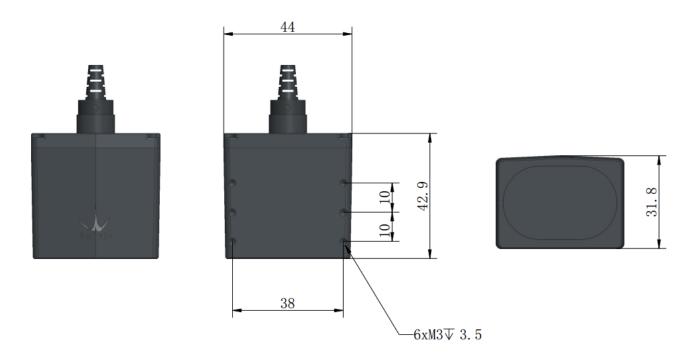| Spot 100m away | Size: 100cm*28cm | Spot 150m away | Size: 150cm*42cm |

Ⅲ Figure for Product Dimensions

Figure 3 TF03 dimensions (Left 1: top view; Left 2: vertical view; Left 3: front view)

Ⅳ Protection Level Descriptions

The IP protection grade is composed of two figures. The first figure represents the grade of electrical appliance dust proof and preventing the instrusion of foreign objects , and the second representing degree of electrical appliance moisture proof and water proof .

TF03 has its protection level of IP67 - IP dust proof level 6, IP waterproof level 7.

IP dust proof level 6: It indicates that TF03 can completely prevent foreign objects and dust intrusion.

IP waterproof level 7: It indicates that TF03 can prevent short-time water immersion; under normal temperature and pressure, no harmful effects will happen to the TF03 enclosure when temporarily immersed in 1m-deep water.

Note: The TF03 enclosure has a high level of protection, but it can not normally measure underwater due to the limitation of the optical principle.