DSO Camera ASI294MC 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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1 Product Introduction



The ASI294MC Pro is the first camera in the world equipped with the latest Sony sensor IMX294CJK. This is one of the top-selling cameras from ZWO. Looking at the specifications and comparing it to the relatively low price, it is easy to see why. Some of the highlights include:

· **back-illuminated** sensor – improving sensitivity and reducing noise
· **4/3" format with 4.63 μm pixel size** – ideal for many types of telescopes
· **14-bit ADC**– giving high dynamic range of 13 stops
· An impressive **7ke**- full well capacity- helping to reduce the issue of, for example, saturated stars.
On top of this, it also has a very high QE-value with a peak of over **75%**. If you are looking for a small-format OSC camera for astrophotography, you can't go wrong with the ASI294MC Pro.

HCG Mode

HCG (high conversion gain) mode, which reduces read noise to even lower levels at higher gain without loss to dynamic range, is automatically enabled when the gain setting is 120 or higher. Read noise will drop under 2e-,while dynamic range will remain at 13 stops.



Full well capacity

The ASI294MC provides a great full well capacity of 63700e-, which is 3 times higher than the capacity of the highly regarded ASI1600. Even bright stars won't saturate under long exposures. This also means that this camera can achieve higher SNR (signal to noise ratio) with just one single exposure.

USB 3.0 Port & USB2.0 HUB

USB 3.0 Port: Provide 5Gb bandwidth to make it possible for ASI294 Pro to run at 16 fps (14bit, normal mode) or 19 fps (12bit, high speed mode) at full resolution(11.7Mega).
USB 2.0 HUB: can connect with various accessories, such as filter wheel, guide camera and electronic focuser, so you can better manage your cables. The ASI294 Pro includes two short 0.5m USB 2.0 cables. The integrated USB 2.0 hub is powered by the external power source if you connect one.



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. If the voltage exceeds this range, the camera will activate its automatic protection mechanism.

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℃ ~ 50℃
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.

3 Getting to Know Your Camera

3.1 External View



1. Heat sink
2. M42 11mm ring: Can be screwed off if needed.
3. AR protective window (D32 x 2mm)
4. USB 2.0 Hub
5. USB 3.0/USB 2.0 data transmission port
6. LED indicator
7. DC power port: D5.5 x 2.1mm, center pole positive. 12V@3A power supply is recommended to use.
8. Ultra-quiet magnetic levitation fan: Only runs when cooling is turned on.

The camera can be supported by the ZWO holder ring. There is a 1/4” screw interface at the base of the ring.



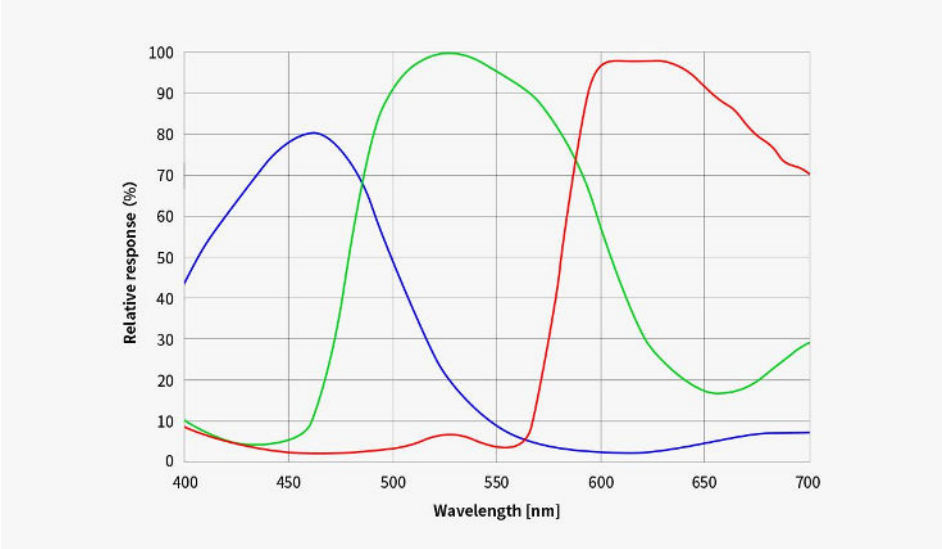
3.2 Camera Specifications

Sensor	SONY IMX294
Sensor format	4/3″
Diagonal	23.2mm
Resolution	11.7MP 4144 x 2822
Pixel size	4.63μm
Sensor size	19.2mm x 13mm
Max frame rate	19fps
Shutter	Rolling shutter
Exp range	32μs-2000s
Read noise	1.2e
QE peak	About 75%
Full well capacity	63.7k e
ADC	14 bit
DDR3 buffer	256MB
USB port	USB 3.0/USB 2.0
Connection adapter	2″ / 1.25″ / M42 x 0.75
Protective window	AR
Camera diagonal	78mm
Net weight	410g
Back focus distance	6.5mm
Cooling	2-stage TEC cooling
Delta-T	30°~35°@ environmental temperature 30°C
Power consumption (Cooling on)	12V, Max current 3A
Supported OS	Windows, Linux & Mac OSX

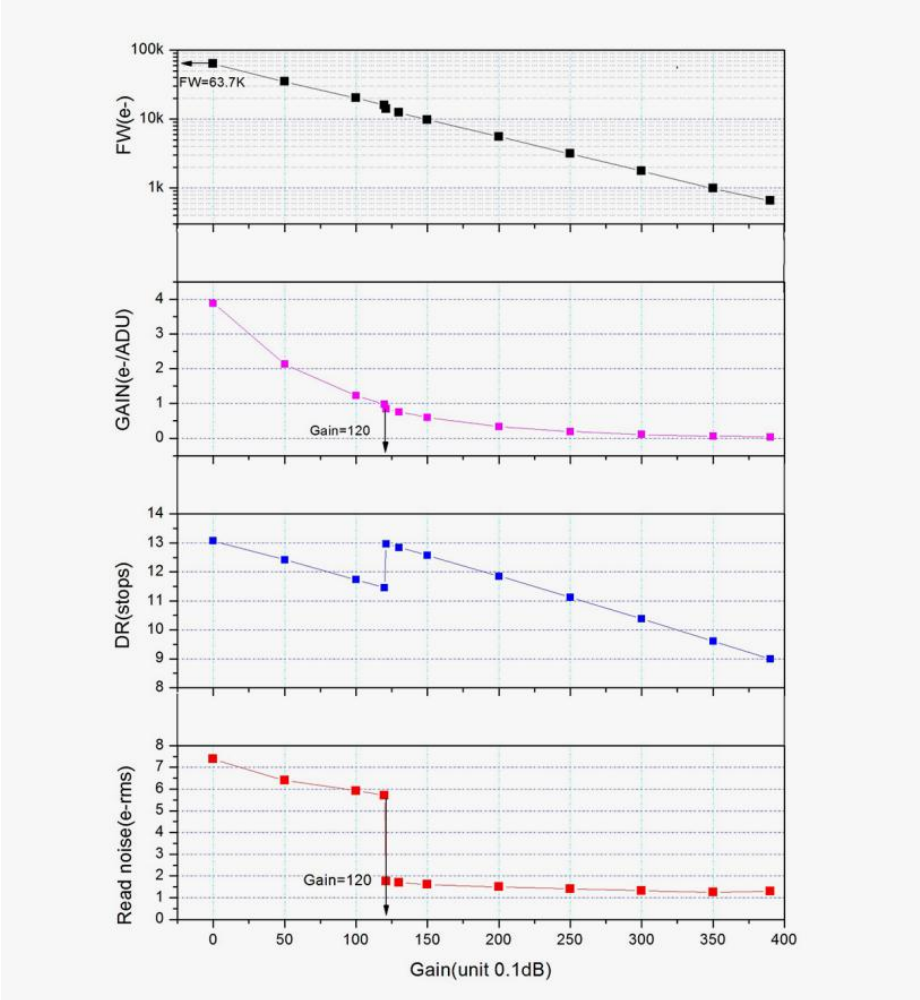
3.3 Quantum Efficiency & Read Noise

Quantum Efficiency

According to our test results, the QE peak value of ASI294MC Pro is about 75%.

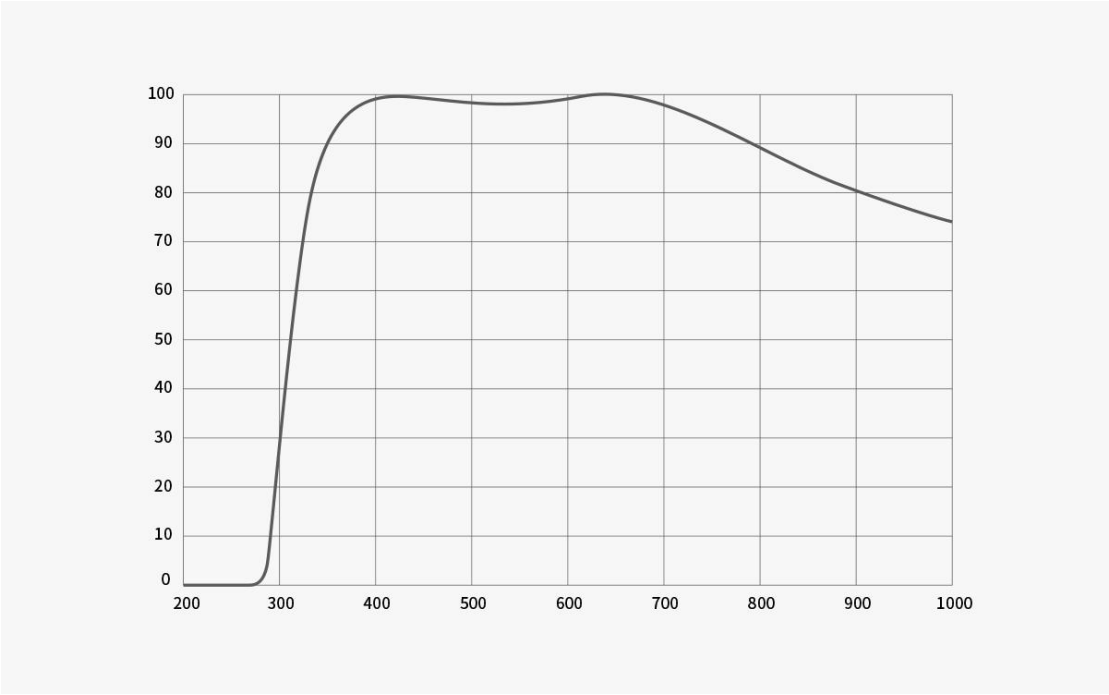


Read Noise



3.4 Protective Window (AR-Coated Anti-Reflection Filter)

The ASI294MC Pro camera is equipped with a 32mm diameter, 2mm thick AR-coated anti-reflective filte r as a protective window. This filter safeguards the sensor from external damage while enhancing light tr ansmission across the near-ultraviolet to near-infrared spectrum.



3.5 Analog to Digital Converter (ADC)

ASI294 Pro has very similar parameters as its color version. Both have the 14bit ADC and a high dynamic range of 13 stops, which is even higher than that of the well-known and celebrated ASI1600MM Pro camera.

Resolution	USB 3.0	
	12Bit ADC	**14Bit ADC**
4144×2822	19fps	16fps

3.6 Two-stage TEC Cooling

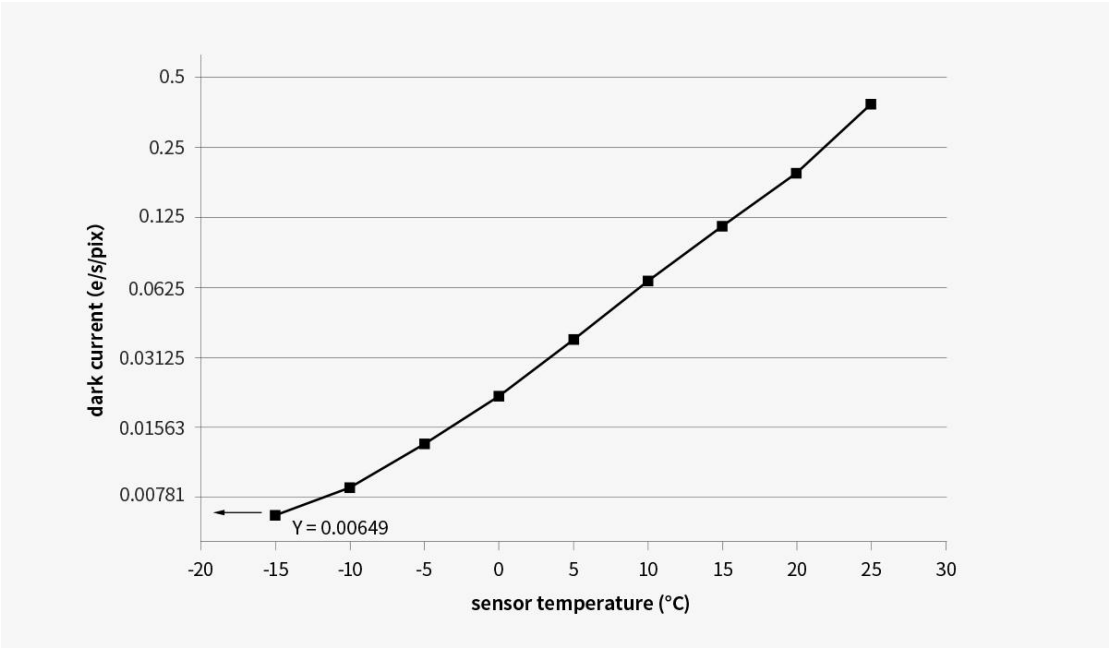
Thanks to the two-stage TEC cooling, ASI294MC Pro can lower the CMOS sensor temperature to more than 35 degrees Celsius below ambient temperature, which can greatly reduce dark current generation and sensor noise even during extended exposure times.

*The Delta T 35℃ is tested at 30℃ ambient temperature. It might get down when the cooling system is

working for a long time. Also, as the ambient temperature falls, the Delta T would decrease.
Below is the dark current curve of ASI533MC Pro at the temperature from -20℃ to 30℃.

Dark Current

The dark current of the ASI294 is a bit lower than the ASI1600 at same temperature, based on our test results. Dark frame sample @ Highest dynamic range settings, 300s, -10°C, bin1. Please check the dark frame to make sure you fully know the performance.

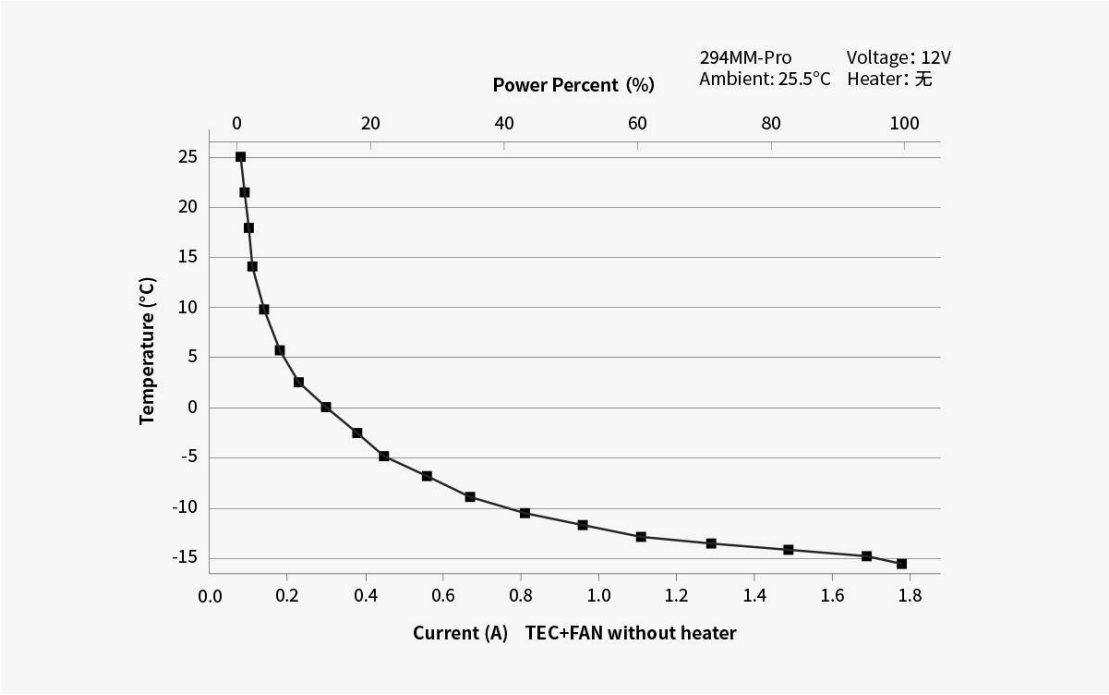


3.7 Anti-Dew

ASI294MC Pro comes with the polyimide heater that completely fits the protective window to avoid dew problems. You can turn this feature off in software if you want to save some power.

3.8 Power Consumption

All ASI cameras have low power consumption. ASI294MC Pro is no exception. When it's at non-cooling status, the max power consumption is only 1.85W.



3.9 USB 3.0 & 256MB DDR3 Memory

The ASI294MC Pro incorporates a high-speed USB 3.0 interface paired with a dedicated 256MB DDR3 memory buffer. This architecture minimizes data loss and latency, delivering fast, stable, and secure transmission even during long exposures and continuous high-resolution capture.

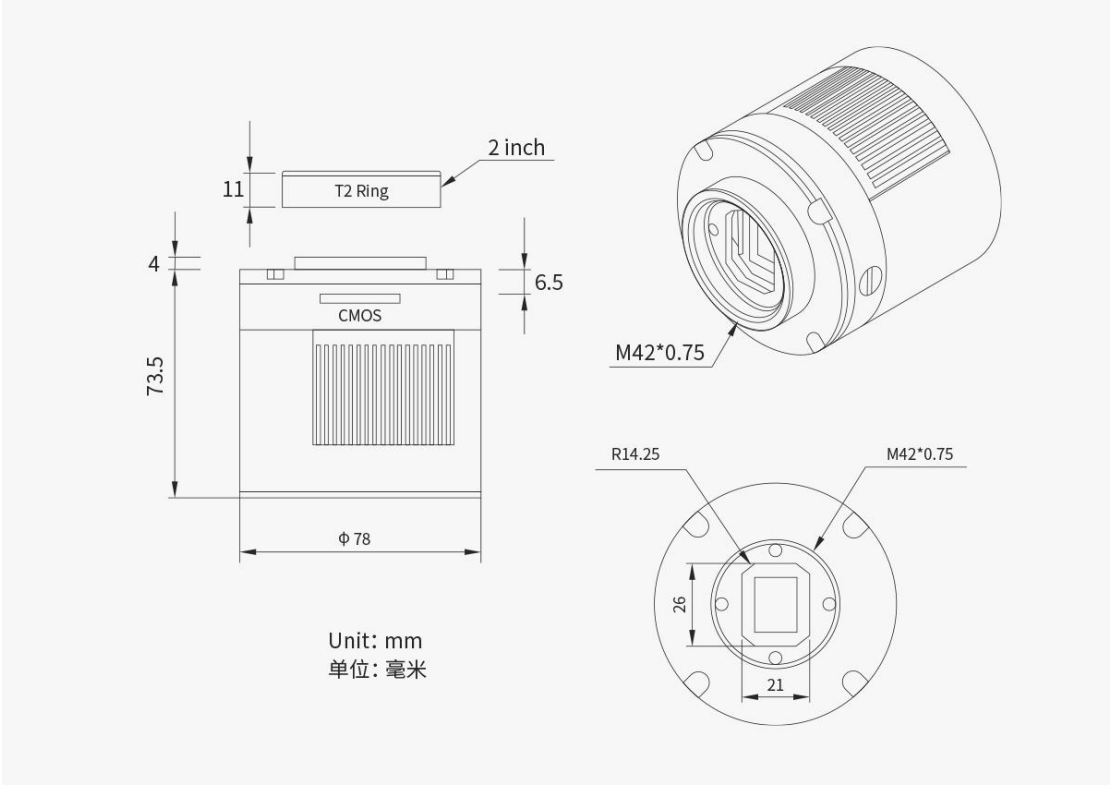


4 What’s in the Box?



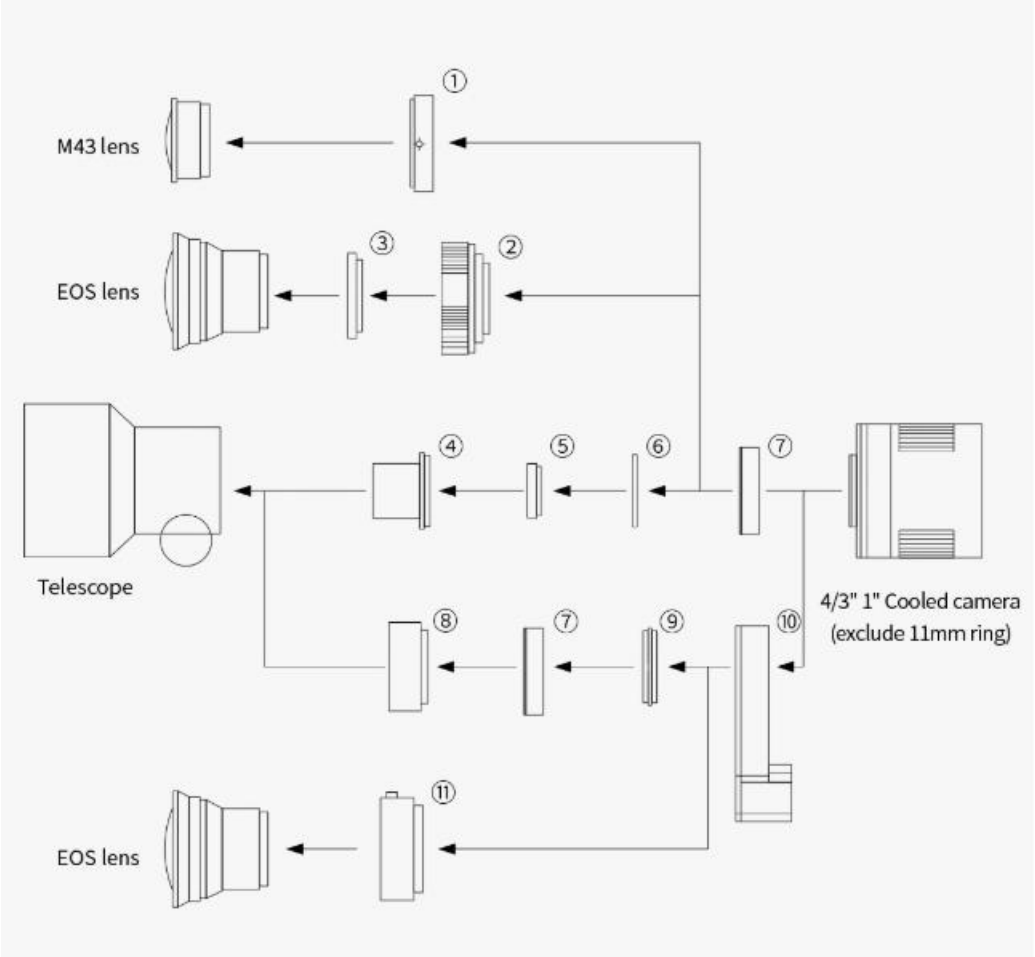
Spacer x 4：0.1mm 1 个；0.2mm 2 个；0.5mm 1 个

5 Structural Dimension Diagram



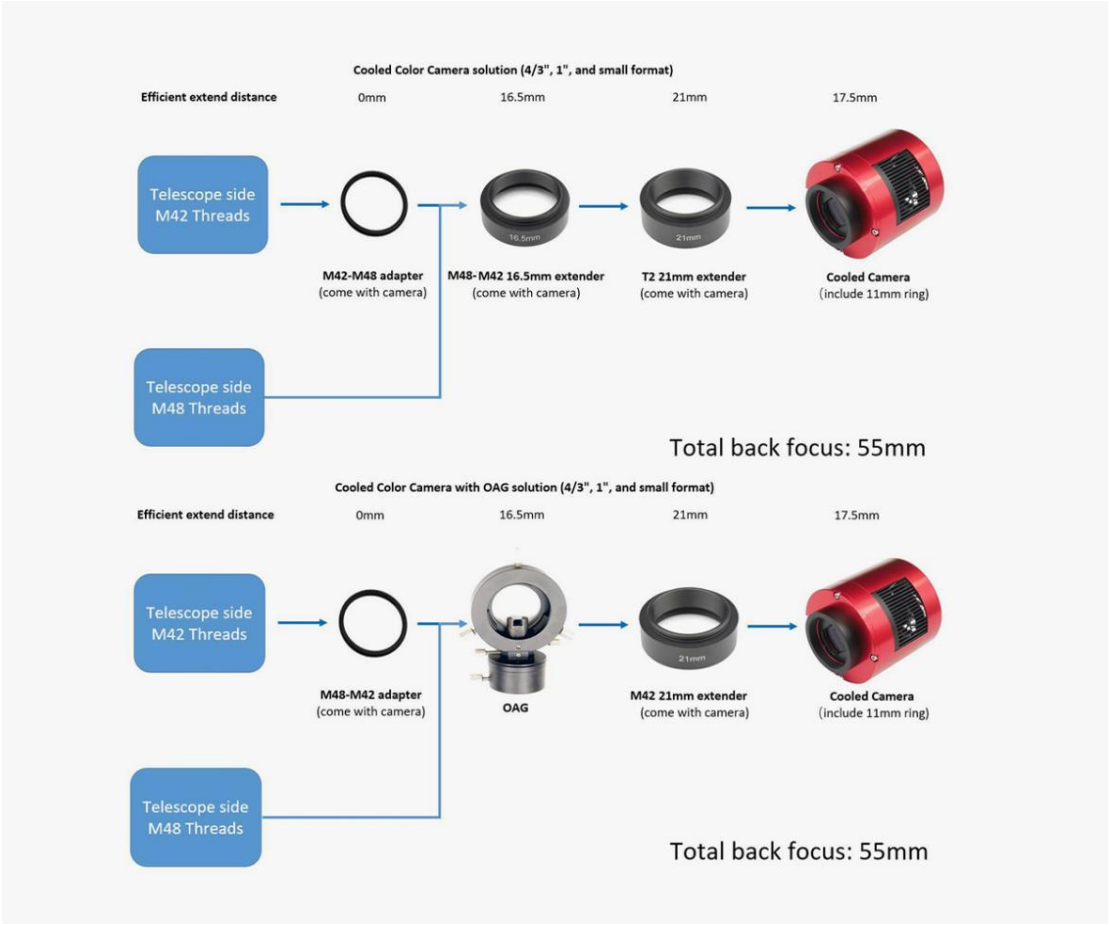
6 Connection Methods

6.1 Connecting to Nikon/Canon Lens



1. M43-T2 adapter ring (optional)
2. EOS-T2 adapter ring (optional)
3. 2” filter (optional)
4. 1.25” nosepiece
5. 1.25” filter (optional)
6. M42-1.25” adapter ring (optional)
7. T2 11mm ring
8. M42-M48 16.5mm extender
9. T2-T2 adapter ring
10. EFW mini
11. EOS-EFW adapter ring

6.2 Solutions for 55mm best back focus distance



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.

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 towards 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;

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

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.);

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

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

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

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);

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;

9) No valid purchase invoice or warranty certificate;

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 having no RMA code that have been returned privately without ZWO written confirmation.

3. 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.