

TF02 Single-point Ranging LiDAR Product Specification

1. Product Overview

As a new generation of TF01-based single-point ranging LiDAR researched, developed and massively produced on the basis of rich experience, TF02 boasts higher performance and can be used in a wider range of applications.

On the basis of many advantages of the last generation, it has been significantly improved and optimized in its energy system, product structure and fusion algorithm, so that it can reach the range up to 22meters and a more stable ranging performance. Its enclosure is made from high-strength anticorrosive materials, which has improved its adaptability to outdoor severe environment. At the same time, due to innovative production technology and massive software and hardware optimization, the LiDAR has really reached the consumption level and been successfully applied to UAV, intelligent traffic, material level monitoring, intelligent parking lots and relevant other fields.

TF02 uses the phase method to realize its ranging function based on TOF (Time-of-Flight), namely the time-of-flight principle. Specifically, TF02 gives out modulated near infrared light, which will be reflected in case of obstacles; its sensor can calculate the phase difference produced by emission and reflection of the modulated infrared light and then convert such a difference into the distance away from the target object, so as to generate the depth information. As shown in the figure.

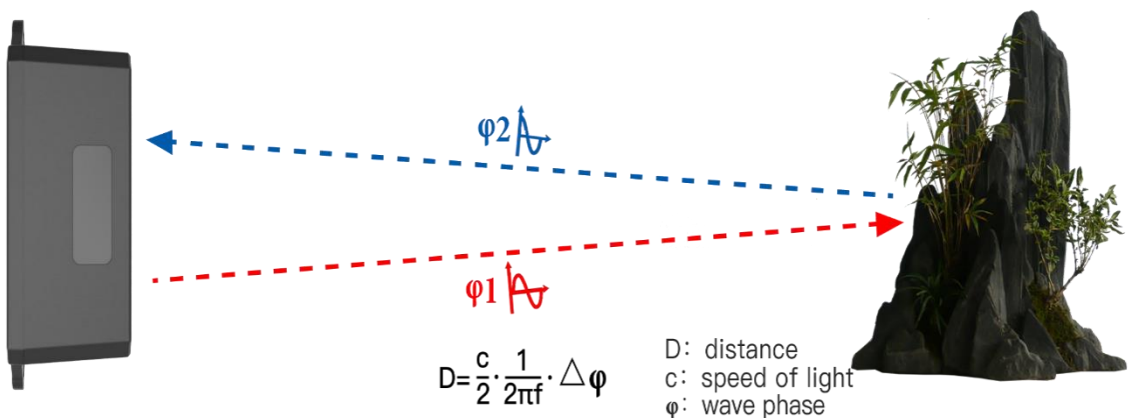


Figure 1. Schematic of TF02 ranging principle

2. Specification Parameters

Table 1 TF02 Key Parameters

Parameter Name		Value
Performance Parameters	Range ¹	22m@90% reflectivity, 10m@10% reflectivity (indoor)
		10m@30% reflectivity (outdoor, 100Klux ambient light)
	Blind Area ²	40cm
	Resolution	1cm
	Accuracy ³	<6cm (within 5m) , <2% (5~22m)
	Repeatability ¹	1σ: <1cm (within 10m) , 1σ: <2cm (10~22m)
	Output frame rate	100Hz
Ambient light resistance	100Klux	
Optical Parameters	Light source	LED
	Light source wavelength	850nm
	FOV ^{II}	3°
	Spot size	@10m: 52cm*52cm (horizontal*vertical)
	Eye-Safe ⁴	Exemption Level (EN62471)
Electrical Parameters	Power supply voltage ⁵	DC 5V (≥1A)
	Power consumption	1W
Other Parameters	Dimensions	69mmx46mmx26mm
	Weight	52g (with cables)
	Enclosure material	Anticorrosive plastics
	Installation Specification	2 M3 mounting holes at the bottom
	Working temperature	-10~60°C
	Storage temperature	-20~80°C
	Protection Level	IP65
	Certification	CE, FCC, RoHS, EN62471

¹ The range, distance accuracy and distance repeatability parameters are measured in a specific scene and different in performance under different reflectivity or different ambient light conditions.

² Abnormal values of 0 or more than 40 cm may appear in the blind area, and the data in the blind area are not reliable.

³ Accuracy is measured in white object (90% reflectivity) and will be somewhat different in case of different reflectivity or light sensitivity conditions.

⁴ Meet the EN62471 standard

⁵ Support 4.5V-8.5V power supply



I Relationship between repeatability and signal strength

The repeatability of LiDAR ranging distance is related to the signal strength. The higher strength will achieve higher Dist stability and smaller Dist standard deviation.

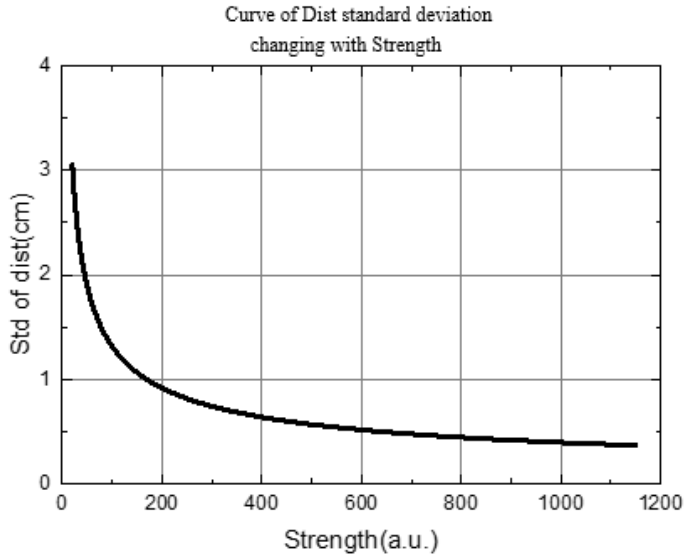


Figure 2 Curve of Dist standard deviation changing with Strength

II Detection angle descriptions

The detection angle of TF02 is 3 degrees. At different distances, the spot size, namely, the side length of the detection range is different, as shown in FigureFigure 3. Side length of the detection range at different distances (the detection range is a square), as shown in Table. Therefore, it is noted that the side length of the target object generally should be longer than that of the TF02 detection range; if the side length of the detected object is shorter than that of the detection range, the output (Dist) from TF02 will be a value between the actual distance values of the two objects(as shown in FigureFigure 3).

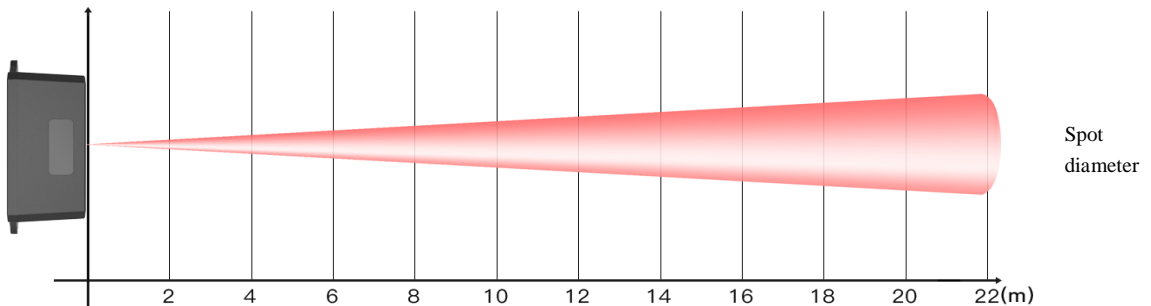


Figure 3 Detection angle schematic of TF02



Table 2 Spot detect range – Side length

Distance(m)	1	2	3	4	5	6	7	8	9	10	15	20	22
Detection range-Side length(cm)	5	10	16	21	26	31	37	42	47	52	79	105	115

3. Figure for product dimensions

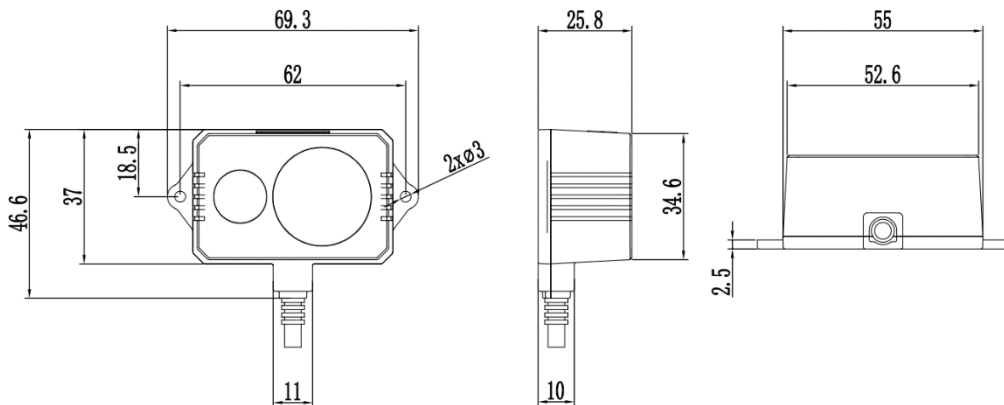


Figure 4 TF02 Dimensions (left 1: front view, left 2: left view, left 3: bottom view)

4. Communication protocol and Inter face

Table 2 Serial port communication protocol

Protocol	UART
Baud rate	115200
Data bit	8
Stop bit	1
Parity check	None

Table 3 Serial port data frame

Data bit	Definition	Description
Byte0	Frame header	0x59
Byte1	Frame header	0x59
Byte2	DIST_L	DIST low 8-bits
Byte3	DIST_H	DIST high 8-bits

Byte4	STRENGTH_L	STRENGTH low 8-bits
Byte5	STRENGTH_H	STRENGTH high 8-bits
Byte6	SIG	The byte means the data credibility, which is divided into 8 levels, represented by 0x01-0x08 respectively; when the credibility is 7 or 8, it indicates that the data is credible; when the credibility is any other numerical value, the data is incredible.
Byte7	Spare	0x00
Byte8	Checksum	Low 8 bits of Checksum bit, Checksum = byte0 + byte1 + byte2 + ... + byte7, Checksum are the low 8 bits of the checksum of former 8 bytes.

Table 4 CAN Communication Interface

Protocol	CAN
Baud Rate	1M
ID	0x00090002
Frame format	Expansion frame

Table 5 CAN Data frame format

Data bit	Definition	Description
Byte0	DIST_H	DIST high 8-bits
Byte1	DIST_L	DIST low 8-bits
Byte2	STRENGTH_H	STRENGTH high 8-bits
Byte3	STRENGTH_L	STRENGTH low 8-bits
Byte4	TIME	Exposure time: A larger numerical value indicates longer exposure time.
Byte5	SIG	The byte means the data credibility, which is divided into 8 levels, represented by 0x01-0x08 respectively; when the credibility is 7 or 8, it indicates that the data is credible; when the credibility is any other numerical value, the data is incredible.
Byte6	Spare	0x00
Byte7	Spare	0x00

More details of communication protocol and interface please refer to TF02 manual.



5. Configurable Items

Table 6 TF02 Configurable items

Configurable items	Description	Default
Setting trigger source	Setting internal trigger mode or external trigger mode	Internal trigger mode
Setting Data output cycle	Adjustable from 1Hz to 100Hz	100Hz
Setting serial port baud rate	Support serial port baud rate configuration: 9600, 14400, 19200, 115200, 256000	115200
Setting CAN baud rate	Support CAN baud rate configuration: 125K, 250K, 500K, 666K, 1M	1M

More configurable items and related details please refer to TF02 manual.

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