DSO Camera ASI4400MC Pro Product Manual



Thank you so much for purchasing ZWO ASI camera! Before using the product, please read this manual carefully.

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Introduction

Thank you for choosing the ZWO camera!

Before you begin using the camera, please take a moment to read through the ASI4400MC Pro Product Manual (hereinafter referred to as “this manual”). It may take several hands-on sessions to become fully familiar with the operation of the cooled deep-sky camera.

This manual provides detailed step-by-step guidance, functional explanations, reference materials, and helpful tips to ensure a smooth and enjoyable user experience. The purpose of this document is to introduce the proper usage of the cooled deep-sky camera through clear instructions and illustrations, while also highlighting potential risks of improper operation.

Please read this manual carefully before operating the camera, and follow all instructions with caution. Any damage to the device or personal injury resulting from improper operation shall be the sole responsibility of the user.

Reading Tips

Quick Keyword Search

You can use the search function in the PDF to quickly find keywords. For example, in Adobe Reader, Windows users can press Ctrl + F and Mac users can press Command + F to search.

Jump via Table of Contents

The Table of Contents helps you understand the structure of this Manual. Click a title to jump directly to the corresponding section.

Printing the Manual

This manual supports high-quality printing.

Usage Recommendations

ZWO provides this documentation to guide users. Please follow the instructions carefully during operation. The content of the manual may be updated from time to time. For the latest instructions, refer to the online manual available at **https://www.zwoastro.cn/support/manuals**.

It is recommended to read this manual first to understand proper usage. For detailed product information, disclaimers, and safety guidelines, please refer to this manual.

Disclaimer

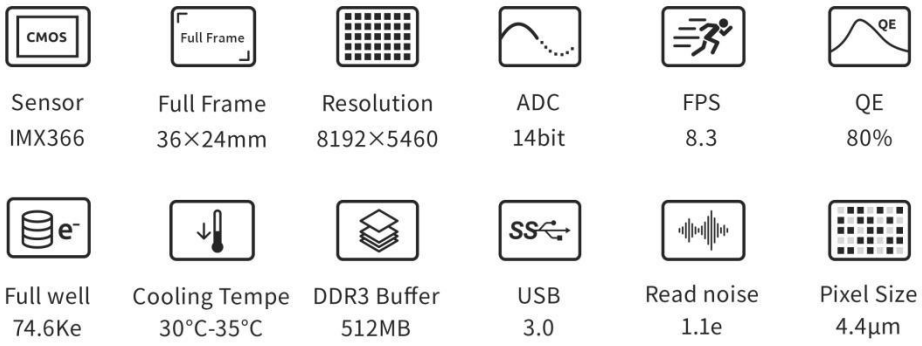
This product is not a toy. Keep the camera, accessories, and cables out of reach of children. Always exercise caution when operating the device in environments where children are present.

Please read the entire ASI4400MC Pro Product Manual and ensure you are familiar with the product's functions before operation. Improper use may result in product damage or property loss. ZWO assumes no responsibility for any loss or damage caused by failure to follow the instructions in this manual.

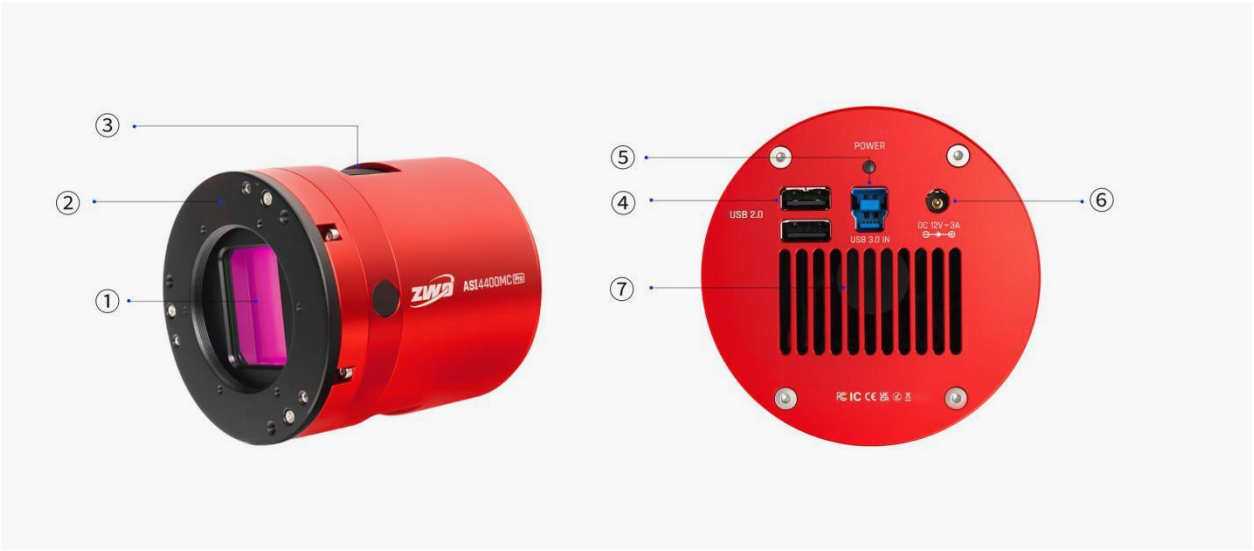
Within the limits of applicable laws and regulations, ZWO reserves the right of final interpretation of this document. ZWO may update, revise, or discontinue this manual at any time without prior notice.

1. Product Introduction

The ASI4400MC Pro camera adopts the Sony back-illuminated IMX366AJK full-frame CMOS sensor, featuring a 4.4um square pixel array and 44.72MP effective pixels with a full resolution of 8192 × 5460. The ASI4400MC Pro is equipped with a native 14-bit ADC (Analog-to-Digital Converter), offering a maximum full well capacity of about 74.6ke- and a read noise as low as 1.1e-.



1.1. External View



1. Protective window (D60 x 2mm), as UV-IR CUT filter
2. Target plane adjustment ring, M54 x 0.75F thread, removable
3. Heat sink
4. USB 2.0 hub
5. USB 3.0/USB 2.0 data transmission port
6. DC power port: D5.5 x 2.1mm, center pole positive. 12V@3A power supply is recommended to use.
7. Ultra-quiet magnetic levitation fan: Only runs when cooling is turned on.

1.1.1. Target Plane Adjustment

The target plane adjustment ring on the front of the ASI4400MC Pro camera is equipped with three sets of screws, which can be used to adjust the relative alignment between the sensor plane and the telescope's optical axis. Each set consists of a push screw and a pull screw.



1. Capture an image with stars using the camera. Analyze the image in software to identify the direction of tilt, then adjust the corresponding set(s) of flange adjustment screws on the camera.

2. Capture another image and compare it with the previous one in the software.

If the star distortion is reduced, the adjustment direction is correct.

If the distortion worsens, the adjustment direction is incorrect.

3. Repeat Step 2 until the stars in all corners of the frame appear sharp and well-shaped.

Rear Tilt Adjustment Design (Optional)

The three-point rear tilt adjustment design allows fine-tuning of the sensor tilt without removing the device, ensuring more convenient and precise alignment.



1.1.2. Holder Ring（Optional）

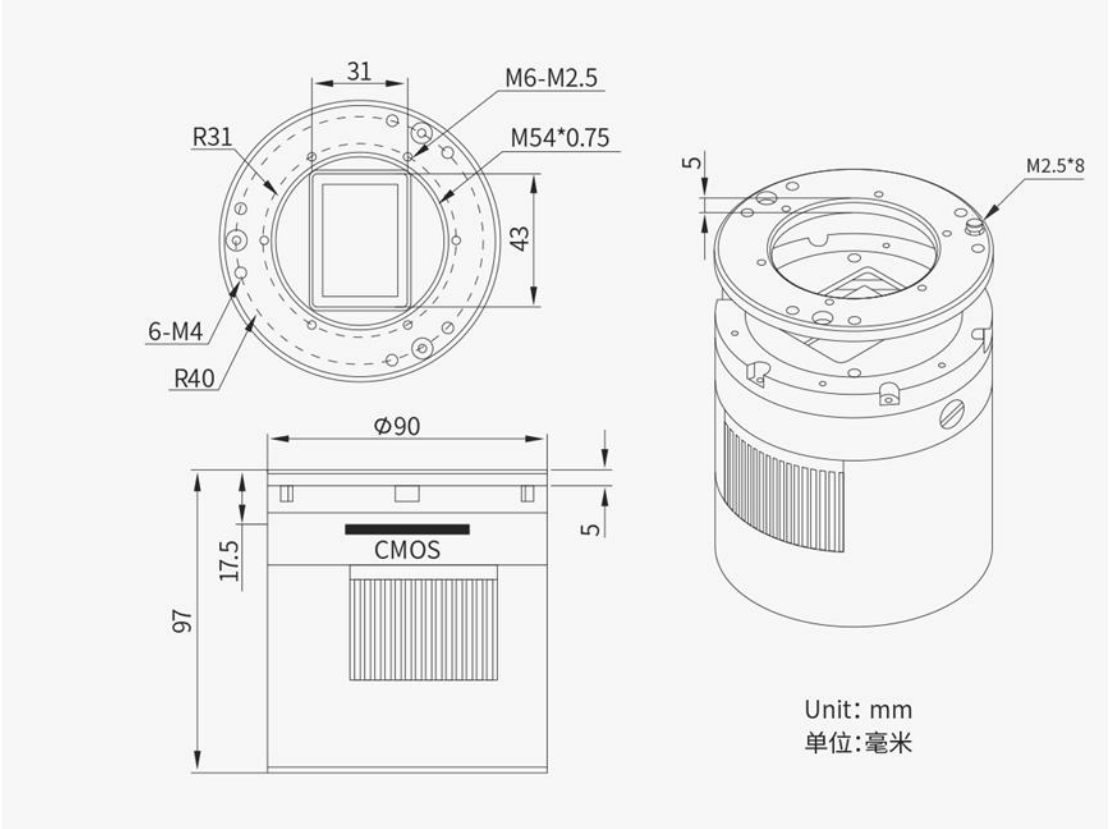
The camera can be supported by the ZWO holder ring. As shown

below:



1.2. Structural Dimension Diagram

The structural dimension diagram of the ASI4400MC Pro camera is shown below:



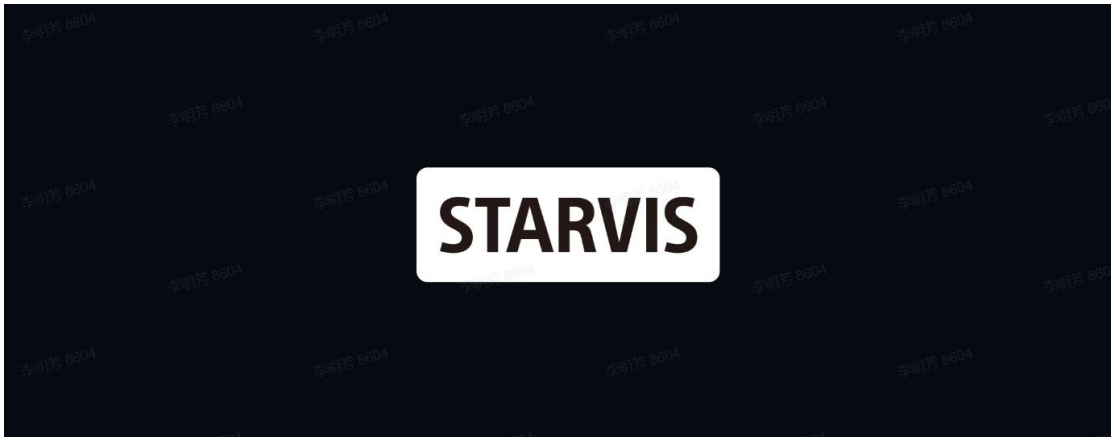
1.3. Specifications

Model	**ASI4400MC Pro**
Sensor	SONY IMX366
Sensor format	Full frame
Diagonal	43.3mm
Resolution	44.72 MP (8192 × 5460)
Pixel size	4.4μm
Sensor size	36mm x 24mm
Max frame rate	8.3fps（Full Frame USB 3.0 RAW8 High-Speed）
Shutter	Rolling shutter
Exp range	32μs-2000s
Read noise	1.1-7.6 e
QE peak	TBD
Full well capacity	74600e
ADC	14bit
DDR3 buffer	512MB
USB port	USB3.0/USB2.0
Connection adapter	M54 x 0.75F
Protective window	D60x2mm　UV-IR Cut Filter

Camera diagonal	90mm
Net weight	700g
Back focus distance	17.5mm (With Tilt Adjustment Plate) / 12.5mm
Cooling	2-stage TEC cooling
Delta-T	30°C~35°C@environmental temperature 30°C
Power consumption (Cooling on)	12V, Max current 3A（Recommended）
Supported OS	Windows, Linux & Mac OSX

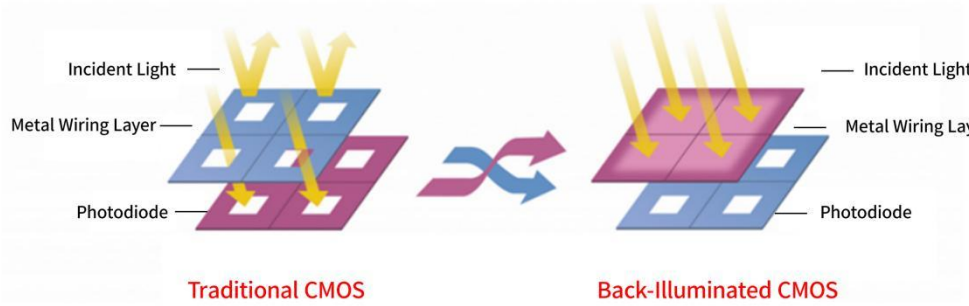
1.3.1. STARVIS

The ASI4400MC Pro uses a Sony STARVIS back-illuminated sensor, designed for lower glow and higher quantum efficiency.



Traditional front-illuminated CMOS sensors place metal wiring above the photodiodes, blocking or reflecting part of the light—so only about 70% (or less) is absorbed.

With back-illuminated design, the wiring is placed behind the photodiodes, allowing light to reach them directly. This means higher light absorption and better image quality.



1.3.2. No Amp Glow

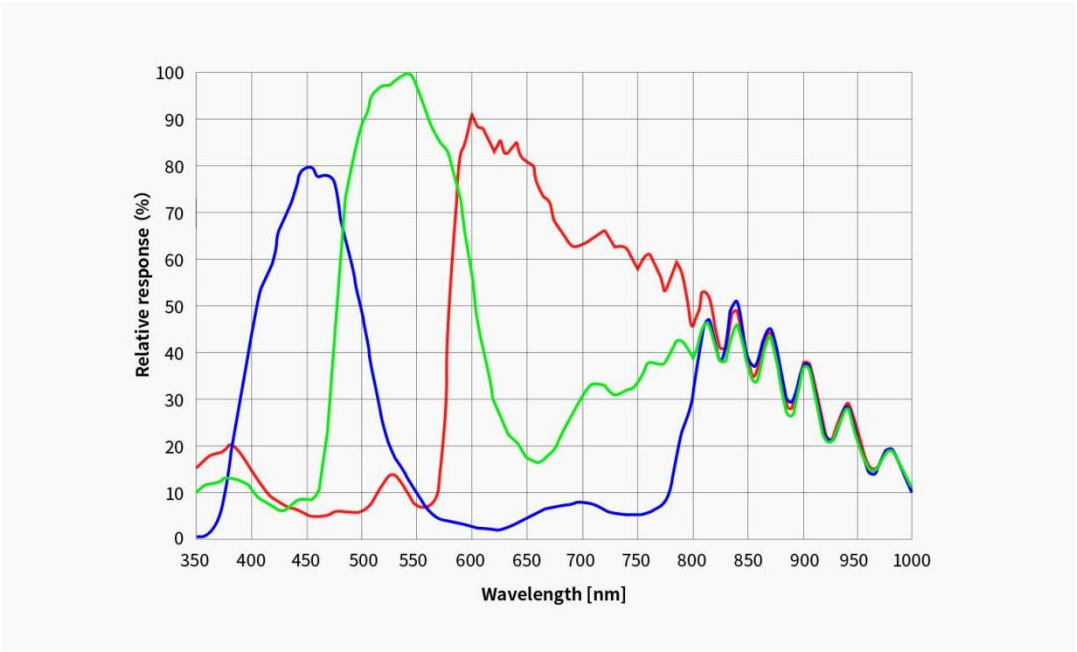
Traditional CMOS sensors generate faint infrared light from their working circuits when powered on. During exposure, this acts as an unwanted light source, reducing overall image quality.

The ASI4400MC Pro adopts a zero-glow design, ensuring that image quality is unaffected even under long exposures or high gain settings.



1.3.3. Quantum Efficiency

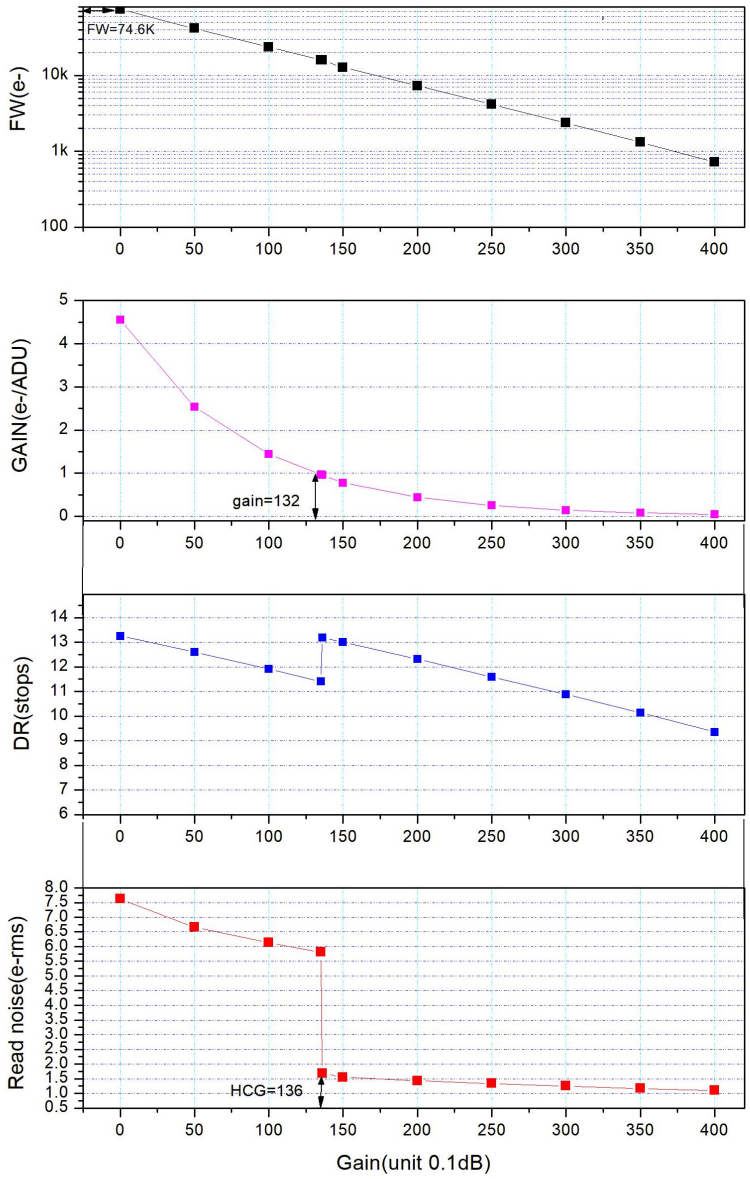
Relative response curve of ASI4400MC Pro (as shown in the figure below).



1.3.4. Pixel Performance

The ASI4400MC Pro camera delivers excellent performance with a 13.3-bit dynamic range. At a gain of 136, the HCG (High Conversion Gain) mode is activated, significantly reducing read noise while maintaining near-peak dynamic range. For deep-sky imaging, a gain of 0 or 136 is recommended. The Unity Gain position is at 132.

Read noise, full well, gain and dynamic range for ASI4400MC Pro



1.3.5. Frame Rate

The ASI4400MC Pro camera features a rolling shutter and is equipped with 11-, 12-, 13-, and 14-bit ADCs, supporting ROI (Region of Interest).

For astrophotography purposes, we tested the camera's frame rates under RAW8 and RAW16 output. The results are shown in the table below.

ASI4400MC Pro Frame Rate		
USB3.0（100% Bandwidth）		
	Normal Mode：14BIT ADC	
Resolution	RAW16	RAW8
8192 x 5460	4.3fps	8.3fps
7680 x 4800	5.2fps	9.5fps
6400 x 4096	7.4fps	11.1fps
4096 x 2160	20.8fps	20.8fps
1920 x 1080	40.7fps	40.7fps
1280 x 720	59.7fps	59.7fps
640 x 480	86.9fps	86.9fps
320 x 240	159.2fps	159.2fps

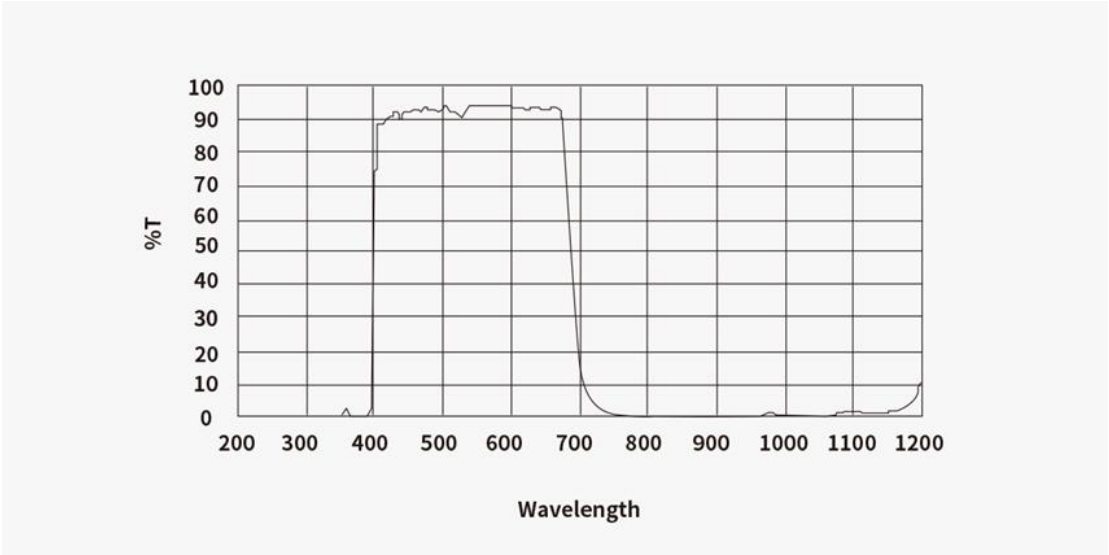
USB2.0（100% Bandwidth）		
	Normal Mode：14BIT ADC	
Resolution	RAW16	RAW8
8192 x 5460	0.48fps	0.97fps
7680 x 4800	0.59fps	1.17fps
6400 x 4096	0.83fps	1.62fps
4096 x 2160	2.44fps	4.89fps
1920 x 1080	10.4fps	20.9fps
1280 x 720	23.5fps	47fps
640 x 480	70.5fps	86.8fps
320 x 240	159.2fps	159.2fps

1.3.6. Protective Window & Anti-dew

The ASI4400MC Pro camera is equipped with a 60mm diameter, 2mm thick UV-IR Cut filter on the front of the sensor, serving as a protective

window. It safeguards the sensor from external damage while effectively reducing infrared interference and improving image quality.

The filter’s transmission curve is shown in the figure below:



Glass Window Heating: The camera features a built-in heating film that warms the glass window, ensuring close contact between the glass and the heating layer. This prevents fogging during operation. The heating film consumes 3.84 W and the dew-prevention function can be turned off via software to save power.

1.3.7. Temperature Control System and Power Consumption

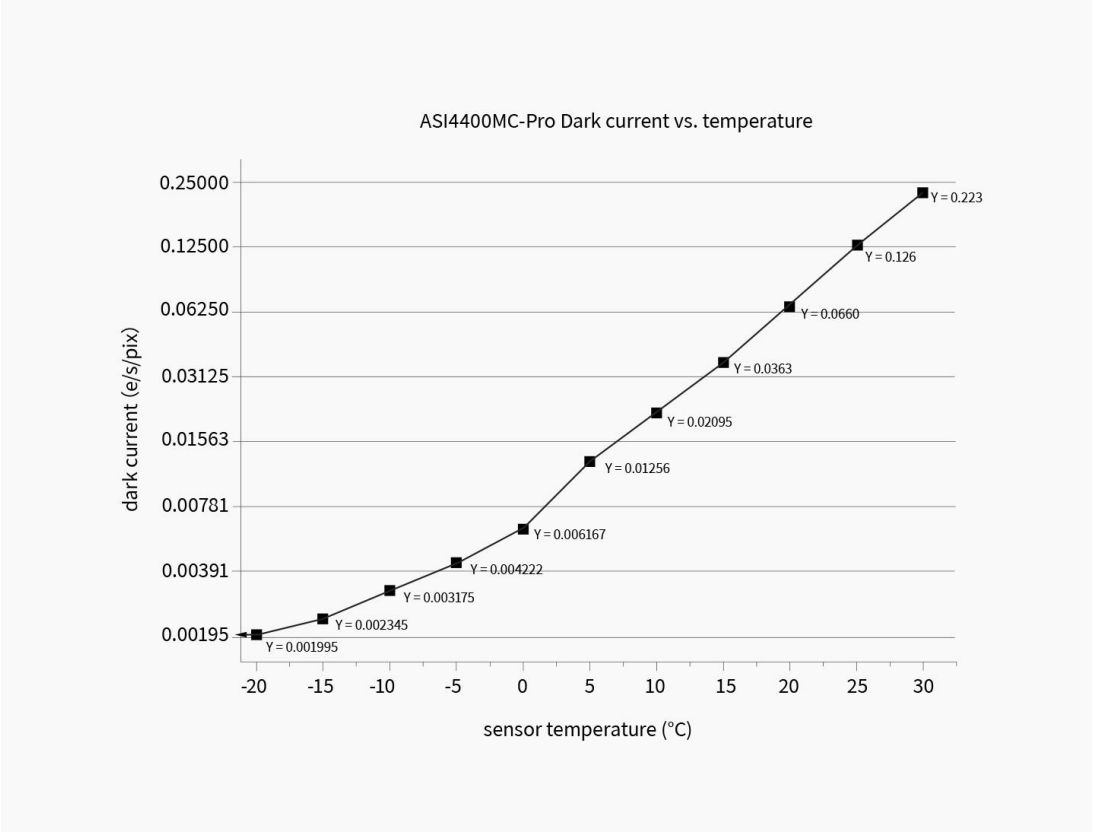
The ASI4400MC Pro camera features a CMOS temperature sensor and a two-stage TEC cooling module to stabilize the sensor’s operating temperature.

At room temperature, the TEC module can achieve a maximum temperature difference of approximately 35℃
(Note 1: Tested at an ambient temperature of 30℃; Note 2: The lower the ambient temperature, the smaller the temperature difference; Note 3: TEC

cooling requires proper heat dissipation—ensure the camera is operated in a well-ventilated environment).

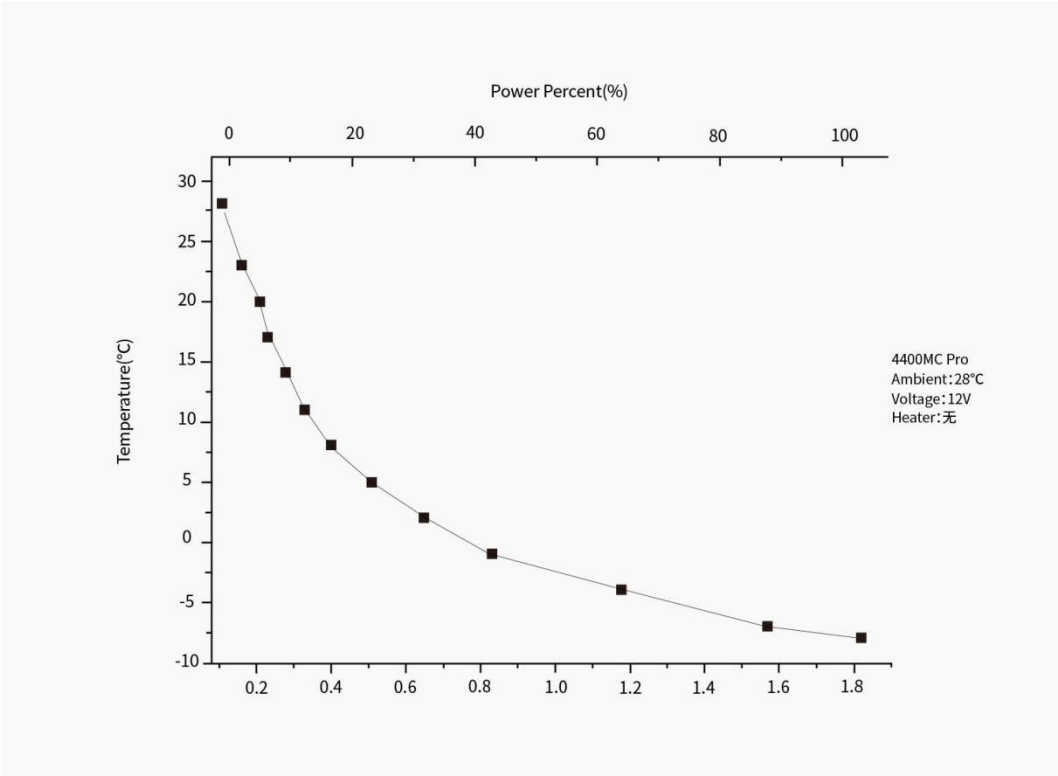
The strong cooling effectively suppresses dark current, ensuring very low noise even during long exposures of several hundred seconds.

The following curve shows the relationship between dark current and sensor temperature for the ASI4400MC Pro:

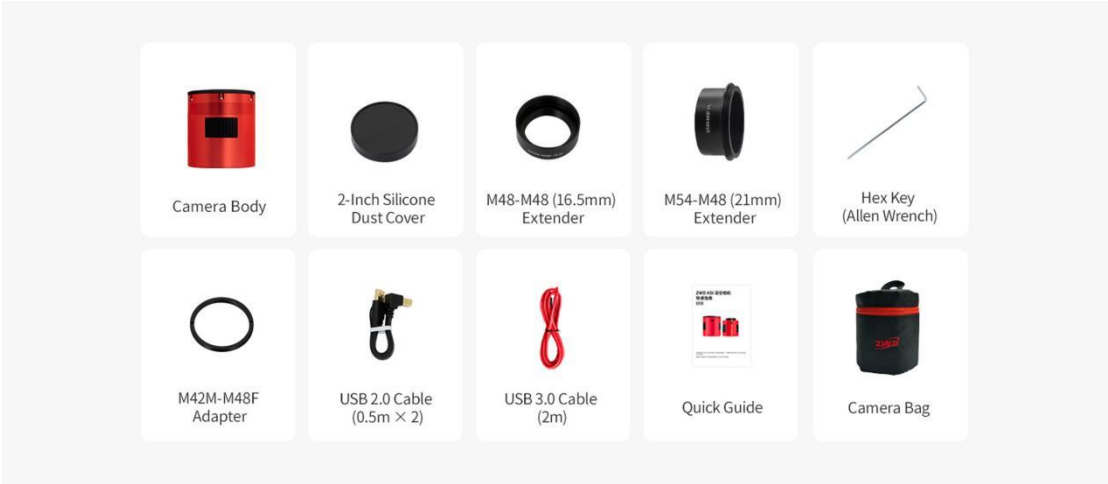


The maximum power consumption of the ASI4400MC Pro camera is 35.66 W (12V supply: 30.96 W, USB supply: 4.7 W).

The relationship between cooling performance and power consumption is shown below:



1.4. What's in the Box?



In addition to the camera body, the ASI4400MC Pro is shipped with the following standard accessories:

1 × Cover

1 × M48-M48 Extender (16.5mm)

1 × M54-M48 Extender (21mm)

1 × Hex Key

1 × M42M－M48F Adapter

2 × USB 2.0 Cables (0.5m)

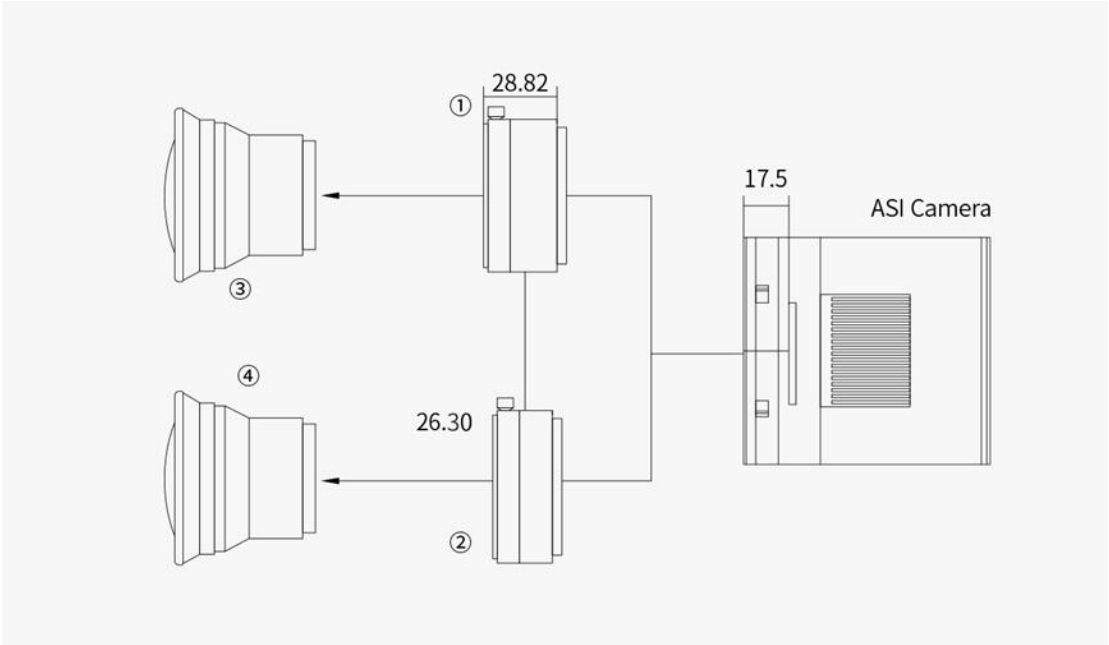
1 × USB 3.0 Cable (2m)

1 × Quick Guide

1 × Camera Bag

1.5. Connection Methods

1.5.1. Connecting to Nikon/Canon Lens



1.Nikon-M54 adapter (optional)

2.EOS-M54 adapter (optional)

3.Nikon lenses (purchased separately)

4.Canon lenses (purchased separately)

1.5.2. Solutions for 55mm best back focus distance



2. Notice for Use

Before using the camera, please read this manual carefully.

External power supplies are needed for all ASI cooled cameras. We recommend you use a 12V@3A~5A DC adapter (D5.5x2.1mm, center pole positive) or a lithium battery with 11-14V to power the camera. You can also use ASIAIR to power the cameras. Be aware that using power supply out of this voltage range will probably lead to irreparable damage to the camera.

Note that the camera can only be used and stored under the following conditions. Usages out of the environment limits might lead to damage to the camera.

Storage temperature	-20°C ~ 60°C
Storage humidity	20% ~ 95%
Working temperature	-5°C ~ 50°C
Working humidity	20% ~ 80%

Please do not use corrosive solutions to clean the camera to avoid corroding the oxide layer on the surface and damaging the camera. Meanwhile, please do not keep the camera exposed to the sun for a long time to avoid discoloration of the oxide layer on the camera surface.

2.1. Cable Connection

The ASI4400MC Pro camera provides two USB 2.0 ports, which can be used to connect other devices as needed. The USB 3.0 IN port serves as the camera’s primary data interface and can be connected to a

computer (purchased separately), ASIAIR (optional), or other control devices depending on your setup.



Note: Please pay attention to the length and positioning of the USB data cables to avoid entanglement or pulling during equatorial mount operation, which may cause damage to the camera.

3. Using the ASIAIR App (Recommended)

This chapter introduces the ASIAIR App (optional) for controlling the camera. This workflow is the recommended method by ZWO. Before starting, please power on both the camera and the ASIAIR.

3.1. Download the ZWO ASIAIR

Scan the QR code with your mobile device to access the download link.

iOS: Available on the App Store.

Android: Available on Google Play or from the ZWO official website.

Note: Mobile devices refer to smart devices supporting iOS or Android operating systems with network connectivity (e.g., smartphones, tablets).

The Android version requires Android 8.0 or above.

The iOS version requires iOS 12 or above.







3.1.1. Minimum and Recommended System Requirements

The ASIAIR App supports devices running iOS or Android. For the best experience, it is recommended to run the app on devices that meet or exceed the recommended specifications.

	Android	**iOS**	**MacOS**
Minimum Requirements	Android 8 or above, RAM > 4 GB	iOS 12 or above	Mac devices with Apple Silicon
Recommended Requirements	Android 12 or above, RAM > 6 GB	iOS 15 or above	Mac devices with Apple Silicon

3.2. Network Connection

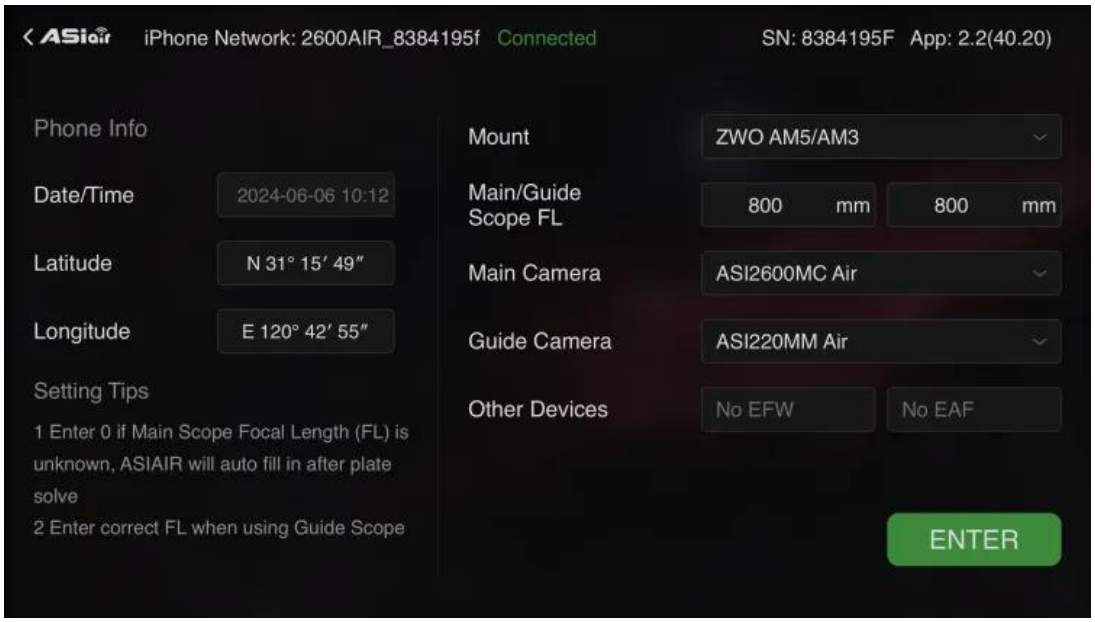
After powering on the ASIAIR, use a mobile device to connect to the WiFi hotspot “ASIAIR_xxxxxx”. The default password is 12345678.

3.3. Controlling the Camera via ASIAIR App

1.Launch the ASIAIR App and go to the “ASIAIR” page. Tap “Enter Device” to access the ASIAIR control interface.



2.On the control page, select your connected devices, then tap “Enter” to access the App operation interface.



3.Once in the operation interface, the following screen will appear.



① Top

Tap icons to open device settings: ASIAIR, Main Camera, Guide Camera, Mount, EFW, EAF, Storage, About. Icons light up if connected, otherwise gray.

② Right

Main function area. Tap “Preview” to switch between Focusing, Polar Alignment, Plan Shooting, Multi-target, Live Stacking, Video Mode.

③ Bottom

Shows ASIAIR status and camera info: resolution, gain, temperature, cooling power.

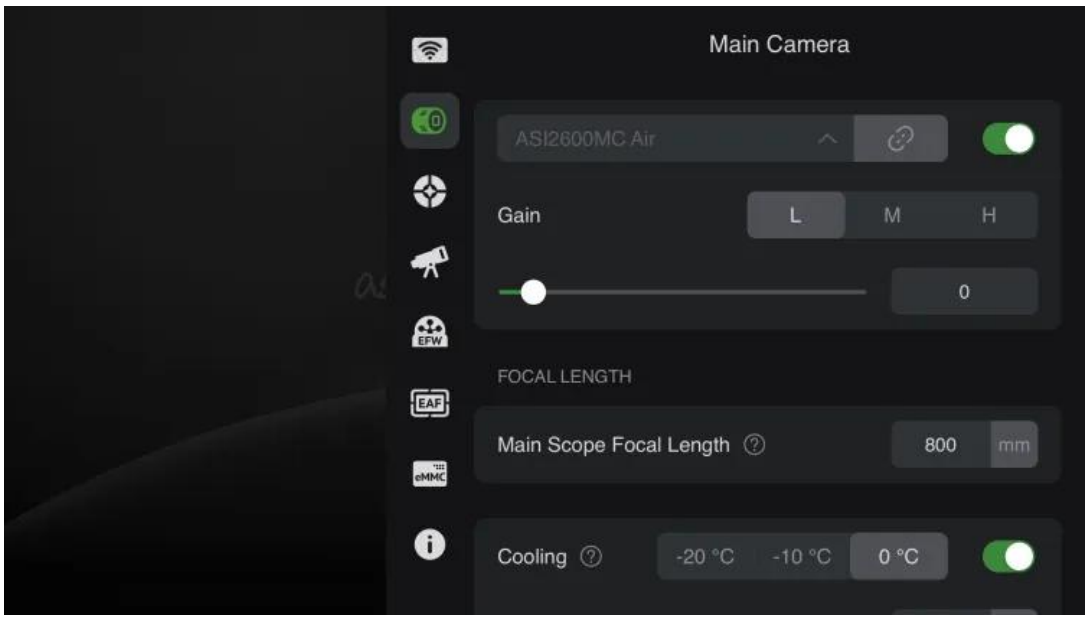
④ Left

Available tools: Histogram, Focusing, Guiding, Analysis, Crosshair, Annotation, Star Detection. Tap to enable/disable.

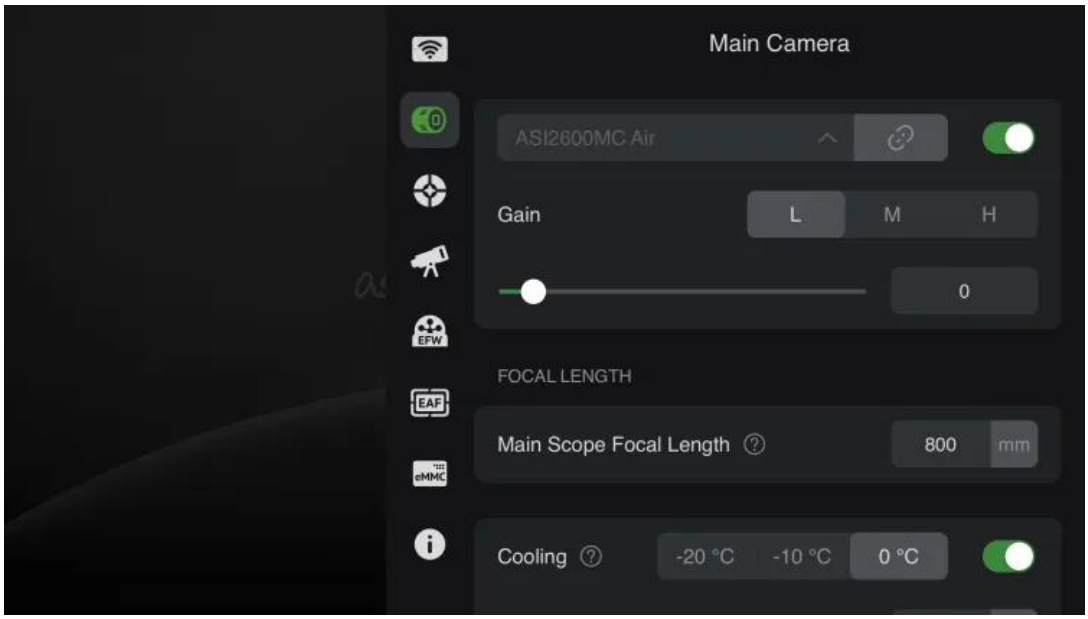
To control a ZWO ASI cooled camera as the main camera, tap the Main Camera Settings icon on the top bar.



4.Select the camera and open the drawer-style settings page.



From the first drop-down menu, select the cooled camera and toggle the slider to connect the main camera, as shown below:



Next, set the gain and enter the main telescope focal length.

Gain: The amplification factor of the camera signal. A medium gain is generally recommended. If the image is too dim or lacks detail, increase

the gain level or adjust the slider manually. Once the cooled camera is connected as the main camera, the cooling function is enabled by default, and you can set the target cooling temperature. Some models also support window heating for defogging.

File Name Configuration: Allows you to define how captured images are saved. Options include camera model, gain, temperature, and custom names.

Advanced Settings: Includes Auto White Balance, Mono Bin, Continuous Preview, Auto Cooling on camera connection, and Auto Window Heating during cooling.

5.Tap the black area on the left to return to the main page. On the right toolbar, select the first button → Preview. Then tap the round button to start exposure. After the set time and download, the captured image will appear in the center.



6.For more instructions on controlling cameras with the ASIAIR, please refer to the Guides and Manuals - Discovery Astrophotography with ZWO ASTRO 《ASIAIR User Manual》

4. Using ASIStudio for Imaging (Windows)

This section explains the main functions of ASIStudio on Windows and how to use them. Before starting, follow these steps:

1.Go to the ZWO official website: https://www.zwoastro.cn/downloads

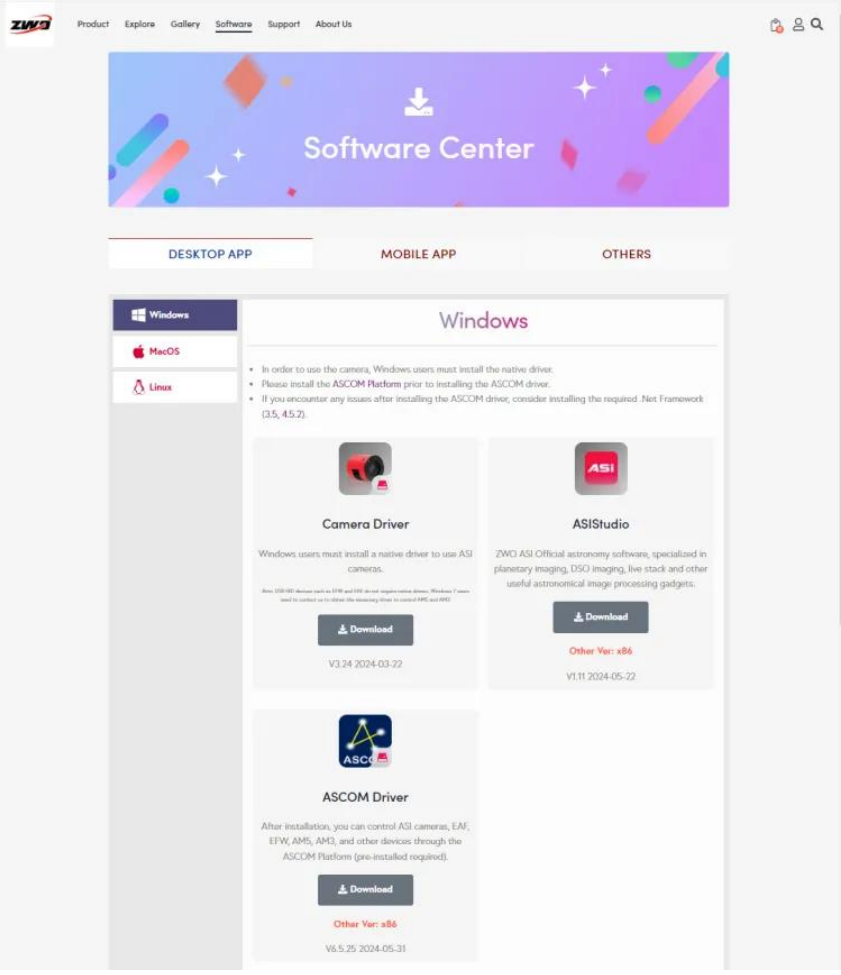
Download and install:

ASIStudio

ASI camera driver

ASCOM driver

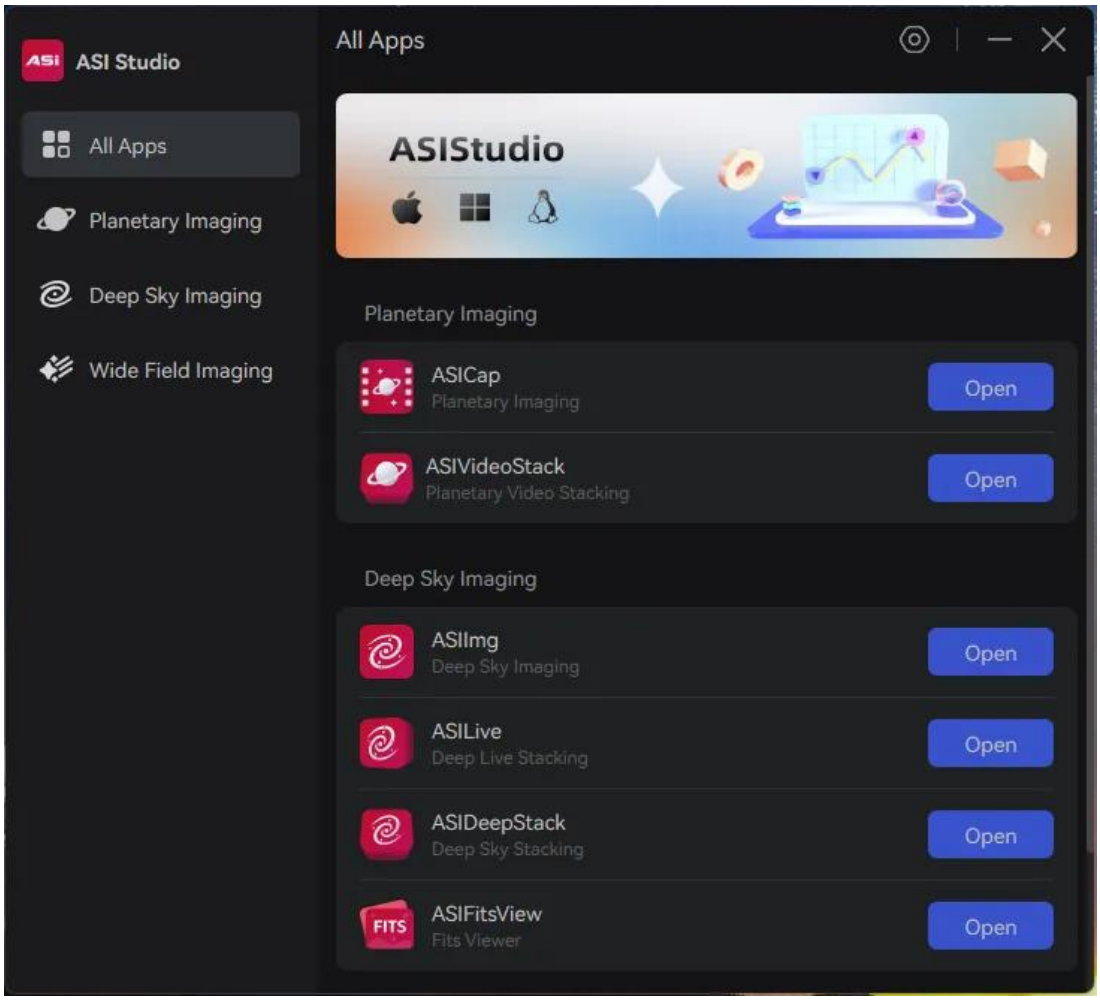
If you are using a ZWO cooled camera for the first time, or on a new computer, also install the ASCOM Platform.



2.For first-time users of ZWO cooled cameras (or on a new computer), install in this order: ASCOM Platform → ASIStudio → ASI camera driver → ASCOM driver. If installation of ASCOM Platform or ASCOM driver fails, install .NET Framework (3.5, 4.5.2) and try again.

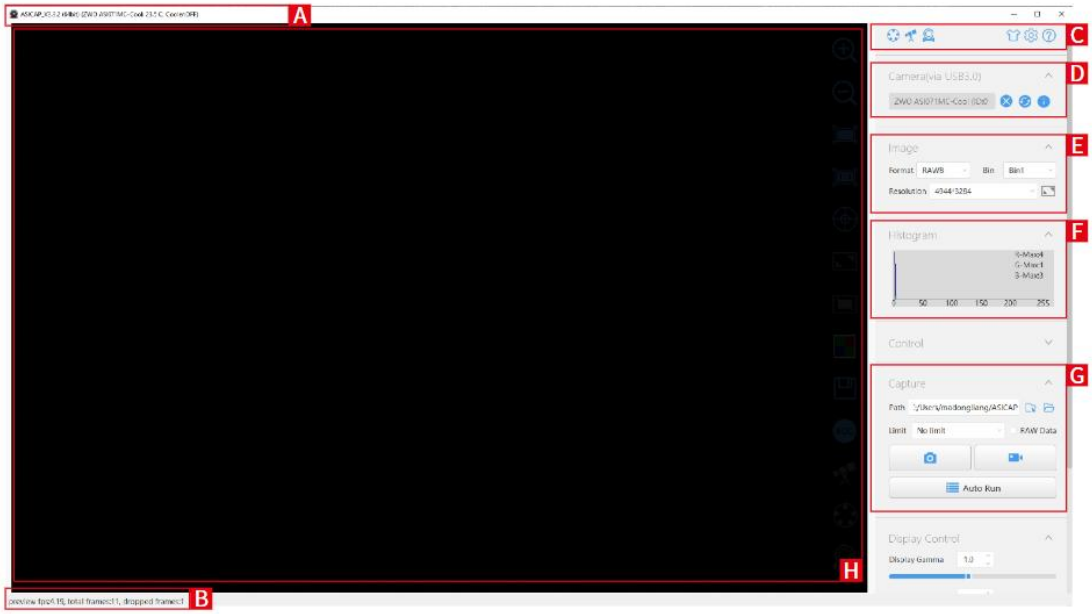
3.Power on the camera and connect it to the computer with a USB cable.

4.Launch ASIStudio and go to the ASIStudio start page.



You can use ASICap, ASIImg, and ASIMeteorCap for planetary, deep-sky, and skycape astrophotography.Here, due to space limits, we use ASIImg to demonstrate controlling a cooled deep-sky camera.

5.Open ASIImg. You will see the following interface, divided into 10 sections:





Section A: Window title – shows software name, version, camera name, and real-time status (temperature, cooling status, cooling power for cooled cameras).

Section B: Settings panel – includes EFW (optional), EAF (optional), themes, general settings, help.

Sections C, D, G: Camera control, parameter settings, image capture, histogram.

Section E: Status bar – shows imaging progress and exposure

status.

Section F: Image display area.

Section H: Vertical toolbar.

Section I: EAF quick control panel.

Section J: Full-screen button.

6.In the Camera Control area (Section C), you can see the connected camera name. Click the button next to it to turn on the camera.



7.After turning on the camera, click the button in the Image Display area (Section D). The captured image will then appear in the display area (Section F).

8.For more instructions on controlling the camera with ASIStudio, please refer to:
https://www.zwoastro.cn/support/manuals?menu=asiStudio

5. Imaging with Third-Party Software

5.1. Driver & Basic Software Installation

5.1.1. Core Drivers

Windows: Install the ASI camera driver (download from ZWO official website). After installation, verify the camera model is correctly recognized in Device Manager → Imaging Devices.

MacOS/Linux: No separate driver installation is required.

5.1.2. ASCOM Platform Support

If using ASCOM-compatible software (e.g., N.I.N.A, SGP), first install ASCOM Platform 6.6+, then install the ZWO ASCOM driver.

Ensure .NET Framework 3.5/4.5.2 is installed; otherwise, driver loading may fail.

5.2. Operating System Compatibility

Operating System	Support Status	Note
Windows 10/11	Full Support	It is recommended to disable USB power-saving mode.
Windows 7	Limited Support	
macOS 10.15+	Partial Support	Use ASIStudio or INDI driver for best performance.
Ubuntu 16.04+	Partial Support	

5.3. Third-Party Software Configuration

5.3.1. Imaging Software Settings

SharpCap: Select “ZWO ASI Camera” via Device → Camera.

NINA: Select “ASI Camera (ASCOM)” in the Devices tab.

5.3.2. SDK Development Support

C++ developers can integrate the libASICamera2 SDK (supports Windows, macOS, Linux).

5.4. Troubleshooting

5.4.1. Connection Issues

Camera not recognized: Try a different USB port/cable, or update the USB host controller driver in Device Manager.

Low transfer frame rate: Ensure USB 3.0 mode is enabled (check for “USB 3.0 Root Hub” in Device Manager).

5.4.2. Compatibility Issues

Software crashes: Check the camera firmware version and roll back to a stable version if necessary.

Image problems (color shift/striping): Try reducing the USB transfer speed limit to 50%.

5.5. Recommended Software List

Software Type	Recommended Tools	Note
Planetary Imaging	SharpCap 4.0+	
Deep-Sky Imaging	NINA 3.0+	Auto Guiding, Sequence Shooting
Guiding Control	PHD2	Recommended: Use ASCOM driver

6. Product Certifications

The product complies with the following certification requirements:

Certification	Logo
CE	
FCC	
IC	
RCM	
Rohs	
UKCA	
WEEE	

7. Warranty

1.ZWO provides users with a warranty period of 2 years for ZWO branded products. The warranty starts from the second day when the customer gets the product. For the ASIAIR PLUS product, the warranty starts from the date the device is activated by the user.

2.If a User encounters the following Dead on Arrival (DOA) and contacts ZWO within the corresponding time limit to issue the product purchase invoice and relevant evidence, ZWO will provide door-to-door pick-up service and, as appropriate, after-sale replacement (or partial replacement), repair or return (or partial return) service for the following Products:

1) Product quality problem

Provided that a user detects a quality problem and contacts ZWO within 30 days after receipt of the products, and ZWO support team confirms that the products indeed have a quality problem or defect after their inspection, ZWO will provide free replacement service for such products.

2) Product transportation problem

Provided that a user finds obvious signs of bubbling, serious overstocking, or deformation on the outer package of the products upon receipt of the products, and provides ZWO with pictures of the outer package and proof of receipt within 3 days after receipt of such products, ZWO support team will verify the actual shipper and determine the responsible party for such transportation problem. In the event that ZWO is the actual shipper, ZWO will be responsible for providing the relevant return or replacement service, however, if the products are directly sold or

transported to the user by an agent of ZWO, the agent will be responsible for providing the relevant return or replacement service.

3.If the products are under the following circumstances, they are not within the scope of warranty service, ZWO may provide maintenance services to the users:

1) The warranty period of the products has expired; or

2) The products are injected into liquid or affected by moisture or corrosion; or

3) The products are damaged by an external force (such as the broken of the camera protection window glass, the deformation of the product shell, the broken of the USB port, etc.); or

4) Disassembling, repairing by a third party, refurbishment of the products (such as downloading erroneous firmware) without the written authorization of ZWO; or

5) The product system is modified, or the maintenance notice is lost or changed; or

6) Product quality problem caused by installation not following the requirements or instructions for the products; or

7) Physical damage or failure of the products caused by the force majeure (such as strong vibration or extrusion such as flood, fire, earthquake, or thunder stroke); or

8) Damage caused by the improper customer operation during the period of shooting or use, such as using without the equipment protection or direct shooting of the sun; or

9) No valid purchase invoice or warranty certificate; or

10) The products are second-hand products.

8. Servicing

For software upgrades, please refer to “Guide & Manuals” on our official website.

https://www.zwoastro.com/guides-and-manuals/

For repairs and consultation, you can visit here:

https://support.astronomy-imaging-camera.com/

Email: info@zwoptical.com

Phone: 0512-65923102

1.For the normal repair or replacement of the products during the warranty period, the user will bear the return cost. When returning the products, users shall specify the actual reasons for the damage to the products, and shall provide the corresponding valid certificates, such as pictures or videos, etc.

For the products that need to be replaced after being confirmed by ZWO in writing, the user shall return the products with the complete package, together with all accessories, manuals, etc., to the address designated by ZWO.

By sending back the product to ZWO, the user agrees to pay out-of-warranty fees that may arise during the repair process of the product. ZWO will send back the product after charging.

2.For the products that need to be returned for after-sales service, ZWO will provide the corresponding RMA code for reference. ZWO will not accept any products that have no RMA code and have been returned privately without ZWO's written confirmation.

If a user purchases the ZWO products from a ZWO agent, the user may contact the ZWO agent directly for the relevant after-sales service.