ZENMUSE XT S

User Manual v1.0

2019.12
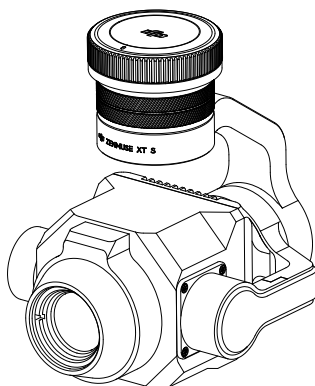
Using this Manual

Legend

⊘ Warning   ⚠ Important   ☀ Tips

Download the DJI Pilot App

The DJI Pilot app is required when using Zenmuse XT S.

Scan the QR code or visit http://www.dji.com/zenmuse-xt-s/downloads to download and install the app.

Disclaimer and Warning

Congratulations on purchasing your new DJI™ product. The information in this document affects your safety and your legal rights and responsibilities. Please read this entire document carefully to ensure proper configuration before use. Failure to read and follow instructions and warnings in this document may result in serious injury to yourself or others, or damage to your DJI product or damage to other objects in the vicinity. This document and all other collateral documents are subject to change at the sole discretion of SZ DJI Technology Co., Ltd. (DJI). For up to date product information, visit http://www.dji.com and click on the product page for this product.

Do Not Modify or Alter the Zenmuse XT S

The ZENMUSE™ XT S has been calibrated specifically for the designated camera and lens before leaving the factory. No physical or mechanical modification or adjustment of the gimbal is required or recommended. Do not add any other component or device (such as a filter, lens hood, etc.) to the camera.

The Zenmuse XT S is a delicate instrument. Do not disassemble the gimbal or camera as this will cause permanent damage.

Be sure to use a DJI approved battery, otherwise performance may be hindered and internal malfunction or damage may occur.

Only Use Compatible Aircraft

The Zenmuse XT S is currently compatible with the following DJI Aircraft: MATRICE™ 200 series V2 and Matrice 200 series. It will also be compatible with other designated products in due course. To optimize the gimbal's performance, download the latest DJI Pilot app and update the latest aircraft firmware, otherwise the Zenmuse XT S may not function properly.

IP44 Protection Rating

Under stable laboratory conditions, the Zenmuse XT S achieves an IP44 protection rating by IEC60529 standards. However, this protection rating is not permanent and may reduce over time after long-term use.

- Make sure the gimbal port and gimbal surface are free from any liquid before installation.
- Make sure the gimbal is securely installed onto the aircraft, the microSD card slot cover is clean and firmly in place.
- Make sure the gimbal surface is dry before opening the microSD card slot cover.

Safe Use

Make sure to operate your aircraft in the safest manner possible. Observe the procedures contained in the user manual and the online tutorials to mount and connect the gimbal to your aircraft. Please respect the AMA's National Model Aircraft Safety Code.

By using this product, you hereby signify that you have read this disclaimer and warning carefully and that you understand and agree to abide by the terms and conditions herein. You agree that you are solely responsible for your own conduct while using this product, and for any consequences thereof. You agree to use this product only for purposes that are proper and in accordance with all

applicable laws, rules, and regulations, including international and domestic airspace regulations, and all terms, precautions, practices, policies, and guidelines DJI has made and may make available.

DJI accepts no liability for damage, injury or any legal responsibility incurred directly or indirectly from the use of this product. The user shall observe safe and lawful practices including, but not limited to, those set forth in the User Manual.

Caution

1. Do not expose the camera lenses to a strong energy source such as the sun, lava or laser beam. The temperature of the observation target should not exceed 600°C, otherwise it will burn the camera and cause permanent damage.
2. Do not place the product under direct sunlight, in areas with poor ventilation, or near a heat source such as a heater.
3. Do not frequently power on/off the product. After it is turned off, wait at least 30 seconds before turning back on, otherwise the product life will be affected.
4. Do not plug or unplug the microSD card during use.
5. Do not touch the surface of the camera lenses and keep it away from hard objects, as doing so may lead to blurred images and affect the imaging quality.
6. Clean the surface of the camera lenses with a soft, dry, clean cloth. Do not use alkaline detergents.

Contents

Introduction

The Zenmuse XT S gimbal and camera features a Longwave Infrared Thermal Camera with a resolution of 640×512 and a frame rate of up to 25 Hz, high sensitivity (≤40 mK @ f/1.0) and 4x digital zoom. As with other DJI 3-axis gimbal systems, the Zenmuse XT S can be mounted onto the Matrice 200 Series V2 or Matrice 200 Series aircraft. It can also stream live video to the DJI Pilot app, and is a highly capable tool for a variety of aerial thermal applications such as inspection, maintenance, search and rescue, and more.

Zenmuse XT S
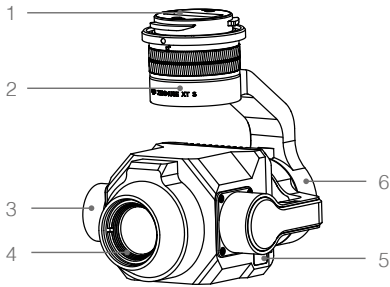
1. Gimbal Connector
2. Pan Motor
3. Tilt Motor
4. Infrared Thermal Camera
5. microSD Card Slot
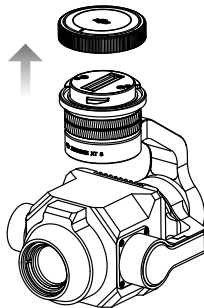6. Roll Motor

Installation

Supported Aircraft

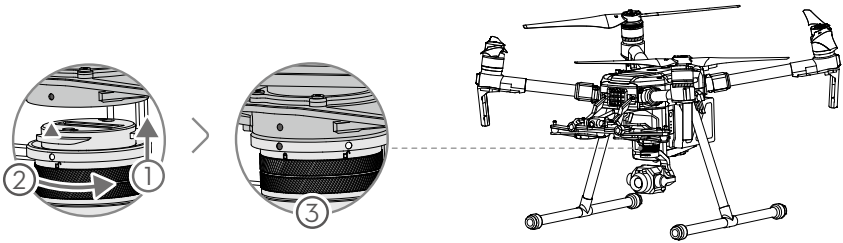Matrice 200 series V2   Matrice 200 series

Mounting the Zenmuse XT S

1. Remove the gimbal cap.

2. The following installation display uses the Matrice 210 V2 aircraft as an example.
   Rotate the gimbal connector to the unlocked position and insert the gimbal, and then rotate the gimbal connector to the locked position.

⚠️ • Ensure that the Zenmuse XT S is mounted securely. Hold the gimbal connector firmly and apply a steady, firm rotating force when attaching or detaching the gimbal.
  • Ensure that both the aircraft and the remote controller have been updated with the latest firmware, meeting the following requirements:
    Matrice 200 series V2 – both the aircraft and the remote controller firmware version is v01.00.0590 or later.
    Matrice 200 series – the aircraft firmware version is v02.00.0450 or later, the remote controller firmware version is v02.00.0170 or later.
  • When mounting onto an aircraft with the dual gimbal configuration, if Zenmuse XT S is the only gimbal and camera, ensure that it is mounted to gimbal connector I.
  • Ensure the microSD card slot cover is firmly in place to prevent dust or moisture entering during usage or transportation.
  • Do not disassemble the gimbal or camera, as this will cause permanent damage.

DJI Pilot App

Connecting DJI Pilot App

1. Power on the aircraft and remote controller.
2. If you are using the DJI CrystalSky, install it onto the remote controller.
   If you are using other mobile device, connect it to the remote controller via a USB cable.
3. Launch DJI Pilot and enter Camera view. When a connection is established, your mobile device will display a live video feed from the camera.
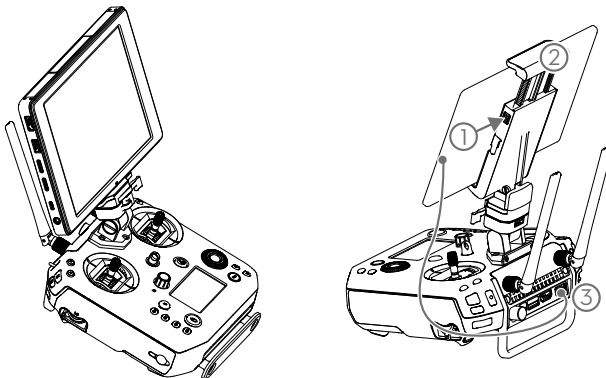
Settings

You can view the video from the Zenmuse XT S and change camera settings in Camera View.

Camera View

1. FFC Calibration

Tap this button to enable FFC calibration, which is used to optimize image quality. During calibration, your screen may freeze momentarily and the camera will make a clicking sound.

2. Digital Zoom

Tap to adjust the digital zoom. 2x and 4x zoom options are supported.

3. Temperature Measurement*

Spot Meter

The temperature of any position within the temperature measurement area on the screen can be measured.

Area Measurement

Enabling this function will display the average temperature, lowest temperature, highest temperature, and the corresponding locations of each area in DJI Pilot.

The temperature measurement accuracy is affected by various factors:

(1) Reflectivity of objects – shiny metals with high reflectivity will reflect more of the background radiation and result in lower accuracy, whereas objects with matte surfaces will produce a higher accuracy.

(2) Temperature of background radiation – a sunny day without clouds will have less of an effect on the accuracy than a cloudy day.

(3) Air temperature and humidity – the temperature and humidity have been calibrated before delivery, but some temperature measurement errors are inevitable. Extreme temperatures or humidity levels will affect the measurement accuracy.

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* When measuring a blackbody 5 m away at a windless 25°C indoors, the camera provides an accuracy of up to ±2°C or ±2% (whichever is the larger value). Since the emissivity of different blackbody varies, this measurement result only represents the accuracy of the tested blackbody, for reference only.

(4) Distance between the camera and the object – the default distance used in calibration is 5 m, and the temperature measurement is most accurate at this distance. Deviations from this distance will lower the accuracy.

(5) Emissivity of objects – the emissivity of the object will affect the temperature measurement accuracy. Generally, accuracy increases proportionally to emissivity. Emissivity is affected by factors such as the material, the roughness or the degree of oxidation of the object's surface.

4. Camera Settings

Tap to enter the photo and video settings.

• Photo Settings

Shooting modes: include Single Shot, Burst (2/3/5/7/10/15/20/30/60 s).

Photo Format: R-JPEG, JPEG.

• Video Settings

The video format is MP4.

• General Settings

Palette

The Zenmuse XT S offers a variety of palette options. Distinct colors are used to show temperature differences in the thermal image, which are related to grayscale intensity. The temperature range of the image is mapped to 256 colors and displayed in the 8-bit JPEG or MP4 format.

The following table shows all palette options.

White Hot	
Fulgurite	
Iron Red	
Hot Iron	
Medical	
Arctic	
Rainbow 1	
Rainbow 2	
Tint	
Black Hot	

Palette	Description
White Hot	The most commonly used pseudo color, using white for high temperatures and black for low temperatures, which is a natural association for people.
Fulgurite	Dark red represents low temperatures and white represents high temperatures. The warm tone of this palette aligns with people's association with hot temperatures.

Iron Red	This palette displays nuanced differences in heat signatures, quickly displaying anomalies and human bodies. Hotter objects appear as light warm colors and colder objects appear as dark cool colors.
Hot Iron	Red represents high temperatures, and cool colors represent low temperatures. It is able to identify hot targets quickly, while showing the details of cool targets.
Medical	This palette shows nuanced differences in temperatures, and is therefore ideal for scenarios with small temperature changes. In environments with low contrast, it is still able to detect objects and slight temperature changes. It is mainly used in the medical field for human body temperatures.
Arctic	Uses the same palette as Medical, except switching the purple for a cool blue to better reflect temperature changes.
Rainbow 1	Similar to Medical, it reduces the warm color ratio and increases the cold color ratio for high temperature targets to better show the details of cool targets.
Rainbow 2	The color transition is reduced, the warm and cold colors are moderately proportioned, which can show the details of high and low temperature targets at the same time.
Tint	Uses black and white for low temperatures and bright red for high temperatures, it is able to detect high temperature targets quickly. Mainly used for high-contrast environments, ideal for quickly and accurately identifying high temperature targets at night.
Black Hot	The opposite to White Hot, using black for warmer objects and white for cooler objects. The heat distribution of high temperature targets can be better observed when outdoors.

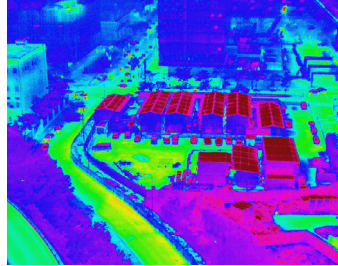Different palettes applied to the same example image are shown below.

White Hot

Black Hot

Iron Red

Rainbow 1

Isotherm

This feature allows designated temperature ranges to be represented with different color schemes, so that objects measured in a single color scheme impart higher contrast and better visibility.

Individual isotherms (or color schemes) are separated by upper and lower thresholds.

Hot Iron Isotherm

Fulgurite Isotherm

Iron Red Isotherm

Medical Isotherm

There are three options for Isotherms: Search People, Search Fire, and Customized. When Search People or Search Fire is selected, upper and lower temperature thresholds will be set. The video feed will show the people or fire with an enhanced display for greater visibility.

☼ Infrared temperature measurement is affected by many factors including the environment and the distance of the object. If the default measurements settings of "Search People" or "Search Fire" are not met, please set thresholds in "Customized" to view the best isotherm results.

Gain Modes

High Gain Mode: A narrower temperature range can be captured with a higher sensitivity to temperature differences.

Low Gain Mode: A wider temperature range can be captured with a lower sensitivity to temperature difference.

Temperature Alert

After enabling the Area measurement feature, an alert temperature value can be set.

When the highest temperature in the selected area exceeds the alert value, an onscreen notification will appear in DJI Pilot.

Gridlines

Enable or disable the gridlines or diagonal.

Restore Settings

Tap restore factory default settings to restore the camera to the default settings.

Format SD card

Tap "Format microSD card" to format and remove all content from the microSD card.

5. **Shutter/Record Toggle**

   Tap to switch between photo and video modes.
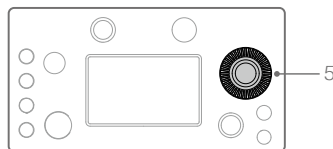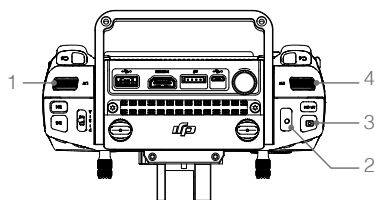
6. **Shutter/Record Button**

   Tap to shoot photos or start/stop recording.

7. **Playback**

   Tap to view photos and videos from the microSD card.

Remote Controller Operation

Adjust the gimbal's tilt using the left dial. Press the right dial to control the gimbal's pan. Press the Shutter Button or Record Button to take photos or record video. The camera setting dial can be used to select palette or adjust zoom.

1. **Left Dial**

   Turn to adjust the gimbal's tilt.

2. **Record Button**

   Press to start/stop recording video.

3. **Shutter Button**

   Press to take a photo, you can set the photo mode as single or interval in the DJI Pilot App. Taking single photo is supported during video recording.

4. **Right Dial**

   Turn to adjust the gimbal's pan.

5. **Camera Setting Dial***

   Turn to select palette or adjust zoom. The dial selects palette by default, press the button inside the dial to switch between palette and zoom adjustment.

   * Only supported by Matrice 200 series V2 aircraft.

Updating Firmware

Ensure that the Zenmuse XT S is securely mounted onto the aircraft and the aircraft is powered off. Ensure that there is enough free space on your microSD card and the Intelligent Flight Batteries are fully charged.

1. Visit DJI official website and go to Zenmuse XT S download page.
2. Select the latest firmware to download.
3. Copy the downloaded firmware update file to the root directory of the microSD card.
4. Insert the microSD card into the microSD card slot of Zenmuse XT S.
5. Power on the aircraft, the gimbal and camera will start to perform an auto-check, then it will start to update automatically and the buzzer will beep to indicate the status.
6. Restart the device after the firmware update is completed.

Alarm	Description
4 short beeps	An update file is detected, preparing for update.
1 long beep	Updating firmware, do not stop the update.
1 long beep followed by 2 short beeps	The firmware update was successful.
Continuous long beep	The firmware update failed, please try to update again. Contact DJI support for help if needed.

⚠ • Ensure that there is only one firmware update file on your microSD card.
   • Do not power off the aircraft or detach the Zenmuse XT S during updating the firmware.

Specifications

General	
Name	Zenmuse XT S
Dimensions	105×101×83 mm
Weight	387 g
Ingress Protection Rating	IP44
Supported Aircraft	Matrice 200 series V2, Matrice 200 series
Gimbal	
Angular Vibration Range	±0.025°
Mount	Detachable
Controllable Range	Pan: ±320°, Tilt: -120° to +30°
Mechanical Range	Pan: ±330°, Tilt: -135° to +45°, Roll: -90° to +60°
Max Controllable Speed	Pan: 90°/s, Tilt: 90°/s
Camera	
Thermal Imager	Uncooled VOx Microbolometer
Lens Focus	19 mm
Digital Zoom	1x, 2x, 4x
Video Resolution	640×512 @ 25 Hz
Video Format	MP4
Image Resolution	640×512
Image Format	JPEG, R-JPEG*
Pixel Pitch	17 µm
Spectral Band	8-14 µm
Sensitivity (NETD)	≤40 mK @ f/1.0
Scene Range (High Gain)	-40° to 150° C
Scene Range (Low Gain)	100° to 550° C
Temperature Measurement Method	Spot Meter, Area Measurement
Still Photography Mode	Single shot Interval: 2/3/5/7/10/15/20/30/60s
File Storage	Supports a microSD card with capacity of up to 64 GB. A UHS-I Speed Grade 3 rating microSD card is required.
Image Processing & Display Control	
Temperature Alarm	Yes
Isotherm	Yes
Palette	Yes
Environment	
Operating Temperature	-20° to 50° C (temperature measurement is only supported in temperature range of -10° to 50° C)
Storage Temperature	-20° to 60° C

* By importing R-JPEG images into DJI Thermal Analysis Tool, you can measure temperature, and adjust parameters such as emissivity and reflection temperature.

Download the DJI Thermal Analysis Tool at https://www.dji.com/zenmuse-xt-s/downloads

DJI Support
http://www.dji.com/support

Download the latest version from
http://www.dji.com/zenmuse-xt-s