MS200 系列多光谱相机

MS200 series Multispectral camera

用户手册(v1.0)

SPECIFICATION

Yusense Information Technology and Equipment (Qingdao) Co., Ltd

长光禹辰信息技术与装备（青岛）有限公司

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特此声明！

文中标识说明

 ：注意事项，操作不当可能导致设备不能正常使用，但是不会损坏设备。

Precautions: Improper operation may cause the equipment to malfunction, but it will not damage the equipment.

△：警告事项，操作不当可能导致设备不能正常使用，且可能导致设备损坏。

Warning: Improper operation may cause the equipment to not function properly and may result in equipment damage.

 ：说明事项，查看该说明事项，将有助于对内容的理解。

Explanatory notes: reviewing these notes will help to understand the content.

1. 概述 overview

MS200 是一款高性价比的“马赛克滤光片型”多光谱相机，创新双镜头多光谱波段设计，可实现 5 个通道光谱图像数据的同步获取，满足精准农业、生态环保、城市绿化等领域科研和行业应用需求。MS200 is a cost-effective "mosaic filter type" multispectral camera with innovative dual lens multispectral band design, which can achieve synchronous acquisition of spectral image data from five channels, meeting the scientific research and industry application needs of precision agriculture, ecological protection, urban greening, and other fields.

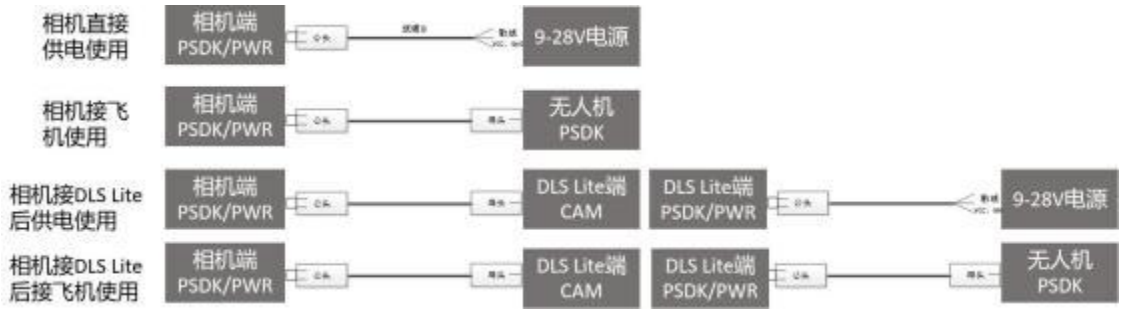
MS200 系列多光谱相机主要包括相机主机和简化版下行光传感器（“Down-welling Light Sensor Lite”，以下简称“DLS Lite”或“DLS”）两部分。主机实现相机工作模式和参数的配置，光谱图像数据的获取和存储；DLS Lite 用于同步测量相机 5 个通道对应的光谱辐照度数据以及位置坐标信息。The MS200 series multispectral camera mainly includes two parts: the camera host and a simplified version of the down welling light sensor Lite (hereinafter referred to as "DLS Lite" or "DLS"). The host realizes the configuration of camera working mode and parameters, as well as the acquisition and storage of spectral image data; DLS Lite is used to synchronously measure the spectral irradiance data and position coordinate information corresponding to the five channels of the camera.

MS200 系列多光谱相机组配灵活，可以搭载 DJI M3/M30 及其他第三方轻小型无人机，用户可以根据搭载平台选用不同类型的集成件和连接线缆，并切换使用 PSDK 或 WiFi WEB 功能。The MS200 series multispectral camera is flexible in configuration and can be equipped with DJI M3/M30 and other third-party lightweight unmanned aerial vehicles. Users can choose different types of integrated components and connecting cables according to the platform they are equipped with, and switch to using PSDK or WiFi WEB functions.

2. 使用步骤Usage steps

2.1. 连接connect

相机主机仅有一个 USB Type-C 接口，使用提供的线缆可以连接 DLS Lite 后通过 DLS Lite 连接 PWR/PSDK 使用，也可以直接连接 PWR/PSDK 使用。
The camera host only has a USB Type-C interface, and the provided cable can be used to connect to DLS Lite and PWR/PSDK through DLS Lite, or directly connect to PWR/PSDK for use.



2.1.1. 插入 Micro SD 卡 Insert Micro SD card

确保插入 Micro SD 卡，位置如下图所示。

Make sure to insert the Micro SD card, as shown in the following image.

注意 attention

1. Micro SD 卡最大容量不超过 64GB；
   The maximum capacity of Micro SD card shall not exceed 64GB;
2. Micro SD 卡文件格式为 ex Fat/FAT32；
   Micro SD card file format is ex Fat/FAT32;
3. Micro SD 卡写入速度不低于 60MB/s；
   The write speed of Micro SD card shall not be less than 60MB/s;
4. 相机推荐使用自带 Micro SD 卡。
   It is recommended to use the built-in Micro SD card for the camera.

2.1.2. 连接 DLS Lite Connecting DLS Lite

根据上图所示，通过 Type-C 接口线缆连接 DLS Lite 的 CAM 口与相机 DLS/PWR 口，根据槽口判断方向，槽口与接口一致。As shown in the above figure, connect the CAM port of DLS Lite to the camera DLS/PWR port

through the Type-C interface cable, and determine the direction based on the slot. The slot is consistent with the interface.

DLS Lite 测量获取的环境光、位置和姿态信息作为元数据记录在图像中。

The ambient light, position, and attitude information obtained from DLS Lite measurements are recorded as metadata in the image.

 警告 warn
安装时保证 DLS Lite 水平放置、扩散片空间内无遮挡。 Ensure that the DLS Lite is placed horizontally and there is no obstruction in the diffuser space during installation.

2.1.3. 连接电源线 Connecting the power cord

使用标配线缆将 Type C 接口连接到 DLS Lite 模块的 PWR/PSDK 接口，接入外部电源供电；若连接飞行器使用，则通过 Type C 接口连接线将 DLS Lite 与飞行器连接使用；相机也可直接连接外部电源供电使用或连接飞行器使用。
Connect the Type C interface to the DLS Lite module PWR/PSDK interface using a standard cable, and connect it to an external power supply; If connected to the aircraft for use, connect the DLS Lite to the aircraft through the Type C interface cable; The camera can also be directly connected to an external power supply for use or connected to an aircraft for use.


警告warn

相机供电电压 9V~28V，考虑到供电线有一定的压降，建议最低电压不小于 9V，最高电压不能高于 28V，并确保极性正确。若不遵循此条，将会永久导致相机主机、DLS Lite 损坏，且不属于质保范围之内。

The power supply voltage of the camera is 9V~28V. Considering that there is a certain voltage drop in the power supply line, it is recommended that the minimum voltage is not less than 9V, and the maximum voltage should not be higher than 28V, ensuring correct polarity. If this clause is not followed, it will permanently cause damage to the camera host and DLS Lite, and it is not within the warranty scope.

2.2. 相机的使用 Camera usage

2.2.1. 设备上电Power on the device

当外部电源连接并使能后相机即上电。

当相机上电后相机状态灯、DLS Lite 状态灯为白色常亮，当初始化完成后根据运行状态开始闪烁，具体状态定义请查阅“2.2.3 LED 灯状态”章节相关信息。

When the external power supply is connected and enabled, the camera is powered on. After the camera is powered on, the camera status light and DLS Lite status light are white and constantly on. After initialization is completed, they start flashing according to the operating status. For specific status definitions, please refer to the relevant information in the section "2.2.3 LED Lamp Status".

2.2.2. 设备下电 Equipment power-off

工作完成后直接关闭外部电源，相机将完成断电。

After completing the work, directly turn off the external power supply, and the camera will complete the power outage.

2.2.3. LED 灯状态 LED light status

LED 灯的显示状态对应相机不同的工作状态和故障信息，可用作飞行前的判断，具体见下表所示：

The display status of LED lights corresponds to different working states and fault information of the camera, which can be used for pre flight judgment, as shown in the following table:

状态显示 Status display		
颜色colour	闪烁频率flicker frequency	意义meaning
红色 red	10Hz	系统温度过高System temperature too high
红色 red	2Hz	GPS 未连接或 GPS 无信号 GPS not connected or GPS no signal
红色 red	1Hz	DLS Lite 未连接 DLS Lite not connected
红色 red	0.5Hz	SD 卡未插入/SD 卡容量已满 SD card not inserted/SD card capacity full
红色 red	常亮 Light	软件升级失败 Software upgrade failed
黄色 yellow	1Hz	GPS 信号质量差 Poor GPS signal quality
黄色 yellow	0.5Hz	SD 卡容量不足 Insufficient SD card capacity
蓝色 blue	10Hz	SD 卡清除 SD card clearing
蓝色blue	2Hz	软件升级过程中 During the software upgrade process
绿色 green	10Hz	写入 SD 卡 Write to SD card
绿色 green	1Hz	正常 normal
绿色 green	常亮 Light	升级成功 Upgrade Successful
白色 white	常亮 Light	相机初始化或相机固件异常 Camera initialization or camera firmware abnormality

3. 相机配置和预览显示Camera configuration and preview display

相机内置 WiFi 天线，可通过任何具备 WiFi 功能的移动设备连接相机，并通过该移动设备的浏览器对相机进行访问配置和图像预览。
The camera is equipped with a built-in WiFi antenna, which can be connected to the camera through any mobile device with WiFi function, and the camera can be accessed, configured, and image previewed through the browser of the mobile device.

3.1. 建立 WiFi 连接 Establishing a WiFi connection

通过 WiFi 连接设备的具体步骤如下：

1) 相机按要求连接、开机并等待初始化完成；

2) 搜索 WiFi，选择名称为“MS200-XXXXXXXXXXX（X 为相机 SN）”的热点并连接，无密码，若连接不畅，请尝试多次连接；

3) 连接后，打开任意浏览器输入“192.168.18.1”访问相机的 WEB 配置页面；

4) 首先进入欢迎页面，可选择中英文显示，点击“点击进入”按钮进入相机页面。

The specific steps for connecting devices through WiFi are as follows:

1) Connect the camera as required, turn it on, and wait for initialization to complete;
2) Search for WiFi, select a hotspot named "MS200 XXXXXXXXXXX (X is camera SN)" and connect without a password. If the connection is not smooth, please try connecting multiple times;
3) After connecting, open any browser and enter "192.168.18.1" to access the camera's WEB configuration page;
4) First, enter the welcome page, where you can choose to display in both Chinese and English. Click the "Click to enter" button to enter the camera page.

WEB 配置页面包括 4 个页面内容：The WEB configuration page includes four page contents:

3.2. 监控页面Monitoring page

本页面提供了相机系统的主要状态，具体包括：

1) 存储状态：Micro SD 卡的总容量、剩余容量、工作状态信息；

2) DLS 状态：DLS Lite 的连接状态、工作状态；

3) GPS 状态： 目前搜星颗数和信号质量；

4) 坐标位置：经纬度；

5) 飞行高度：海拔高度和地表相对高度；

6) 时间：为 UTC 时间，当 GPS 无信号或信号质量差时，显示的起始时间无实际参考意义；

7) 捕获状态：显示当前设置生效的自动捕获模式，可用于飞行前参考判断；

8) 图片格式：图像存储格式：包括 TIFF-16bit、REF-JPG 两种。

9) 相机状态：显示当前相机状态，与 LED 灯状态一致；

10) 软件版本号：显示相机程序版本，使用 SD 卡实现程序升降级，升级方法请查阅“6.固件升级 ”章节相关内容；

11) 产品序列号：显示相机 SN 号；

12) 生产商信息：显示生产商信息。

This page provides the main status of the camera system, including:

1) Storage status: The total capacity, remaining capacity, and working status information of the Micro SD card;

2) DLS status: The connection status and working status of DLS Lite;

3) GPS status: current number of satellite searches and signal quality;

4) Coordinate position: longitude and latitude;

5) Flight altitude: altitude and relative surface elevation;

6) Time: refers to UTC time, which is the starting time displayed when there is no GPS signal or the signal quality is poor

No practical reference significance;

7) Capture status: displays the automatic capture mode in effect with the current settings, which can be used for pre flight reference judgment;

8) Image format: Image storage format: includes TIFF -16bit and REF-JPG.

9) Camera status: Display the current camera status, consistent with the LED light status;

10) Software version number: Display camera program version, use SD card to achieve program upgrade and upgrade, upgrade party

Please refer to the relevant content in the "6. Firmware Upgrade" section for details;

11) Product serial number: Display the camera SN number;

12) Manufacturer Information: Display manufacturer information.

3.3. 设置页面 Settings page

本页面有基本设置和高级设置两部分。This page has two parts: basic settings and advanced settings.

3.3.1. 基本设置 Basic Settings

本页面用于配置相机的自动捕获模式，主要包括定时触发和重叠率触发两种模式。This page is used to configure the automatic capture mode of the camera, mainly including two modes: timing trigger and overlap rate trigger.

注意 attention
1.设置自动捕获模式后，可通过主页上的捕获状态和相关参数进行确认，该模式设置将会自动保存为默认设置，相机重启后仍将保持。 2.当相机未连接 DLS Lite 使用时，只提供定时触发，无重叠率触发模式。 1.After setting the automatic capture mode, it can be confirmed through the capture status and related parameters on the homepage. This mode setting will be automatically saved as the default setting, which will still be maintained after the camera restarts. 2. When the camera is not connected to DLS Lite for use, only timed triggering is provided and there is no overlap rate triggering mode.

- 定时触发模式 Timing trigger mode

1) 自动捕获模式下拉菜单选择“定时触发”；Select 'Timing Trigger' from the automatic capture mode drop-down menu;

2) 设置定时触发周期间隔； Set the interval between timed triggering cycles;

3) 设置定时触发使能高度；Set the timing trigger enable height;

4) 设置完毕后保存确认； Save and confirm after setting;

5) 开始触发。 Start triggering.

注意 attention

1. 定时触发模式设定后，相机将在飞行器起飞达到预期的相对高度后才开始进行触发拍照，旨在避免因立即生效而造成的在未执行飞行任务前产生大量冗余图像数据。

2. 设置定时触发周期间隔不得低于 0.5 秒。

1. After the timed trigger mode is set, the camera will not start triggering photography until the aircraft reaches the expected relative altitude after takeoff, aiming to avoid generating a large amount of redundant image data before executing the flight mission due to immediate effect.

2. Set the interval between timed trigger cycles to not be less than 0.5 seconds.

3. 最低限制高度不能高于实际工作高度，否则相机将不拍照。The minimum height limit cannot be higher than the actual working height, otherwise the camera will not take photos.

- 重叠率触发模式 Overlap rate triggering mode

1) 自动捕获模式下拉菜单选择“重叠率触发”；Select 'Overlap Rate Trigger' from the automatic capture mode drop-down menu;

2) 输入目标飞行高度值；Enter the target flight altitude value;

3) 输入目标飞行速度值；Enter the target flight speed value;

4) 下拉菜单设置选择两次触发拍照图像的航向重叠率；Dropdown menu setting to select the heading overlap rate for two triggered photo images;

5) 设置完毕后保存确认；Save and confirm after setting;

6) 开始触发。Start triggering.

注意attention

1．用户可根据预飞行情况，修改飞行速度的默认值，避免实际工作在重叠率触发模式时，超过相机最快捕获速率的限制。一旦超出，用户可采用增加飞行高度，或降低飞行速度，或降低重叠率的方法来修改触发方案。

2．相机拍摄间隔不得低于 1s。

1. Users can modify the default value of flight speed based on the pre flight situation to avoid exceeding the camera's fastest capture rate limit when working in the overlap rate triggering mode. Once exceeded, users can modify the triggering scheme by increasing flight altitude, reducing flight speed, or reducing overlap rate.

2. The camera shooting interval should not be less than 1 second.

警告warn

为避免无人机上升或下降过程相机触发产生冗余图像数据，相机在相对起飞点高度高于 10 米时开始拍照，请客户严格注意 WEB 中设定的飞行高度和实际飞行高度的匹配，否则可能导致相机不拍照。To avoid redundant image data generated by camera triggering during drone ascent or descent, the camera starts taking photos when the relative takeoff point altitude is higher than 10 meters. Customers are advised to strictly pay attention to the matching between the flight altitude set in the WEB and the actual flight altitude, otherwise it may cause the camera to not take photos.

3.3.2. 高级设置advanced setting

高级设置菜单包括图像存储格式、存储设备格式化、DLS 信息、PSDK 模式设置、校准功能、恢复出厂设置等功能。The advanced settings menu includes functions such as image storage format, storage device formatting, DLS information, PSDK mode setting, calibration function, and factory reset.

- 图像存储格式 Image storage format

在高级设置里，可以设置相机保存的多光谱图像数据的格式为 TIFF-16bit 或 REF-JPG；其中 REF-JPG 格式数据为计算完成的反射率数据，由于 JPG 格式为有损压缩，反射率数据与 TIFF 数据计算出的反射率数据会存在误差。In advanced settings, the format of the multispectral image data saved by the camera can be set to TIFF -16bit or REF-JPG; The REF-JPG format data is the calculated reflectance data. Due to the lossy compression of the JPG format, there may be errors between the reflectance data and the reflectance data calculated from TIFF data.

警告 warn

1. 多光谱图像存储格式为 REF-JPG，即保存 JPG 格式反射率数据时，执行拍摄任务之前必须先进行自动灰板拍摄，且保证灰板区域完整、不过曝，否则会造成反射率数据不准确或者无法生成反射率数据。

2. 数据处理仅支持 Yusense Map。

1. The storage format for multispectral images is REF-JPG, which means that when saving reflectance data in JPG format, automatic gray plate shooting must be performed before executing the shooting task, and the gray plate area must be complete and not exposed, otherwise it may cause inaccurate reflectance data or inability to generate reflectance data.

2. Data processing only supports Yusense Map.

- 存储设备格式化 Storage device formatting

当 Micro SD 卡容量不够充足或已满时可直接通过该功能进行格式化。When the capacity of the Micro SD card is insufficient or full, it can be formatted directly through this function.

过程中状态
In process status

完成状态

Completion status

警告 warn
执行 SD 卡格式化功能，将会清除 Micro SD 内所有内容，不可恢复。Executing the SD card formatting function will clear all contents in Micro SD and cannot be restored.

- **DLS** 信息

点击“DLS 信息”选项，可以看到 DLS Lite 的序列号和及其固件版本号。

Click on the "DLS Information" option to view the serial number and firmware version number of DLS Lite.

- **PSDK** 模式设置 PSDK mode settings

如果使用 PSDK 功能，需要在此开启 PSDK 功能，并将相机接入飞行器指定接口后才能使用，设置成功后重启相机生效。开启后需在 DJI Pilot App 中控制相机使用，实现实时多光谱指数预览和遥感拍照，WEB 端只提供基础配置功能，预览页面将无法使用，具体 PSDK 功能使用请查阅“4.使用 PSDK 功能连接飞行器”章节内容。不开启 PSDK 功能连接飞行器，飞行器只给相机供电，仍需使用 WEB 端配置相机。

If using the PSDK function, it is necessary to enable the PSDK function here and connect the camera to the designated interface of the aircraft before using it. After successful setting, restarting the camera will take effect. After opening, it is necessary to control the camera usage in the DJI Pilot App to achieve real-time multispectral index preview and remote sensing photography. The WEB end only provides basic configuration functions, and the preview page will not be available. For specific PSDK function usage, please refer to the section "4. Using PSDK Function to Connect Aircraft". Connect the aircraft without activating the PSDK function. The aircraft only supplies power to the camera and still needs to be used Configure a camera on the WEB end.

㉧ 校准功能 Calibration function

当监控页面下的飞行方向与相机实际方向相差较大时，可通过该校准功能进行校准。建议多光谱相机安装到无人机上后再进行地磁校准。校准时，请确保周边没有金属和强磁场干扰。When the flight direction on the monitoring page differs significantly from the actual direction of the camera, calibration can be performed using this calibration function. It is recommended to install the multispectral camera on the drone before conducting geomagnetic calibration. When calibrating, please ensure that there is no metal or strong magnetic field interference around.

地磁校准步骤如下：The steps for geomagnetic calibration are as follows:

1) 进入校准功能界面，点击“开始”按钮进行地磁校准；Enter the calibration function interface and click the "Start" button to perform geomagnetic calibration;

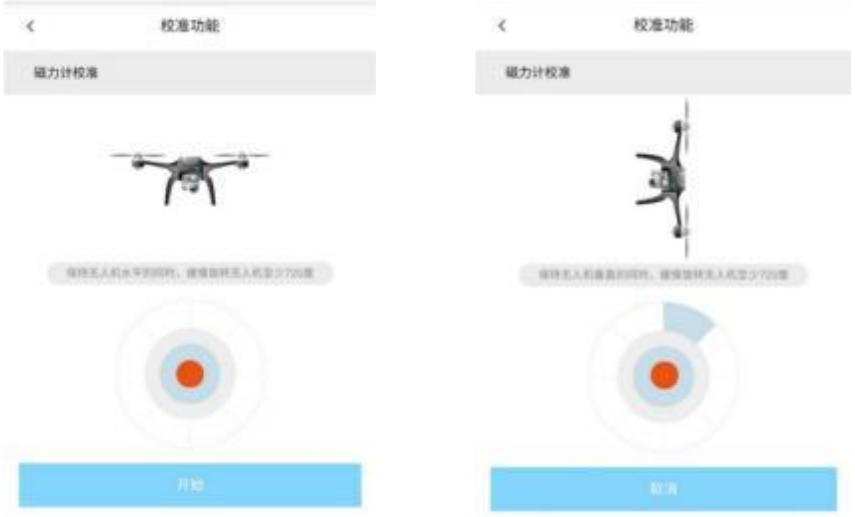
2) 首先进行水平校准模式，水平朝一个方向缓慢旋转无人机至少 720°， 旋转的同时保持校准界面中的红色圆点不超出蓝色范围；Firstly, perform horizontal calibration mode, slowly rotate the drone horizontally in one direction by at least 720 °, while maintaining the red dots in the calibration interface within the blue range;

3) 当最外层白色圆圈的 8 个部分全部变成蓝色后，水平校准完成，进入竖直校准模式；When all 8 parts of the outermost white circle turn blue, horizontal calibration is completed and vertical calibration mode is entered;

4) 竖直校准模式下，首先按照界面中的提示竖直朝一个方向缓慢旋转无人机至少 720°， 旋转的同时保持校准界面中的红色圆点不超出绿色范围；In vertical calibration mode, first follow the prompts on the interface to slowly rotate the drone vertically in one direction by at least 720 degrees, while maintaining the red dots in the calibration interface within the green range;

5) 当最外层白色圆圈的 8 个部分全部变成蓝色后，磁力计校准完成

When all 8 parts of the outermost white circle turn blue, the calibration of the magnetometer is completed.



注意 attention

1. 校准完成后需要使用第三方指南针进行校验，可对比主页上的“飞行方向”栏中的角度进行确认，对应正北方向不应超过±10°， 如果误差超过该值建议重新校准。

2. 地磁校准过程中，设备禁止断电。

3. 地磁校准需连接 DLS Lite 使用。

After calibration is completed, a third-party compass needs to be used for calibration. It can be confirmed by comparing the angle in the "Flight Direction" column on the homepage, and the corresponding north direction should not exceed ± 10 °. If the error exceeds this value, it is recommended to recalibrate.

During the geomagnetic calibration process, it is prohibited to power off the equipment.

3. Geomagnetic calibration needs to be connected to DLS Lite for use.

- 恢复出厂设置 Restore factory settings

点击恢复出厂设置按钮后，重新启动相机，自动捕获模式等功能参数即可恢复至出厂默认状态，Micro SD 卡内数据不受影响。

After clicking the 'Restore Factory Settings' button, restart the camera, and the automatic capture mode and other functional parameters can be restored to the factory default state. The data in the Micro SD card is not affected.

3.4. 预览页面 Preview Page

预览页面提供显示近似实时刷新的图像，该页面主要辅助飞行前的灰板定标工作，也可以判断相机目前的成像角度和效果。The preview page provides a display of approximately real-time refreshed images, which mainly assists in the grayboard calibration work before flight and can also determine the current imaging angle and effect of the camera.

3.4.1. 预览功能 Preview function

当切换到该页面时，预览使能按键默认为“”，当点击启动后变为“”，将会在预览区域看到对应原始通道近似实时的图像（约 2Hz），同时右上角的刷新计数将会不断累计更新。相机提供 NDRE 通道和 NDVI 通道两个原始通道的视频预览。
When switching to this page, the preview enable button defaults to ″″, and when clicked to start, it changes to ″″. You will see an approximate real-time image of the corresponding original channel (approximately 2Hz) in the preview area, and the refresh count in the upper right corner will continue to accumulate and update. The camera provides video previews of two original channels, NDRE channel and NDVI channel.

预览关闭

Preview Close

预览打开

Preview Open

注意 attention

1. 未插存储卡或者存储卡写满时，不能进行预览；

2. 开启 PSDK 功能后此预览视频无法打开，需要在 DJI Pilot App 中控制相机查看实时视频。

1. When the storage card is not inserted or is full, preview cannot be performed;

2. After turning on the PSDK function, this preview video cannot be opened. You need to control the camera in the DJI Pilot App to view real-time videos.

3.4.2. 预览过程中的触发拍照 Trigger photography during preview process

在预览过程中可进行触发拍照，触发拍照按键等同于机械快门按键，未拍照时为“”，拍照过程中图标变暗为“”，结束后恢复为“”，并提示拍照成功。

During the preview process, triggering the camera button is equivalent to the mechanical shutter button. When not taking a photo, it is set to "". During the photography process, the icon darkens to "", and when finished, it returns to "", indicating successful photography.

拍照完成Photography completed

注意 attention
预览界面拍照必须在打开预览模式的情况下才能操作。The preview interface photography can only be operated when the preview mode is turned on.

3.4.3. 自动灰板拍摄功能 Automatic grayboard shooting function

在预览过程中，点击“”按钮开始进入自动灰板拍摄模式，同时弹出“已打开自动灰板拍摄功能”提示，提示此时正处于自动灰板拍摄模式，灰板拍摄成功后会提示“灰板自动拍摄成功”并保存灰板图像至 SD 卡；自动灰板拍照中再次点击“”图标将关闭自动灰板拍摄模式，如下图所示。

During the preview process, click the "" button to enter the automatic grayboard shooting mode, and a prompt "Automatic grayboard shooting function is turned on" will pop up, indicating that the automatic grayboard shooting mode is currently in use. After the grayboard shooting is successful, a prompt "Automatic grayboard shooting successful" will be displayed, and the grayboard image will be saved to the SD card; Clicking the "" icon again during

automatic grayboard photography will turn off the automatic grayboard shooting mode, as shown in the following figure.

3.5. 规划页面 Planning page

该页面提供了简单的飞行任务规划和当前作业预估功能。

This page provides simple flight mission planning and current job estimation functions.

飞行前预估器作为评估飞行任务的计算器工具，输入任务参数，按“计算”键可显示计算结果。计算结果可以得到飞行时间、图像幅宽、捕获次数和所需存储容量等预估值。The pre flight predictor serves as a calculator tool for evaluating flight tasks, inputting task parameters and pressing the "Calculate" button to display the calculation results. The calculation results can provide estimated values such as flight time, image width, number of captures, and required storage capacity.

最佳作业时间可以给出当前时刻下进行飞行作业的的建议，可参考此建议来决定是否进行飞行作业。The optimal operating time can provide suggestions for conducting flight operations at the current time, and can be used as a reference to decide whether to proceed with flight operations.

飞行后可使用 KML 下载功能，将 KML 文件导入移动设备的地图 APP 中（推荐谷歌地图、奥维地图等），可以查看航点，用于判断航点是否均匀、是否存在漏拍等。After flight, you can use the KML download function to import the KML file into the mobile device's map app (recommended by Google

Maps, Ovi Maps, etc.), and view the waypoints to determine whether they are even and whether there are missed shots.

 注意attention
飞行前估计器的评估结果仅供参考，请根据实际情况和使用经验判断。 The evaluation results of the pre flight estimator are for reference only, please make a judgment based on the actual situation and usage experience.

4. 使用 PSDK 功能连接飞行器Connect the aircraft using the PSDK function

当相机搭载 DJI Matrice 30 系列和 DJI Mavic 3 行业系列飞行器平台时，可使用 PSDK 功能接入飞行器使用，通过 DJI Pilot APP 实现相机的功能配置和实时预览。When the camera is equipped with DJI Matrix 30 series and DJI Mavic 3 industry series aircraft platforms, the PSDK function can be used to connect to the aircraft for use, and the camera's functional configuration and real-time preview can be achieved through the DJI Pilot APP.

注意 attention
使用 PSDK 功能前需在相机的 WEB 配置页面设置-高级设置中开启 PSDK 功能。Before using the PSDK function, you need to enable it in the camera's WEB configuration page settings - Advanced settings.

4.1. 安装到飞行器 Installation to aircraft

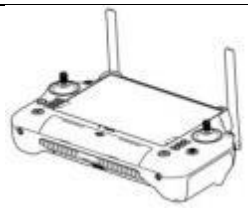
按照下图所示，将相机安装在配套的集成支架上，通过 Type-C 接口数据线将相机主机、DLS Lite 与飞行器顶端的 PSDK 接口相连，注意两条 Type-C 线连接方向与接口一致。As shown in the following figure, install the camera on the supporting integrated bracket and connect the camera host, DLS Lite, and PSDK interface on the top of the aircraft through Type-C interface data cables. Note that the two Type-C cables are connected in the same direction as the interface.

4.2. 连接 DJI Pilot App Connecting to DJI Pilot App

1）开启飞行器与遥控器。 Turn on the aircraft and remote control.

2）连接成功后进入相机界面,可预览到相机实时视频画面和推送的状态信息。

After successful connection, enter the camera interface and preview the real-time video image and push status information of the camera.



Matrice 30 系列遥控器示意

Schematic of Matrice 30 Series Remote Control

Mavic 3 行业系列遥控器示意

Mavic 3 Industry Series Remote Control Schematic

4.3. 相机设置 Camera Settings

4.3.1. 相机界面 Camera interface

1. 相机状态浮窗 Camera status floating window

包含相机状态、图像存储格式、灰板拍摄状态、重叠率触发模式状态、存储设备容量、相机版本号、DLS 版本号等。
This includes camera status, image storage format, grayboard shooting status, overlap rate trigger mode status, storage device capacity, camera version number, DLS version number, etc.

2. 预览窗口 preview Window

显示当前视频类型下的实时视频。Display real-time videos under the current video type.

3. 系统设置 System settings

系统设置为 DJI Pilot提供，可以对无人机及相机进行相关设置。其中  为相机设置按钮，点击系统按钮，进入 Payload 设置页面，可以设置是否显示实时

数据、重叠率触发模式、航向重叠率和拍摄照片格式。
The system settings are provided for DJI Pilot, which allows for relevant settings for drones and cameras. Among them is the camera settings button. Click the system button to enter the Payload settings page, where you can set whether to display real-time data, overlap rate triggering mode, heading overlap rate, and photo format.

重叠度触发模式与航向重叠率为相机航线参数。飞行过程中相机不会接收飞控命令，必须开启重叠率触发，相机按照预设的航向重叠率进行拍照；关闭重叠率触发，相机只能执行拍照按钮下发的拍照命令。The overlap triggering mode and heading overlap rate are camera route parameters. During flight, the camera will not receive flight control commands and must activate the overlap rate trigger. The camera will take photos according to the preset heading overlap rate; Turn off the overlap rate trigger, and the camera can only execute the photography command issued by the photography button.

拍摄照片可以选择 TIFF-16bit 和 REF-JPG 格式，TIFF-16bit 格式为未压缩的原始 16bit DN 值数据，REF-JPG 格式为经过压缩处理的 8bit JPEG 格式的反射率数据。You can choose between TIFF 16bit and REF-JPG formats for taking photos. TIFF 16bit format is uncompressed raw 16bit DN value data, while REF-JPG format is compressed reflectance data in 8bit JPEG format.

4. 拍照设置（格式化存储设备）Photography settings (formatting storage devices)

点击此按钮，在弹出的页面中选择  可对存储设备进行格式化。存储设备格式化后内容将被清空，请谨慎操作。Click this button and select to format the storage device in the pop-up page. After formatting the storage device, the content will be cleared. Please operate with caution.

5. 拍照与录像 Photography and Video Recording

点击此按钮，在弹出的页面中选择切换拍照模式和录像模式。

Click this button and select to switch between shooting mode and recording mode on the pop-up page.

6. 拍摄按钮 Capture button

在拍照模式下，点击一次拍摄按钮即执行一次触发拍照；在录像模式下，第一次点击拍摄按钮，开始录像，再次点击拍摄按钮，停止录像，每个视频时长为 5 分钟，录像时长超过 5 分钟则自动保存至下一个视频。
In the shooting mode, clicking the shooting button once will trigger the shooting process once; In recording mode, click the capture button for the first time to start recording, then click the capture button

again to stop recording. Each video has a duration of 5 minutes, and if the recording duration exceeds 5 minutes, it will be automatically saved to the next video.

7. 相机功能菜单 Camera Function Menu

点击此按钮，有 3 个相机的功能选择：Click this button to select three camera functions:

回：点击开启相机状态浮窗，开启后按钮变为黄色，关闭按钮为白色。Click to open the camera status floating window. After opening, the button will turn yellow and the close button will turn white.

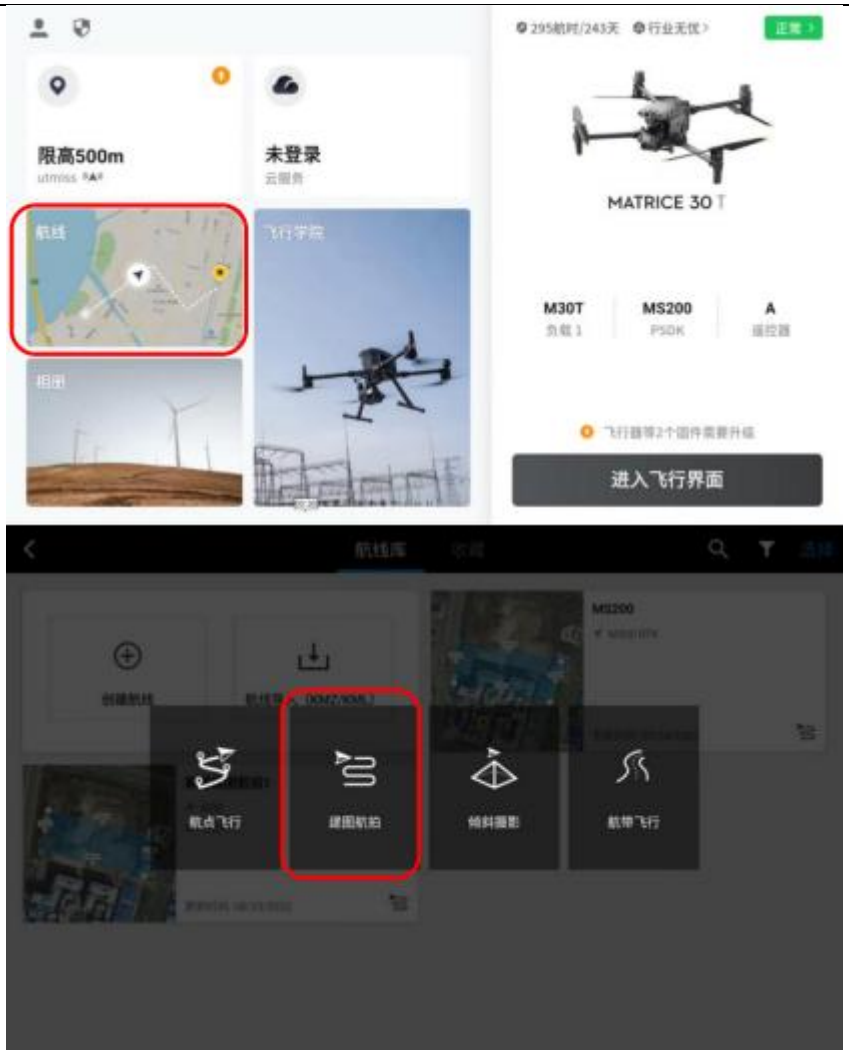
回：此功能用于执行拍摄任务前，自动拍摄灰板照片，对反射率进行校准。This function is used to automatically take grayboard photos and calibrate reflectivity before performing shooting tasks.

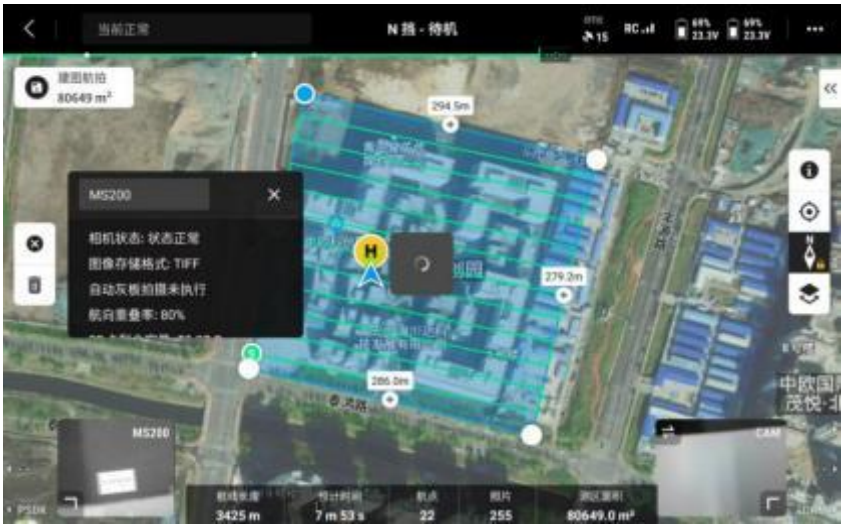
 ：此功能可以切换页面显示的预览视频类型，相机提供 NDRE 通道和 NDVI 通道两个原始通道的视频预览。This function can switch the preview video type displayed on the page, and the camera provides video previews of two original channels, NDRE channel and NDVI channel.

4.3.2. 任务规划 mission planning

执行航线拍摄任务时，请按照下图所示方法设置。When performing route shooting tasks, please follow the method shown in the following figure to set up.

首先，打开相机的重叠率触发模式并设置好航向重叠率，然后进入航向飞行界面,创建航线，选择“建图航拍 ”模式，点击屏幕提示框生成测绘区域。Firstly, turn on the camera's overlap rate trigger mode and set the heading overlap rate. Then, enter the heading flight interface, create a flight route, select the "mapping aerial photography" mode, and click on the screen prompt box to generate a mapping area.


限高500m
未登录
航线
飞行学院
相册
MATRICE 30 T
M30T
MS200
A
进入飞行界面
航点飞行
建图航拍
倾斜摄影
航带飞行



生成测绘区域后，在弹出的菜单中选择“ 自定义相机”，进入自定义相机选项，点击“新建相机”，根据下图所示填入相应的参数，完成相机模型的创建。
After generating the mapping area, select "Custom Camera" from the pop-up menu, enter the Custom Camera option, click "New Camera", fill in the corresponding parameters as shown in the following figure, and complete the creation of the camera model.

选择使用 MS200 相机后，设置航线飞行高度、起飞速度、航线速度参数。

After selecting to use the MS200 camera, set the flight altitude, takeoff speed, and flight speed parameters for the route.

点击“高级设置”可以设置重叠率参数，其中航向重叠率必须与相机重叠率模式下的航向重叠率相同。

Click on "Advanced Settings" to set the overlap rate parameter, where the heading overlap rate must be the same as the heading overlap rate in camera overlap rate mode.


当前正常
N 挡 - 待机
建图航拍
80649 m²
MS200
相机状态: 状态正常
图像存储格式: TIFF
自动灰板拍摄未执行
航向重叠率: 80%
MS200
航线长度
3425 m
预计时间
7 m 53 s
航点
22
照片
255
测区面积
80649.0 m²
高级设置
旁向重叠率(%)
70
10
90
航向重叠率(%)
80
10
90
边距(m)
0
0
100
拍照模式
等距间隔拍照

5. 采集数据 collect data

5.1. 数据采集前检查 Check before data collection

在使用 MS200 多光谱相机拍照采集数据前，请确认以下工作已完成：Before using the MS200 multispectral camera to take photos and collect data, please confirm that the following tasks have been completed:

1) 确保相机“YUSENSE”字样与飞行方向保持一致，DLS Lite 模块的 LED 灯所指方向与飞行方向保持一致；Ensure that the words "YUSENSE" on the camera are consistent with the flight direction, and that the direction indicated by the LED lights on the DLS Lite module is consistent with the flight direction;

2) 飞行前请保证相机镜头窗口、DLS Lite 扩散片窗口的清洁；Please ensure the cleanliness of the camera lens window and DLS Lite diffuser window before flight;

3) 确保 GPS 模块接收的信号质量良好；

4) 确认图像存储格式；Ensure good signal quality received by the GPS module;

5) 已拍摄灰板，TIFF 格式可以使用自动灰板拍摄和手动拍摄两种方式，REF-JPG 格式必须使用自动灰板拍摄功能；The grayboard has been shot, and the TIFF format can use two methods: automatic grayboard shooting and manual shooting. The REF-JPG format must use the automatic grayboard shooting function;

6) 已设置触发模式。Trigger mode has been set.

5.2. 灰板拍摄 Gray board shooting

5.2.1. 相机未连接 PSDK 情况下 When the camera is not connected to PSDK

若需要获取精确的反射率数据，每次飞行前后应立即通过灰板进行标定，且灰板不过曝或响应过低。灰板拍摄步骤如下：If accurate reflectance data is required, calibration should be carried out immediately before and after each flight using a gray plate, and the gray plate should not be exposed or have a low response. The steps for shooting the gray board are as follows:

1) 打开灰板盒，放置于平整地面，使灰板完全暴露在阳光下；Open the gray board box and place it on a flat surface, so that the gray board is completely exposed to sunlight;

2) 使多光谱相机平稳处于灰板正上方的 80cm 处，确保无阴影或其他障碍

物遮挡灰板；Ensure that the multispectral camera is stably positioned 80cm above the gray board, ensuring that there are no shadows or other obstacles obstructing the gray board;

3) 打开 WEB 配置中的预览页面，开始预览，调整相机的位置，使灰板和二维码全部处于每个通道的视野中，点击“  ”按钮，等待一段时间，当提示“灰板自动拍摄成功”时，说明拍摄灰板成功并退出自动灰板拍摄模式；当提示“灰板自动拍摄失败”时，说明未成功拍摄灰板，并退出自动灰板拍摄模式，需要重新进行灰板拍摄工作；Open the preview page in the WEB configuration, start the preview, adjust the camera position so that the gray board and QR code are all in the field of view of each channel, click the "" button, wait for a period of time, and when the prompt "Gray board automatic shooting successful" is displayed, it indicates that the gray board shooting has been successful and the automatic gray board shooting mode has been exited; When prompted with "Automatic grayboard shooting failed", it indicates that the grayboard shooting was not successful and the automatic grayboard shooting mode has been exited. It is necessary to redo the grayboard shooting work;

4) 若自动灰板拍摄一直失败，需要点击触发拍摄按钮“  ”手动拍摄灰板，使用预览拍照功能，调整相机的位置使灰板处于每个通道的视野中，可以参考自动灰板拍摄模式下预览窗口中灰板的位置，拍摄完成后会提示“拍照成功”，没有“灰板自动拍摄成功”的提示。
If the automatic grayboard shooting continues to fail, you need to click the trigger shooting button to manually capture the grayboard. Use the preview shooting function to adjust the position of the camera so that the grayboard is in the field of view of each channel. You can refer to the position of the grayboard in the preview window in the automatic grayboard shooting mode. After the shooting is completed, there will be a prompt of "successful shooting", without a prompt of "successful automatic grayboard shooting".

5.2.2. 相机连接 PSDK 情况下 When the camera is connected to PSDK

1) 连接 DJI Pilot App。Connect to the DJI Pilot App.

2) 点击自动灰板拍摄按钮 ，点击后图标变为 ，说明相机进入自动灰板拍摄状态，同时云台相机自动进入视轴垂直对地状态。

Click the automatic grayboard shooting button, and the icon will change to, indicating that the camera has entered Automatic grayboard shooting status, while the pan tilt camera automatically enters the vertical ground to line of sight state.

3) 根据相机实时预览画面，手持飞行器将云台相机视轴对准灰板，使灰板部分处于预览画面的中心位置，且相机镜头和灰板间的距离保持在 80cm 左右，相机会自动识别灰板并自动拍摄；如果灰板识别失败，会在 DJI Pilot 浮窗界面上提示灰板识别失败，需要重复上述步骤重新对灰板进行识别直至浮窗显示“已拍摄灰板”。According to the real-time preview image of the camera, the handheld aircraft will align the camera's visual axis with the gray board, so that the gray board part is in the center position of the preview image, and the distance between the camera lens and the gray board is maintained at about 80cm. The camera will automatically recognize the gray board and take photos; If the grayboard recognition fails, a prompt will be displayed on the DJI Pilot floating window interface indicating that the grayboard recognition has failed. The above steps need to be repeated to re recognize the grayboard until the floating window displays "grayboard captured".

灰板拍摄示意图

自动灰板拍摄按钮

注意 attention

1. 需使用出厂标配的灰板盒， 自动灰板拍摄需识别灰板盒上的二维码。

2. 需在外部光线充足的情况下使用自动灰板拍摄功能，阴天情况下建议使用手动方式拍摄灰板；

3. 设置为 REF-JPG 格式时，起飞前必须进行自动灰板拍摄

1. It is necessary to use the factory standard gray plate box, and automatic gray plate shooting requires recognition of the QR code on the gray plate box.

2. It is recommended to use the automatic gray board shooting function when there is sufficient external light, and manual shooting of the gray board is recommended in cloudy days;

3. When setting to REF-JPG format, automatic grayboard shooting must be performed before takeoff

5.3. 数据采集建议 Data collection suggestions

为了使用 MS200 系列多光谱相机更加有效精确的采集多光谱图像数据，当规划航线触发拍摄时，有以下建议可以参考：In order to use the MS200 series multispectral camera to collect multispectral image data more effectively and accurately, the following suggestions can be referred to when planning a flight route to trigger shooting:

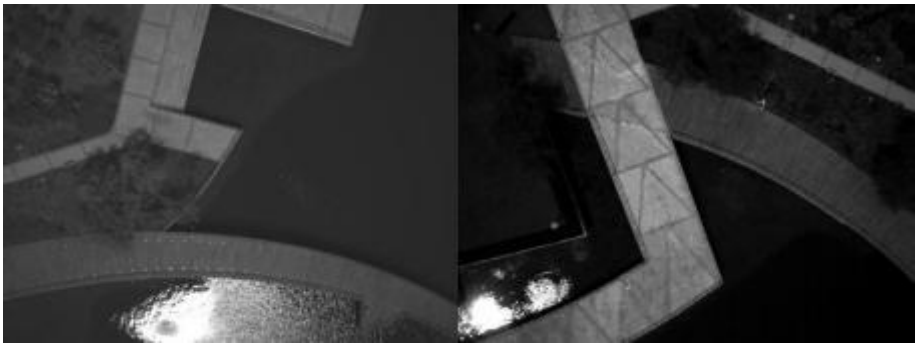
1) 航向和旁向重叠率建议不低于 75%；It is recommended that the overlap rate between heading and sidetracking should not be less than 75%;

2) 至少有 1 条航线超出规划飞行采集区域的边缘，以确保边缘数据的有效获取；At least one route exceeds the edge of the planned flight acquisition area to ensure effective acquisition of edge data;

3) 建议在天气晴朗的条件下进行数据采集，为了更好的数据结果建议在当地正午时间前后 2.5 小时内进行数据采集，涉及水面除外，避免太阳耀斑影响；It is recommended to collect data under clear weather conditions. For better data results, it is recommended to collect data within 2.5 hours before and after local noon time, except for water surfaces, to avoid the impact of solar flares;

4) 在进行包含水域场景的多光谱图像数据采集作业时，需避开太阳正射水

面而造成的耀斑现象（如图所示），这种情况建议在太阳高度角稍降低后飞行采集，或航线规划时尽量避开水域。进行水域拍摄且有拼接需求时，建议单景影像中陆地面积占比不低于 1/3；
When conducting multispectral image data collection operations that include water scenes, it is necessary to avoid the phenomenon of flares caused by the sun's direct reflection on the water surface (as shown in the figure). In this case, it is recommended to fly and collect after the sun's altitude angle is slightly reduced, or try to avoid water as much as possible during route planning. When shooting water areas and there is a need for splicing, it is recommended that the proportion of land area in a single scene image should not be less than 1/3;



5) 在进行农作物多光谱图像数据采集作业时，为了获取农作物的高度信息，建议垂直农作物种植垄的方向规划飞行采集；When conducting crop multispectral image data collection operations, it is recommended to plan flight collection in the direction perpendicular to the crop planting ridge in order to obtain the height information of the crops;

6) 如果规划的飞行区域面积较大而需要多架次采集，建议前后两次飞行要保证至少 1 条航线的重叠区间；If the planned flight area is large and requires multiple sorties for collection, it is recommended to ensure at least one overlapping interval between the two flights before and after;

7) 建议避开大量动态目标的场景使用。It is recommended to avoid scenarios with a large number of dynamic targets.

5.4. 文件存储 File storage

每次相机上电后，在首次触发拍照时会自动在存储卡内新建“IMG_REF_XXX”、“IMG_SET_XXX”两个文件夹，触发拍照获取的 REF-JPG 或 TIFF 图像数据会存入上述文件夹内，若文件夹未做删除，每次重新上电触发拍照建立的文件夹名称序号将依次增加。使用自动灰板拍摄功能拍摄的灰板图片将以“MS200_XXXX_(greyboard)_0.tif”和“MS200_XXXX_(greyboard)_1.tif”

的形式存储在“IMG_SET_XXX”文件夹内，手动拍摄的灰板图片为触发拍照，不会另做区分。

Every time the camera is powered on, it will automatically create a new one in the memory card when the first photo is triggered

The REF-JPG or TIFF image data obtained by triggering photography will be stored in the two folders "IMG_REF_XXX" and "IMG_SET_XXX". If the folder has not been deleted, the name and sequence number of the folder created by triggering photography will be sequentially increased each time the power is turned on again. The grayboard images captured using the automatic grayboard shooting function will be stored in the "IMG_SET_XXX" folder in the form of "MS200_XXXX_ (greyboard) _ 0. tif" and "MS200_XXXX_ (greyboard) _ 1. tif". The manually captured grayboard images are trigger shots and will not be distinguished.

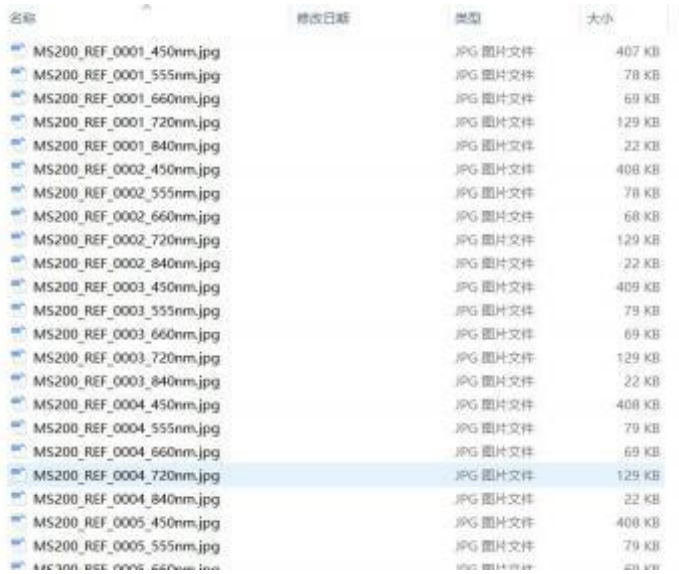
1）TIFF

默认情况下，每次触发拍照将会在“IMG_SET_XXX”文件夹内建立 2 个图像文件，每个图片文件将以“MS200_XXXX_0.tif”和“MS200_XXXX_1.tif”的形式存储，每个文件夹可存储 1000 组文件，当拍摄次数超出 1000 次时，会新建文件夹存储，文件序号续上一个文件夹；“MS200_XXXX_0.tif”为 NDRE 通道原始图像，“MS200_XXXX_1.tif”为 NDVI 通道原始图像，每个文件为约 2.64MB 大小，包含 1280×1080 像元信息，元数据以 EXIF、XMP 格式存在每个文件中。
By default, two image files will be created in the "IMG_SET_XXX" folder every time a photo is triggered. Each image file will be stored in the form of "MS200_XXXX_0. tif" and "MS200_XXXX_ 1. tif". Each folder can store 1000 sets of files. When the number of shots exceeds 1000, a new folder will be created for storage, and the file number will be continued from the previous folder; MS200_XXXX_0. tif "is the original image of the NDRE channel, and" MS200_XXXX_ 1. tif "is the original image of the NDVI channel. Each file is approximately 2.64MB in size and contains 1280 × 1080 pixel information, with metadata stored in EXIF and XMP formats in each file.

2）REF-JPG

每次触发拍照将会在“IMG_REF_XXX”文件夹内建立 5 个图像文件，为解耦后的 5 个多光谱通道的反射率图片，每个通道的多光谱图像以“MS200_REF_XXXX_XXXnm”的形式命名，多光谱每个文件大小一般不会超过 500KB，元数据以 EXIF、XMP 格式存在每个文件中。

Each time a photo is triggered, 5 image files will be created in the "IMG_REF_XXX" folder, which are the reflectance images of the decoupled 5 multispectral channels. The multispectral images of each channel are named in the form of "MS200_REF_XXXX_XXXnm", and the file size of each multispectral file generally does not exceed 500KB. The metadata is stored in EXIF and XMP formats in each file.



注意

TIFF 模式存储 DN 值信息，记录传感器响应灰度值，REF-JPG 模式存储反射率信息，反映地物本身反射特性。由于 JPG 格式为有损压缩，反射率数据与 TIFF 数据计算出的反射率数据会存在一定误差。

The TIFF mode stores DN value information, records sensor response grayscale values, and the REF-JPG mode stores reflectance information, reflecting the reflection characteristics of the ground object itself. Due to the lossy compression of the JPG format, there may be some errors between the reflectance data and the reflectance data calculated from TIFF data.

警告

在移除 SD 卡前确保电源已经关闭，若不遵循该操作将会导致 SD 卡仍在写入过程中文件

的错误和丢失，且可能永久无法恢复。Before removing the SD card, ensure that the power is turned off. Failure to follow this operation will result in errors and loss of files while the SD card is still being written, and may be permanently unrecoverable.

6. 固件升级UPGRADE

请关注公司官网 https://www.yusense.com.cn/，获取最新的固件升级包。

升级过程步骤如下：

1) 确保 DLS Lite 与相机正确连接；

2) 将升级包文件(.bin 格式)拷贝到存储卡根目录下；

3) 相机电源为关闭状态，插入存储卡；

4) 相机上电开机开始自动升级；

5) 升级过程中，相机状态灯蓝色闪烁；

6) 升级成功后，相机/DLS Lite状态灯变为绿色常亮；如果升级失败，状态灯变为红色常亮，重复步骤 4）直至升级成功，若多次仍无法升级成功，请联系公司技术支持；

7) 升级完成后重启相机，刚上电时 DLS Lite 为白灯常亮，30s 后恢复正常，在 WEB 页面查看固件版本号，以确认升级成功。

Please follow the company's official website https://www.yusense.com.cn/ Obtain the latest firmware upgrade package.

The upgrade process steps are as follows:

1) Ensure that the DLS Lite is correctly connected to the camera;

2) Copy the upgrade package file (in. bin format) to the root directory of the storage card;

3) The camera power is turned off and the memory card is inserted;

4) The camera automatically upgrades when powered on;

5) During the upgrade process, the camera status light flashes blue;

6) After successful upgrade, the camera/DLS Lite status light will turn green and remain on; If the upgrade fails, the status light will turn red and remain on. Repeat step 4 until the upgrade is successful. If the upgrade still fails multiple times, please contact the company's technical support;

7) After the upgrade is completed, restart the camera. When the DLS Lite is first powered on, the white light is always on. After 30 seconds, it returns to normal. Check the firmware version number on the WEB page to confirm successful upgrade.

 注意

1. 严禁将 2 个及以上不同版本的升级包放在同一张存储卡内；
2. 在固件升级后，重新使用移动端 WEB 页面配置设备时，建议清除浏览器的缓存。

1. It is strictly prohibited to place two or more upgrade packages of different versions on the same storage card;
2. After firmware upgrade, it is recommended to clear the browser cache when reusing the mobile web page to configure the device.

7. 机械接口 mechanical interface

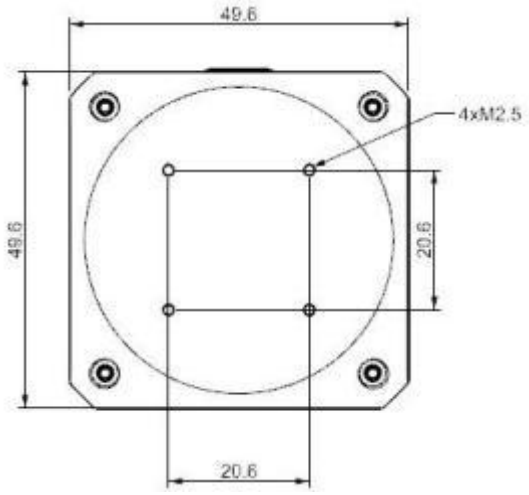
MS200 主机底部有 4 个 M2.5 的螺钉孔用于固定安装。

There are four M2.5 screw holes at the bottom of the MS200 host for fixed installation.

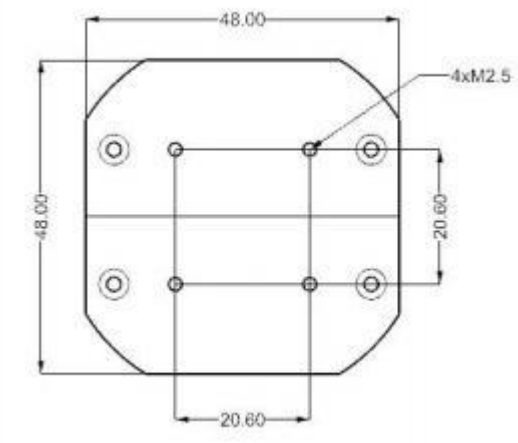
 注意

保证相机的所有表面有空气对流，对于散热是非常必要的，相机在安装到无人机上时注意不要完全覆盖或隔离相机的安装面。

Ensuring air convection on all surfaces of the camera is essential for heat dissipation. When installing the camera on a drone, be careful not to completely cover or isolate the mounting surface of the camera.



DLS Lite 模块尺寸如图所示，底部有 4 个 M2.5 的螺钉孔用于固定安装。



8. 参数说明

基本参数表Basic parameter table

总体参数	
产品名称 Name	MS200
尺寸 SIZE	49.6mmx49.6mmx46.7mm
重量 weight	总重：140.5g total 相机：97.2g　　DLS Lite：43.3g
功耗 consumption	3W@12V（包含 DLS Lite 模块）
相机参数	
传感器类型 sensor type	CMOS
快门类型 shutter type	全局快门 Global shutter
像元大小 pixel size	2.7μm
分辨率 resolution ratio	1.3MPx
视场角 viewing angle	HFOV：36.7°， VFOV：31.3°
GSD	6.23cm@h=120m

光谱通道 spectral channel	组合：450nm@30nm、555nm@27nm、 660nm@22nm、 720nm@10nm、840nm@30nm；
量化位数Quantization Bits	12bit

最大捕获速率 Maximum capture rate	0.5 秒/次　0.5 seconds/time
存储 storage	最大支持 64G 容量，传输速度达到 UHS-I Speed Class 3 (U3)评级的 micro SD 卡 Micro SD card with a maximum capacity of 64G and a transmission speed of UHS-I Speed Class 3 (U3) rating
环境参数	
工作环境温度 Ambient Temperature	-10℃~+50℃（相对风速≥1m/s）
储存环境温度 storage temperature	-30℃ ~+70℃

FCC Warnning:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection againstharmful interference in a residential installation. This equipment generates, uses and can radiateradio frequency energy and, if not installed and used in accordance with the instructions, maycause harmful interference to radio communications. However, there is no guarantee thatinterference will not occur in a particular installation. If this equipment does cause harmfulinterference to radio or television reception, which can be determined by turning the equipmentoff and on, the user is encouraged to try to correct the interference by one or more of thefollowing measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1)This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

结束页 End

让每架无人机都拥有合适的多光谱相机

如有其他技术问题，请联系我们：

support@yusense.com.cn