TFN LM Series Laser Rangefinder Modules (5km/6km/8km/10km)

Product Introduction

The TFN LM Series (LM5A, LM6A, LM8A, LM10A) are high-performance 1535nm erbium-glass laser rangefinder modules designed for long-distance precision measurement in defense, security, and industrial UAV applications. Ranging from 5,000 meters (on 2.3×2.3m targets) up to 15,000 meters for large targets, these compact modules deliver ±1m accuracy and >98% measurement reliability. Leveraging Class 1 eye-safe laser technology (IEC 60825-1), low power consumption (standby as low as 1W), and ruggedized front-face sealing, LM Series modules integrate seamlessly into UAV payloads, border surveillance systems, handheld thermal imagers, and unmanned ground vehicles (UGVs). With wide operating temperature (-40° C to +70° C) and flexible communication interfaces (RS422/TTL/UART/CAN optional), they are the optimal choice for global OEM integrators demanding long-range, eye-safe LRF solutions in harsh environments.

Product Key Selling Points

☑ 1535nm Eye-Safe Technology

The LM Series utilizes a self-developed erbium glass laser at 1535nm, classified as Class 1 eye-safe under IEC 60825-1. Unlike 905nm alternatives, 1535nm is absorbed by the eye's vitreous humor without reaching the retina, eliminating retinal injury risk. This allows unrestricted operation during military training, border patrols, and civilian drone missions without protective goggles, ensuring operator safety and regulatory compliance.

☑ Ultra-Compact & Lightweight Design

Weighing as little as 57g (LM5A) up to 130g (LM10A) with dimensions as small as 48.5×36×26mm, the LM Series fits into space-constrained platforms such as mini-UAV gimbals, pocket-sized thermal monoculars, and robotic sensors. Achieve long-range measurement without payload penalties – critical for extended flight endurance and portable handheld devices where every gram counts.

☑ Harsh Environment Reliability

Integrated front-face multi-point sealing and non-thermal receiving optical design ensure stable

operation from -40 ° C to +70 ° C with ≤ 0.1mrad optical axis stability across the full temperature range. Welded wire internal connections eliminate connector oxidation, loosening, and moisture ingress. Perfect for border surveillance in deserts, high-altitude UAV operations, and maritime systems where condensation and vibration are constant challenges.

☑ Low Power Consumption & High Ranging Frequency

Standby power below 1.5W (≤1W for LM5A/LM8A) and peak ≤7W, with selectable ranging frequency from 1Hz to 10Hz (LM5A/LM6A/LM8A) or 1-5Hz (LM10A). Supports continuous ranging for over 30 minutes. Ideal for battery-powered unmanned systems requiring persistent target tracking, minimal thermal footprint, and extended mission life without frequent battery swaps.

☑ Flexible Communication & Multi-Target Output

Supports RS422, TTL, UART, and optional RS232 or CAN bus with default baud rate 115200 (8N1). LM6A/LM8A/LM10A offer multi-target ranging (first & last target logic) plus laser emission count query. Easy integration with existing fire control systems, AI trackers, and telemetry links – dramatically reduces development time for integrators and allows plug- and- play upgrades.

Product Specifications

Parameter	LM5A (5km)	LM6A (6km)	LM8A (8km)	LM10A (10km)
Wavelength	1535nm ±10nm (Eye-Safe Class 1)			
Max Ranging (large target)	10000m	10000m	13000m	15000m
Ranging on 2.3×2.3m target (30% reflectivity)	5000m (vis 12km)	6000m (vis ≥ 25km)	8000m (vis ≥ 25km)	10000m (vis 15km)
Min. ranging distance	20m	30m	50m	20m
Ranging accuracy	±1m			
Measurement accuracy	≥98%			
Divergence angle	≤0.5mrad			
Ranging frequency	1~10Hz			1~5Hz
Receiving aperture	Φ19mm	Φ25mm	Φ25mm	Customizable
Communication interface	RS422 / TTL (custom)	RS422 / UART_TTL / RS232	RS422 / UART_TTL / RS232	RS422
Voltage	5V	9-15V	9-15V	5.6-8.4V
Power consumption (standby/rated/peak)	≤1W / ≤ 1.6W / ≤4W	≤1.5W / ≤ 4W / ≤7W	≤1W / ≤1.6W / ≤4W	avg≤3W / peak≤6W
Operating temperature	-40℃～+70℃	-40℃～+60℃	-40℃～+60℃	-40℃～+60℃
Storage temperature	-50℃～+75℃	-45℃～+70℃	-45℃～+70℃	-45℃～+70℃
Weight	≤57g	≤100g	≤100g	≤130g
Dimensions (mm)	≤48.5×36× 26	≤70×48×32	≤70×48×32	≤69×57×45
Non-parallelism (optical axis to mounting)	<0.3mrad	<0.3mrad	≤0.25mrad	≤2mrad (verticality)

Note: All performance indicators and interfaces can be customized according to requirements

(OEM).

Product Features

Section 1: Single & Continuous Ranging Modes

Switch between precise single-shot measurement for static targets and automatic continuous ranging at 1-10Hz to track moving vehicles or drones. Eliminates the need for external trigger circuits. Field operators benefit from real- time distance updates during reconnaissance, while UAV autopilots receive stable altimeter data. Solves the pain of latency and mode switching – the LM Series delivers reliable data even under vibration or rapid target movement.

Section 2: Comprehensive Self- Check & Diagnostic Reporting

Power - on self - test (POST) and runtime health monitoring check laser bias voltage, temperature, echo status, and counter integrity. Reports detailed fault codes (system abnormal, temperature alarm, etc.) via serial interface. Maintenance teams can preemptively detect laser deterioration or optical misalignment, reducing field failures. Perfect for mission- critical border towers and UAV fleets where unexpected downtime is unacceptable.

Section 3: First/Last Target Logic (Multi- Target Ranging)

LM6A/8A/10A modules intelligently output both the closest (first) and farthest (last) target distances in a single laser pulse. This feature cuts through obscurants like bushes, rain, or camouflage nets, giving gunners or drone operators the true range to the intended hard target. Solves the common problem of false returns from foreground clutter – ensures accurate engagement or obstacle avoidance.

Section 4: Field- Upgradable Firmware & Laser Shot Counter

Support for remote software upgrade via communication interface (RS422/TTL) and query of total laser emission counts (up to 6.5 million shots). Maintenance planners can schedule laser diode replacement based on actual usage, not calendar time. End users avoid unexpected module failures and reduce total cost of ownership – particularly valuable for military depots and large- scale UAV operators.

Section 5: Extreme Temperature Stability & Low Power Drift

Non - thermal receiving optical design and fully temperature - compensated electronics maintain ranging accuracy (±1m) from -40° C to +70° C without performance roll- off. No need for external heaters or coolers. Integrates seamlessly into Arctic surveillance drones or desert patrol vehicles. Solves the pain of thermal expansion misalignment and battery drain – the LM Series keeps working where consumer- grade sensors fail.

Applications & Pain Points Solved

Application	Customer Pain Point Solved
UAV Payloads (Mapping & Targeting)	Heavy LRF modules reduce flight time; LM5A at only 57g solves weight constraints while providing 5km+ ranging for power line inspection and border patrol. Low peak power (≤4W) extends mission endurance.

Border Surveillance Systems	In harsh environments (sandstorms, snow), traditional sensors give false alarms. LM series with ≥98% accuracy and anti-condensation sealing ensures reliable tripwire detection at 8km+, reducing patrol frequency and manning costs.
Handheld Thermal/Night Vision Monoculars	Users need instant range to targets without laser glare. 1535nm invisible beam and eye-safe operation allow covert ranging. Compact size (≤ 70mm length) fits into grip-mounted designs, solving integration challenges.
Unmanned Ground Vehicles (UGVs)	UGVs navigating complex terrain require multi-target output to avoid branches or grass. LM6A first/last target logic provides clear distance to obstacles and ground, enabling autonomous path planning and safe navigation.
Industrial Telemetry & Crane Positioning	Dusty/humid industrial sites damage unprotected lasers. The front-face sealed LM8A (welded internal wires) resists moisture ingress, offering ±1m accuracy for stockpile volume measurement and crane anti-collision.

Q&A

Q1: Is the 1535nm wavelength truly eye-safe for military field use?
Yes. All LM modules meet Class 1 eye-safe classification (IEC 60825-1). The 1535nm erbium glass laser is absorbed by the eye's vitreous humor without reaching the retina, unlike 905nm systems. This allows unlimited exposure without protective goggles during training and combat operations.

Q2: What affects the maximum ranging performance on a 2.3×2.3m target?
Visibility (atmospheric attenuation), target reflectivity, and background light. LM5A reaches 5000m in 12km visibility (30% reflectivity); LM6A/LM8A achieve 6000m/8000m in ≥25km visibility. For extended range, we advise larger targets or higher reflectivity. Contact us for customized sensitivity tuning.

Q3: Can the communication interface be customized for legacy systems?
Absolutely. Default is RS422 (115200bps, 8N1) but we support TTL, RS232, and CAN bus on request. The protocol can be adjusted to match your host system – including baud rate, parity, and message formatting. MOQ and lead time depend on customization level.

Q4: How do I mount the module while maintaining optical axis alignment?
The LM Series provides mounting reference holes and non-parallelism specification (≤ 0.3mrad). We recommend using the provided mechanical drawings for CNC-machined brackets. For high-vibration UAV applications, use the four M2.5 mounting points. Axis stability ≤ 0.1mrad over full temperature range ensures retained zero after thousands of cycles.

Q5: What is the typical lifetime of the laser diode?
The 1535nm erbium glass laser is rated for >1 million shots under normal conditions. You can query the accumulated emission count via command 0x07. At 1Hz continuous operation, that

translates to over 11 days of non- stop ranging; for most surveillance drones (2000 shots/day) lifetime exceeds 3 years. Elevated temperatures may slightly reduce life, but our -40° C to +70° C rating guarantees industrial durability.

Package Contents

1× LM Series Laser Rangefinder Module (model LM5A / LM6A / LM8A / LM10A as ordered)
1× Matching connector (DF52-10S-0.8 for LM5A / PHD-2×5 for LM6A/LM8A / A1257WR-S-7P for LM10A)
1× Quick Start Guide (including communication protocol examples and command tables)
1× Mechanical drawing (PDF) and 3D step file (downloadable link)
Optional: Test cable assembly (RS422 to USB adapter, available for purchase)

OEM bulk packaging (tray or anti- static bags) is available for volume orders. All modules undergo 100% range and temperature testing before shipment.