

Artemis-M Pro Camera Manual

V1.0

Dec, 2024

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Product Features

DSO cooled camera line is the most advanced product line in Player One history. We start the project from 2021, through a lot of modify and rebuild we made this final version. It brings our newest technology and design to everyone, we are very proud to introduce this camera line.



Technical parameters

Sensor	New SONY IMX492 4/3" CMOS (mono)
Diagonal	23.2mm
Total Pixels	47 Mega Pixels
Max Resolution	8288×5648 @bin1 4144×2824 @bin2
Pixel Size	2.315μm
Chip Size	19.2mm×13mm
Frame Rate	8FPS@BIN1（10bit） 33FPS@BIN2 (10bit)
Shutter	Rolling shutter
Exposure Range	32μs-2000s
Readout Noise	7.7-1.46e @bin1 7.8-1.2e @bin2
Full Well	18.6Ke @bin1 65.8Ke @bin2
QE Peak	≈90%
ADC	12bit @bin1 14bit @bin2
Cooling System	High quality 2 stage TEC cooling Component
Cooler Power Consumption	12V – 3A Max
Delta T	40℃ ± 2℃ (below ambient)
Working Temperature and Humidity	Working Temperature: -10°C—60°C Working Relative Humidity: 0%—80%
Protective Window	D46*2MM High Quality AR Plus (Anti Reflection) Multi-Layer Coating
Data Port	Type-C USB3.0/USB2.0
Adapter	M48X0.75, 2", 1.25"
Back Focal Length	17.5mm, 12.5mm(without sensor tilt plate)
Diameter	90mm
Weight	650g
Resolution and FPS	Under USB3.0 mode Resolution 10bit ADC 16bit ADC 8288×5648 8FPS 4FPS More resolution options could be setup in capture software!

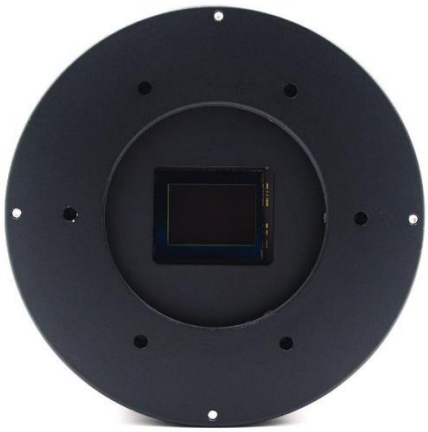
Product Description

New Cutting-edge Design

Polygon like regular hexagon is very Player One, the DSO cooled cameras we want to make it more beautiful and practical. After a lot of trying, we fix the final style, which uses a scientific and technological octagon to construct the main body line and 4 sides are cambered surface, supplemented by round chamfers to achieve both rigidity and flexibility. The front piece is round to avoid diffraction on RASA. The positive red, which is like a summer fire, is matched with the low-key and steady black, and the super-fine frosting process on the entire surface makes the camera look luxurious and cool, and keep Player One style.



Artemis-M Pro (IMX492) cooled camera is developed by Player One Astronomy, it's design for advanced DSO imaging. it adopts **Sony IMX492 4/3″ format** monochrome sensor. The **2.315um pixel size** accommodates a well depth of **18.6Ke** with a total of 47**MP** (the resolution is 8288*5648)**,** and the diagonal is **23.2mm**.

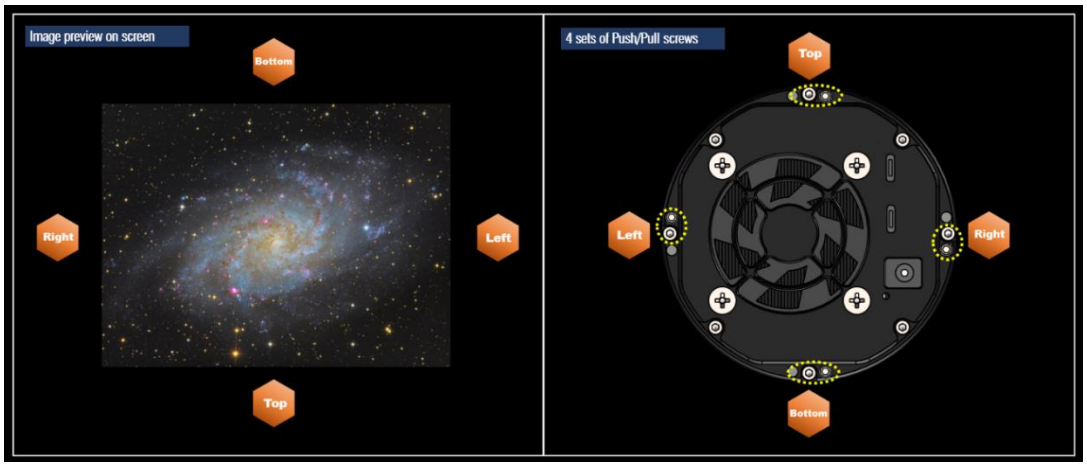


Rear Adjustment 4 Point Sensor Tilt Plate

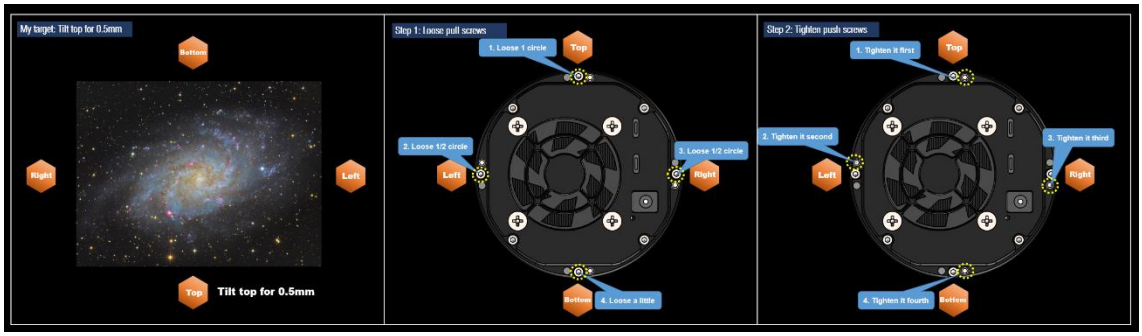
When taking deepsky objects, using sensor tilt plate can get a much smaller field curvature of the telescope. We adopt rear Adjustment and 4point tilt plate, it has a lot advantages in usage.



4 Point adjustment is easier to know which corner is needed to adjust. The built-in high-density sponge shading pad can block the light from the side slits without any side leakage.



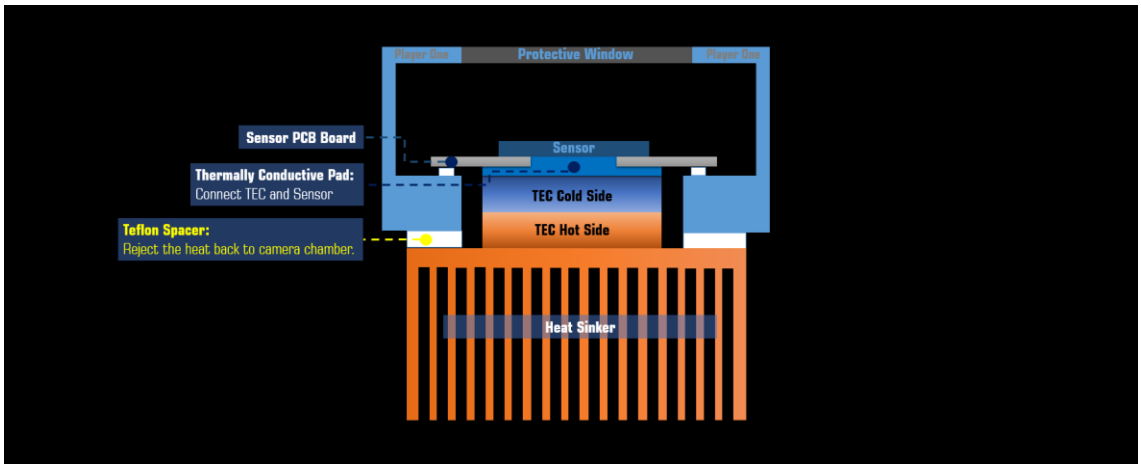
For understand 4 Point adjustment method, we made an example for users:



Deep Cooling

Player One cooled camera series use 2 Stage TEC Cooling unit, after improved the structure design to reject the heat back to camera chamber, Camera **Delta-T** can reach over **40℃**.

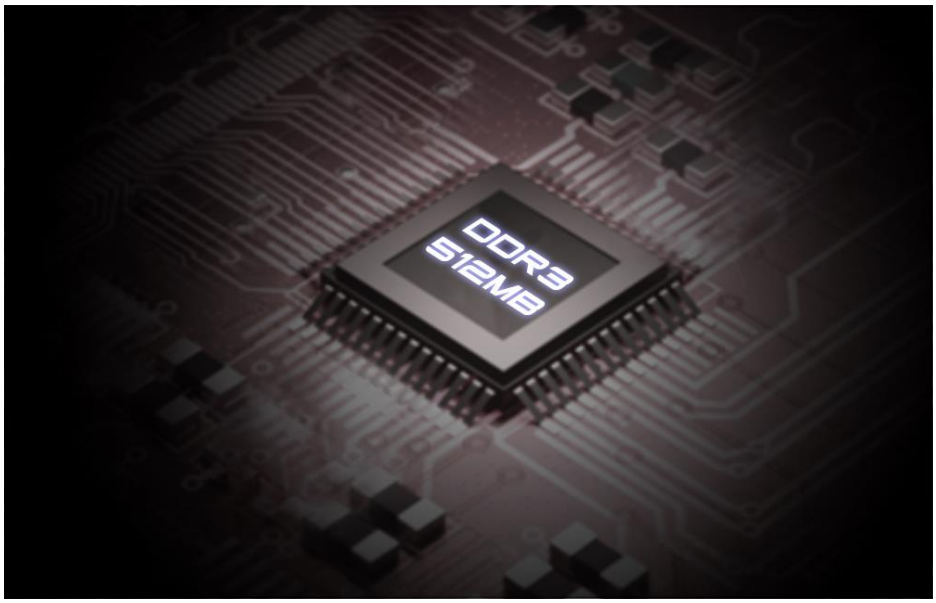




512MB DDR3 Cache

As an improvement, DDR3 cache in cooled cameras are increased to 512MB. It helps stabilize and secure data transmission, it effectively avoids frame dropping and greatly reduces readout noise.

With the DDR3 cache, the camera does not have high demands on computing needs any longer, it will still have excellent performance even if it is connected to a USB 2.0 port.

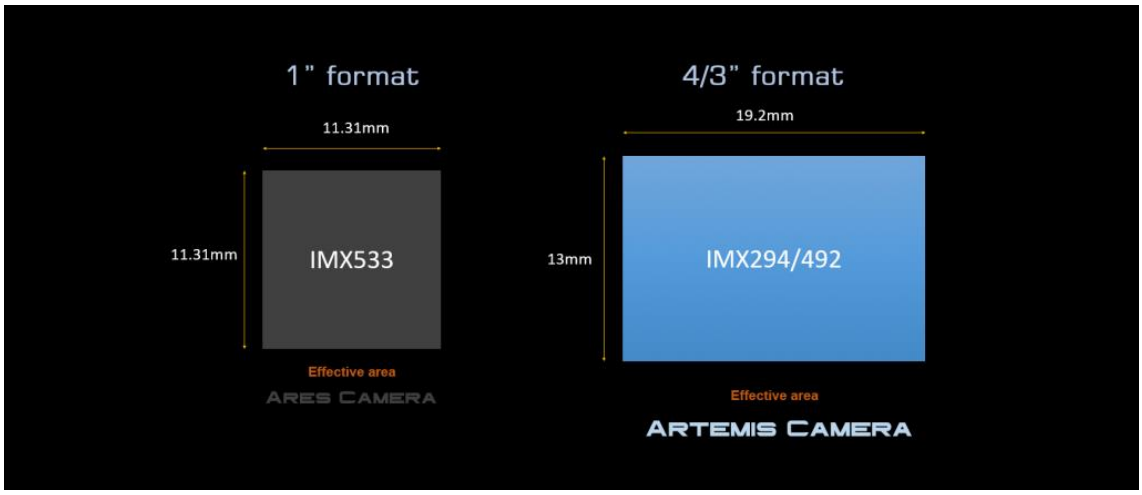


STARVIS Technology

Artemis-M Pro (IMX492) cooled camera based on **Sony STARVIS technology**, it is back-illuminated pixel technology used in CMOS image sensors.

4/3″ Format

Artemis-M Pro cooled camera has 4/3″ format (19.2mm*13mm), this size is very popular for DSO imaging.



Pixel BIN mode

IMX492 sensor has **native 47 Mega** pixels, **no need to unlock anything and don't need any technology to do that**. After you know this, following description will be very easy to understand.

12bit depth: IMX492 has 12bit on-chip ADC. When use **BIN1 mode,** IMX492 has 47Mega pixels, pixel size is 2.315um, and bit depth is 12bit (4096 levels).

14bit depth: When use **hardware BIN2 mode,** IMX492 will has 11.7Mega pixels, pixel size is 4.63um, and bit depth extend to 14bit (16384 levels)

BIN1 and BIN2 also will cause the full well, FPS and readout noise be changed.

Software BIN support BIN3 and BIN4 mode (and we provide Sum BIN and Average BIN), hardware BIN only has BIN2 mode (Average BIN).

**Sum BIN: Sum the values of original pixels*

**Average BIN: Calculate Average value of original pixels*

Type-C Data port and Power port

Back piece of cooled camera has 2 Type-C data port and 12V DC 5.5×2.1mm power port.



Main data port support USB3.0 protocol, the camera can run 8fps under RAW8 mode. Type-C port is easier to plug in when assemble the imaging equipment in night.

When recording images, since the actual writing speed will be affected by the writing speed of the hard disk itself, when the hard disk writing speed is slow, the recording may not reach the theoretical speed. It is recommended that you use a high-quality solid state drive to record data to give full play to the performance of the camera.

The camera has 12V DC5.5*2.1mm port to provide enough power to TEC cooling system. If you don't need to power up cooling, only need to connect the main Type-C port, the camera will work as an uncooled camera.



Standard Cable Usage



Cooling System and Anti-Dew Heater

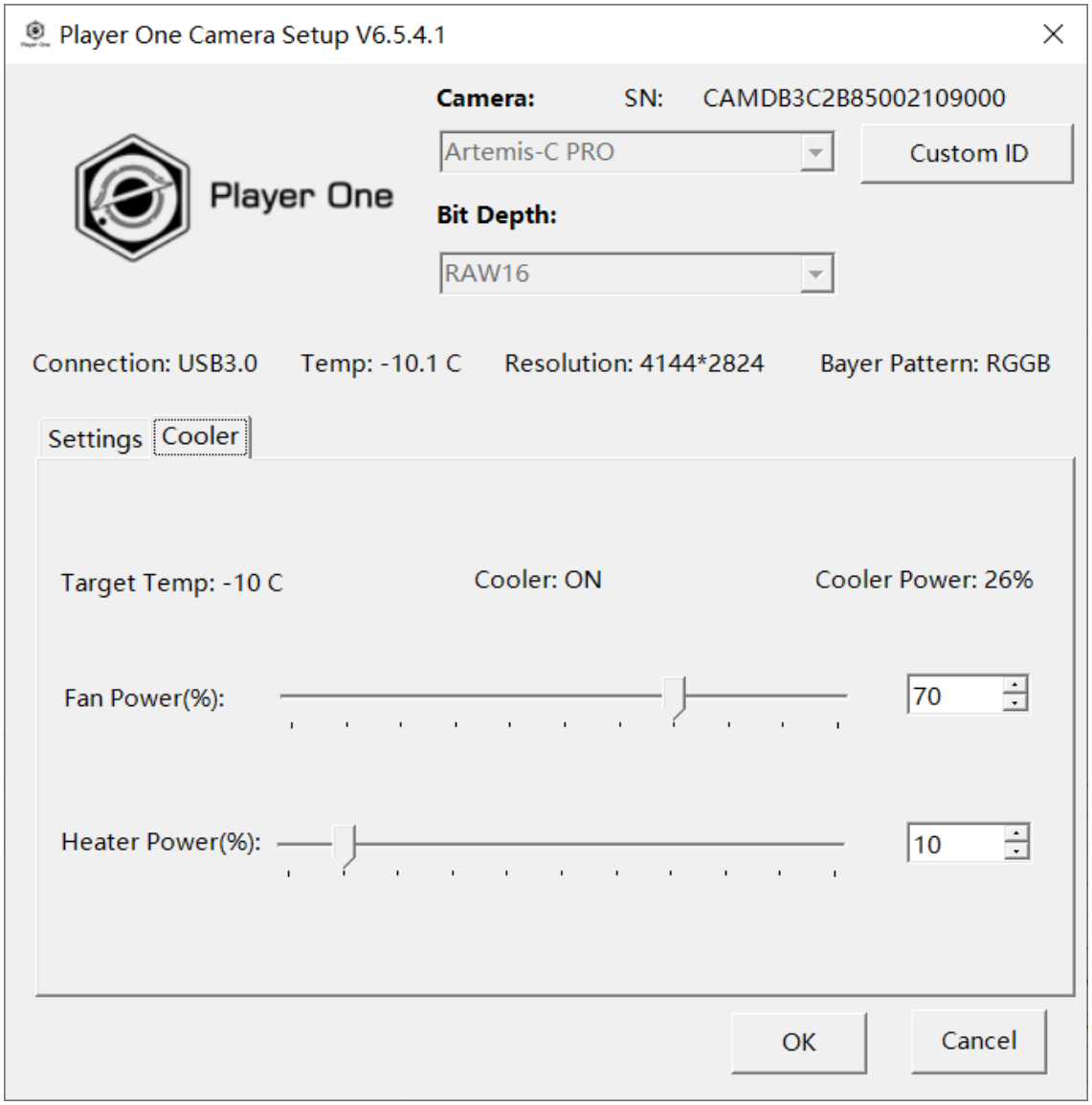
In ASCOM window, we provide 3 adjustable parameters: Target temperature, Fan Speed and Anti-Dew power.

Standard Delta-T: 40℃ (±2℃), when **ambient temp 30℃, fan speed 100%, dew heater 10%**.

Recommend Delta-T settings: 35℃ **below ambient, fan speed 70%, dew heater 10%, power consumption 40- 60%.**

The rotation speed of cooling fan is also adjustable; the **default value is 70%** speed.

Dew problem is the biggest enemy in astro imaging, the camera integrated anti-dew heater in front of the camera. The heat power is adjustable.



Overvoltage and overcurrent protection mechanism

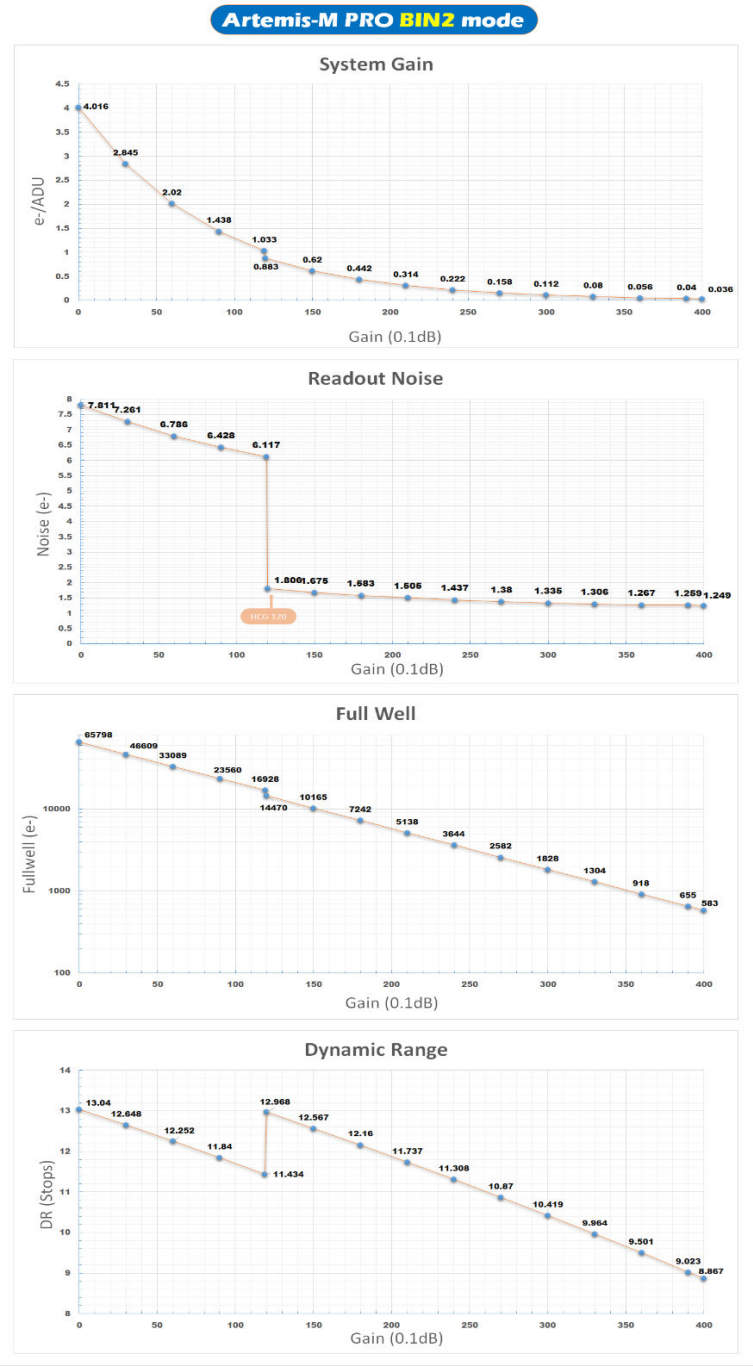
Player One cameras produced by us ensures the safety of your camera and other equipment through overvoltage and overcurrent protection mechanisms.

Performance

Hardware BIN2 mode:

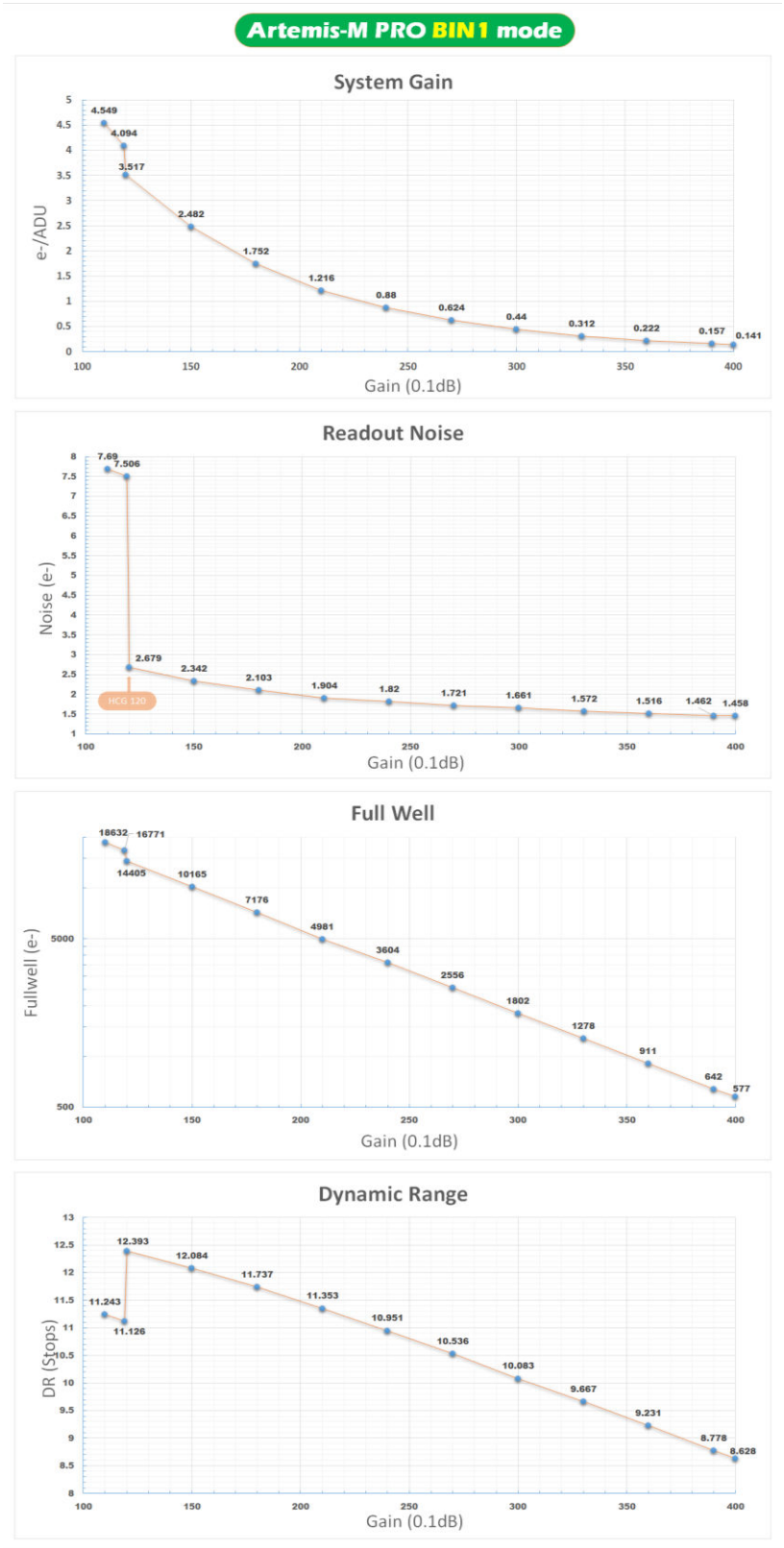
At gain=0, the camera has 13 stops dynamic range and 65.8Ke full well capacity, readout noise is 7.8e.

HCG open at gain=120, the camera has 12.97 stops dynamic range and 14.5Ke full well, readout noise drops to only 1.8e.



BIN1 mode

in BIN1 mode, Artemis-M PRO start with Gain 110. *(If use set gain value < 110, the camera will use gain 110 instand of it)*



Frame rate

Under RAW8 mode, Artemis-M Pro cooled camera can run 33FPS @ Hardware BIN2 mode and 8FPS @BIN1 mode.

That's much faster than existing models on market.

Readout Noise

Regarding readout noise, we solemnly promise that all values are obtained from actual tests. And for users, you could use Sharpcap 4 for testing. SC4 has a function called **Sensor Analysis**, provide a very simple way to test readout noise.

We wrote a tutorial on our website: https://player-one-astronomy.com/service/manuals/

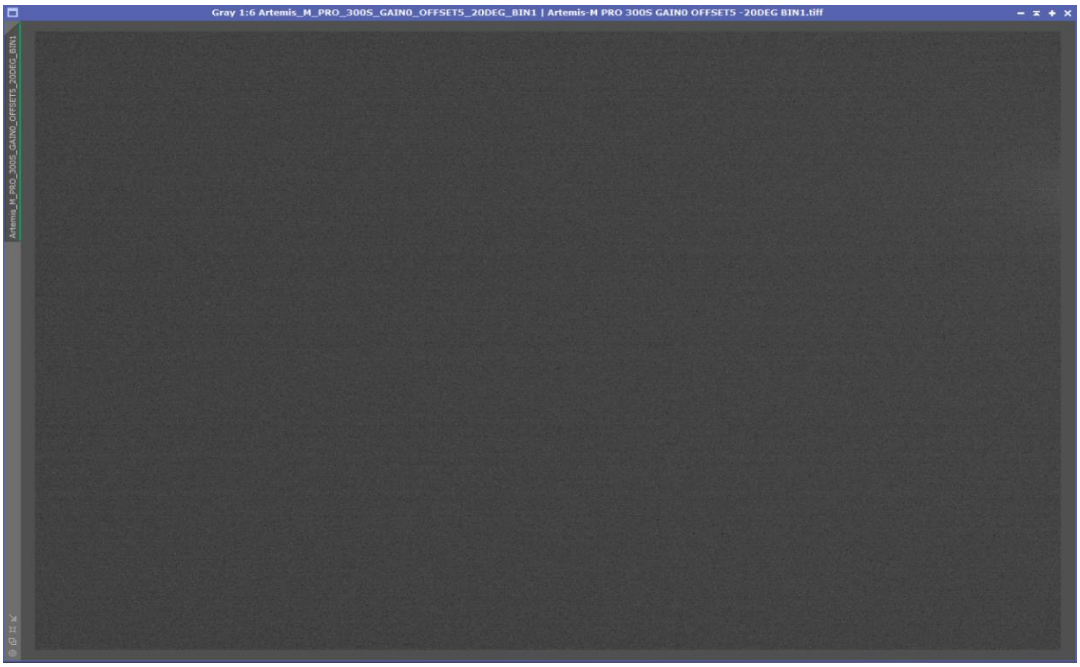
If you are interested in readout noise testing, you may try it yourself, which is very simple.

Dark Frame

Artemis-M PRO camera has amp-glow. In BIN2 mode or using higher gain the amp-glow will be more obvious. Please notice this before you buy the camera.

We provide 2 original dark frame of Artemis-M PRO camera.

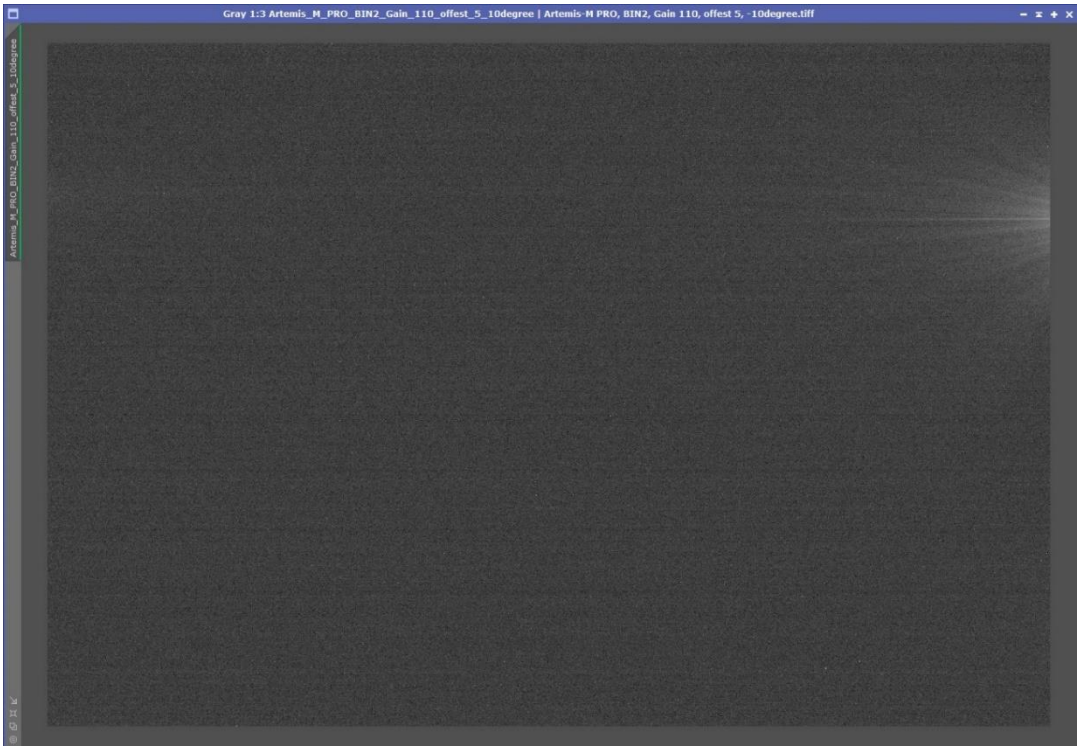
Dark frame 1: BIN1, Gain=110, offset=5, exposure=300s, Temp=-10℃:**Download Dark frame1**



STF auto-Stretch in Pixinsight 1.86

Dark frame 2: BIN2 mode, Gain=110, offset=5, exposure=300s, Temp=-10℃:

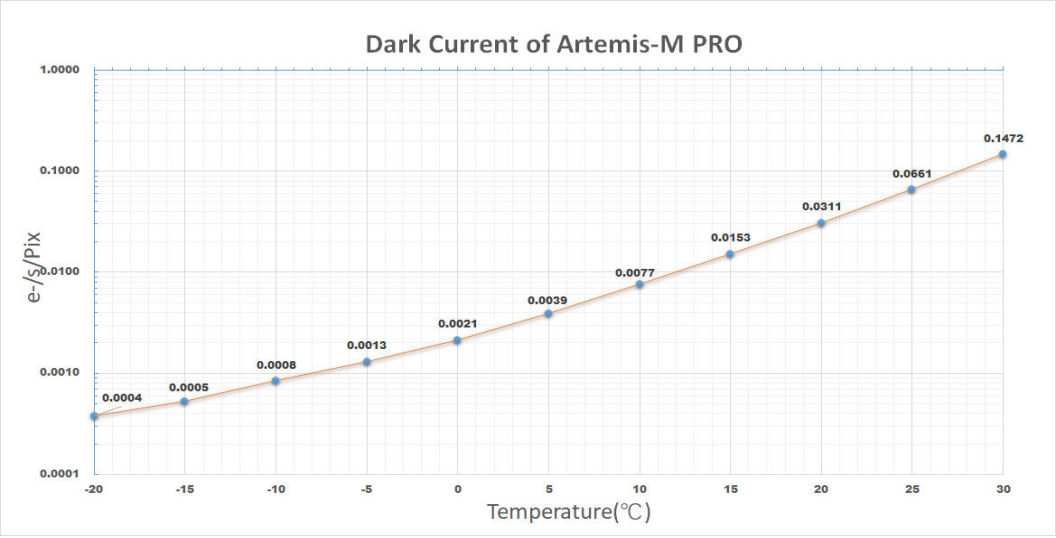
Download Dark frame2



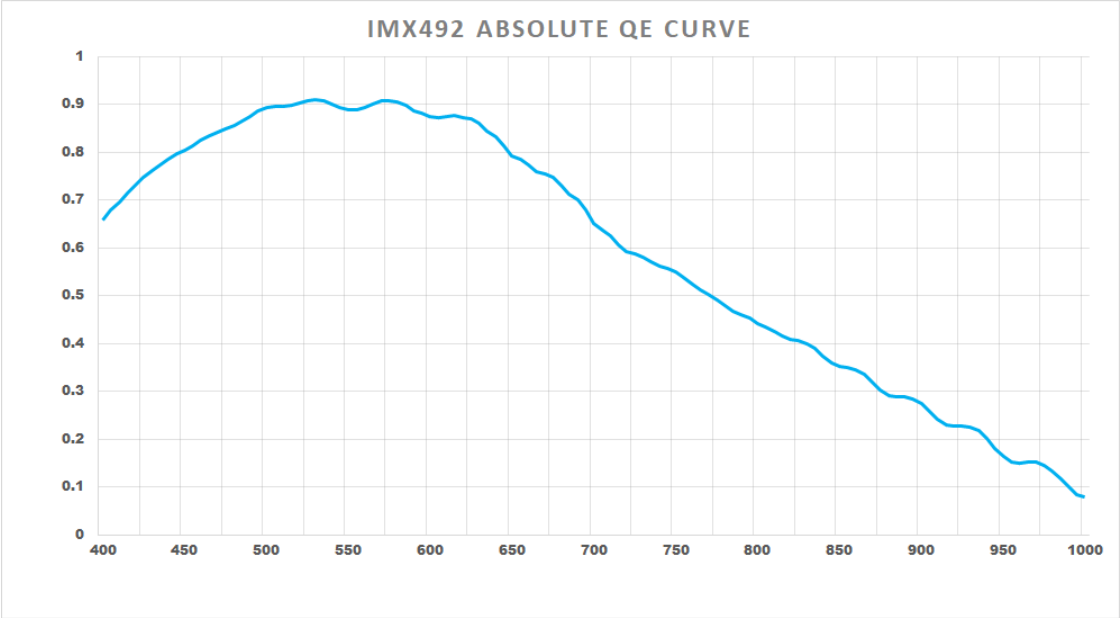
STF auto-Stretch in Pixinsight 1.86

Dark Current

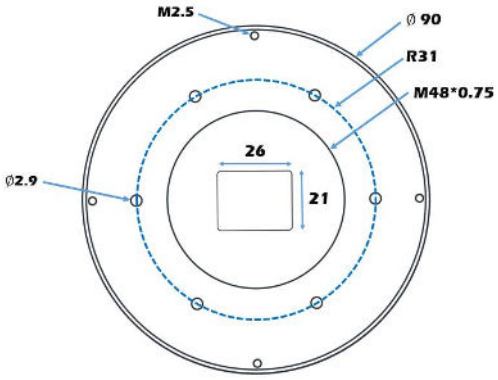
The dark current is only 0.0004 e/s/pix at -20℃, and 0.0021e/s/pix at 0℃. In entire curve, dark current is almost like a straight a line, which can prove that Artemis camera has very good quality.

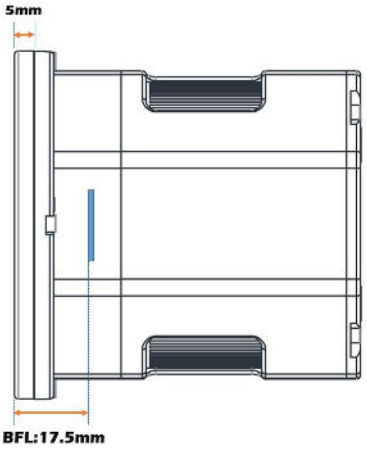


QE Curve

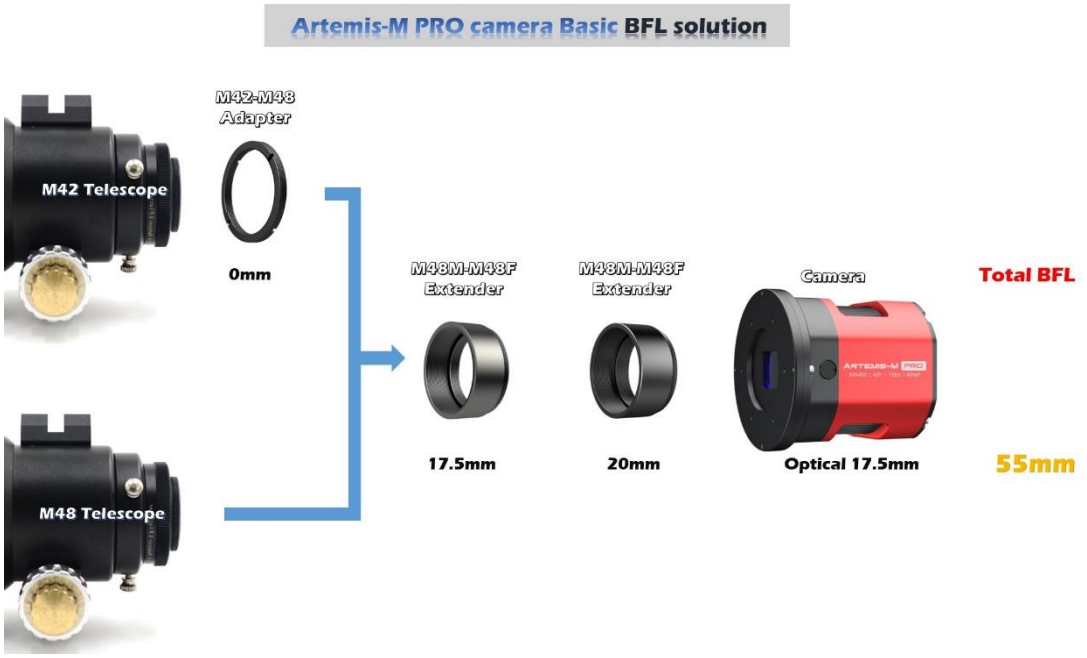

IMX492 ABSOLUTE QE CURVE
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
400
450
500
550
600
650
700
750
800
850
900
950
1000

Mechanical Drawing





BFL Solutions

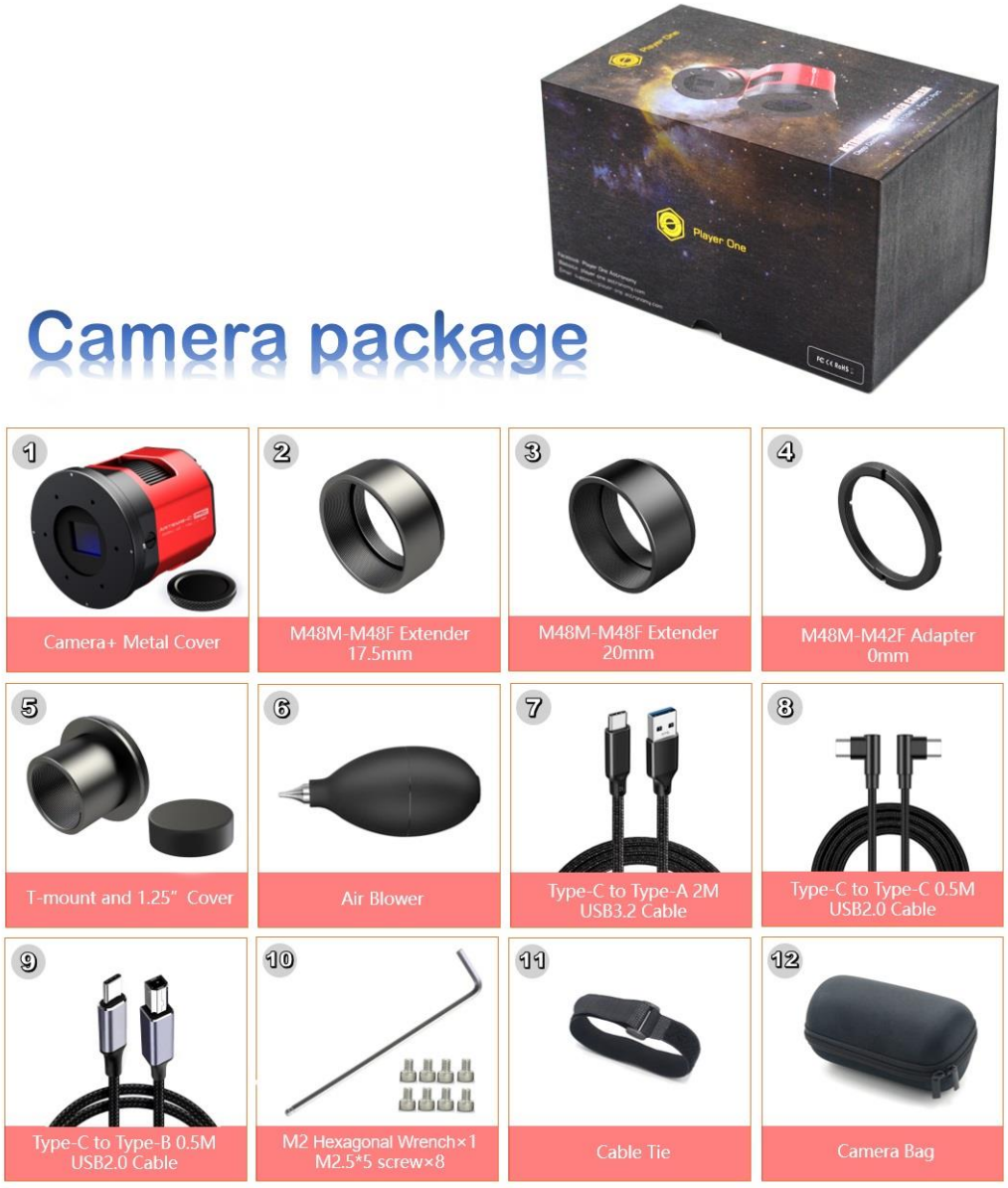






Notice: Some BFL solution is 56mm (Compensate light path differences which caused by filters)

Package List



Warranty & Shipping Policy

Payment method

We provide *PayPal* and *PayPal checkout* on our website.

Shipping and Delivery

Shipping Fee:

- Amount >= 299USD: free express shipping
- Amount < 299USD: 29.9USD for express shipping

Shipping Services:

- We usually use DHL, UPS, FedEx, TNT for shipping.
- Make sure your email is correct, we maybe will contact with you through emails in case of emergency.

If customer wants to designate a shipping company or has special requirement, please send an email to *support@player-one-astronomy.com* and tell us your detailed requirement.

Shipping time:

- Usually 7-14 days.
- Tracking number will be updated in 3 days after paid.

For orders from areas where transportation is not easy, such as islands, town in mountainous regions, delivery time will be slightly longer.

Please send an email to *support@player-one-astronomy.com* immediately, if the following occurs:

- Shipping delayed or has some abnormal information.
- The packing is badly damaged on arrival, take pictures and do not sign.

Tax

- The price on our website without tax.
- Please note that buyers are liable to charge tax involved, such as Import tax, VAT, customs handling fee, etc.
- Those fees possibly will be collected at the time of delivery by courier.

For best experiences, we recommend customers to purchase our products form local dealers.

After-sales Service

Warranty Policy

2-year free warranty (time start from delivered) for Player One products. If the product has any issue, please send the image or video and description to support@player-one-astronomy.com for further check to confirm.

- Purchase from Player One official online store, we will provide warranty service directly.
- Purchase form dealer, we will provide warranty service through dealer.

Repair in warranty, customer only pay the shipping fee of shipping back the product to us or dealer, and no other extra fees.

Replacement Policy

You can request our Replacement Service:

√ Within 30 calendar days of receiving the product if the product does not match the original description of the product in one or more significant respects.

√ Within 30 calendar days of receiving the product if the product suffers performance failure.

Please contact our After-Sales team by email to *support@player-one-astronomy.com* within 30 calendar days of receiving the products. Player One shall be responsible for the two-way replacement freight for any products sent in for replacement due to performance faults.

Warranty and Replacement Policy Exceptions:

× Warranty service time or replacement service time expired.

× Legal proof-of-purchase, receipts, or invoices are not provided, or are reasonably believed to have been forged or tampered with.

× A product sent to Player One for replacement does not include all original accessories, attachments and packaging, or contains items damaged by user error.

× A product is found to have no defects after all appropriate tests are conducted by Player One.

× Any fault or damage of the product is caused by unauthorized use or modification of the product, including exposure to moisture, entry of foreign bodies (water, oil, sand, etc.) or improper installation or operation.

× Product labels or serial numbers show signs of tampering or alteration.

× Damage is caused by uncontrollable external factors, including falling down, fires, floods, or lightning strikes, etc.

× Proof of damage during transit issued by the carrier cannot be provided.

× Other circumstances stated in this policy.

In those situations, repair the product might have extra cost, we will estimate cost and email customer to know the information before send product back.