

ASI2400 Manual

Version 1.2

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Please download the latest version from our Official website.

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1. Instruction

Congratulations and thank you for buying one of our ASI Cameras！ This manual will give you a brief introduction to your ASI camera. Please take the time to read it thoroughly and if you have any other questions, please feel free to contact us at info@zwoptical.com.

Welcome to join ZWO FB and User Forum below!
Facebook : https://www.facebook.com/ZwoDesignAstronomyCameras
User Forum: https://bbs.astronomy-imaging-camera.com/

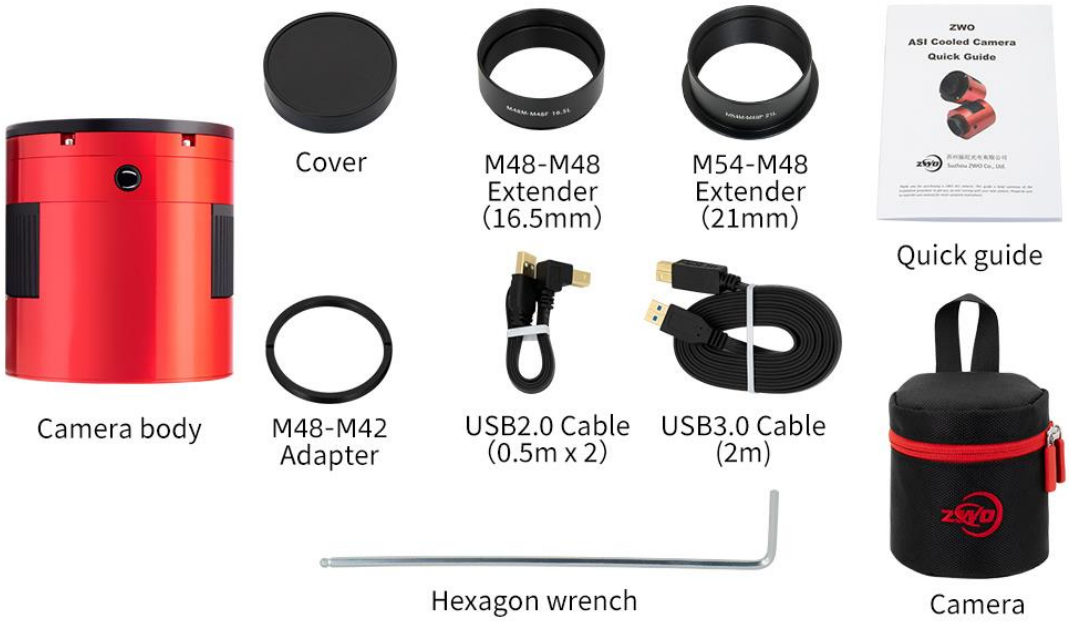
ASI2400 Camera is specifically designed for astronomical photography. It is not only suitable for DSO imaging but also for Planetary imaging. You will be impressed by its superior performance and wide use!

Model	Mono/Color	（TEC）Cooling	DDR3 Buffer	Sensor
ASI2400MC Pro	**Color**	Two Stage	256MB(2Gb)	SONY IMX410

For software installation instructions and other technical information, please refer to our official website https://astronomy-imaging-camera.com/

2. What's in the box?

ASI2400MC Pro

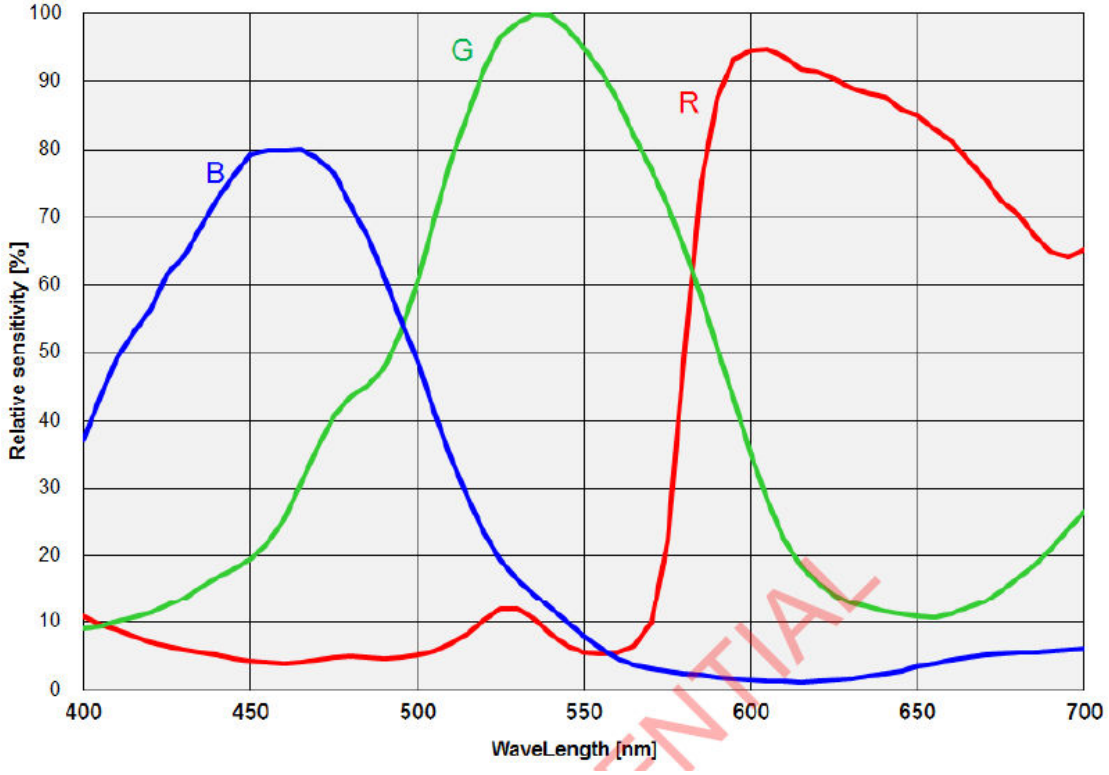


3. Camera technical specifications

Sensor	SONY IMX410 CMOS
Diagonal	43.3mm
Resolution	2400 Mega Pixels 6072*4042
Pixel Size	5.94μm
Image area	36mm*24mm
Max FPS at full resolution	8FPS
Shutter	Rolling shutter
Exposure Range	32μs-2000s
Read Noise	1.1-6.4e
QE peak	Above 80%
Full well	100000e
Unity Gain	158
ADC	14bit
DDR3 buffer	256MB(2Gb)
Interface	USB3.0/USB2.0
Adapters	M54*0.75
Protect window	IR CUT
Dimensions	90mm
Weight	0.7kg
Back Focus Distance	17.5mm
Cooling:	Regulated Two Stage TEC
Delta T	35°C (based on 30°C ambient temperature)
Cooling Power consumption	12V at 3A Max
Working Temperature	-5°C~50°C
Working Relative Humidity	0~80%
Supported OS	Windows, Linux & Mac OSX

4. QE Graph & Read Noise

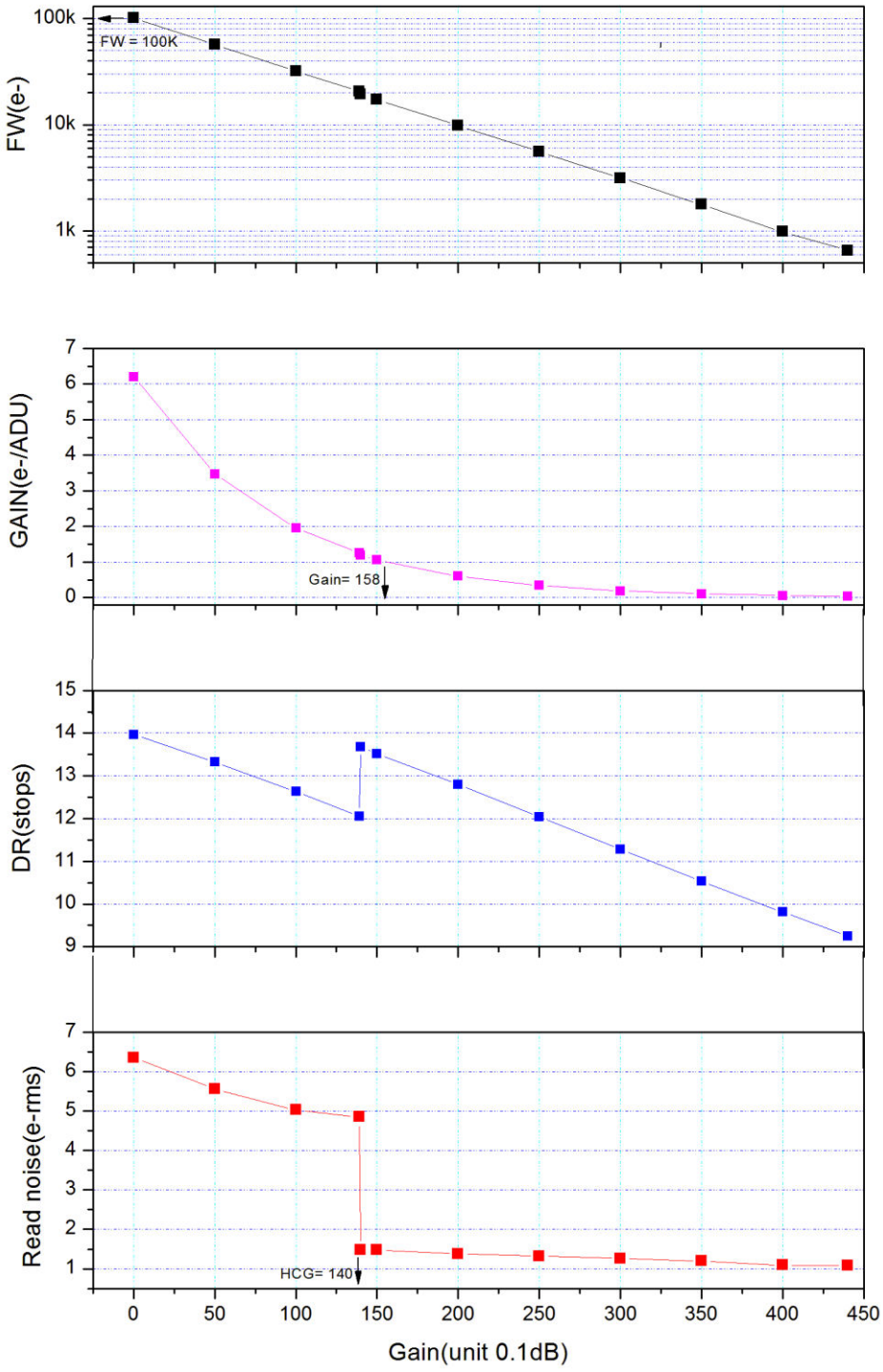
QE and Read noise are the most important parts to measure the performance of a camera.
Higher QE and Lower read noise are needed to improve the SNR of an image.
For the 2400 Sensor, the peak value for QE is above 80%.



Read noise includes pixel diode noise, circuit noise and ADC quantization error noise. The lower the better.
As you can see, the Read Noise of the ASI2400 camera is extremely low when compared with traditional CCD cameras. In addition, it is with Built-in HCG mode, which can effectively reduce read noise at high gain and keep the same wide dynamic range for this camera as at low gain. When the gain is 140, the HCG mode will be automatically turned on. Additionally, the read noise is as low as 1.1e while the dynamic range can still be close to 14bit.

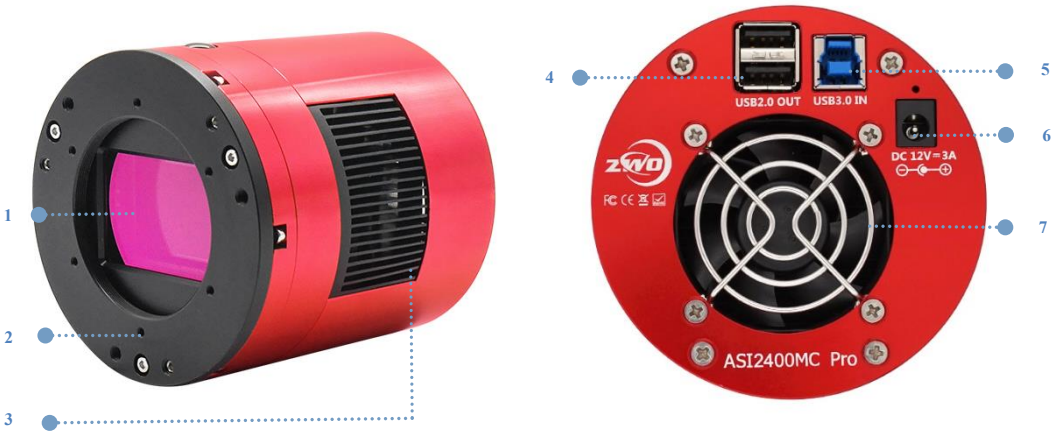
Depending on your target, you can set the gain lower for higher dynamic range (longer exposure) or set the gain higher for lower noise (such as short exposure or lucky imaging).

Read noise, full well, gain and dynamic range for ASI2400MC-Pro



5. Getting to know your camera

5.1 External View



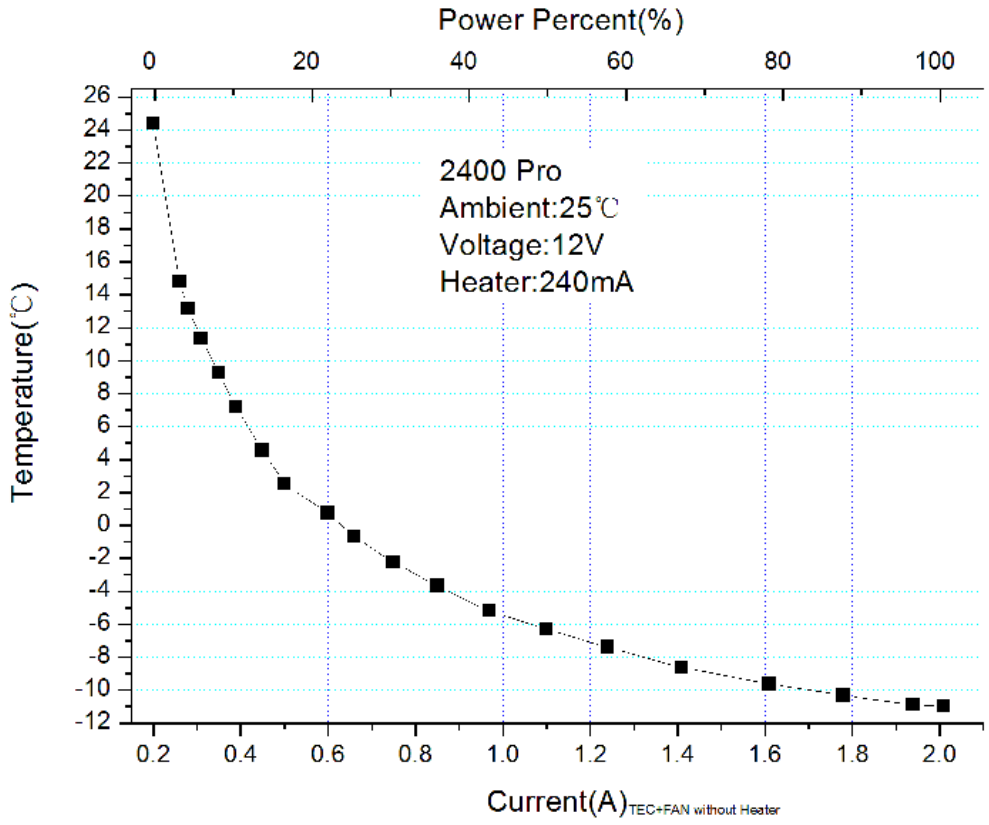
1. Protective Window, IR CUT, D60*2mm
2. Tilt adjustment ring, M54*0.75 thread, thickness 5mm, can be removed
3. Radiator
4. USB2.0 Hub
5. USB3.0/USB2.0 Interface
6. Cooling power supply DC power port: size 5.5 * 2.1mm, positive inside and negative outside, 12V@3A power is recommended.
7. Ultra-quiet magnetic levitation fan, will rotate only when the cooling is on.



The camera can be placed on a holder ring for Cooled cameras with a 1/4” thread under the ring.

5.2 Power consumption

ASI2400 camera is with low power consumption, max at 4.47W. USB3.0 cable is recommended for power supply.
Recommended power supply for cooling: 12V @ 3A DC adapter (5.5*2.1mm, center pole positive).
Also suitable: lithium battery with 11-15V.
Here is the ASI2400 cooling efficiency graph.



5.3 DDR Buffer

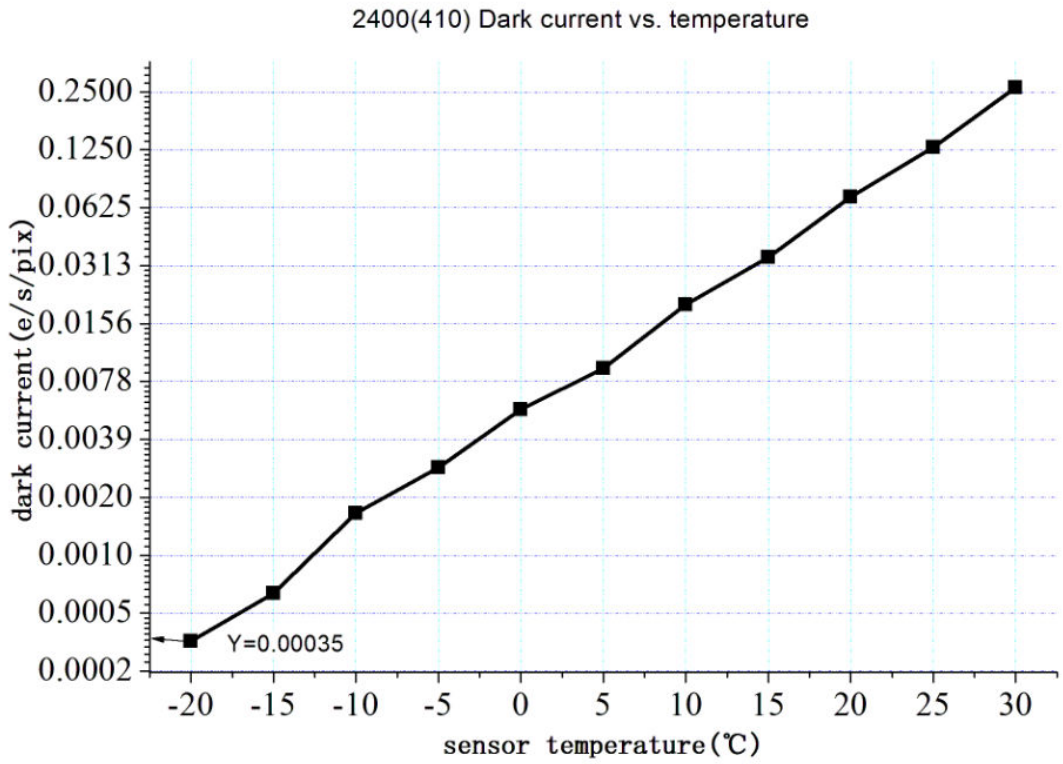
The ASI2400 Pro camera includes a 256MB(2Gb) DDR3 memory buffer to ensure the stability of data transmission. Additionally, the use of a memory buffer minimizes amp-glow, which is caused by the slow transfer speeds.

5.4 Cooling System

The Cooling system of ASI2400 camera can precisely control the sensor temperature. Unlike traditional CCD, the ASI2400 camera has ultra-low readout noise, efficient cooling, and adjustable

gain. There is no need to use ultra-long exposures to shoot targets, which significantly reduces the requirements for the photography system as well as the guide system. However, if you use short exposures (for example, less than 100ms), the effect of cooling on the image will be little.
Based on the testing result at 30℃ ambient temperature, the Delta T of can be 35℃. Please note that the Delta T might get down when the cooling system is working for long time. Also, as the ambient temperature falls, the Delta T would also decrease.

Here's the dark current curve of ASI2400 sensor between -20 ℃ and 30 ℃.

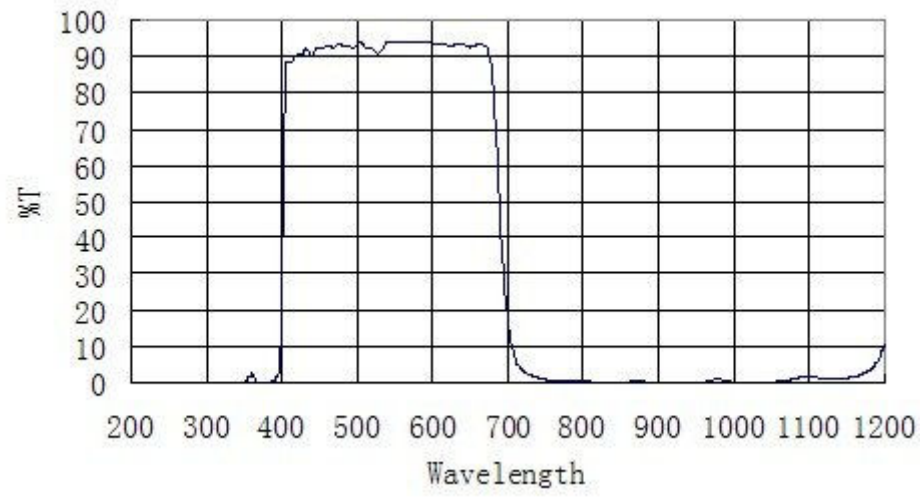


5.5 Focus Distance

The female flange to the sensor is 17.5mm. You can reach 55mm back focus distance with the 21mm and 16.5mm extender included in the camera package.

5.6 Protective Window

There is a protective window-IR CUT filter in front of the ASI2400 camera sensor, with 60mm diameter and 2mm thickness.



5.7 Analog to Digital Converter (ADC)

The ASI2400 camera has a built-in 14bit ADC. 12bit ADC mode for output will be used when we do hardware Bin. This camera also supports custom ROI partial readout mode, with faster frame rate at small ROI resolutions.

Please see below attached different frame rates under different resolutions on USB3.0 and USB2.0 of ASI2400 in 14bit mode.

Resolution	14Bit ADC	
	USB 2.0	USB 3.0
6072×4042	0.88fps	8.01fps
4096×3072	1.72fps	13.67fps
4096×2160	2.45fps	19.25fps
3840×2160	2.61fps	19.25fps
1920×1080	10.43fps	37.27fps
1280×720	23.48fps	54.17fps
640×480	70.43fps	77.64fps
320×240	136.98fps	136.98fps

5.8 Binning

The ASI2400 camera supports bin2, bin3, bin4 software Binning mode and hardware bin2, bin3, the best advantage of hardware binning is the faster frame rates. If you don't care about speed, we suggest you use software binning.

5.9 Tilt Adjustment

There are 3 sets of screws that can be used to tilt the sensor, to make it same with the primary mirror of Newtonian, two screws per set for screw in /out.



You can refer to below:

1. Take a starred image with the camera, you will easily find out the tilt part in the image through the software, and then adjust one or more sets of flange adjustment screws on the camera corresponding to the image.

2. Take another image after the sensor tilt adjustment, compare the new image with the previous one in the software. If the tilt issue is reduced, that means the adjustment is correct. Otherwise, the adjustment is wrong.

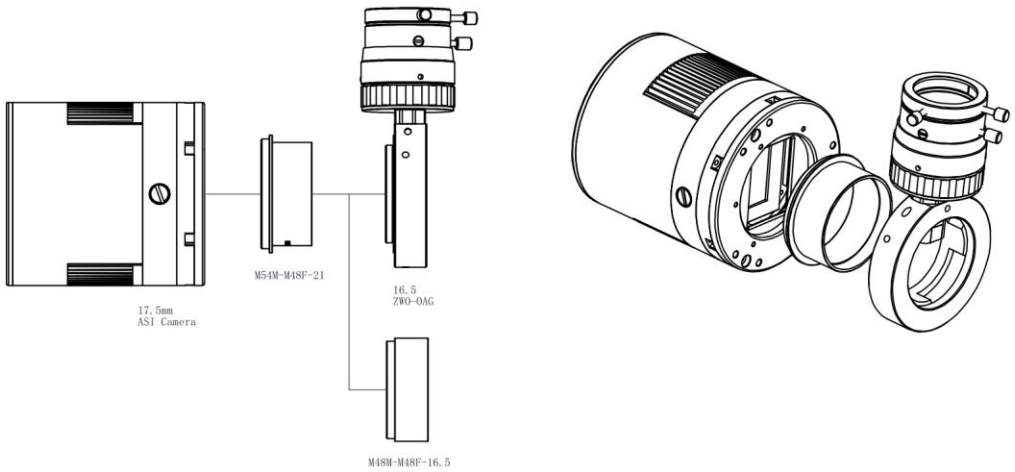
3. Repeat step 2 until the stars in all corners are perfect.

6. How to use your camera

Using an adapter, the ASI2400 camera can be connected to a telescope, or a camera lens. Most of the adapters are already included in the package, and the rest can be purchased directly from our official website below.
https://astronomy-imaging-camera.com/

6.1 OSC Cameras Connection Diagram:

1) Connecting with filter drawer

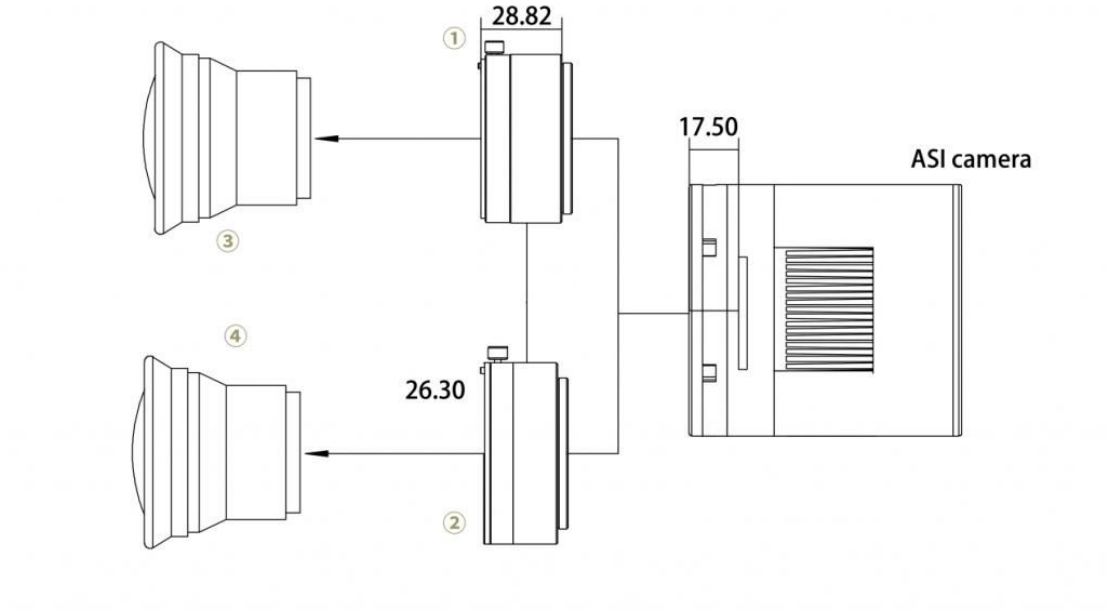


2) Connecting only by adapters



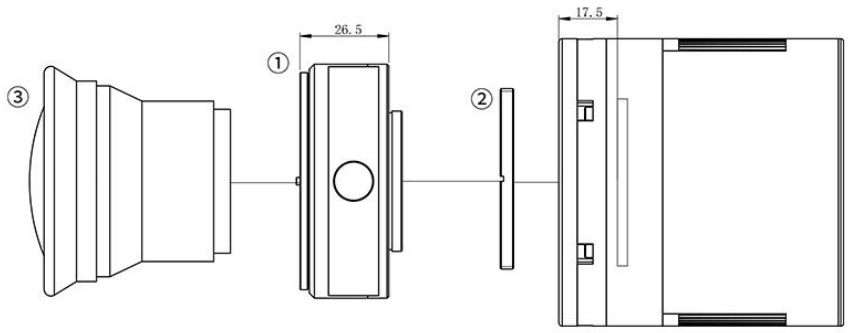
6.2 Nikon/Canon Lens Connection Diagram:

1) Connecting without filters



1. Nikon-M54 adapter
2. EOS-M54 adapter
3. Nikon lens
4. EOS lens

2）Connecting with filters (This solution only works for EOS lens)



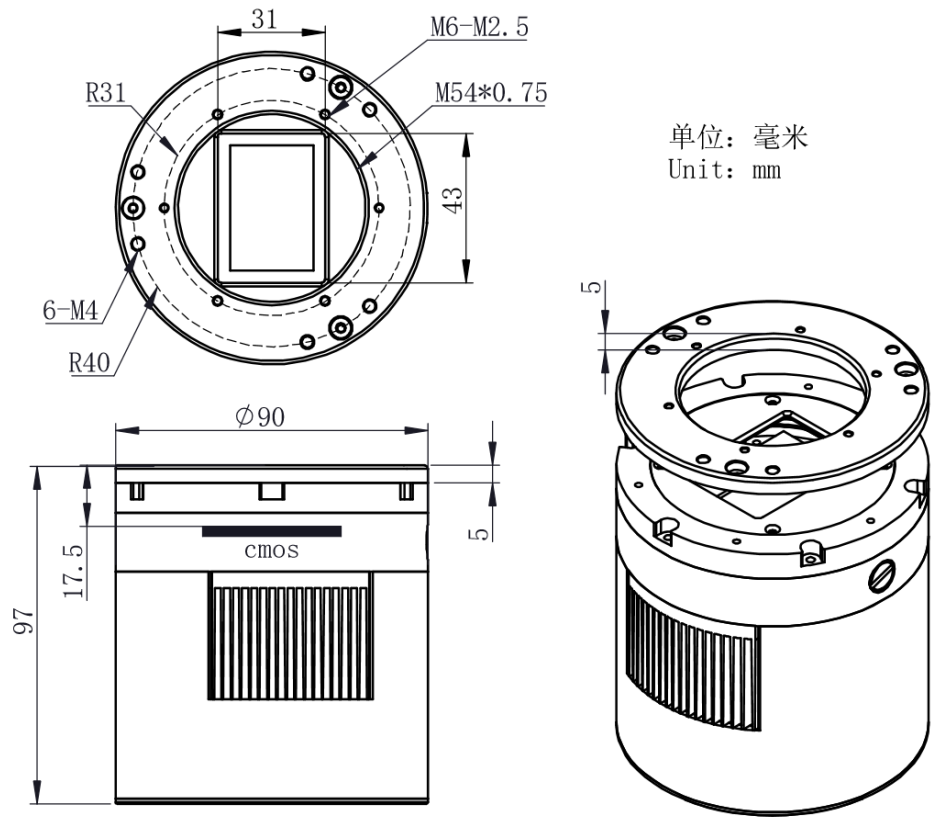
1. New filter Drawer for EOS lens
2. M54-M42 adapter
3. EOS lens

6.3 External Device Connection Diagram



7. Mechanical drawing

ASI2400MC Pro



8. Servicing

For software upgrades, please refer to “Support-manual and software” on our official website.
https://astronomy-imaging-camera.com/
Repairs and servicing are available by emailing info@zwoptical.com
For customers who bought the camera from your local dealer, dealer is responsible for the customer service.

9. Warranty

We provide 2-year warranty for our products. We offer repair service or replacement for free if the camera doesn’t work within warranty period.
After the warranty period, we continue to provide repair support and service on a charged basis.
This warranty does not apply to damage that occurred as a result of abuse or misuse, or caused by a fall or any other transportation failures after purchase.
Customer must pay for shipping when shipping the camera back for repair or replacement.