



ASI290 Manual

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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 read it thoroughly. If you have any other questions, please feel free to contact us. info@zwoptical.com

ASI290 Cameras are designed for astronomical photography.
Its excellent performance and multifunctional usage will impress you a lot!

For software installation instructions and other technical information please refer to “Support” on our official website.
<https://astronomy-imaging-camera.com/>

2. Camera Models and Sensor Type

There are 4 types of ASI290 models:

Model	Mono or Color	Regulated TEC Cooling	Sensor
ASI290MM	Mono	No	IMX290LQR
ASI290MC	Color	No	IMX291LQR
ASI290MM-COOL	Mono	Yes	IMX290LQR
ASI290MC-COOL	Color	Yes	IMX291LQR

Which camera to choose:

Monochrome camera sensors are capable of higher details and sensitivity than color sensors, but you need additional accessories such as filter wheel and filters. The post-processing is more complicated too. So color camera is often recommended for beginner of astrophotographer.

TEC cooling will help to reduce dark current noise for long exposures. For short exposures, such as under one second, the dark current noise is very low. However, cooling is recommended for DSO imaging when long exposures are required.

3. What's in the box?

ASI290MM or ASI290MC



ST4 cable



Camera body



quick guide



USB3.0 cable



1.25" cover



1.25" nose piece

ASI290MM-COOL or ASI290MC-COOL



camera bag



camera body



USB3.0 cable



quick guide



0.5m USB 2.0 cable × 2



1.25" nose piece



1.25" cover

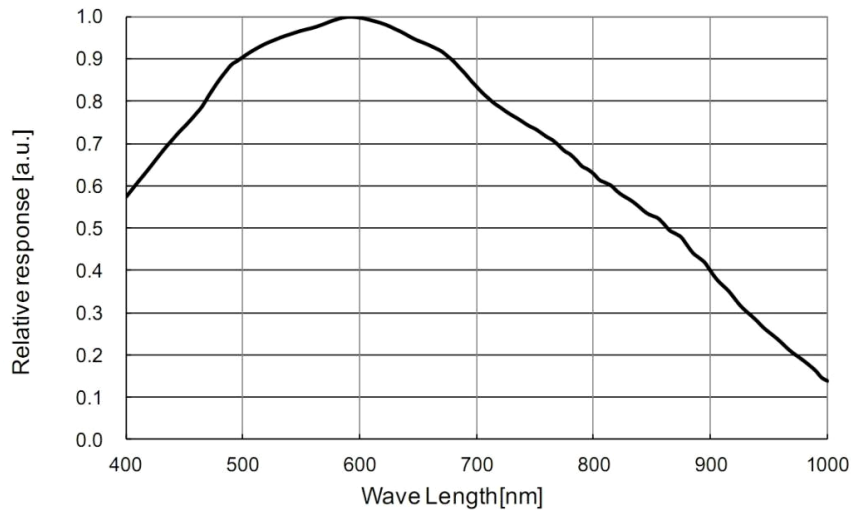
4. Camera technical specifications

Sensor	1 / 2.8" CMOS
Diagonal	6.5mm
Resolution	2.1Mega Pixels 1936×1096
Pixel Size	2.9μm
Image area	5.6mm*3.2mm
Max FPS at full resolution	170FPS
Shutter	Rolling shutter
Exposure Range	32μs-2000s
Read Noise	1.0~3.2e
QE peak	TBD
Full well	14.6k e
ADC	12 bit
Interface	USB3.0/USB2.0
Adapters	2" / 1.25" / M42X0.75
Protect window	AR window
Dimensions	Uncooled 62mm/Cooled 78mm
Weight	Uncooled 120g/Cooled 410g
Back Focus Distance	Uncooled 12.5mm/Cooled 17.5mm
Cooling:	Regulated Two Stage TEC
Delta T	35°C-40°C below ambient
Cooling Power consumption	12V at 2A Max
Supported OS	Windows, Linux & Mac OSX
Working Temperature	-5°C—45°C
Storage Temperature	-20°C—60°C
Working Relative Humidity	20%—80%
Storage Relative Humidity	20%—95%

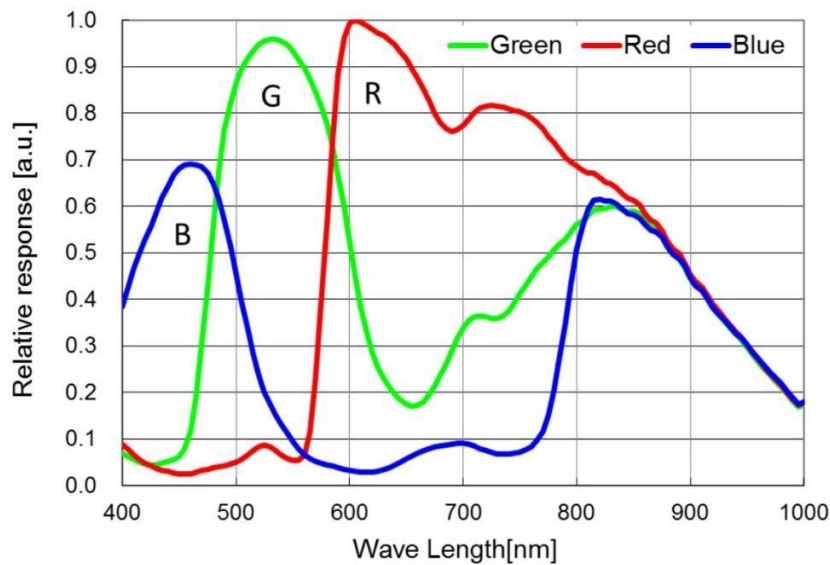
5. QE Graph & Read Noise

QE and Read Noise are the most important parameters to measure the performance of a camera. Higher QE and lower Read Noise are needed to improve the SNR of an image.

Mono 290 sensor Relative QE Curve



Color 290 sensor Relative QE Curve

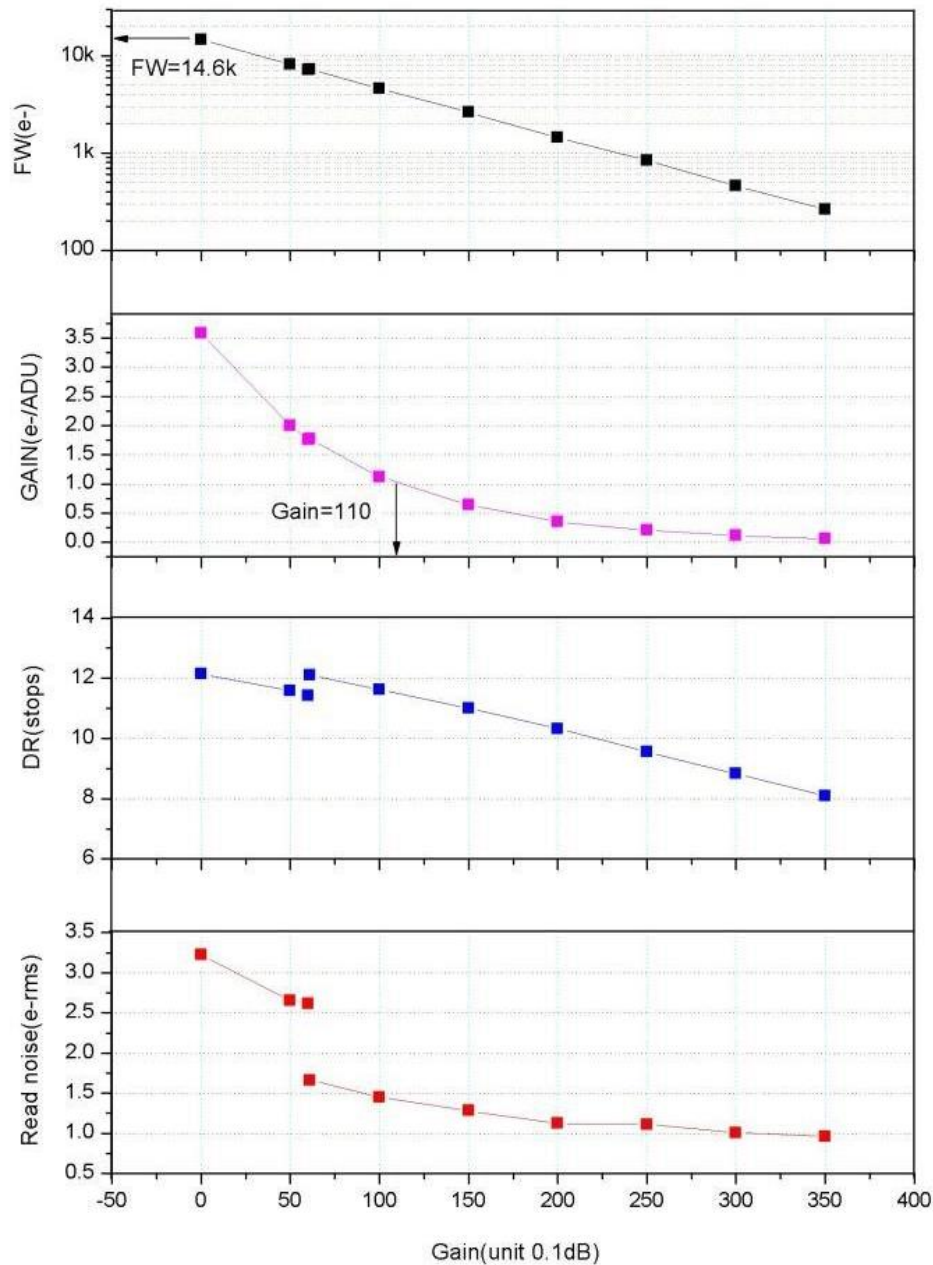


Read Noise includes pixel diode noise, circuit noise and ADC quantization error noise, and the lower the better.

The Read Noise of the ASI290 cameras is extremely lower when compared with traditional CCD cameras. It is even lower when the camera is set at a higher Gain.

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 ASI290



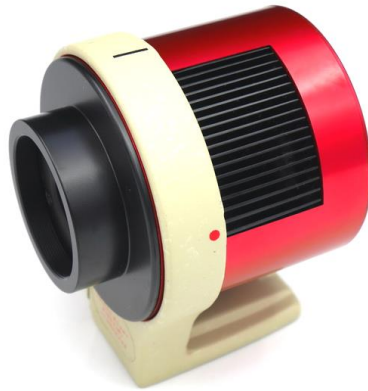
6. Getting to know your camera

6.1 External View



*The first generation of cooled camera we used a ST4 port instead of USB2.0 hub

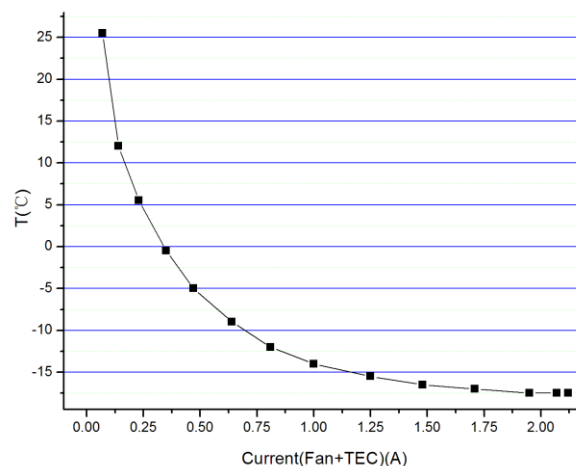
You can order the [holder ring](#) from us or our dealer to mount the cooled camera to tripod. There is 1/4" screw under the holder



6.2 Power consumption:

ASI cameras are designed to have very low power consumption which is around 160ma@5V. You only need the USB cable to power up the camera. However, you will need a separate power supply to activate the cooler. We recommend 12V at 3A or more AC-DC adapter for cooler power supply (2.1mm*5.5mm, center positive). You may also use a battery supply from 9V to 15V to power the cooler.

Here is a test result of the cooler power consumption of our cooled camera. It only needs 0.5A to cool the camera to 30 degree below ambient.



6.3 Cooling system

The cooled ASI290 cameras have a robust, regulated cooling system, which means that the camera sensor can be kept at the desired temperature throughout your imaging session. The super low readout noise, combined with efficient cooling and adjustable gain setting, allows you to do short

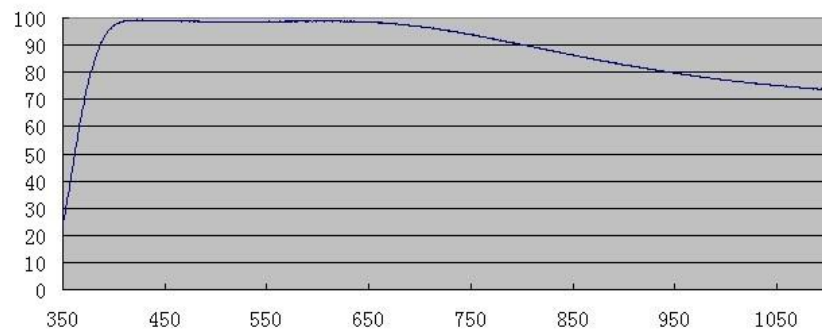
exposure or lucky DSO imaging, unlike the traditional CCD cameras which need very long exposures for each frame. However, keep in mind that cooling won't help with very short exposures such as less than 100ms. The lowest temperature that can be set is -30°C.

6.4 Protect Window

There is a protect window before the sensor of ASI290 camera.

Our ASI290MM and ASI290MC comes with the D21 AR window, thickness is 1.1 mm.

While ASI290MM-COOL and ASI290MC-COOL has the D25 AR window, thickness is 3 mm.



6.5 Analog to Digital Converter (ADC)

The ASI290 camera records in 12bit ADC and 10bit ADC. You can image at a faster fps rate if you choose to use 10bit ADC (high speed mode). This camera also supports ROI (region of interest) shooting, and this smaller ROI has faster fps.

Here is the maximum speed of ASI290 running at 10bit ADC and 12bit ADC.

Resolution	USB3.0	
	10Bit ADC	12Bit ADC
1936×1096	82.2 FPS	170 FPS
1280×960	93.6 FPS	193.9 FPS
640×480	184 FPS	381.2 FPS
320×240	355.9 FPS	737.5 FPS
2X2Bin 968×548	82.2 FPS	170 FPS

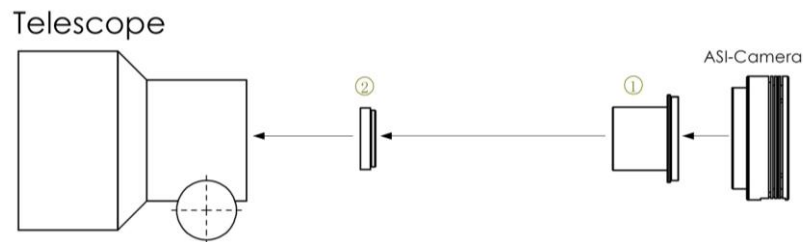
6.6 Binning

The ASI290 camera supports software bin2 mode. You should use 10bit ADC. We recommend customer to use software binning if you don't care speed.

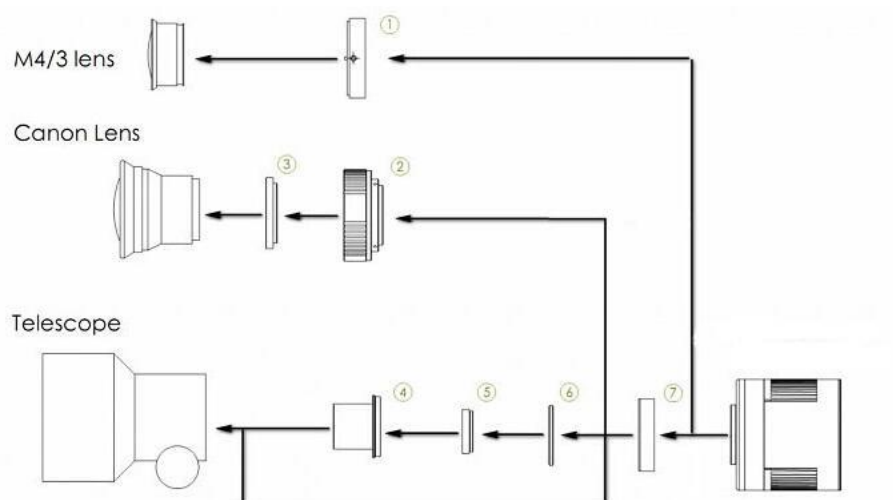
7. How to use your camera

There are many adapters available for this camera for connecting to your scope or lens. Some are included with the camera and others you can order from our site:

Color camera connecting drawing:

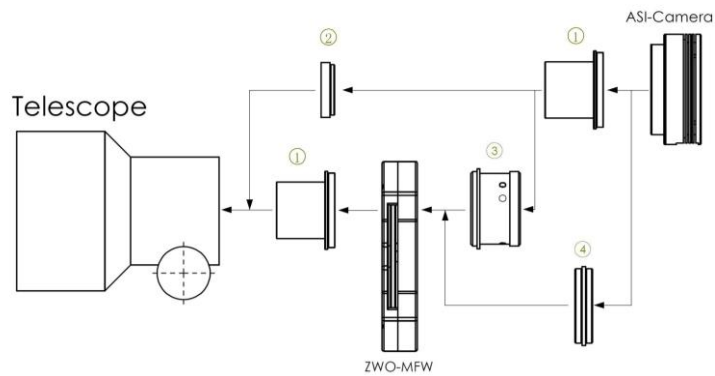


1. 1.25" T-Mount
2. 1.25" filter(optional)

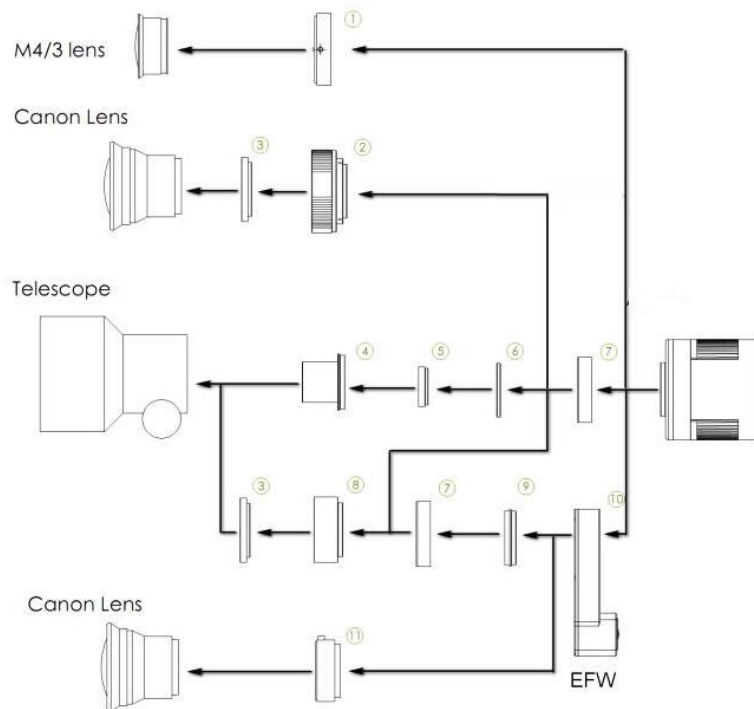


1. M43-T2 adapter
2. EOS-T2 adapter
3. 2" Filter (optional)
4. 1.25" T-Mount
5. 1.25" Filter (optional)
6. M42-1.25" Filter (optional)
7. T2 extender 11mm

Mono camera connecting drawing:



1. 1.25" T-Mount
2. 1.25" filter(optional)
3. M42-1.25" adapter
4. M42-M42 (Male screw thread)



1. M43-T2 adapter
2. EOS-T2 adapter
3. 2" Filter (optional)
4. 1.25" T-Mount
5. 1.25" Filter (optional)
6. M42-1.25" Filter (optional)
7. T2 extender 11mm
8. M42-M48 extender 16.5mm
9. T2-T2 adapter
10. EFW mini
11. EOS adapter for EFW

Planetary/Guide Cameras
External Device Connecting Drawing

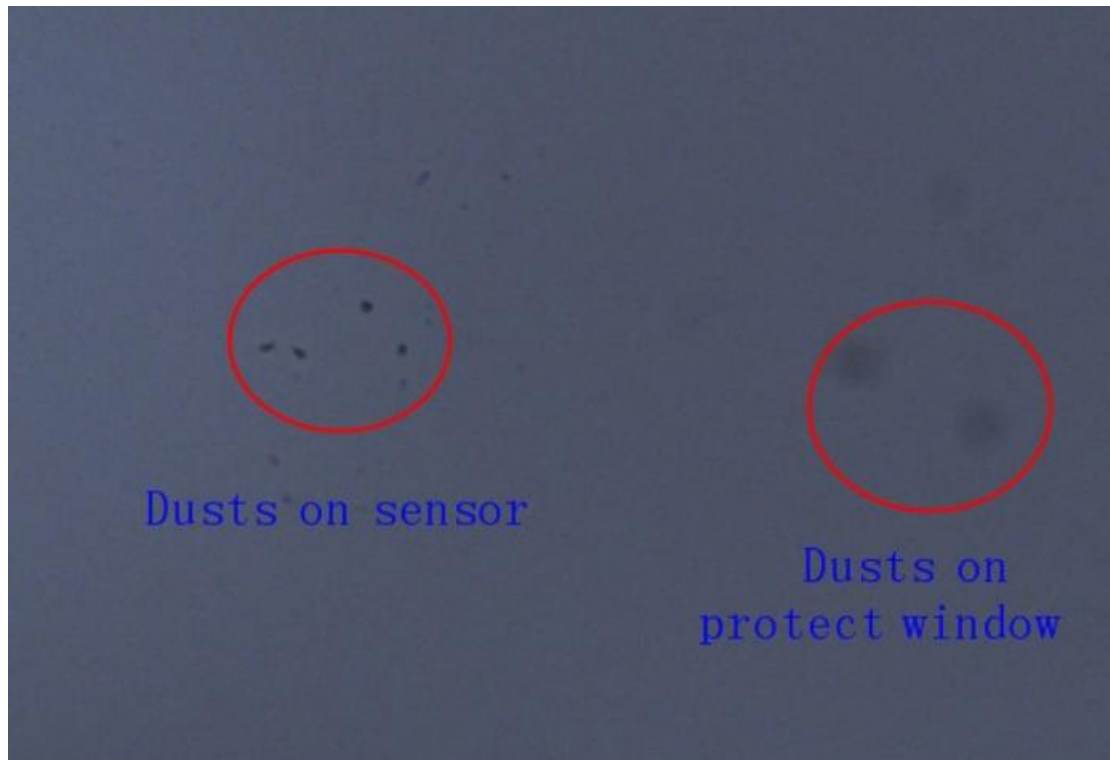


Cooled Cameras
External Device Connecting Drawing



8. Clean the camera and redry desiccant

The camera comes with an AR protect window, which can protect the sensor from dust and humidity. Should you need to clean the sensor, it's better to do so during the daytime. To see the dust, you just need to setup your telescope and point it to a bright place. A Barlow is required to see these dusts clear. Then attach the camera and adjust the exposure to make sure not over exposed. You can see an image like below if it's dirty.



The big dim spot on the image (at right) are the shadows of dust on the protect window.

The very small but very dark spot in the image (at left) are the shadows of the dusts on the sensor.

The suggested way to clean them is try to blow them away with a manual air pump. To clean the dust on the sensor you will need to open the camera chamber.

We have a very detailed instruction on our website:

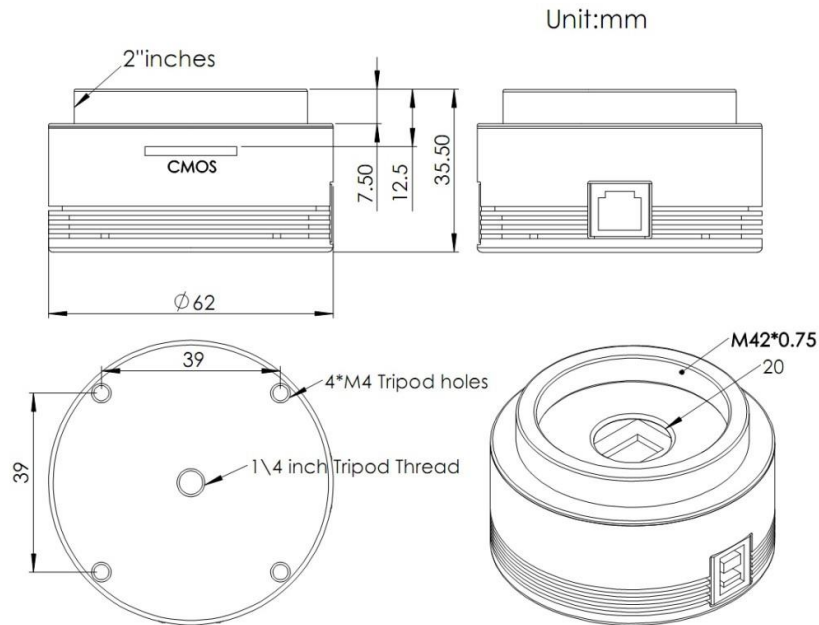
<https://astronomy-imaging-camera.com/manuals/>

Quickguide

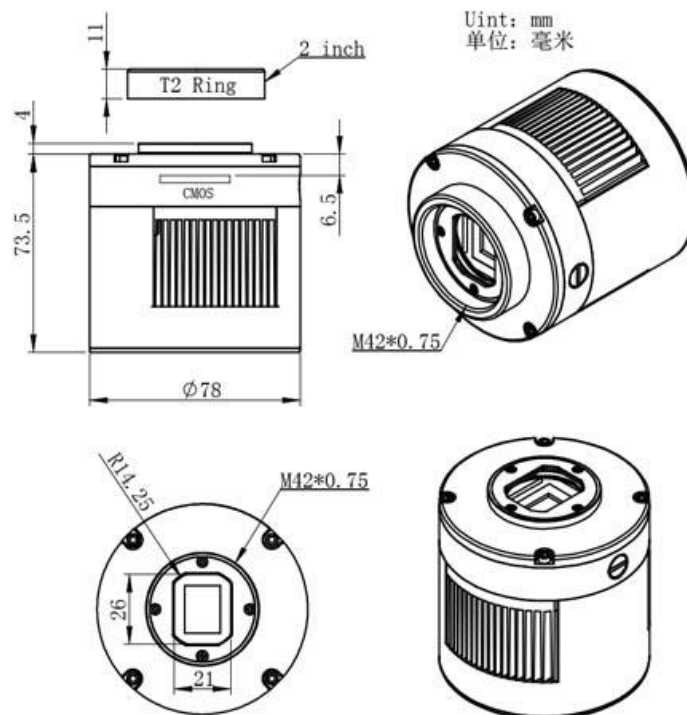
- [ZWO ASI Camera Quick Guide](#)
- [ZWO ASI Cooled Camera Quick Guide](#)
- [How to clean ASI camera and redry the desiccant](#)

9. Mechanical drawing

ASI290MM/ASI290MC



ASI290MM-COOL/ASI290MC-COOL



10. 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.

11. 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.