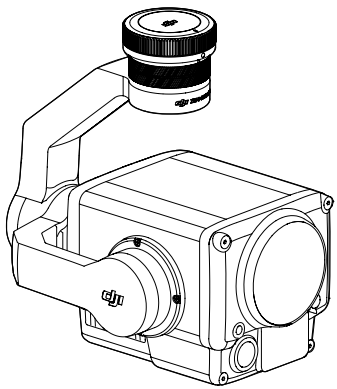
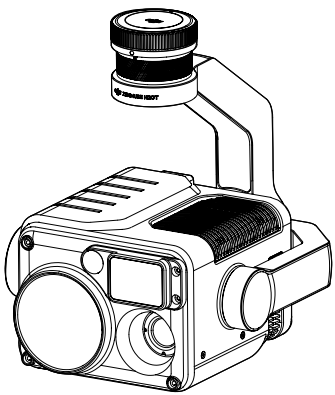
ZENMUSE H20 SERIES

User Manual v1.0

2020.05





Searching for Keywords

Search for keywords such as “battery” and “install” to find a topic. If you are using Adobe Acrobat Reader to read this document, press Ctrl+F on Windows or Command+F on Mac to begin a search.

Navigating to a Topic

View a complete list of topics in the table of contents. Click on a topic to navigate to that section.

Printing this Document

This document supports high resolution printing.

Using this Manual

Legend

Warning | Important | Tips

DJI Pilot App Download

The DJI Pilot app is required when using Zenmuse H20 series.
Scan the QR code or visit http://www.dji.com/zenmuse-h20-seires/downloads to download and install the app.

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Caution

1. Please store the camera in a dry and ventilated area at normal temperature, to avoid fogging the lenses due to excessive ambient humidity. If the lenses fog up, the water vapor will usually dissipate after turning on the device for a while. The recommended storage environment is a relative humidity less than 40% at a temperature of 20±5 °C.
2. Do not expose the infrared camera lenses to a strong energy source such as the sun, lava or laser beam. The temperature of the observation target should not exceed 800°C, otherwise it will burn the camera and cause permanent damage.
3. Do not place the product under direct sunlight, in areas with poor ventilation, or near a heat source such as a heater.
4. 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.
5. Under stable laboratory conditions, the Zenmuse H20 series achieves an IP44 protection rating by IEC60529 standards. However, this protection rating is not permanent and may reduce over time after long-term use.
6. Make sure the gimbal port and gimbal surface are free from any liquid before installation.
7. Make sure the gimbal is securely installed onto the aircraft, the microSD card slot cover is clean and firmly in place.
8. Make sure the gimbal surface is dry before opening the microSD card slot cover.
9. Do not plug or unplug the microSD card during use.
10. 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.
11. Clean the surface of the camera lenses with a soft, dry, clean cloth. Do not use alkaline detergents.

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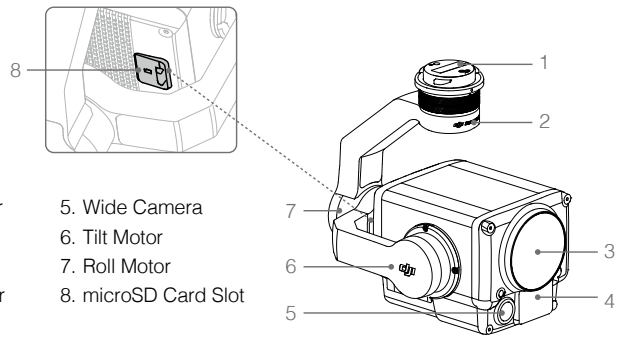
Introduction

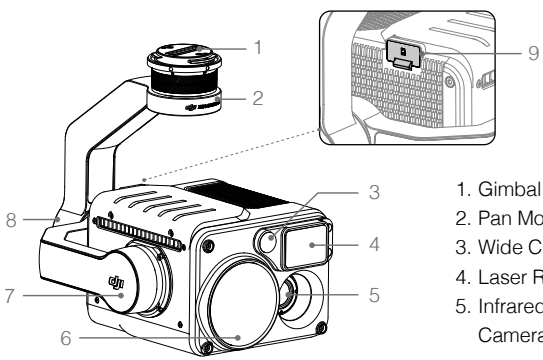
The Zenmuse H20 gimbal and camera features a zoom and wide camera. Operators can quickly switch to a high-magnification zoom image for detailed observation after recognizing the target from the wide camera view. The Zenmuse H20T also features a Longwave Infrared Thermal Camera, which can provide both infrared and visual images simultaneously. Both the Zenmuse H20 and H20T are equipped with a laser rangefinder, providing distance and location information applicable to various missions such as search and rescue, inspection, and more. For optimal performance, the Zenmuse H20 Series is compatible with the Matrice 300 RTK aircraft.

Zenmuse H20



1. Gimbal Connector
2. Pan Motor
3. Zoom Camera
4. Laser Rangefinder
5. Wide Camera
6. Tilt Motor
7. Roll Motor
8. microSD Card Slot

Zenmuse H20T



1. Gimbal Connector
2. Pan Motor
3. Wide Camera
4. Laser Rangefinder
5. Infrared Thermal Camera
6. Zoom Camera
7. Tilt Motor
8. Roll Motor
9. microSD Card Slot

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Installation

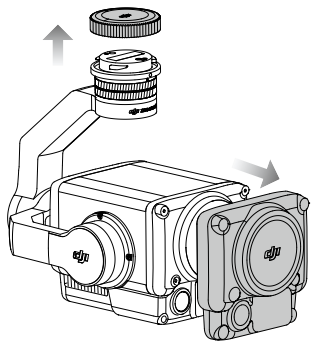
Supported Aircraft

Matrice 300 RTK

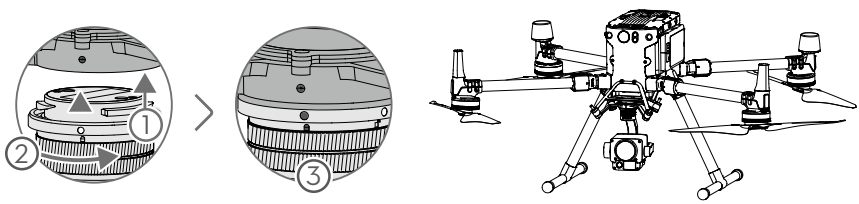
Mounting the Zenmuse H20 Series

The following installation display uses the Zenmuse H20 as an example.

1. Remove the gimbal cap and lens protector.



2. Rotate the gimbal connector of the Matrice 300 RTK aircraft to the unlocked position and insert the gimbal, and then rotate the gimbal connector to the locked position.



- Hold the gimbal connector firmly and apply a steady, firm rotating force when attaching or detaching the gimbal.
- Ensure the microSD card slot cover is firmly in place to prevent dust or moisture entering during usage or transportation.
- The Zenmuse H20 series is a delicate instrument. Do not disassemble the gimbal or camera as this will cause permanent damage.

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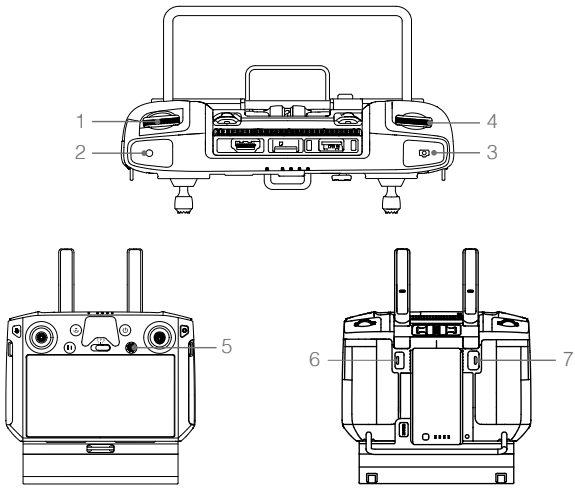
Remote Controller Operation

Adjust the gimbal's tilt using the left dial and adjust its pan by the right dial. Press the shutter button or record button to take photos or record video. Toggle the 5D button to adjust the zoom (up and down) and EV value (left and right). The customizable button C1 can be used to recenter the gimbal, and the customizable button C2 can be used to switch between the main and auxiliary screen.



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. 5D Button
   The default function is as follows. The function for this button can be customized in the DJI Pilot App.
   Left: Decrease EV value
   Right: Increase EV value
   Up: Zoom in
   Down: Zoom out
6. Customizable Button C2
   The default function is to switch between the main and auxiliary screen. The function for this button can be customized in the DJI Pilot App.
7. Customizable Button C1
   The default function is to recenter the gimbal. The function for this button can be customized in the DJI Pilot App.

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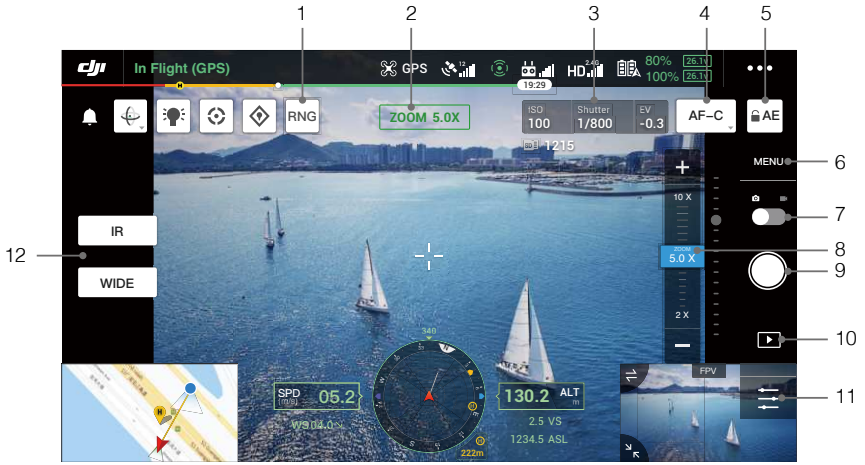
DJI Pilot App

The touch interface can be used for capturing photos, recording videos and playback. The visual cameras support intelligent functions such as High-Res Grid Photo and Night Scene, while the infrared thermal camera supports Digital Zoom, Spot Meter, Palette and Isotherm functions, which can all be configured in the app.

⚠ Among the following functions, those marked with * are only applicable to the infrared thermal camera of the Zenmuse H20T.

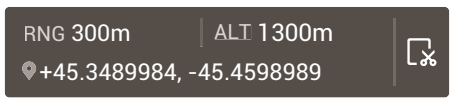
Basic Functions

You can view the liveview from the Zenmuse H20 series and change camera settings in Camera View.



1. Laser Ranging

   Tap to enable the laser ranging function. Laser ranging can measure the distance of objects within the measurement range, and displays the distance from the aircraft, relative height and GPS position of the measured object in the middle of the screen. After enabling this function, you can save the current camera view with laser ranging information by tapping the screenshot button. The image will be stored in the remote controller.



2. Camera and Zoom

   Shows the camera of the current liveview and its zoom ratio.

3. Camera Parameters

   Shows the camera's current shoot/record parameters.

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4. Focus Mode

   Tap to switch the focus mode. Various focus modes are supported: MF (manual focus), AF-C (continuous autofocus) and AF-S (single autofocus).

5. Auto Exposure Lock

   Tap to lock the exposure value.

6. Camera Settings

   Tap to enter the photo and video settings.

   • Photo Settings

   Photo Mode: includes Single Shot, High-Res Grid Photo, and Interval (2/3/5/7/10/15/20/30/60 s)
   Image Ratio: 4:3
   Image Format: JPEG
   Save Photo: Includes Current View, Wide Photo, Zoom Photo and Infrared Photo. Current view will save the photo taken by the current camera, but in SBS display mode of the infrared thermal camera, it will save the screenshot instead. Photos will be saved in the microSD card in the gimbal and camera.

   • Video Settings

   Video Size: Zoom: 4KP30, 1080P30
   Wide: 1080P30
   IR: 640P30
   Video Format: MP4
   Save Video: Includes Current View, Wide Video, Zoom Video and Infrared Video. Current view will save a recording of the current liveview of the app (not the HD camera feed). Videos will be saved in the microSD card in the gimbal and camera.

   • General Settings

   Night Scene

   If the main screen shows the zoom camera view, you can enable Night Scene mode. In night scene mode, the zoom camera will switch the IR filter to optimize for imaging in low-light environments.
   This function is only available for the zoom camera, tap Menu > General Settings, and then enable Night Scene.

   Add Timestamp and GPS Info

   Enable or disable adding timestamps, which includes time and GPS information.

   Lock Gimbal while Shooting

   Enable or disable locking the gimbal while taking photos. If enabled, the gimbal will be locked steady for a moment for shooting, to avoid imaging being affected when the aircraft is moving.

   ROI (Region of Interest)*

   Use this feature to manage color range distribution across the screen to maximize contrast for regions of highest interest.
   Select “Full” to evenly distribute the color spectrum across the entire image.
   For instance, if there is a large patch of sky (relatively low temperature) in your image, much of the color spectrum will be allocated to the lower range, meaning that other parts of the spectrum will have a lower contrast. In this case, you may select “Sky excluded (33%)” or “Sky excluded (50%)” to ignore areas of the sky so that most of the spectrum can be allocated to remaining areas, providing higher contrast and utility for analysis.

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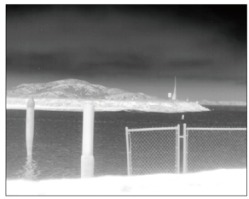

ROI set to “Full”

Sky excluded from ROI

Scene Parameter*

- DDE (Digital Detail Enhancement): Enhances image details and/or suppresses fixed pattern noise.
- Contrast: The ratio of the black and white of the image. Colors will be richer and have more contrast when the value is high.
- Brightness: The brightness of the image.

Gain Mode*

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.

Auto FFC*

Enable or disable the automatic FFC calibration. The infrared thermal camera will automatically calibrate at regular intervals.

Gridlines

Enable or disable the gridlines or diagonal.

Smart LED

Enable or disable smart LED such as frame arm LEDs or beacon.

Reset Camera Settings

Tap to reset the camera to the default settings.

Format SD card

Tap to format and remove all content from the microSD card. Operate with caution.

7. Photo/Video Toggle

   Tap to switch between photo and video modes.

8. Zoom Slider (Zoom camera)

   Tap to adjust the zoom magnification level of the zoom camera.

   If the main screen shows the zoom camera view, the liveview will be changed directly by adjusting the zoom. Otherwise, only the zoom camera preview box in the middle of the screen will be changed.

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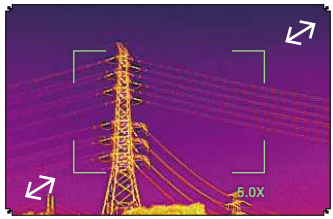
The zoom magnification of the zoom camera ranges from 2x to 200x.



9. Shutter/Record Button

   Tap to start shooting photos or recording video.

10. Playback

    Tap to enter Playback and preview photos and videos as soon as they are captured.

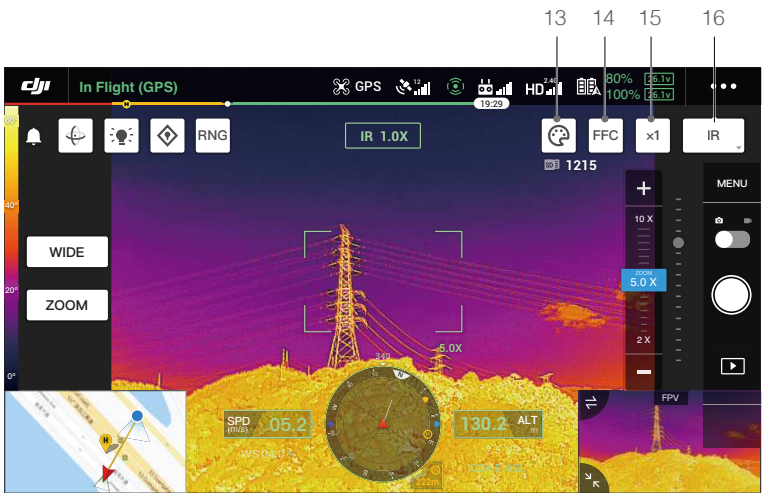
11. Parameter Settings

    Tap to set ISO, shutter, exposure values and other parameters.

12. Camera View Switch Button

    Tap to switch the main screen to the camera view corresponding to the button.

    The infrared camera view switch button only appears when using the Zenmuse H20T.



13. Palette/Isotherm*

    Palette

    The Zenmuse H20T 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.

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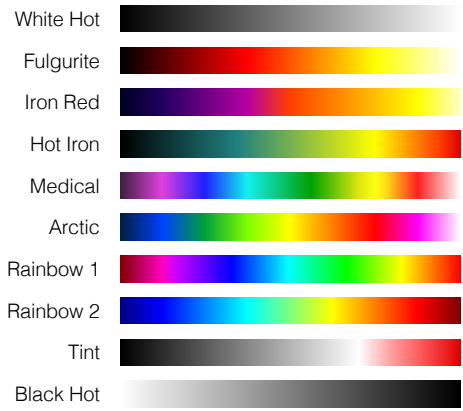
The following table shows all palette options.



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.

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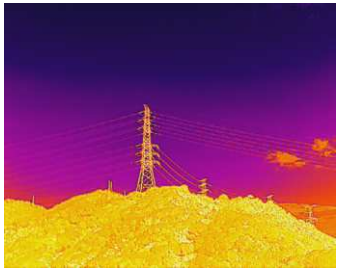
Black Hot	The opposite to White Hot, using black for warmer objects and white for cooler objects. The heat distribution of high temperature targets can be better observed when outdoors.

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

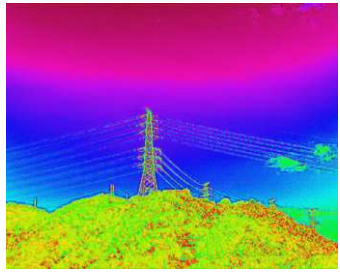
White Hot

Black Hot

Iron Red



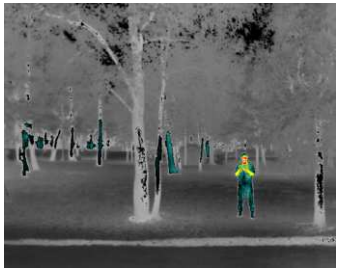
Rainbow 1



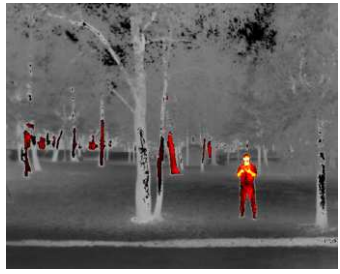
Isotherm

This feature allows designated temperature ranges to be represented with different color schemes, so that objects within this range impart higher contrast and better visibility.
The temperature range is set by upper and lower thresholds.

Hot Iron Isotherm



Fulgurite Isotherm



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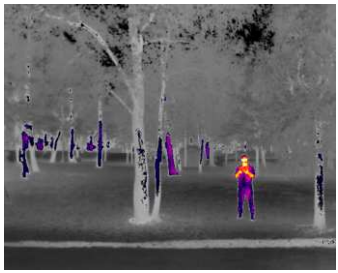
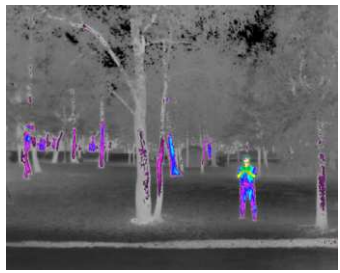
Iron Red Isotherm



Medical Isotherm



14. FFC Calibration*

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

15. Zoom (Infrared thermal camera)*

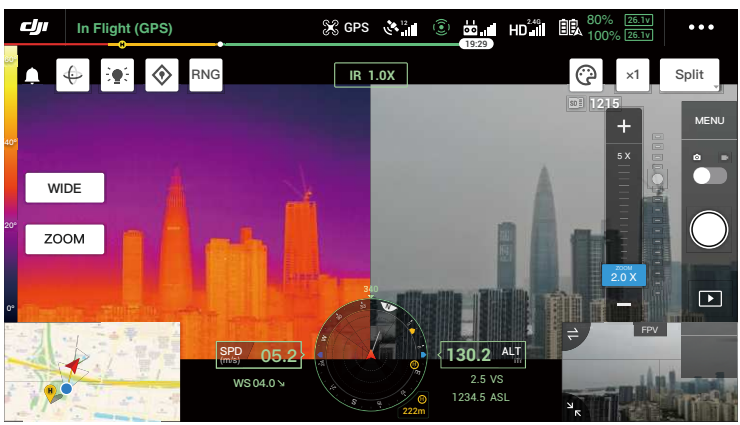
    Tap to adjust the digital zoom of the infrared thermal camera. 2x, 4x and 8x zoom options are supported.

16. Display Mode*

    Tap to switch between the IR and Split display modes for infrared thermal camera.

    IR: only displays footage that the infrared thermal camera captures.

    Split: Both the footage that the infrared thermal and the wide camera captures will be displayed side by side.



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Intelligent Functions

Click to Aim

Double-click the point of interest on the main screen, the gimbal will automatically move to the point of interest in the center of the screen.

High-Res Grid Photo

Drag to select an area in the wide camera view, the gimbal will move automatically and take a series of 20MP photos of the selected area at the current zoom ratio by the zoom camera.

Tap MENU > Photo Settings, and then select High-Res Grid Photo. After entering this function, the liveview will switch to the wide camera view. You can set the target shooting area by editing, moving and zooming the white grid on the screen.

All photos will be saved in the same sub-folder in the microSD card, and an HTML file will be created. To view the wide and close-up images, open this HTML file using a browser on a PC.

Night Scene

In Night Scene Mode, the camera will switch the IR filter of the zoom camera, which enabled shooting in low-light environment.

This function is only available for zoom camera, tap MENU > General Settings, and then enable the Night Scene.

Temperature Measurement*

Spot Meter

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

Area Measurement

Drag an area within the temperature measurement area on the screen, the average temperature, lowest temperature, highest temperature, and the corresponding locations of this area will be displayed in DJI Pilot.

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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 – sunlight has a great influence on the temperature measurement accuracy, direct or reflected sunlight should be avoided from the infrared thermal camera.
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.
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.

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.

Updating Firmware

Ensure that the Zenmuse H20 series gimbal and camera 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 H20 series 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 H20 series gimbal and camera.
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 gimbal and camera during updating the firmware.

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Specifications

General	
Name	Zenmuse H20, Zenmuse H20T
Dimensions	150×114×151 mm (Zenmuse H20) 167×135×161 mm (Zenmuse H20T)
Weight	678±5 g (Zenmuse H20) 828±5 g (Zenmuse H20T)
Ingress Protection Rating	IP44
Laser Safety	Class 1M (IEC 60825-1:2014)
Supported Aircraft	Matrice 300 RTK
Gimbal	
Angular Vibration Range	±0.01°
Mount	Detachable
Controllable Range	Pan: ±320°, Tilt: -120° to +30°
Mechanical Range	Pan: ±330°, Tilt: -132.5° to +42.5°, Roll: -90° to +60°
Max Controllable Speed	Pan: 90°/s, Tilt: 90°/s
Zoom Camera	
Sensor	1/1.7" CMOS, Effective Pixels: 20M
Lens	Focal length: 6.83-119.94 mm (equivalent: 31.7-556.2 mm) Aperture: f/2.8-f/11 (normal), f/1.6-f/11 (night) Focus: 1 m to ∞ (wide), 8 m to ∞ (telephoto)
Focus Mode	MF/AF-C/AF-S
Exposure Mode	Manual, Auto
Exposure Compensation	±3.0 (1/3 increments)
Metering Mode	Spot metering, Center-weighted metering
AE Lock	Supported
Electronic Shutter Speed	1-1/8000 s
ISO Range	Video: 100-25600 Photo: 100-25600
Video Resolution	3840×2160@30fps, 1920×1080@30fps
Video Format	MP4
Video Subtitles	Supported
Max. Image Size	5184×3888
Image Format	JPEG
Wide Camera	
Sensor	1/2.3" CMOS, Effective Pixels: 12M
Lens	DFOV: 82.9° Focal length: 4.5 mm (equivalent: 24 mm) Aperture: f/2.8 Focus: 1 m to ∞

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Exposure Mode	Auto
Exposure Compensation	±3.0 (1/3 increments)
Metering Mode	Spot metering, Center-weighted metering
AE Lock	Supported
Electronic Shutter Speed	1-1/8000 s
ISO Range	Video: 100-25600 Photo: 100-25600
Video Resolution	1920×1080@30fps
Video Format	MP4
Video Subtitles	Supported
Max. Image Size	4056×3040
Image Format	JPEG
Infrared Thermal Camera	
Thermal Imager	Uncooled VOx Microbolometer
Lens	DFOV: 40.6° Focal length: 13.5 mm (equivalent: 58 mm) Aperture: f/1.0 Focus: 5 m to ∞
Digital Zoom	1x, 2x, 4x, 8x
Video Resolution	640×512 @ 30 Hz
Video Format	MP4
Image Resolution	640×512
Image Format	R-JPEG* (16 bit raw included)
Pixel Pitch	12 μm
Spectral Band	8-14 μm
Sensitivity (NETD)	≤50 mK @ f/1.0
Temperature Measurement Method	Spot Meter, Area Measurement
Scene Range	-40° to 150° C (High Gain) -40° to 550° C (Low Gain)
Temperature alert	Supported
FFC	Auto/Manual
Palette	White Hot/Fulgurite/Iron Red/Hot Iron/Medical/Arctic/Rainbow 1/ Rainbow 2/Tint/Black Hot
Laser Rangefinder**	
Wavelength	905 nm
Measuring Range	3-1200 m (Vertical reflecting surface with 12 m diameter and 20% reflectivity)
Measuring Accuracy	±(0.2 m+D×0.15%), D is the distance to a vertical surface

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Storage	
Supported SD Cards	Supports a microSD card with capacity of up to 128 GB. A UHS-I Speed Grade 3 rating microSD card is required.
Supported File System	FAT32 (≤32 GB), exFAT (>32 GB)
Recommended microSD Cards	TOSHIBA EXCERIA PRO 32GB micro SD HC II SanDisk_Extreme PRO_32GB_3_A1_micro SD V30 HC I TOSHIBA EXCERIA PRO 64GB micro SD XC II SanDisk_Extreme PRO_64GB_3_A2_micro SD V30 XC I SAMSUNG_EVO_128GB_micro SD 3 XC I TOSHIBA EXCERIA M303E 32GB micro SD HC I TOSHIBA EXCERIA M303E 64GB micro SD XC I TOSHIBA EXCERIA M303 128GB micro SD XC I SAMSUNG_EVO_64GB_micro SD 3 XC I
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-h20-series/downloads

** Optical parameters of the laser rangefinder: laser pulse width is 6.5 ns, repetition frequency is 12.5 kHz, maximum peak power is 45 W. Do not disassemble the laser module to avoid being injured by the laser.

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

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