

DSO Camera ASI533MC 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



Entry-level camera for deep space photography

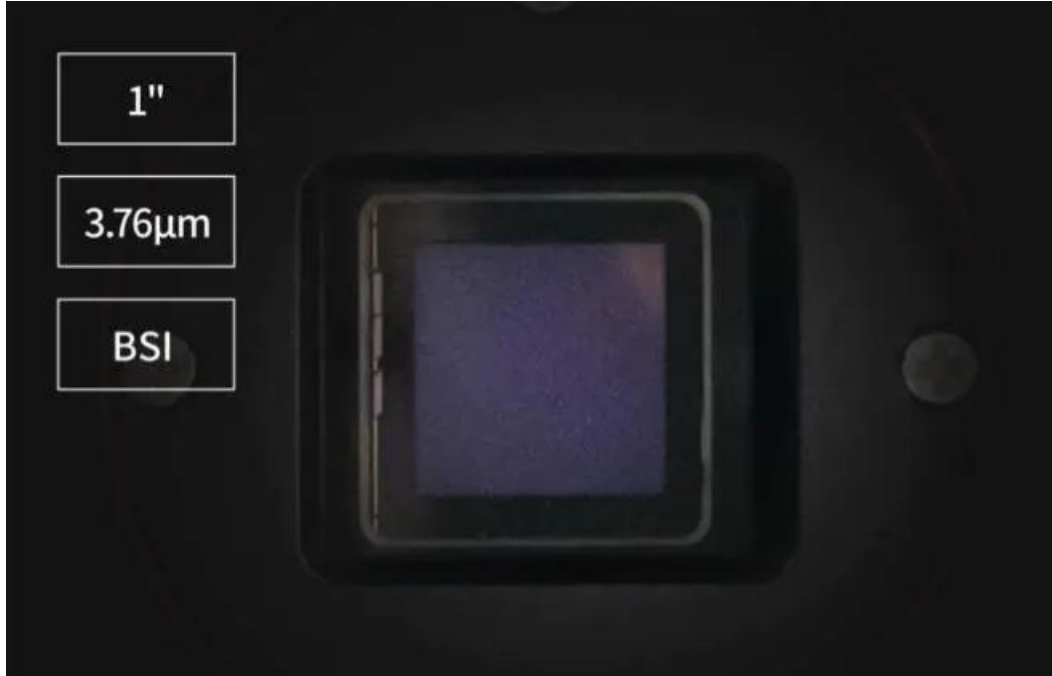
The ASI533MC Pro adopts a SONY back-illuminated IMX533 sensor, which is a 1 inch square frame sensor made suitable for deep sky astrophotography needs. The ASI533MC Pro can be regarded as an upgrade of the ASI183 series. Not only does it retain the high-quality features of ASI183, such as high QE and high frame rate, it also features no amp glow, readout noise as low as 1.0e, pixel size of 3.76µm and a 2-stage TEC cooling. It is highly recommended for beginners of deep sky astrophotography.



One inch square frame

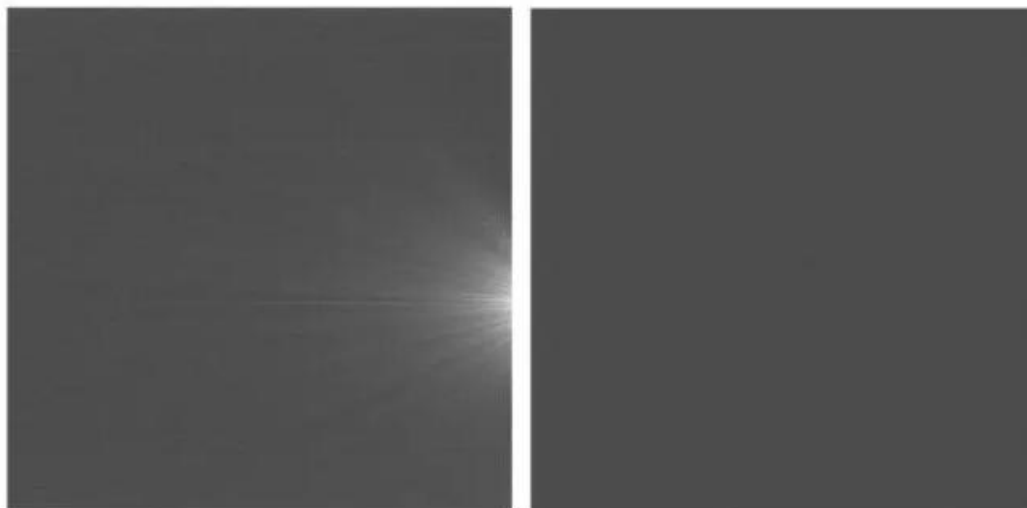
The IMX533 is a 1 inch square frame CMOS image sensor with approximately 9M effective pixels at a

pixel size of $3.76\mu\text{m}$. The 14 bit digital output of IMX533 makes it possible to read out signals of 9m effective pixels at a high-speed of 20 frames per second with read noise as low as $1.0e$, the performance of which is on a par with those of sCMOS or EMCCD sensors. This sensor is suitable for image needs that require high definition and low noise.



No Amp Glow

ASI533MC Pro exhibits extremely clean dark frames with zero amp glow! No matter how long the exposure and how high the gain value is, you can easily get a clean and smooth astro images!



With amp glow
300 seconds exposure

with no amp glow
300 seconds exposure

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°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.

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.



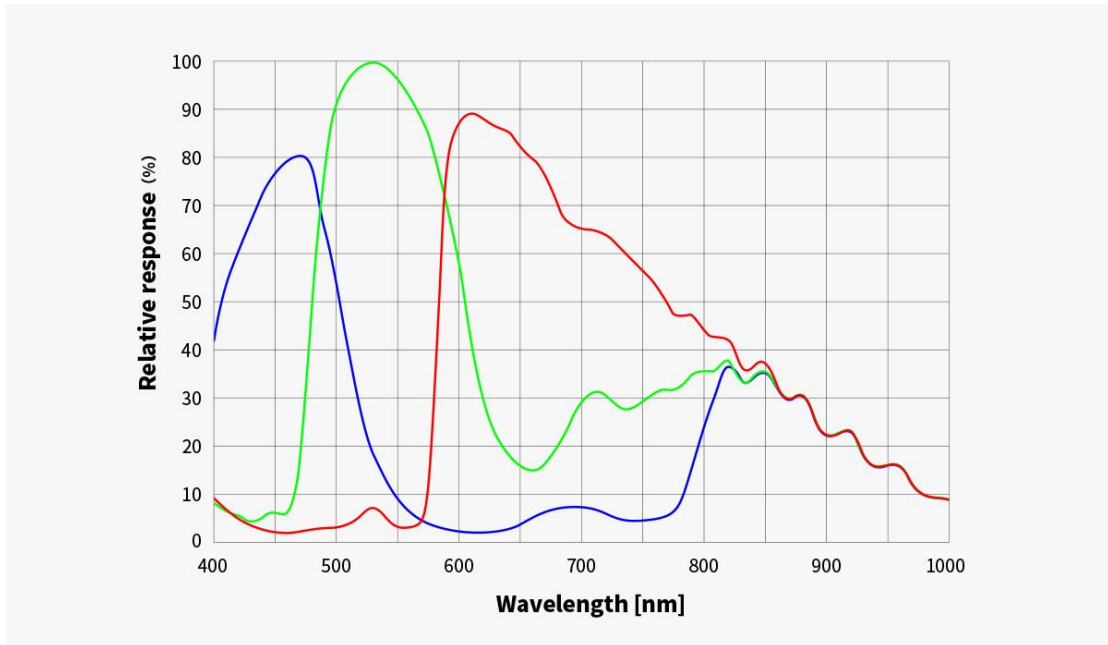
3.2 Camera Specifications

Sensor	CMOS IMX533
Sensor format	1"
Diagonal	16mm
Resolution	9MP 3008 x 3008
Pixel size	3.76 μ m
Sensor size	11.31mm x 11.31mm
Max frame rate	20fps
Shutter	Rolling shutter
Exp range	32 μ s-2000s
Read noise	1.0e-3.8e
QE peak	80%
Full well capacity	50ke
ADC	14 bit
DDR3 buffer	256MB
USB port	USB 3.0/USB 2.0
Connection adapter	2" / 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

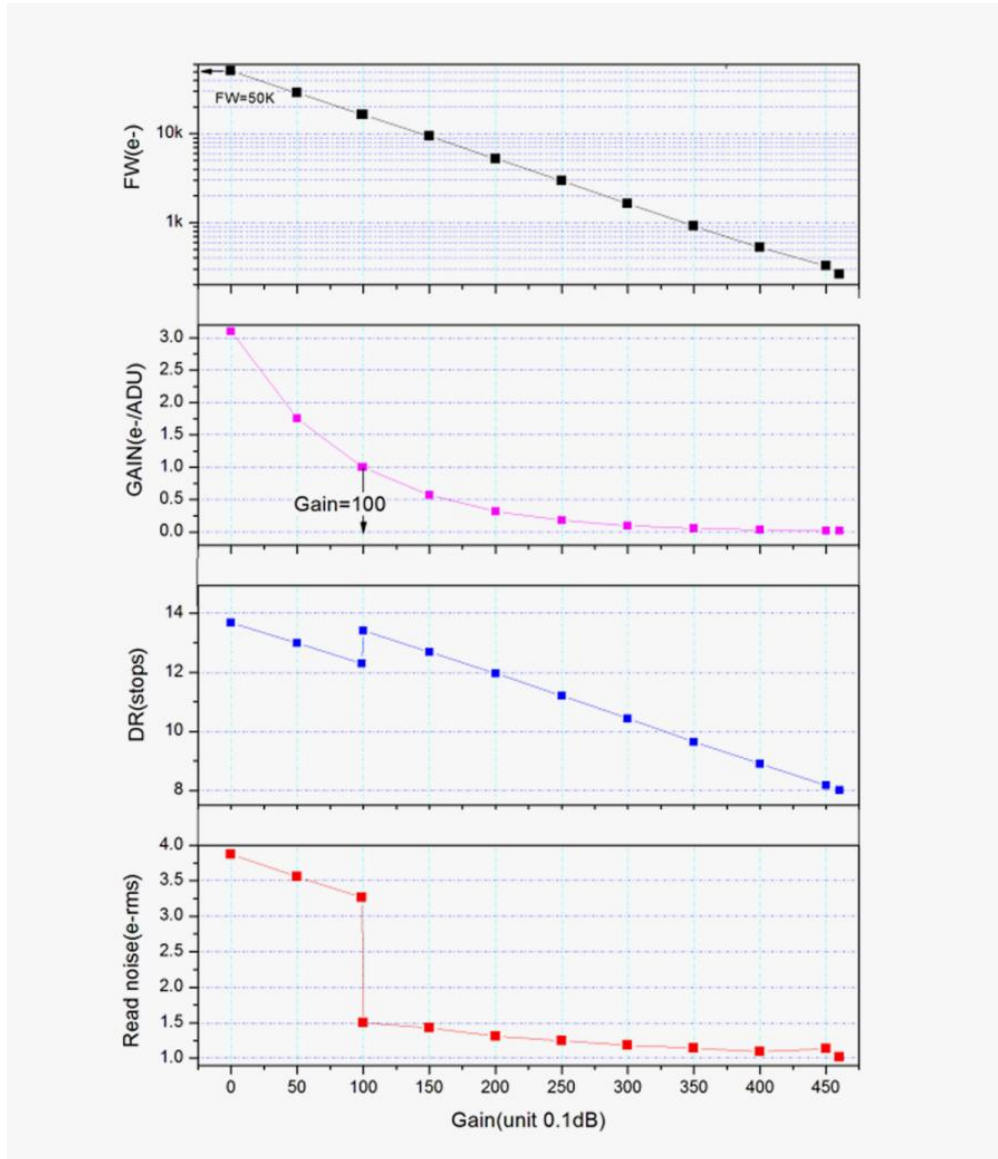
According to our test results, the QE peak value of ASI533MC Pro is 91%.



Read Noise

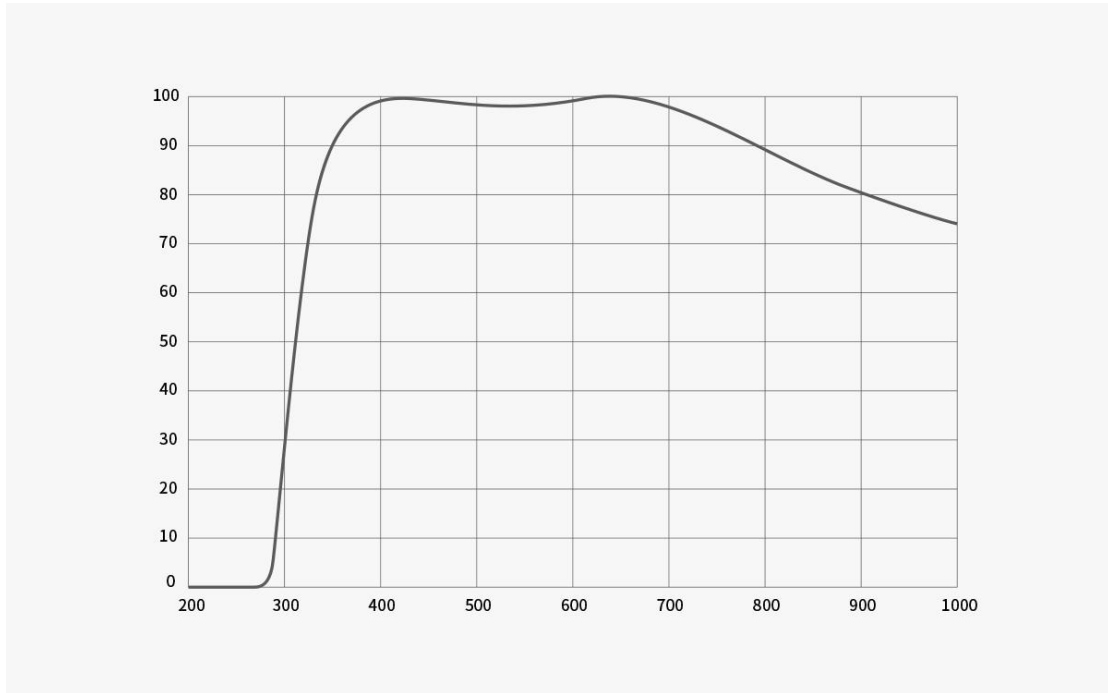
Low read noise, high dynamic range.

When the gain value is set to 100, the HCG high gain mode will be turned on. The readout noise will be greatly reduced, and the dynamic range will remain basically unchanged.



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

The ASI533MC Pro camera is equipped with a 32mm diameter, 2mm thick AR-coated anti-reflective filter as a protective window. This filter safeguards the sensor from external damage while enhancing light transmission across the near-ultraviolet to near-infrared spectrum.



3.5 Analog to Digital Converter (ADC)

ASI533MC Pro has a built-in 14-bit ADC. 12-bit ADC mode for output will be used when we do hardware Bin. It also supports the custom ROI partial readout mode, resulting in a faster frame rate at the smaller ROI resolutions.

Below are the maximum speeds of ASI533MC Pro running at different USB transmission modes.

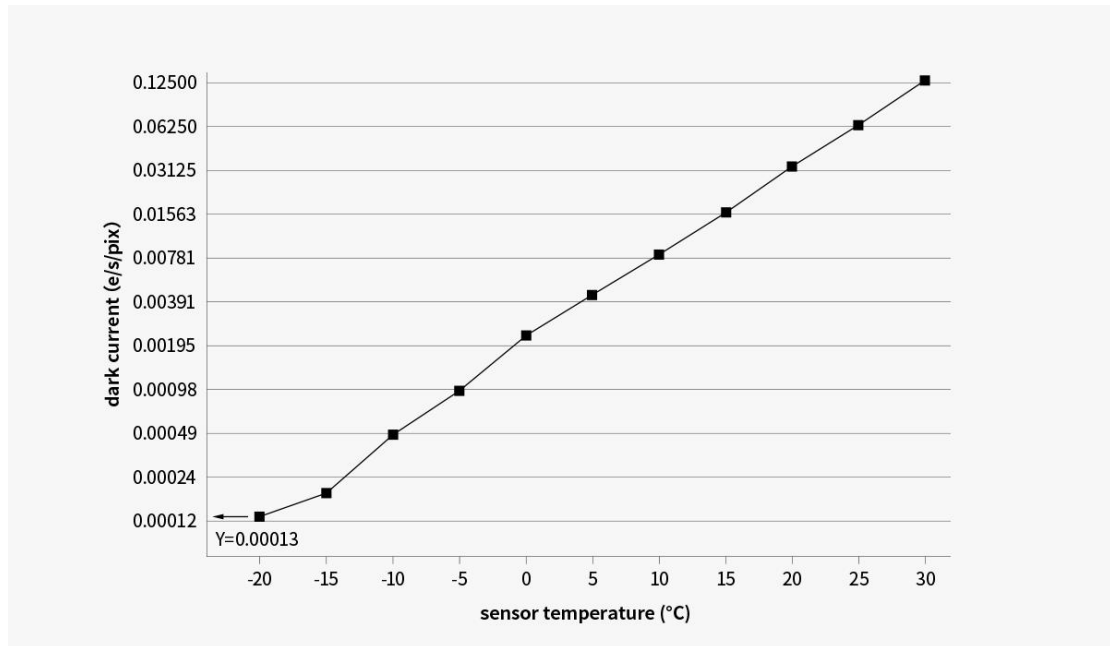
Resolution	14Bit ADC	
	USB 2.0	USB 3.0
3008 x 3008	2fps	20fps
1920 x 1080	10fps	54fps
1280 x 720	24fps	80fps
640 x 480	70fps	117fps
320 x 240	216fps	216fps

3.6 Two-stage TEC Cooling

Thanks to the two-stage TEC cooling, ASI533MC 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.

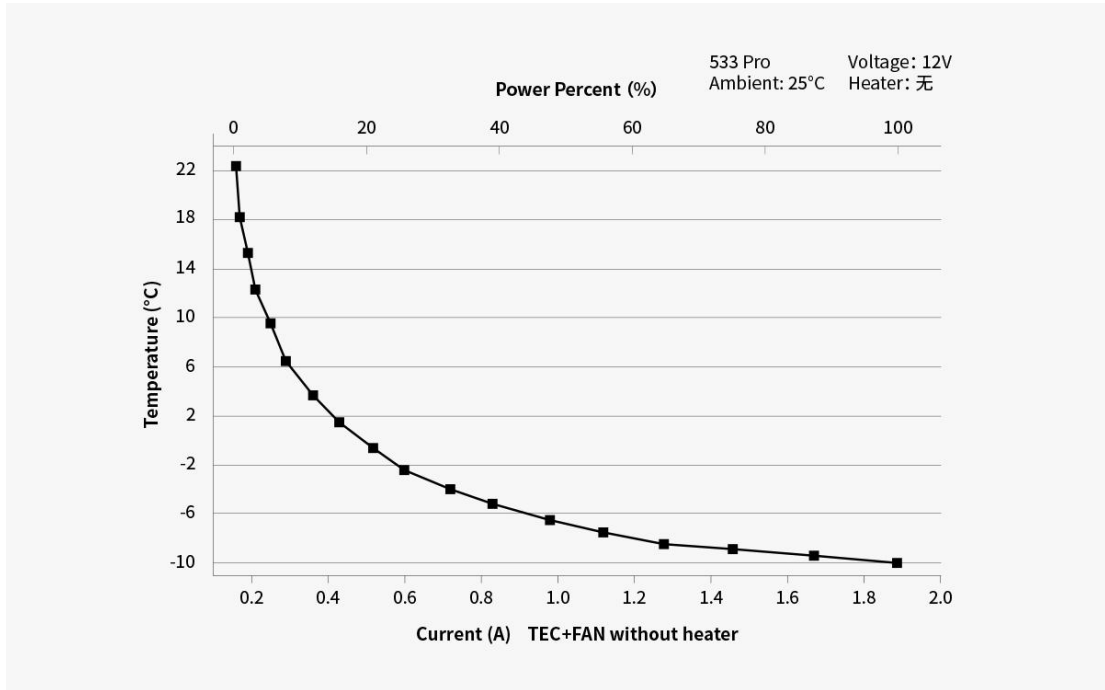
*The Delta T 35°C is tested at 30°C ambient temperature. It might get down when the cooling system is working for a long time. Also, as the ambient temperature falls, the Delta T would decrease.

Below is the dark current curve of ASI533MC Pro at the temperature from -20°C to 30°C.



3.7 Power Consumption

All ASI cameras have low power consumption. ASI533MC Pro is no exception. When it's at non-cooling status, the max power consumption is only 2.5W.



3.8 USB 3.0 & 256MB DDR3 Memory

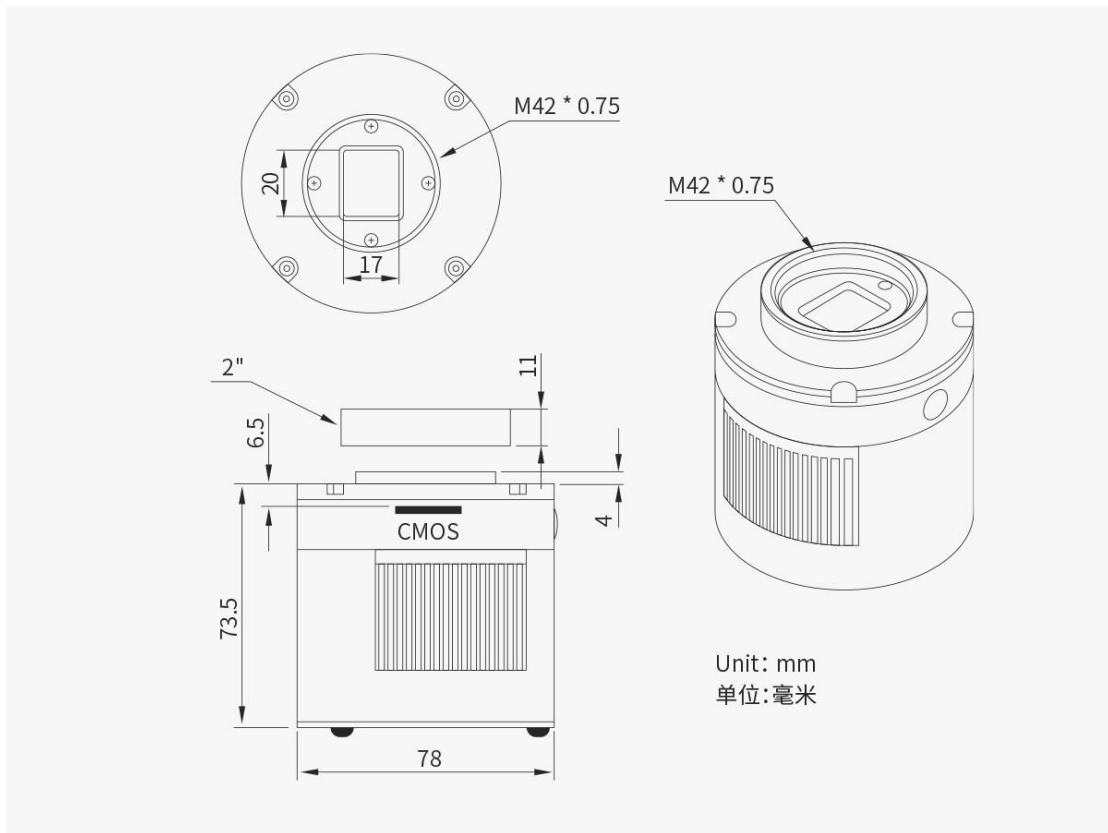
The ASI533MC Pro incorporates a high-speed USB 3.0 interface paired with a dedicated 256MB DDR3 memory buffer. This architecture minimizes data loss and latency, delivering fast, stable, and secure transmission even during long exposures and continuous high-resolution capture.



4 What's in the Box?

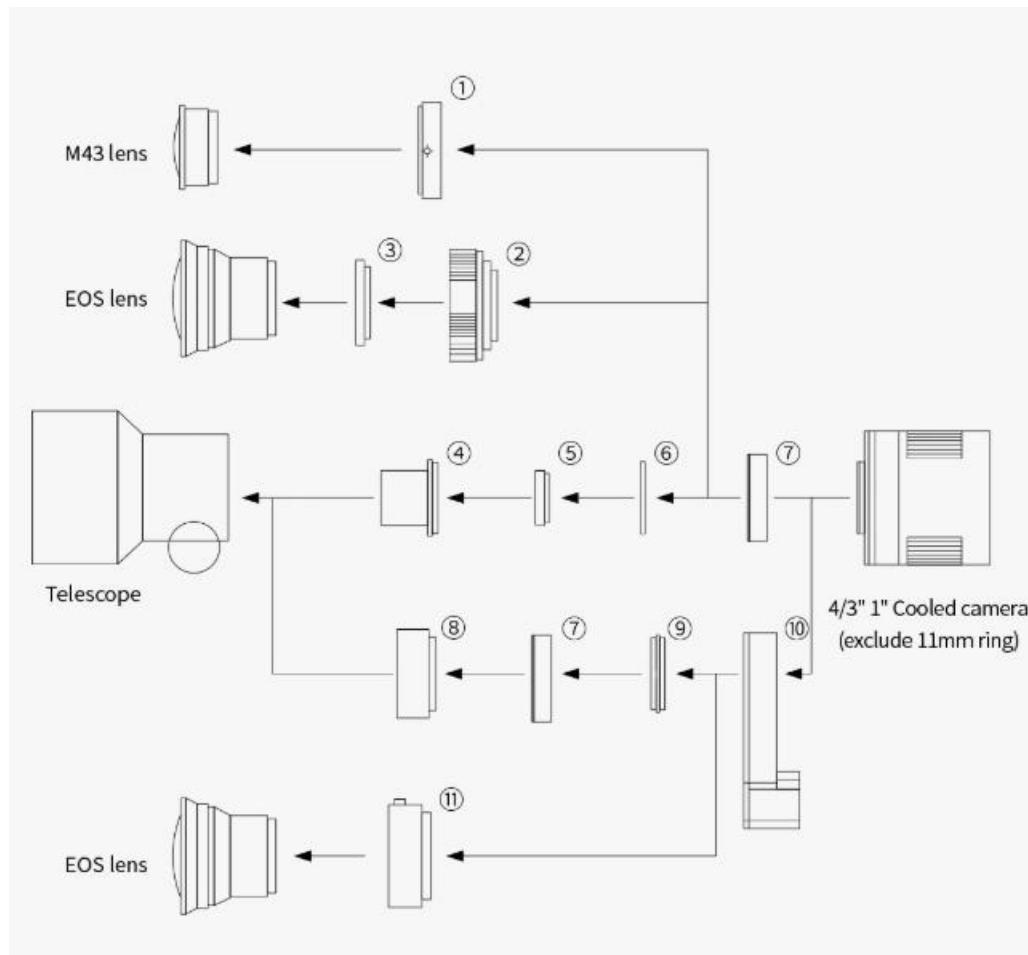


5 Structural Dimension Diagram



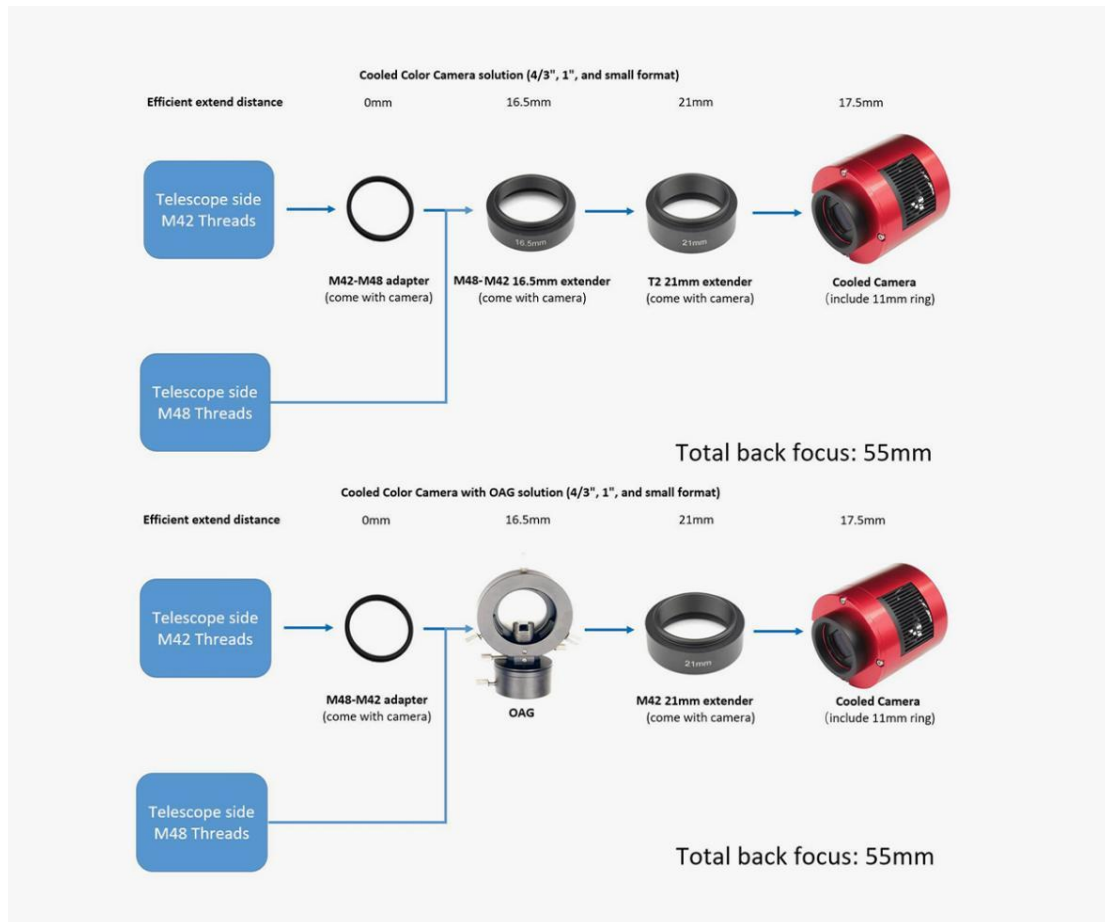
6 Connection Methods

6.1 Connecting to Nikon/Canon Lens

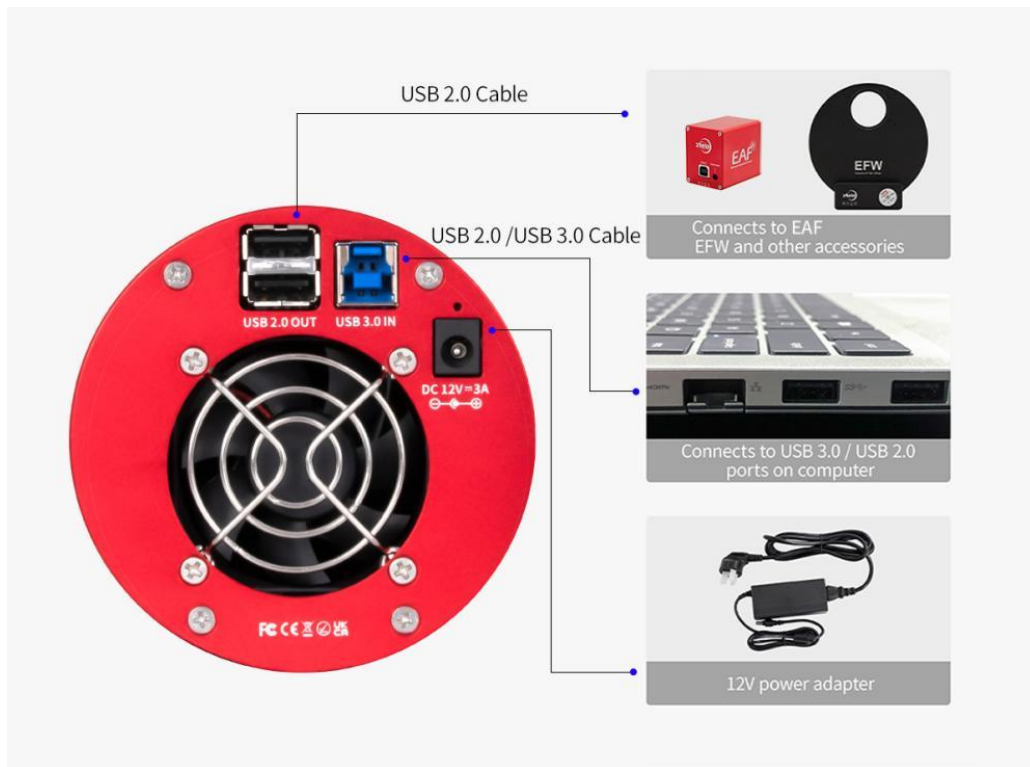


1. M43-T2 adapter ring (optional)
2. EOS-T2 adapter ring (optional)
3. 2" filter (optional)
4. 1.25" nosepiece
5. 1.25" filter (optional)
6. M42-1.25" adapter ring (optional)
7. T2 11mm ring
8. M42-M48 16.5mm extender
9. T2-T2 adapter ring
10. EFW mini
11. EOS-EFW adapter ring

6.2 Solutions for 55mm best back focus distance



6.3 Connecting to external devices



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.