

ELRF-F21

Laser Range Finder Module

Technical Specification



Lumispot

Version 2025.12.10

1. Overview

ELRF-F21 laser rangefinder module is a laser ranging module developed based on our company's independently researched and developed 1535nm Erbium laser. It adopts a single-pulse Time-of-Flight (TOF) ranging method with a maximum ranging distance of $\geq 6\text{km}$. Composed of a laser, transmitting optical system, receiving optical system, and control circuit board, it communicates with the host computer through RS422 serial port. It provides host computer test software and communication protocols, facilitating user secondary development. It boasts features such as small size, light weight, stable performance, high shock resistance, and Class 1 eye safety.

2. Structural Composition and Main Performance Indicators

ELRF-F21 laser rangefinder consists of a laser, a transmitting optical system, a receiving optical system and a control circuit. The main performance is as follows:

2.1 Ranging Capacity

Visibility under the conditions of visibility is not less than 20km, humidity $\leq 80\%$, the distance of large targets (buildings) $\geq 7\text{km}$; For vehicles ($2.3\text{m} \times 2.3\text{m}$ target, diffuse reflectance ≥ 0.3) ranging distance $\geq 6\text{km}$; For personnel ($1.7\text{m} \times 0.5\text{m}$ target plate target, diffuse reflectance ≥ 0.3) ranging distance $\geq 3\text{km}$.

2.2 Main functions

- a) single ranging and continuous ranging;
- b) Range strobe, front and rear target indication;
- c) Self-test function.

2.3 Performance

No.	Item	Parameters
1.	Eye-safety level	Class 1
2.	Wavelength	1535 $\pm$ 5nm
3.	Beam divergency	$\leq 0.3\text{mrad}$

4.	Receiving aperture	$\Phi 21\text{mm}$ $\geq 7\text{km}$ (Big target: $\geq 3\text{m} \times 3\text{m}$)
5.	Ranging ability	$\geq 6\text{km}$ (Vehicle: $2.3\text{m} \times 2.3\text{m}$) $\geq 3\text{km}$ (Human: $1.7\text{m} \times 0.5\text{m}$)
6.	Minimum ranging distance	$\leq 20\text{m}$
7.	Ranging accuracy	$\leq \pm 1\text{m}$
8.	Measurement frequency	1~10Hz
9.	Distance resolution	$\leq 30\text{m}$
10.	Measurement accuracy	$\geq 98\%$
11.	False alarm rate	$\leq 1\%$
12.	Data interface	RS422
13.	Power supply voltage	DC5~28V
14.	Average power consumption	$\leq 1\text{W}$ @5V(1Hz working)
15.	Peak power consumption	$\leq 3\text{W}$ @5V
16.	Standby power consumption	$\leq 0.2\text{W}$
17.	Dimensions	$\leq 65\text{mm} \times 40\text{mm} \times 28\text{mm}$
18.	Weight	$\leq 55\text{g}$
19.	Operating temperature	$-40^{\circ}\text{C} \sim +60^{\circ}\text{C}$
20.	Storage temperature	$-55^{\circ}\text{C} \sim +70^{\circ}\text{C}$
21.	Impact	$>75\text{g}$ @6ms(1000g/1ms can be customized)
22.	Vibration	Vibration environment of combined wheeled vehicles

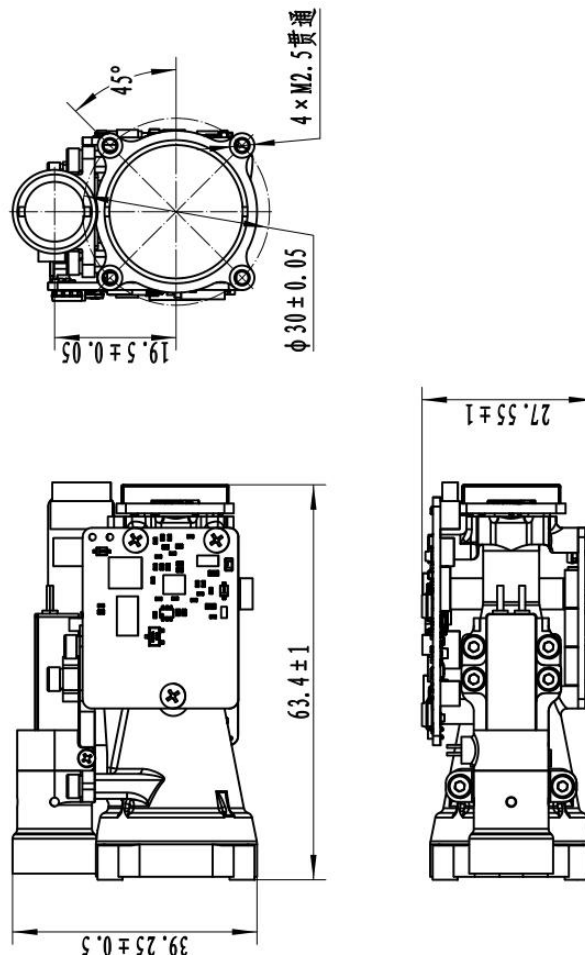
2.4 Interface

Communication interface: RS422, 115200bps

Electrical interface: The interface model is A1002WR-S-10P, and the interface definition is detailed in the following table.

Wire Definition		Wire color	Remarks
No			
1	VIN+	Red	Power supply +
2	VIN-	Black	Power supply -
3	RS422 TX+	Green	RS422 send +
4	RS422 TX-	Orange	RS422 send -
5	RS422 RX-	Yellow	RS422 receives -
6	RS422 RX+	White	RS422 reception +
7	POWER_EN	Purple	Module power supply enabled, TTL_3.3V level;
			Module on (> 2.7V or suspended), Module off (< 0.3V);
8	GND	Blue	Communication ground

2.5 Mounting drawing



3. User Precautions

- The laser emitted by this rangefinder is 1535nm, which is safe for human eyes. Although it is an eye-safe wavelength, it is advised not to look directly into the laser.
- When adjusting the parallelism of the optical axis, be sure to cover the receiving lens to avoid permanent damage to the detector due to excessively strong echoes.
- This rangefinder module is not airtight. Ensure that the relative humidity of the environment is below 80% and maintain a clean and sanitary environment to prevent damage to the laser.
- The range of the rangefinder is related to atmospheric visibility and the nature of the target. Range will be reduced in fog, rain, and sandstorms. Targets like green tree clusters, white walls, and exposed limestone have better reflectivity and can increase range. Additionally, increasing the angle of the laser beam to the target will reduce the range.
- Do not emit lasers at highly reflective targets such as glass or white walls within 30 meters to avoid echo overstrength and damage to the APD detector.
- Do not plug or unplug cables while the device is powered on.
- Ensure the correct polarity of the power supply connection to avoid permanent damage to the equipment.

4. Note

- If you need to install a window lens in front of the rangefinder module, please note:
- The material must be flat glass;
- Effective aperture projection: 1.5 mm for the LRF module's transmit/receive lens outer diameter; Optical window effective aperture: ≥ 2 mm (lens outer diameter);
- Since lens absorbs part of laser, it is recommended that the lens thickness be controlled within 2–4 mm according to its dimensions;
- The air gap between optical and the module should be minimized, less than or

equal to 4 mm is recommended. The lens should be kept parallel to the front surface of the module. A structural element should be installed between the window and the rangefinder to separate the transmit and receive lenses;

- AR coating for 1525–1545nm with transmittance of 99% is recommended.