

LF-M1 series

Laser Methane Pod User Manual V1.0



catalogue

Revise Resume 3 3

1. Product Overview 4 4

 1.1. Product Introduction 4 4

 1.2. Model Introduction 4 4

 1.3. Packing List 4 4

2. Technical Parameters 5 5

 2.1. Overall Parameters 5 5

 2.2. Zoom Camera 5 5

 2.3. Infrared Camera 6 6

 2.4. Laser Ranging Instrument 6 6

 2.5. Laser Methane Telemetry 6 6

 2.6. Pan-Tilt 7 7

3. Function Introduction 7 7

 3.1. Display Mode 7 7

 3.2. Photo and Video Recording Function 7 7

 3.3. Visible Light Camera Function 7 7

 3.4. Infrared Camera 8 8

 3.5. Range Measurement Function 8 8

 3.6. Laser Methane Telemetry Function 9 9

 3.7. Other Functions 9 9

 3.8. Pan-Tilt Function 9 9

4. External Communication Protocols 10 10

5. Host Computer Tools 10 10

6. Precautions 10 10

 6.1. Daily Maintenance 10 10

 6.2. Usage Instructions 11 11

Revise resume

version number	Revision date	Revision
V1.0	2026/1/10	-First release

1. Product Overview

1.1. Product Introduction

The LF-M1 series is a quad-camera pod integrating a 40x ultra-high-definition optical zoom visible light camera, 640-resolution thermal imaging, high-precision laser rangefinder, and laser methane telemetry. Equipped with a lightweight three-axis gimbal and adaptive vibration damping module, it features autofocus and gimbal stabilization algorithms to ensure stable and clear footage during aerial operations.

The LF-M1 features ultra-high-speed response, strong anti-interference capability, and an exceptionally low false alarm rate. It is widely used in gas leak detection for environmental monitoring, oil and gas, coal gas, and chemical industries, enabling rapid detection and localization of leakage sources. Equipped with drone integration and flight path planning functions, it facilitates routine inspection tasks to swiftly identify and pinpoint leakage sources.

1.2. Model Introduction

order number	model	demonstration of the type	remarks
1	LF-M1	Senyun Standard Interface	

1.3. container loading list

order number	name	model	unit	quantity	remarks
1	laser methane pod	LF-M1	tower	1	
2	Shock-absorbing bracket with quick-release	-	cover	1	
3	explosion-proof tank	explosion-proof tank	cover	1	

2. technical parameter

2.1. Overall parameters

video output interface	Ethernet
control signal interface	1 S-BUS, 1 RS422, 1 100Mbps Ethernet, 1 serial port, 1 CAN
Power supply area	10V ~ 28V
System power consumption	20W
levels of protection	IP54
working temperature	-20°C~55°C
Size (excluding shock absorbers)	109.5*155*160mm
Weight (excluding shock absorbers)	<900g
mechanical interface type	Quick-release & fastening hole

2.2. Zoom camera

imaging sensor	8 million pixels			
Maximum photo size	3840*2160 (16:9)			
Video resolution	3840×2160@30fps、 1920×1080@30fps			
coded format	H.264、 H.265			
Focus mode	MF、 AFS			
effective focal length	4.2mm-170mm			
equivalent focal length	29.4mm-1151.4mm			
iris diaphragm	F1.68-F5			
optical zoom	40 times			
angle of field	focal distance	DFOV	HFOV	VFOV
	Wide	72°	64.6	39.2°
	Tele	2.2°	1.9°	1.1°

2.3. infrared camera

thermal imaging	Non-cooling vanadium oxide infrared focal plane detector
-----------------	--

sensor	
Maximum photo size	640*512
Video resolution	640*512@25fps
coded format	H.264、H.265
pixel pitch	12 μ m
wavelength coverage	8-14 μ m
noise equivalent temperature difference	≤ 50 mk@25°C, f#1.0
effective focal length	18mm
equivalent focal length	79mm
iris diaphragm	F1.1
angle of field	24.2°*19.5°
Pseudo-color	Supports 11 pseudo-color modes

2.4. laser distance measuring instrument

range	5-1500m
ranging accuracy	≤ 1 m (≤ 300 m) $\leq \pm 2$ m(> 300m)
operating wavelength	905nm ± 10 nm@25°C
range frequency	Single, 1Hz, 2Hz, 5Hz

2.5. laser methane telemetry

tracer gas	Methane (CH ₄) / (Other gases such as hydrogen fluoride (HF), ammonia (NH ₃), or ethylene can be customized)
Detection principle	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Detection range	0~50000ppm.m/0~99999ppm.m optional
Detection distance	0~100m/0~150m/0~200m available
response time	≤ 0.02 s
sensitivity	5ppm.m
intrinsic error	$\pm 10\%$

high and low temperature tolerance	-20°C ~ 55°C
working humidity	5–98% RH, no condensation

2.6. Cloud Terrace

stabilization system	3 axes (pitch, roll, heading)		
range of rotation	cabrage	roll	azimuth
	±110°	-45° ~ +45°	±320°
stability accuracy	≤0.01°		
work pattern	Follow and Lock		

3. function Introduction

3.1. Display Mode

3.1.1. Single video display

Supports infrared and zoom single-channel video display, and can switch between different camera video streams.

3.1.2. Split Screen

It supports infrared and zoom camera video display side by side.

3.1.3. Picture-in-picture display

Embed a smaller infrared video frame into a zoomed video frame, with infrared video overlaying the main frame's four corners.

3.2. Photo and video recording

- Single shot: Take one photo after clicking the take button.
- Camera resolution: Supports 3840*2160 and 1920*1080 resolution for visible light photography, and 640 resolution for infrared photography.
- Video recording resolution: Supports 3840*2160 and 1920*1080@30fps visible light video, and 640*512@25fps infrared video.

3.3. visible light camera function

3.3.1. Zoom control

- Zoom: Supports up to 40x optical zoom.
- Focus modes: MF (Manual Focus), AFC (Automatic Continuous Focus), AFS (Automatic Single Point Focus).

3.4. infrared camera

3.4.1. Pseudo Color Mode

- Pseudo-color mode: Supports 11 effects including White Heat, Radiant Gold, Iron Red, Rainbow, Soft Glow, Aurora, Red Heat, Jungle, Medical, Black Heat, and Golden Red.

3.4.2. gain mode

Supports two different mode options:

- High-resolution mode: Temperature measurement range-20°C to 150°C, with an accuracy of $\pm 2^{\circ}$ C or $\pm 2\%$ of the reading.
- Wide-range mode: Temperature measurement range is 0°C to 550°C, with an accuracy of $\pm 3^{\circ}$ C or $\pm 3\%$ of the reading.

3.4.3. FFC calibration

- Manual calibration: Set or retrieve the auto shutter switch, minimum shutter interval, maximum shutter interval, and auto shutter correction trigger threshold.
- Automatic calibration: When enabled, the infrared camera will automatically perform FFC calibration periodically.

3.4.4. Temperature measurement function

It supports point temperature measurement, area temperature measurement and global temperature measurement.

3.4.5. DDE

Digital enhancement technology improves image and contour clarity. Supports 0-3 DDE levels for setting or retrieval.

3.5. range measurement function



After enabling the ranging function, avoid direct eye contact with the laser to prevent potential harm.

3.5.1. range mode

- Single measurement: When enabled, it performs a single measurement and reports the distance.
- Continuous ranging: When enabled, it will measure distances continuously at a fixed frequency and report the distance information.

3.5.2. frequency selection

- Supports 1/2/5 Hz.

3.6. Laser methane telemetry function



After activating the laser telemetry, the human eye must not directly view the laser to avoid causing harm to the human body.

3.6.1. telemetry mode

- The system can detect potential leaks in long-distance laser telemetry applications for natural gas (methane) and similar scenarios, enabling early predictive alerts.

3.6.2. Disable feature selection

- Supports detection laser and indicator laser on/off options.

3.7. Other features

3.7.1. memory card

- Supports microSD cards up to 128GB, compatible with FAT32 and ExFAT file systems.

3.7.2. OSD

- Supports custom OSD to display load model and SN code, latitude, longitude, altitude, date, time, and other information

3.7.3. additional function

- Reset camera parameters: Restore camera settings to factory defaults with one click
- Auto-save camera settings: Save user-defined settings by default. The camera will automatically use the last saved settings when you reopen it.
- OSD customization: Supports OSD customization.

3.8. Pan-Tilt Function

3.8.1. pan-tilt control

- One-click return: Quickly resets the gimbal to its original center position, aligning with the camera's orientation.
- One-click downward: Quickly rotates the gimbal vertically downward.

3.8.2. pan-tilt control mode

- Follow: The pod's orientation remains constant relative to the nose.
- Lock: The pod's orientation remains fixed and does not rotate with the aircraft's nose.
- Panning: The gimbal rotates around each axis by small angles through commands sent from the host computer.
- Manual: Control the pan-tilt rotation with up, down, left, or right commands.
- Speed control: The pan-tilt unit automatically adjusts rotation speed according to zoom ratio.

4. external communication protocol

You can contact sales or after-sales for relevant information.

5. Host machine tool

You can contact sales or after-sales for relevant information.

6. matters need attention

6.1. maintenance overhaul

6.1.1. Daily Use and Cleaning

- Dust and dirt protection

Avoid contaminating the lens with chemicals or oil during use. Clean the lens surface immediately after use with a lens cloth.

Direct wiping of optical lenses with hands or rough fabrics is prohibited. It is recommended to use professional lens cleaning kits, dust-free cloths, or alcohol for cleaning.

- Moisture-proof and waterproof

Avoid prolonged use in rainy, snowy, or high-humidity environments. If exposed to damp conditions, wipe the surface with a dry soft cloth after operation and store in a dry environment.

Do not soak or rinse the device directly.

- collision and vibration protection

During transportation or storage, place the pod in the factory-provided explosion-proof box to keep it securely fixed and protect it from violent shaking or dropping.

Do not impact the lens with sharp or hard objects, as this may cause damage and affect its performance.

6.1.2. matters need attention

- Do not disassemble by yourself

Non-professionals must not disassemble the pod's core components (e.g., optical modules or circuit boards), as doing so may cause damage or void the warranty.

- exception handling

If the device exhibits abnormal overheating, unusual noises, or image distortion, stop using it immediately and contact after-sales technical support.

Do not force the device to start in a faulty state.

6.2. Usage Notes

6.2.1. Preparation before use

- Environmental inspection

Maintain the operating environment temperature within -20°C to 55°C, and avoid areas with strong electromagnetic interference.

The use is prohibited during severe weather conditions such as rain, snow, and sandstorms.

- equipment inspection

Check the pod for damage, the lens for stains, and the gimbal for smooth rotation without noise.

Inspect the mechanical structure of the flywheel gimbal for looseness. If any abnormal response is detected, immediately deactivate and perform maintenance.

Check the electrical connections of the system.

Check the normality of the gimbal imaging and function.

6.2.2. Usage Notes

If there are any abnormal situations such as abnormal picture or abnormal control of the pan-tilt unit during the operation, the operation task should be stopped and returned to the ground for inspection.

6.2.3. Post-processing

After use, the system must be powered down before the pod can be removed from the aircraft.

After cleaning the lens, it was put back into the packaging box.