

## The BWHC4-4KAF8MPA Auto Focus HDMI/WiFi/USB Multi-outputs C-mount CMOS Camera Instruction Manual



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## 1 BWHC4-4KAF8MPA Camera Application



Figure 1 The BWHC4-4KAF8MPA Camera

The [BWHC4-4KAF8MPA](#) is a camera that includes multiple modes of output (HDMI/WiFi/USB). It uses ultra-high-performance [CMOS](#) sensor. The camera can be directly connected to an [HDMI](#) display, or it can be connected to a computer via [WiFi](#) or [USB](#), and the image and video can be saved in an SD card /USB flash drive for on-site analysis and subsequent research.

Enhanced with an embedded ARM core, this camera integrates various functions inside. With the help of a [USB mouse](#) and well-designed UI on the [HDMI](#) monitor, all functions could be easily controlled.

The [BWHC4-4KAF8MPA](#) camera comes with the built-in Auto Focus system, which can realize Auto Focus on specific areas of the sample.

By inserting a WiFi module or connecting to a computer via a USB cable, the user can directly control the camera's hardware with the software [View](#) or [Lite](#). The [BWHC4-4KAF8MPA](#) camera can be used for tool field inspection, microscope observation, etc.

The basic characteristic is listed as below:

- Sony STARVIS 2 back-illuminated CMOS sensor
- 4K HDMI/ WiFi / USB multiple video synchronous outputs
- 4K/1080P auto switching according to monitor resolution
- Support 4K 60fps low delay HDMI output mode, with an average delay of 40ms
- SD card/USB flash drive for captured image and video storage, support local preview and playback
- New browsing function, providing rich file operation functions, image to image comparison, image to real-time video comparison, multi-image EDF and other functions
- Provide multiple focusing methods, and the size of the focusing area can be modified; Provide AF+EDF, facilitating the synthesis of high depth of field images in multiple focus areas at high magnification
- Excellent ISP with local tone mapping and 3D denoising
- Provide real-time video EDF function and real-time video WDR output function
- Provide two sets of default ISP parameters for biological microscope and stereo microscope
- Embedded XCamView for the control of the camera and image processing, supporting automatic edge finding and measurement functions
- ImageView software for PC
- iOS/Android applications for smart phones or tablets

## 2 BWHC4-4KAF8MPA Camera Datasheet and Functions

| Order Code     | Sensor & Size(mm)                   | Pixel(μm) | G Sensitivity<br>Dark Signal           | Sensor Output<br>(FPS/Resolution) | Binning | Exposure(ms) |
|----------------|-------------------------------------|-----------|----------------------------------------|-----------------------------------|---------|--------------|
| BWHC4-4KAF8MPA | Sony IMX678(C)<br>1/1.8"(7.68x4.32) | 2.0x2.0   | 3541mv with 1/30s<br>0.15mv with 1/30s | 60@3840*2160                      | 1x1     | 0.019~1000   |

| Camera Model   | Video Saving(FPS/Resolution) | HDMI2.0(FPS/Resolution)      | USB3.0(FPS/Resolution)                       | WiFi(FPS/Resolution)                        |
|----------------|------------------------------|------------------------------|----------------------------------------------|---------------------------------------------|
| BWHC4-4KAF8MPA | 60@3840*2160<br>60@1920*1080 | 60@3840*2160<br>60@1920*1080 | 30@3840*2160<br>45@2688*1512<br>60@1920*1080 | 30@3840*2160<br>60@1920*1080<br>60@1280*720 |



Figure 2 Available Ports on the Back Panel of the Camera Body

| Interface or Button                              | Function Description                                                                                                                                                                                                                                                    |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| USB Mouse                                        | Connect USB mouse for easy operation with embedded <a href="#">XCamView</a> software                                                                                                                                                                                    |
| USB3.0                                           | Connect USB flash drive to save pictures and videos<br>Connect 5G WiFi module to transfer video wirelessly in real time<br>Connect USB microphone for audio and video recording                                                                                         |
| USB Video                                        | Connect PC or other host device to realize video image transmission                                                                                                                                                                                                     |
| HDMI                                             | Comply with HDMI2.0 standard. 4K/1080P format video output and supporting automatic switch between 4K and 1080P format according to the connected monitors                                                                                                              |
| SD                                               | SD card slot, comply with SDIO3.0 standard and SD card could be inserted for video and images saving                                                                                                                                                                    |
| ON/OFF                                           | Power switch                                                                                                                                                                                                                                                            |
| LED                                              | LED status indicator                                                                                                                                                                                                                                                    |
| DC12V                                            | Power adapter connection (12V/1A)                                                                                                                                                                                                                                       |
| Video Output Interface                           | Function Description                                                                                                                                                                                                                                                    |
| HDMI Interface                                   | Comply with HDMI2.0 standard;60fps@4K or 60fps@1080P                                                                                                                                                                                                                    |
| WiFi Interface                                   | Connecting 5G WiFi adapter (USB3.0 slot) in AP/STA mode                                                                                                                                                                                                                 |
| USB Video Interface                              | Connecting USB Video port of PC for video transfer<br>H264/MJPEG format video                                                                                                                                                                                           |
| Other Function                                   | Function Description                                                                                                                                                                                                                                                    |
| Video Saving                                     | Video format: 8M(3840*2160) H264/H265 encoded MP4 file<br>Video saving frame rate: 60fps in Low Delay mode; 30fps in WDR mode                                                                                                                                           |
| Image Capture                                    | 8M (3840*2160) JPEG/TIFF image in SD card or USB flash drive<br>(Default SD card priority, priority can be modified in settings)                                                                                                                                        |
| Measurement Saving                               | Measurement information saved in different layer with image content<br>Measurement information is saved together with image content in burn in mode                                                                                                                     |
| ISP                                              | Exposure(Automatic / Manual Exposure) / Gain, White Balance(Manual / Automatic / ROI Mode), Sharpening, 3D Denoise, Saturation Adjustment, Gamma Adjustment, Contrast Adjustment, Brightness Adjustment, Hue Adjustment, Color to Gray, 50HZ/60HZ Anti-flicker Function |
| Image Operation                                  | Zoom In/Zoom Out(Up to 10X), Mirror/Flip, Freeze, EDF, Cross Line, Overlay, PIP, Auto Focus, Browser(including Picture Browsing, Video Playback, Video Compare, Picture Compare, EDF, Image Processing), Measurement Function                                           |
| Embedded RTC(Optional)                           | To support accurate time on board                                                                                                                                                                                                                                       |
| Restore Factory Settings                         | Restore camera parameters to its factory status                                                                                                                                                                                                                         |
| Multiple Language Support                        | English / Simplified Chinese / Traditional Chinese / Korean / Thailand / French / German / Spanish / Japanese / Italian / Russian / Dutch / Portuguese                                                                                                                  |
| Software Environment under WiFi/USB Video Output |                                                                                                                                                                                                                                                                         |

|                                        |                                                                                                                  |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------|
| White Balance                          | Auto White Balance                                                                                               |
| Color Technique                        | Ultra-Fine Color Engine                                                                                          |
| Capture/Control SDK                    | Windows/Linux/macOS/Android Multiple Platform SDK(Native C/C++, C#/VB.NET, Python, Java, DirectShow, Twain, etc) |
| Recording System                       | Still Picture or Movie                                                                                           |
| Operating System                       | Microsoft® Windows® 8 / 8.1 / 10 / 11(32 & 64 bit)<br>OSx(Mac OS X)<br>Linux                                     |
| PC Requirements                        | CPU: Equal to Intel Core2 2.8GHz or Higher                                                                       |
|                                        | Memory: 4GB or More                                                                                              |
|                                        | USB interface: USB2.0 interface or higher                                                                        |
|                                        | Display:19" or Larger                                                                                            |
|                                        | CD-ROM                                                                                                           |
| Operating Environment                  |                                                                                                                  |
| Operating Temperature (in Centidegree) | -10°~ 50°                                                                                                        |
| Storage Temperature (in Centidegree )  | -20°~ 60°                                                                                                        |
| Operating Humidity                     | 30~80%RH                                                                                                         |
| Storage Humidity                       | 10~60%RH                                                                                                         |
| Power Supply                           | DC 12V/1A Adapter                                                                                                |

## 3 Dimension of BWHC4-4KAF8MPA Camera



Figure 3 Dimension of BWHC4-4KAF8MPA

## 4 BWHC4-4KAF8MPA Camera Packing Information



Figure 4 BWHC4-4KAF8MPA Camera Packing Information

| Standard Packing List                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                      |                                                                                                                         |                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| A                                                                                                                                                                                                                                        | Gift box : L:25.5cm W:17.0cm H:9.0cm (1pcs, 1.7Kg/ box)                                                                                                                                                                                                                                                              |                                                                                                                         |                                                 |
| B                                                                                                                                                                                                                                        | BWHC4-4KAF8MPA Camera                                                                                                                                                                                                                                                                                                |                                                                                                                         |                                                 |
| C                                                                                                                                                                                                                                        | Power Adapter: Input: AC 100~240V 50Hz/60Hz, Output: DC 12V 1A<br><b>American standard:</b> Model: POWER-U-12V1A(MSA-C1000IC12.0-12W-US): UL/CE/FCC<br><b>European standard:</b> Model: POWER-E-12V1A(MSA-C10001C12.0-12W-DE): UL/CE/FCC<br>EMI standard: FCC Part 15 Subpart B<br>EMS standard: EN61000-4-2,3,4,5,6 |                                                                                                                         |                                                 |
| D                                                                                                                                                                                                                                        | USB Mouse                                                                                                                                                                                                                                                                                                            |                                                                                                                         |                                                 |
| E                                                                                                                                                                                                                                        | HDMI Cable                                                                                                                                                                                                                                                                                                           |                                                                                                                         |                                                 |
| F                                                                                                                                                                                                                                        | USB3.0 A male to A male gold-plated connectors cable /2.0m                                                                                                                                                                                                                                                           |                                                                                                                         |                                                 |
| G                                                                                                                                                                                                                                        | CD (Driver & utilities software, Ø12cm)                                                                                                                                                                                                                                                                              |                                                                                                                         |                                                 |
| Optional Accessory                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                      |                                                                                                                         |                                                 |
| H                                                                                                                                                                                                                                        | SD Card(16G or above; Speed: class 10)                                                                                                                                                                                                                                                                               |                                                                                                                         |                                                 |
| I                                                                                                                                                                                                                                        | Adjustable lens adapter                                                                                                                                                                                                                                                                                              | C-Mount to Dia.23.2mm Eyepiece Tube<br>(Please choose 1 of them for your microscope)                                    | 108001/AMA037<br>108002/AMA050<br>108003/AMA075 |
| J                                                                                                                                                                                                                                        | Fixed lens adapter                                                                                                                                                                                                                                                                                                   | C-Mount to Dia.23.2mm Eyepiece Tube<br>(Please choose 1 of them for your microscope)                                    | 108005/FMA037<br>108006/FMA050<br>108007/FMA075 |
| <b>Note:</b> For I and J optional items, please specify your camera type(C-mount, microscope camera or telescope camera), our engineer will help you to determine the right microscope or telescope camera adapter for your application; |                                                                                                                                                                                                                                                                                                                      |                                                                                                                         |                                                 |
| K                                                                                                                                                                                                                                        | 108015(Dia.23.2mm to 30.0mm Ring)/Adapter rings for 30mm eyepiece tube                                                                                                                                                                                                                                               |                                                                                                                         |                                                 |
| L                                                                                                                                                                                                                                        | 108016(Dia.23.2mm to 30.5mm Ring)/ Adapter rings for 30.5mm eyepiece tube                                                                                                                                                                                                                                            |                                                                                                                         |                                                 |
| M                                                                                                                                                                                                                                        | Calibration kit                                                                                                                                                                                                                                                                                                      | 106011/TS-M1(X=0.01mm/100Div.);<br>106012/TS-M2(X, Y=0.01mm/100Div.);<br>106013/TS-M7(X=0.01mm/100Div., 0.10mm/100Div.) |                                                 |
| N                                                                                                                                                                                                                                        | USB flash drive                                                                                                                                                                                                                                                                                                      |                                                                                                                         |                                                 |
| O                                                                                                                                                                                                                                        | USB WiFi adapter                                                                                                                                                                                                                                                                                                     |                                                                                                                         |                                                 |

## 5 BWHC4-4KAF8MPA Camera Configurations

You can use the BWHC4-4KAF8MPA camera in 4 different ways. Each application requires different hardware environment.

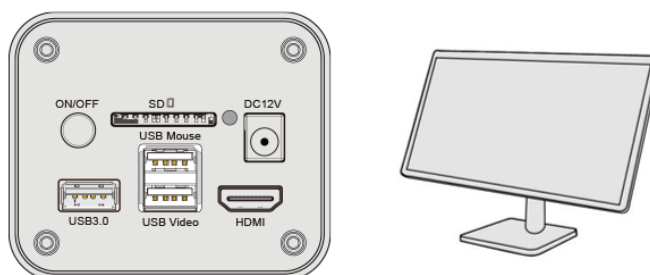
### 5.1 Camera working standalone with built-in XCamView software

For this application, apart from the microscope, you only need an HDMI monitor, the supplied USB mouse, and the camera embedded [XCamView](#) software. A computer or a network connection is not required to operate the camera in this application. The steps to start the camera are listed as below:

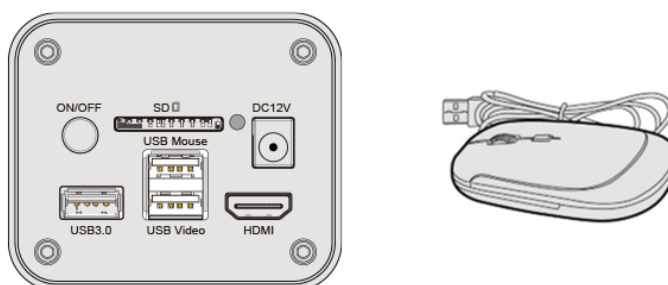


Figure 5 BWHC4-4KAF8MPA Camera with the HDMI Monitor

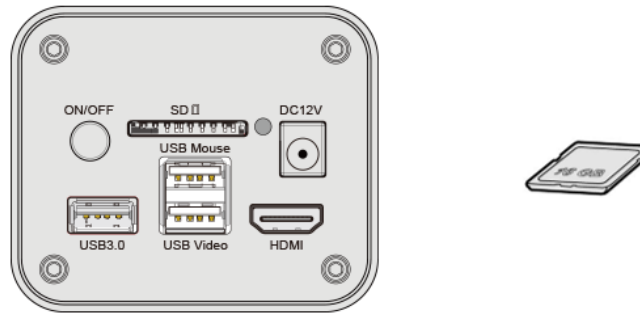
Connect the camera to a HDMI monitor using the HDMI cable;



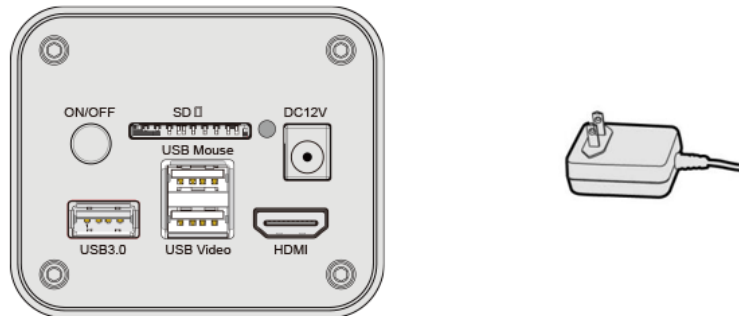
Insert the supplied USB mouse to the camera's USB Mouse port;



Insert the supplied SD card/USB flash drive into the BWHC4-4KAF8MPA camera SD card slot/USB3.0 slot;



Connect the camera to the power adapter and turn it on;



Turn on the monitor and view the video in the [XCamView](#) software. Move the mouse to the left, top or bottom of the [XCamView](#) UI, different control panel or toolbar will pop up and users could operate with the mouse at ease.

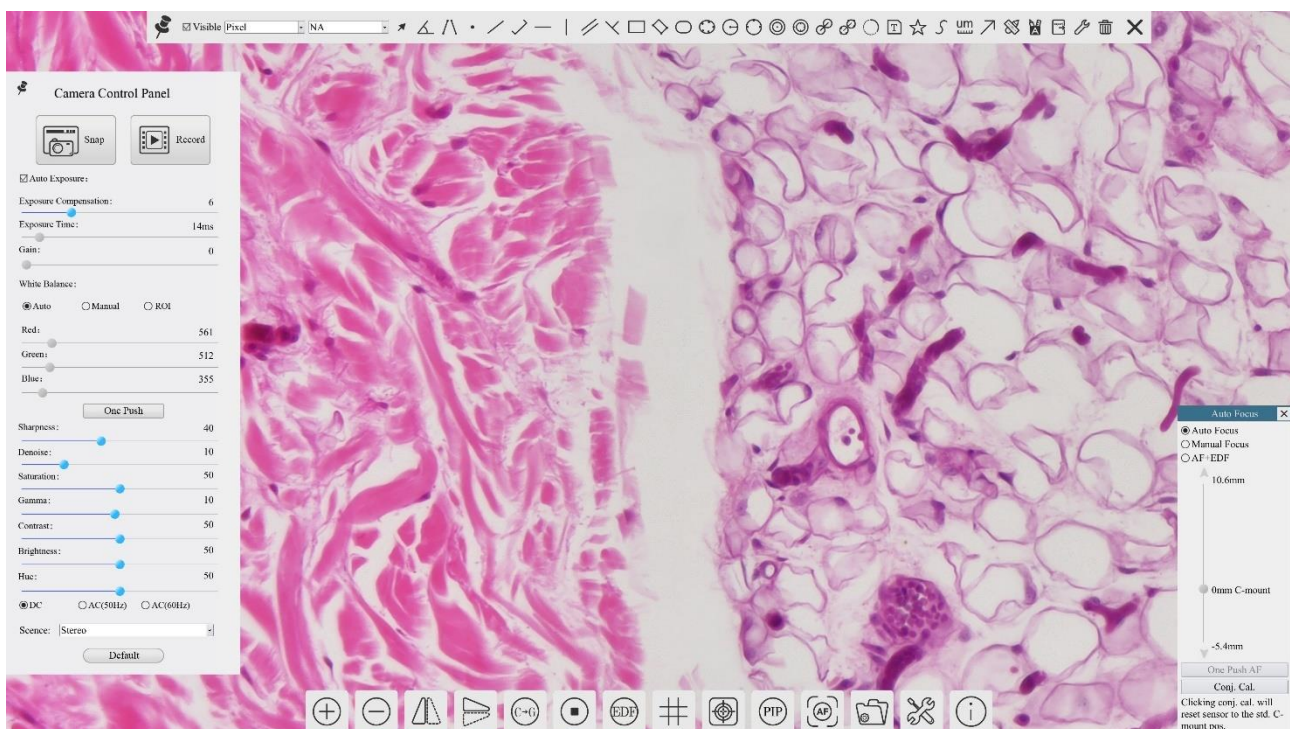


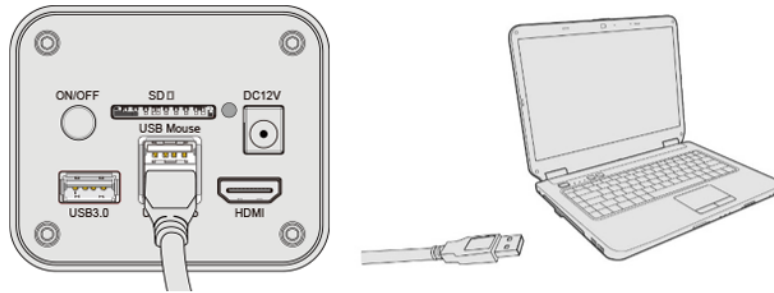
Figure 6 XCamView And BWHC4-4KAF8MPA Camera in HDMI Mode

## 5.2 Connecting camera to computers with USB3.0 port

For Windows user (Windows 8/10/11 (32/64 bit)), please use [ImageView](#).

For macOS and Linux user (macOS 10.10 or above or Linux distributions with kernel 2.6.27 or higher), please use [ImageView](#). The steps to start the camera are listed below:

Start the camera according to Sec. 5.1. After the camera is running, connect camera to computer with USB cable. Please use “USB Video” slot, The upper left corner of the HDMI graphics interface displays “USB3.0 Mode” or “USB2.0 Mode”, indicating that a connection has been established with the PC.



Install [ImageView](#) on your PC or install [ImageView App](#) on the mobile device; Run the software [ImageView](#), clicking the camera name in the [Camera List group](#) to start the live video as shown in Figure 7.

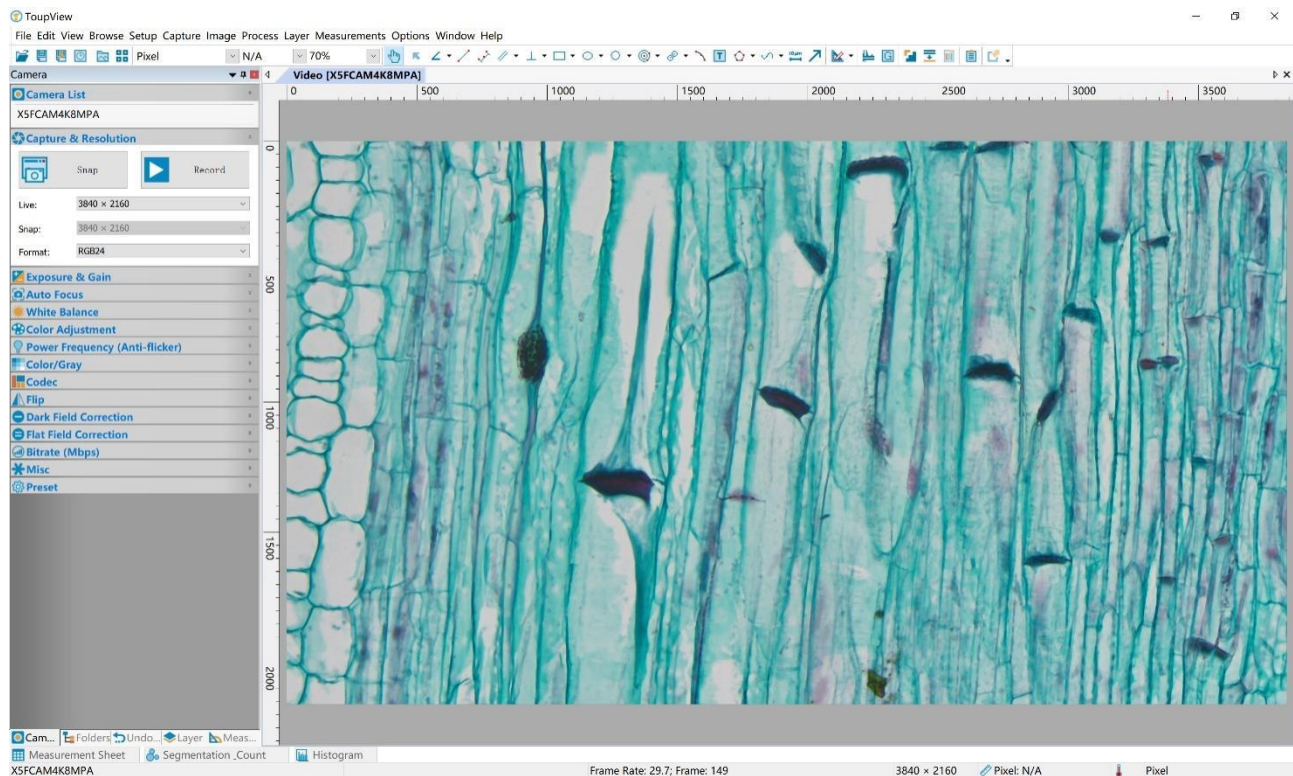


Figure 7 View and BWHC4-4KAF8MPA Camera in USB Mode

### 5.3 Camera working in WiFi mode (AP mode)

Please make sure your PC is [WiFi](#) enabled.



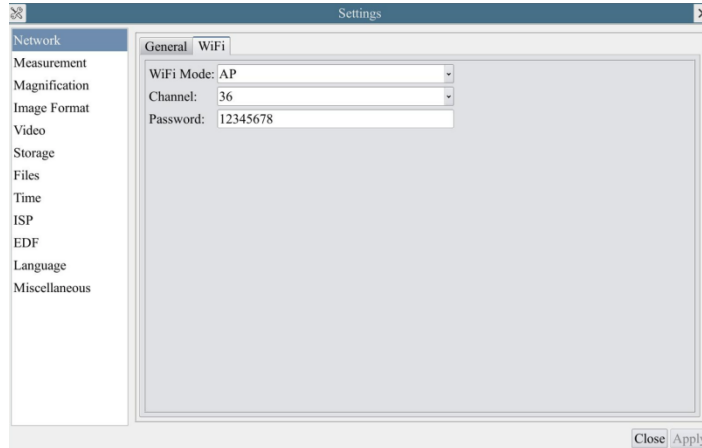
Figure 8 The PC or Mobile Device Connect to the Camera through WiFi

For Windows user (Windows 8/10/10/11 (32/64 bit)), please use [View](#).

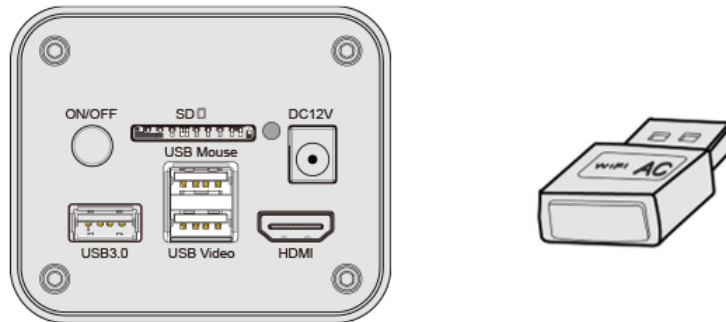
For [macOS](#) and [Linux](#) user ([macOS](#) 10.10 or above or [Linux](#) distributions with kernel 2.6.27 or higher), please use [ImageView](#). When connecting the camera with a mobile device, the free [ImageView App](#) is required. Just make sure that the mobile device uses iOS 11 or higher/Android 5.1 or higher operating systems.

The steps to start the camera are listed below:

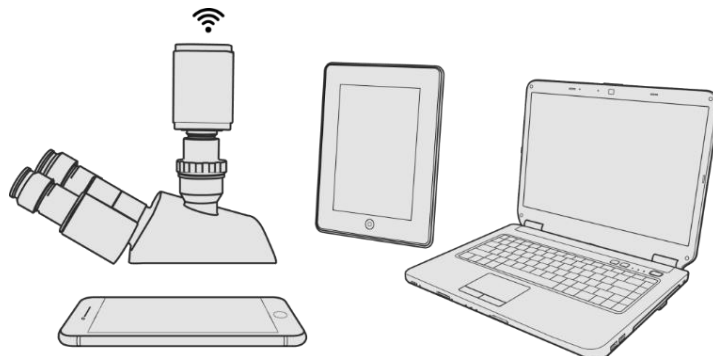
Start the camera according to Sec. 5.1. After the camera is running, move the mouse to the bottom of the GUI and clicking the  button on the [Synthesis Camera Control Toolbar](#) at the bottom of the video window, a small window called [Settings](#) will pop up as shown below. Click [Network](#)> [WiFi](#) property page and choose the [AP](#) in the [WiFi Mode](#) edit box(The factory default configuration is [AP](#) mode ).



Plug the [USB WiFi](#) adapter into the camera's USB3.0 port, the upper left corner of the HDMI graphics interface will display "[AP mode](#)";



Install [ImageView](#) on your PC or install [ImageView App](#) on the mobile device, connect the PC or mobile device to the camera's [WiFi AP](#) point; The network name (SSID) and the [WiFi](#) password (The default one is 12345678) can be found on the camera's [Setting](#)>[Network](#)> [WiFi](#) page in [AP](#) mode.



Start [ImageView](#) software or [ImageView App](#) and check the configuration. Normally, the active BWHC4-4KAF8MPA camera will be automatically recognized. The live image of each camera is shown in Figure 9. For the display, the [Camera List](#) group is used in [ImageView](#) software, and the [Camera Thumbnail](#) is used in [ImageView App](#).

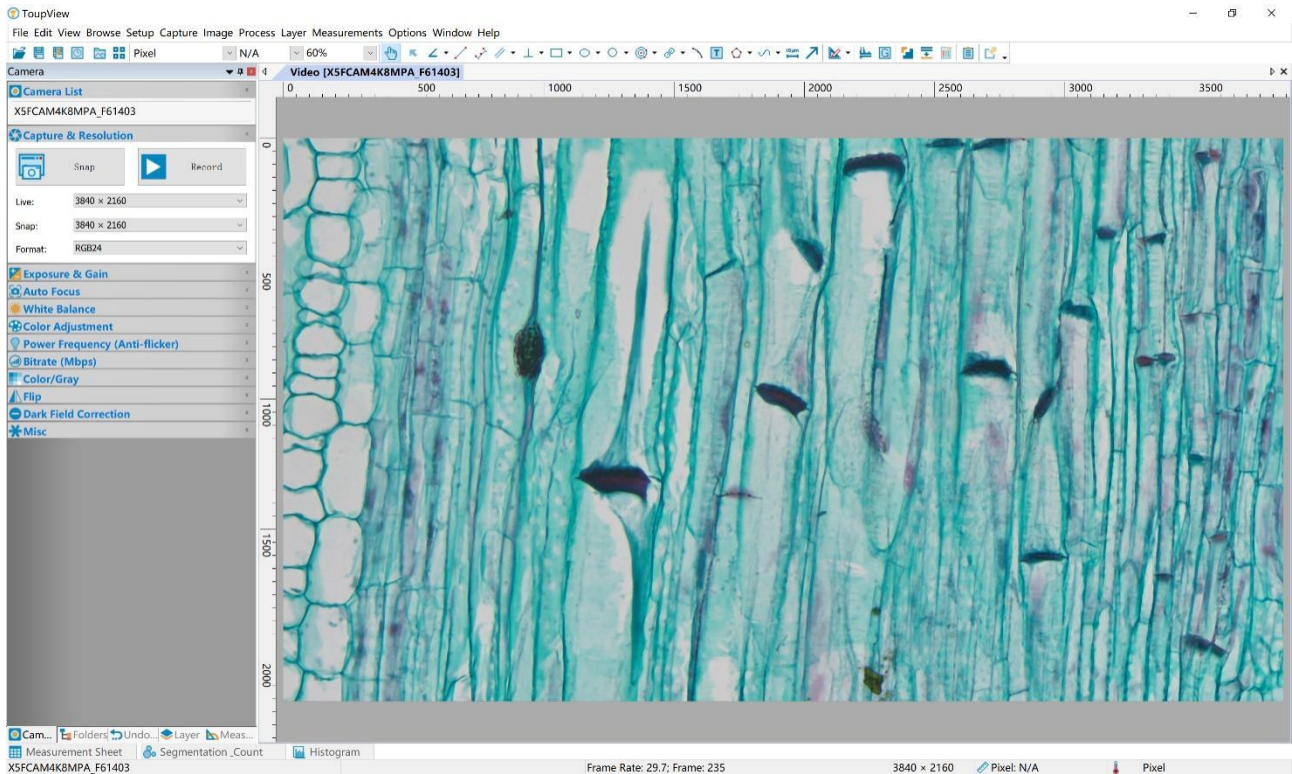


Figure 9 View and BWHC4-4KAF8MPA Camera in WiFi AP Mode

## 5.4 Connecting multi-cameras to the router through the WiFi STA mode for the network application

Multi BWHC4-4KAF8MPA cameras are connected to router through the WiFi STA mode, and the user can control the HDMI camera on the computer or mobile device through WiFi.

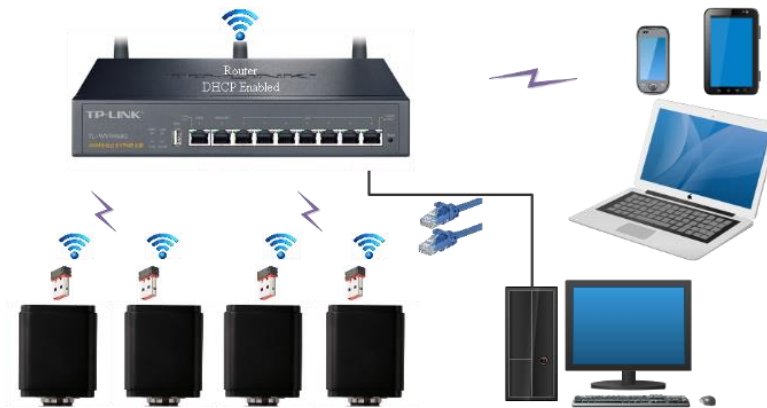
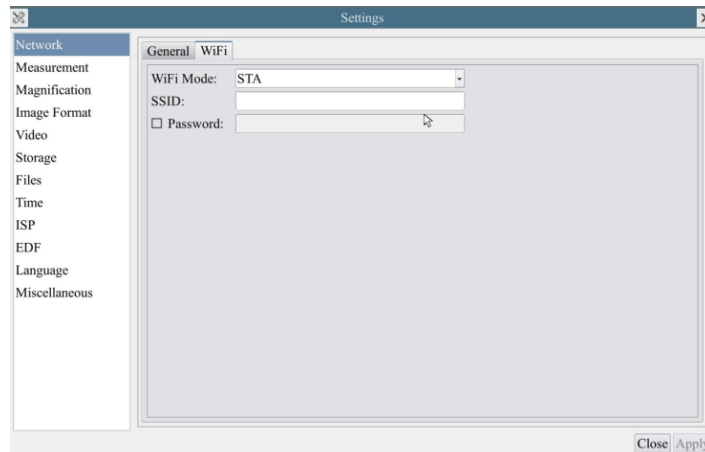


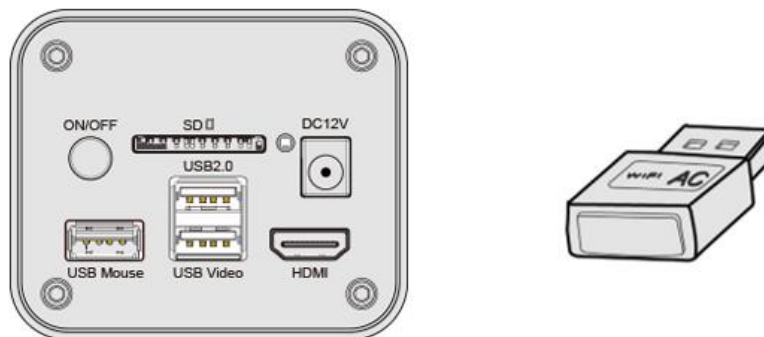
Figure 10 Multi BWHC4-4KAF8MPA Cameras Connecting to the Router through the WiFi Style

Start the camera according to Sec. 5.1. After the camera is running, move the mouse to the bottom of the video window and clicking the  button on the [Synthesis Camera Control Toolbar](#) at the bottom of the video window, a small window called [Settings](#) will pop up as shown below. Clicking [Network> WiFi](#) property page and choosing the [STA](#) in the [WiFi Mode](#) edit box(The factory default configuration is [AP](#) mode ). Input the to be connected router's [SSID](#) and [Password](#) as shown below:

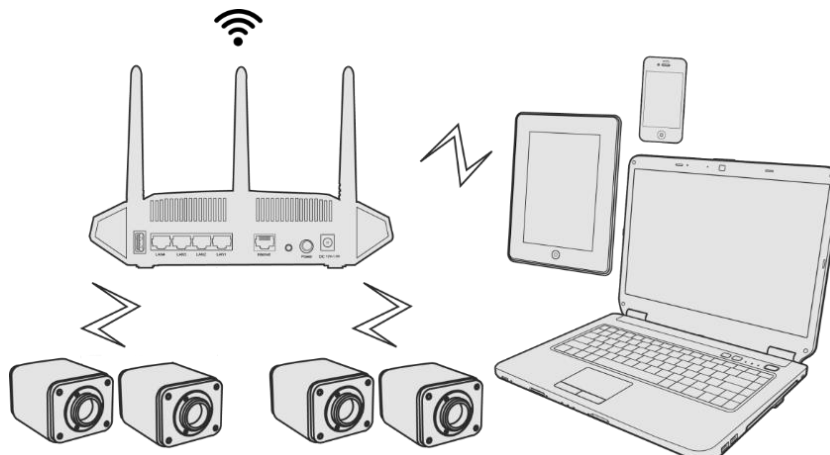


Install [ImageView](#) software on your PC. Alternatively, install the free [ImageView App](#) on the mobile device;

Plug the [USB WiFi](#) adapter into the camera's USB3.0 port(for those connected to router with [WiFi STA](#) mode), the upper left corner of the HDMI graphics interface will display“[STA Mode](#)”;



Finally, as shown below, 4 BWHC4-4KAF8MPA cameras are connected to the same router with [WiFi STA](#) mode (The number of the cameras is determined by the router performance).



Make sure that your PC or your mobile device is connected to the [LAN](#) or [WiFi](#) of the router; Start [ImageView](#) software or [ImaveView App](#) and check the configuration. Normally, active BWHC4-4KAF8MPA camera will be automatically recognized. The live image of each camera is displayed. For the display, [Camera List](#) group is used in [ImageView](#) software, and [Camera Thumbnail](#) is used in [ImageView App](#); Select theBWHC4-4KAF8MPA camera you are interested in. To do so, double click the camera's name in [Camera List](#) tool window if you use [View /Lite](#) software; If you use [View App](#), tap the camera's thumbnail in [Camera List](#) page(See Figure 11)

## About the routers/switches

It is suggested that routers/switches supporting WiFi 5G should be selected to achieve better wireless connection experience.

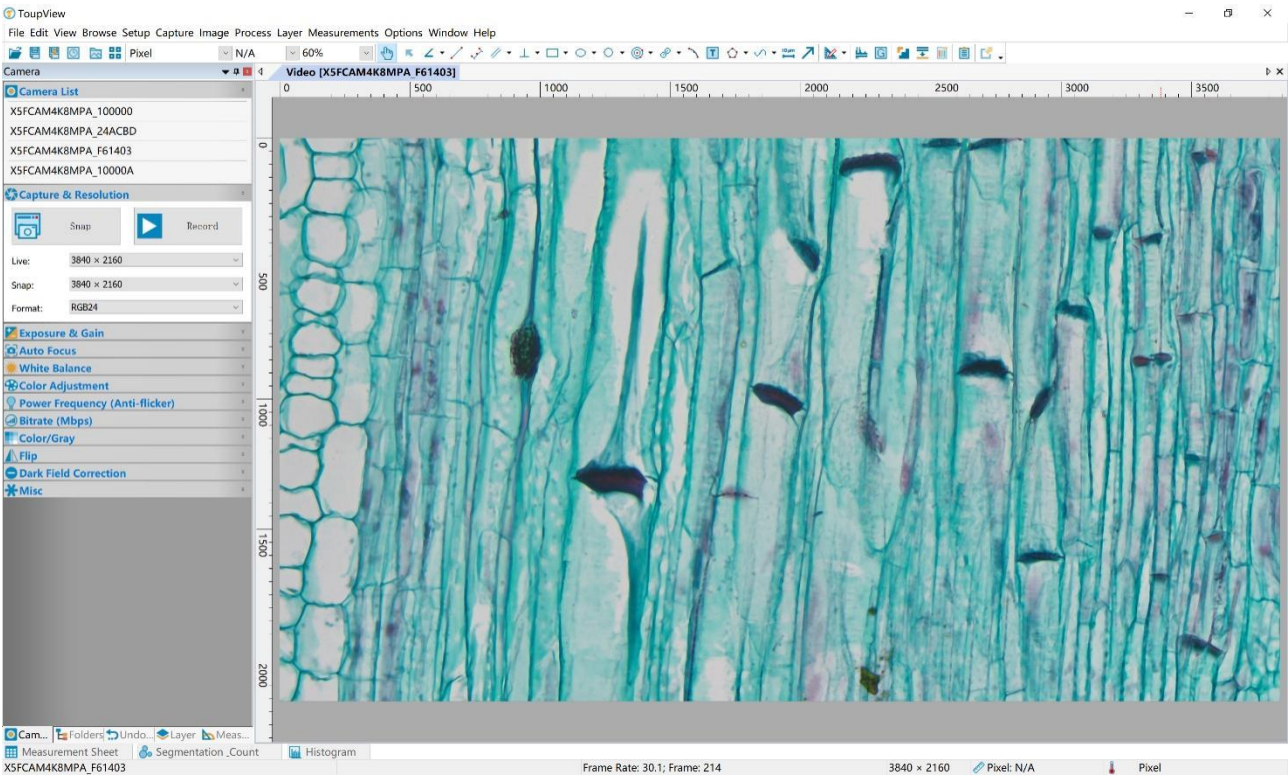


Figure 11 View and BWHC4-4KAF8MPA Camera in WiFi STA mode

## 6 Brief Introduction of BWHC4-4KAF8MPA UI and Its Functions

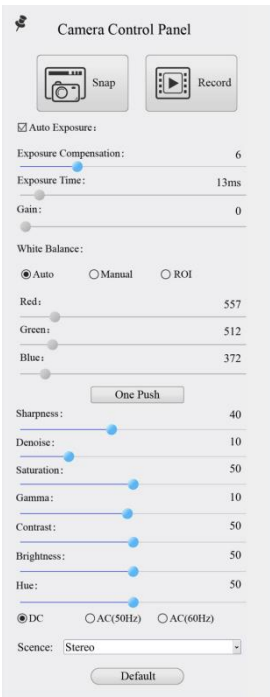
### 6.1 XCamView UI

The BWHC4-4KAF8MPA UI shown in Figure 6 includes a [Camera Control Panel](#) on the left of the video window, a [Measurement Toolbar](#) on the top of the video window and a [Synthesis Camera Control Toolbar](#) on the bottom of the video window.

| Notes |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | To show the <a href="#">Camera Control Panel</a> , move your mouse to the left or right of the video window. See Sec.6.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 2     | Move the mouse cursor to the top of the video window, a <a href="#">Measurement Toolbar</a> will pop up for calibration and measurement operations. When user left-clicks the <a href="#">Float/Fixed</a> button  on the <a href="#">Measurement Toolbar</a> , the <a href="#">Measurement Toolbar</a> will be fixed. In this case the <a href="#">Camera Control Panel</a> will not pop up automatically even if users move mouse cursor to left or right side of the video window. Only when user left-clicks the  button on the <a href="#">Measurement Toolbar</a> to exit from measuring procedure will they be able to do other operations on the <a href="#">Camera Control Panel</a> , or the <a href="#">Synthesis Camera Control Toolbar</a> . During the measuring process, when a specific measuring object is selected, an <a href="#">Object Location &amp; Attributes Control Bar</a>       will appear for changing location and properties of the selected object. See Sec.6.3 for details. |
| 3     | When users move mouse cursor to the bottom of the video window, the <a href="#">Synthesis Camera Control Toolbar</a> will pop up automatically.<br>              See Sec.6.4 for details.                                                                                                                                                                                                                                                                                                              |
| 4     | When users move mouse cursor to the bottom of the video window, the <a href="#">Synthesis Camera Control Toolbar</a> will pop up automatically. Clicking the  button and the <a href="#">Auto Focus Control Panel</a> will appear for autofocus operation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

### 6.2 The camera control panel on the left or right side of the video window

The [Camera Control Panel](#) controls the camera to achieve the best video or image quality according to the specific applications; It will pop up automatically when the mouse cursor is moved to the left or right side of the video window (in measurement status, the [Camera Control Panel](#) will not pop up. The [Camera Control Panel](#) will only pop up when the measurement process is finished or terminated while user's cursor on the left edge of the video window). Left-clicking  button to achieve [Display/Auto Hide](#) switch of the [Camera Control Panel](#).

| Camera Control Panel                                                                | Function              | Function Description                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Snap                  | <a href="#">Capture</a> image and save it to the <a href="#">SD</a> card or USB flash drive                                                                                                                             |
|                                                                                     | Record                | <a href="#">Record</a> video and save it to the <a href="#">SD</a> card or USB flash drive                                                                                                                              |
|                                                                                     | Auto Exposure         | When <a href="#">Auto Exposure</a> is checked, the system will automatically adjust exposure time and gain according to the value of exposure compensation                                                              |
|                                                                                     | Exposure Compensation | Available when <a href="#">Auto Exposure</a> is checked. Slide to left or right to adjust <a href="#">Exposure Compensation</a> according to the current video brightness to achieve proper brightness value            |
|                                                                                     | Exposure Time         | Available when <a href="#">Auto Exposure</a> is unchecked. Slide to left or right to reduce or increase exposure time, adjusting brightness of the video                                                                |
|                                                                                     | Gain                  | Adjust <a href="#">Gain</a> to reduce or increase brightness of video. The Noise will be reduced or increased accordingly                                                                                               |
|                                                                                     | Red                   | Slide to left or right to decrease or increase the proportion of <a href="#">Red</a> in <a href="#">RGB</a> on video                                                                                                    |
|                                                                                     | Green                 | Slide to left or right to decrease or increase the proportion of <a href="#">Green</a> in <a href="#">RGB</a> on video                                                                                                  |
|                                                                                     | Blue                  | Slide to left or right to decrease or increase the proportion of <a href="#">Blue</a> in <a href="#">RGB</a> on the video                                                                                               |
|                                                                                     | Auto                  | <a href="#">White Balance</a> adjustment according to the window video every time the button is clicked                                                                                                                 |
|                                                                                     | Manual                | Adjust the <a href="#">Red</a> 、 <a href="#">Green</a> or <a href="#">Blue</a> item to set the video <a href="#">White Balance</a>                                                                                      |
|                                                                                     | ROI                   | Check the <a href="#">ROI</a> item will display a red <a href="#">ROI</a> rectangle on the video window, drag it to the interested area will perform the <a href="#">White Balance</a> according to the area video data |
|                                                                                     | One Push              | Perform a global white balance based on image conditions                                                                                                                                                                |
|                                                                                     | Sharpness             | Adjust <a href="#">Sharpness</a> level of the video                                                                                                                                                                     |
|                                                                                     | Denoise               | Slide left or right to <a href="#">Denoise</a> the video                                                                                                                                                                |
|                                                                                     | Saturation            | Adjust <a href="#">Saturation</a> level of the video                                                                                                                                                                    |
|                                                                                     | Gamma                 | Adjust <a href="#">Gamma</a> level of the video. Slide to the right side to increase <a href="#">Gamma</a> and to the left to decrease <a href="#">Gamma</a> .                                                          |
|                                                                                     | Contrast              | Adjust <a href="#">Contrast</a> level of the video. Slide to the right side to increase <a href="#">Contrast</a> and to the left to decrease <a href="#">Contrast</a> .                                                 |
|                                                                                     | Brightness            | Adjust <a href="#">Brightness</a> level of the video. Slide to the right side to increase <a href="#">Brightness</a> and to the left to decrease <a href="#">Brightness</a> .                                           |
|                                                                                     | Hue                   | Adjust <a href="#">Hue</a> level of the video. Slide to the right side to increase <a href="#">Hue</a> and to the left to decrease <a href="#">Hue</a> .                                                                |

|  |          |                                                                                                                                                                  |
|--|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | DC       | For DC illumination, there will be no fluctuation in light source so no need for compensating light flickering                                                   |
|  | AC(50HZ) | Check AC(50HZ) to eliminate flickering caused by 50Hz illumination                                                                                               |
|  | AC(60HZ) | Check AC(60HZ) to eliminate flickering caused by 60Hz illumination                                                                                               |
|  | Scence   | Select different default parameters according to the type of microscope                                                                                          |
|  | Default  | Restore all the settings in the Camera Control Panel to default values<br>Right click to select different default parameters according to the type of microscope |

### 6.3 The Measurement Toolbar on top of the video window

The Measurement Toolbar will pop up when moving mouse cursor to any place near the upper edge of the video window. Here is the introduction of the various functions on the Measurement Toolbar:



Figure 12 The Measurement Toolbar on the Upper Side of the Video Window

| Icon | Function                                                                                                                                                                                                                                                                                                                                               |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      | Float/ Fix switch of the Measurement Toolbar                                                                                                                                                                                                                                                                                                           |
|      | Show / Hide Measurement Objects                                                                                                                                                                                                                                                                                                                        |
|      | Select the desired Measurement Unit                                                                                                                                                                                                                                                                                                                    |
|      | Select Magnification for Measurement after Calibration                                                                                                                                                                                                                                                                                                 |
|      | Object Select                                                                                                                                                                                                                                                                                                                                          |
|      | Angle                                                                                                                                                                                                                                                                                                                                                  |
|      | 4 Points Angle                                                                                                                                                                                                                                                                                                                                         |
|      | Point(Point Counter)                                                                                                                                                                                                                                                                                                                                   |
|      | Arbitrary Line                                                                                                                                                                                                                                                                                                                                         |
|      | 3 Points Line                                                                                                                                                                                                                                                                                                                                          |
|      | Horizontal Line                                                                                                                                                                                                                                                                                                                                        |
|      | Vertical Line                                                                                                                                                                                                                                                                                                                                          |
|      | 3 Points Vertical Line                                                                                                                                                                                                                                                                                                                                 |
|      | Parallel                                                                                                                                                                                                                                                                                                                                               |
|      | Rectangle                                                                                                                                                                                                                                                                                                                                              |
|      | 3 Points Rectangle                                                                                                                                                                                                                                                                                                                                     |
|      | Ellipse                                                                                                                                                                                                                                                                                                                                                |
|      | 5 Points Ellipse                                                                                                                                                                                                                                                                                                                                       |
|      | Circle                                                                                                                                                                                                                                                                                                                                                 |
|      | 3 Points Circle                                                                                                                                                                                                                                                                                                                                        |
|      | Annulus                                                                                                                                                                                                                                                                                                                                                |
|      | 3 Points Annulus                                                                                                                                                                                                                                                                                                                                       |
|      | Two Circles and its Center Distance                                                                                                                                                                                                                                                                                                                    |
|      | 3 Points Two Circles and its Center Distance                                                                                                                                                                                                                                                                                                           |
|      | Arc                                                                                                                                                                                                                                                                                                                                                    |
|      | Text                                                                                                                                                                                                                                                                                                                                                   |
|      | Polygon                                                                                                                                                                                                                                                                                                                                                |
|      | Curve                                                                                                                                                                                                                                                                                                                                                  |
|      | Scale Bar                                                                                                                                                                                                                                                                                                                                              |
|      | Arrow                                                                                                                                                                                                                                                                                                                                                  |
|      | Execute Calibration to determine the corresponding relation between magnification and resolution, which will establish the corresponding relationship between measurement unit and the sensor pixel size. Calibration needs to be done with the help of a micrometer. For detailed steps of carrying out Calibration please refer to View help manual. |
|      | Auto Measurement: Two Points Parallel, Circle Detect, Annulus Detect, Rectangle Detect, Polygon                                                                                                                                                                                                                                                        |
|      | Export the Measurement information to CSV file(*.csv)                                                                                                                                                                                                                                                                                                  |
|      | Measurement Setup                                                                                                                                                                                                                                                                                                                                      |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Delete all the measurement objects                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|  | Exit from Measurement mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|  | When the measurement ends, left-click on a single measuring object and the <a href="#">Object Location &amp; Properties Control Bar</a> will show up. User could move the object by dragging the object with the mouse. But more accurate movement could be done with the control bar. The icons on the control bar mean <a href="#">Move Left</a> , <a href="#">Move Right</a> , <a href="#">Move Up</a> , <a href="#">Move Down</a> , <a href="#">Color Adjustment</a> and <a href="#">Delete</a> . |

Note:

1) When user left-clicks [Display/Hide](#) button on [Measurement Toolbar](#), [Measurement Toolbar](#) will be fixed. In this case [Camera Control Panel](#) will not pop up automatically even if moving the mouse cursor to the left edge of the video window. Only when user left-click the button on [Measurement Toolbar](#) to exit from the measurement mode will they be able to doing other operations on [Camera Control Panel](#) or [Synthesis Camera Control Toolbar](#).

2) When a specific [Measurement Object](#) is selected during the measurement process, [Object Location & Attributes Control Bar](#) will appear for changing the object location and properties of the selected objects.

## 6.4 Icons and functions of the Synthesis Camera Control Toolbar at the bottom of the video window



Figure 13 The Synthesis Camera Control Toolbar on the Bottom of the Video Window

| Icon | Function                 | Icon | Function                                |
|------|--------------------------|------|-----------------------------------------|
|      | Zoom In the Video Window |      | Zoom Out the Video Window               |
|      | Horizontal Flip          |      | Vertical Flip                           |
|      | Color/gray               |      | Video Freeze                            |
|      | EDF                      |      | Display Cross Line                      |
|      | Image Overlay            |      | PIP                                     |
|      | Auto Focus               |      | Browse images and videos in the SD Card |
|      | Settings                 |      | Check the Version of XCamView           |

The [Browsing](#) function, for detailed introduction, please refer to Section 6.4.1.

The [Setting](#) function, for detailed introduction, please refer to Sections 6.4.2 to 6.4.14.

### 6.4.1 Browse

Clicking the to browse the dxf, images, videos, and other files saved on the SD card or USB flash drive, as shown in the following figure.

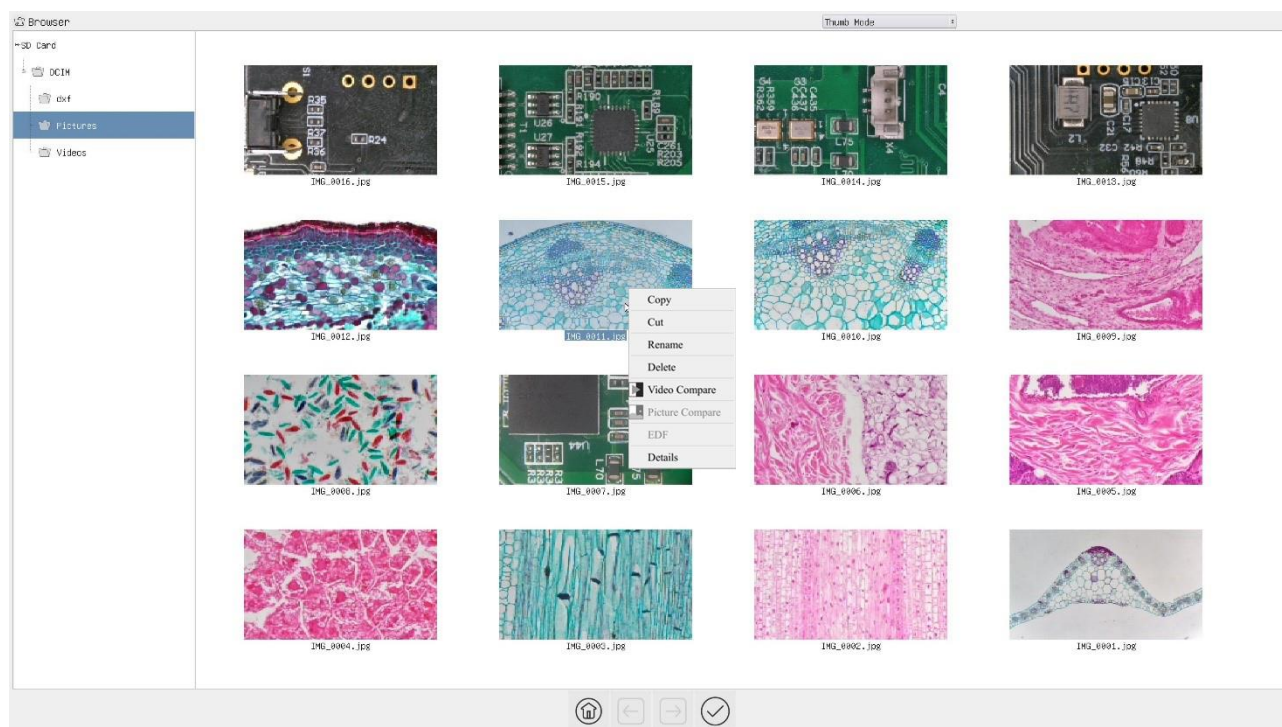


Figure 14 Browsing UI

There are two browsing modes: [List mode](#) and [Thumb mode](#). The default is [Thumb mode](#).

Right click on an empty area to create a new folder.

Right click on an image file to [Copy](#), [Cut](#), [Rename](#), [Delete](#), [Video Compare](#), and view detailed information([Details](#)). Clicking on a thumb to select the 1<sup>st</sup> image, and clicking on another thumb to select the 2<sup>nd</sup> image (or selecting 2 images with frame), then clicking the right mouse button to bring up the context menu and select [Picture Compare](#) to analyze and compare the two images. Clicking on a thumb to select 2~5 (or box select 2~5) pictures focusing on different targets in the same scene, you can perform depth of field compositing on the selected pictures.

Right click on a video file to [Copy](#), [Cut](#), [Rename](#), [Delete](#), [Video Compare](#), and view detailed information([Details](#)).

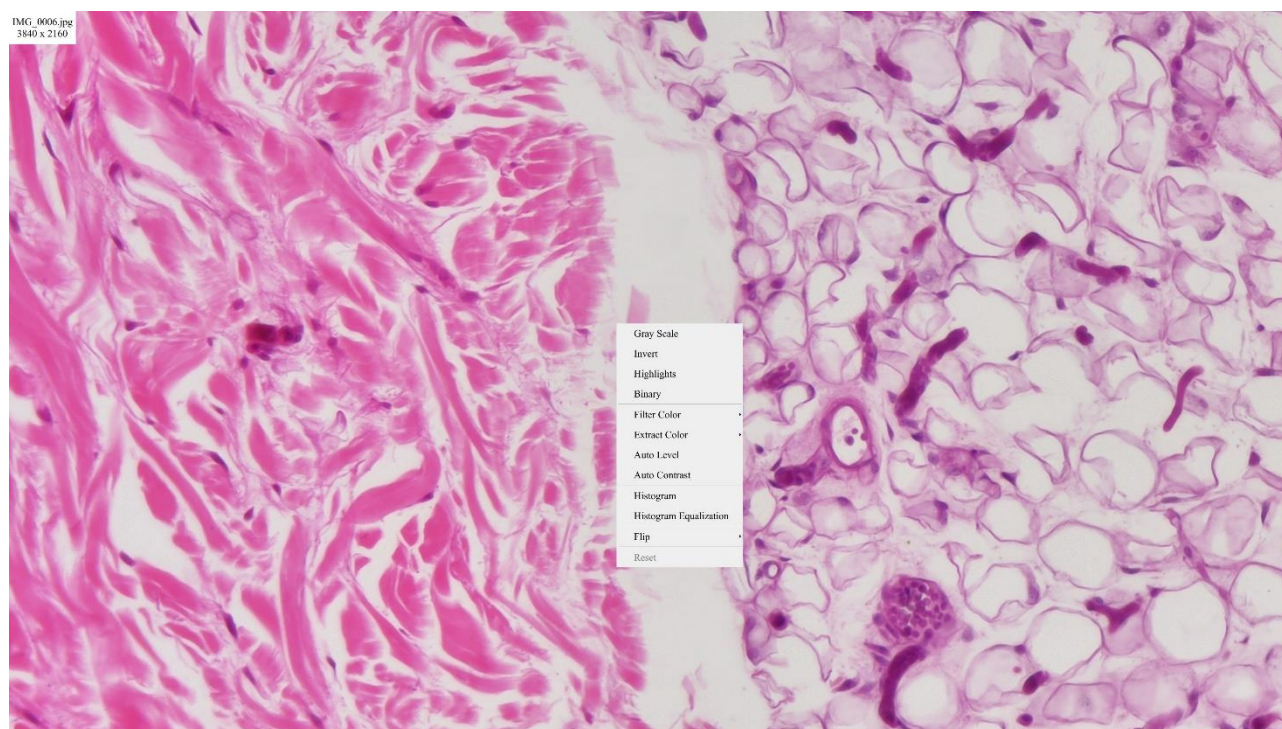


Figure 15 Image Processing

Double-click the thumbnail of the picture with the left mouse button to open the picture, and then right-click the

picture to [Gray Scale](#), [Invert](#), [Highlights](#), [Binary](#), [Filter Color](#), [Extract Color](#), [Auto Level](#), [Auto Contrast](#), [Histogram](#), [Histogram Equalization](#), [Flip](#), and other image processing functions, and then after the processing is completed, you can choose reset to revert back to the original picture, and also you can choose save or save as in the lower sidebar of the picture. The description of each function is as follows:

|                                        |                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">Gray Scale</a>             | Choose <a href="#">Gray Scale</a> command to convert a color image to a Gray Scale image                                                                                                                                                                                                                            |
| <a href="#">Invert</a>                 | Choose <a href="#">Invert</a> command to reverse the pixel values of the active image                                                                                                                                                                                                                               |
| <a href="#">Highlights</a>             | Choose <a href="#">Highlights</a> command to adjust the Highlight parts of the images                                                                                                                                                                                                                               |
| <a href="#">Binary</a>                 | <a href="#">Binary</a> is a kind of gray level process. If the gray of the pixel is greater than the given threshold, the pixel's color will be changed into white. Otherwise, the pixel's color will be changed into black                                                                                         |
| <a href="#">Filter Color</a>           | Choose <a href="#">Filter Color</a> command to filter a special color channel from a color image. Select either Red, or Green, or Blue color to filter. For every pixel, if select Red color to filter, only information about the Red channel will be discarded, the Green and Blue information will remain there. |
| <a href="#">Extract Color</a>          | Choose <a href="#">Extract Color</a> command to extract a special color channel from a color image. Select either Red or Green, or Blue color to extract for every pixel, if selecting Red color to extract, only information about the Red channel will be kept, the Green and Blue information will be discarded. |
| <a href="#">Auto Level</a>             | The <a href="#">Auto Level</a> command moves the level's sliders automatically to set highlight and shadow. It defines the lightest and darkest pixels in each color channel as white and black and then redistributes the pixels' color values proportionately                                                     |
| <a href="#">Auto Contrast</a>          | The <a href="#">Auto Contrast</a> command automatically adjusts the overall contrast in an RGB image                                                                                                                                                                                                                |
| <a href="#">Histogram</a>              | Used to show the distribution of brightness, R, G, B of an image over an image                                                                                                                                                                                                                                      |
| <a href="#">Histogram Equalization</a> | Used to improved image contrast                                                                                                                                                                                                                                                                                     |
| <a href="#">Flip</a>                   | Flip image <a href="#">Horizontally</a> / <a href="#">Vertically</a>                                                                                                                                                                                                                                                |

6.4.2 Settings>Network>General

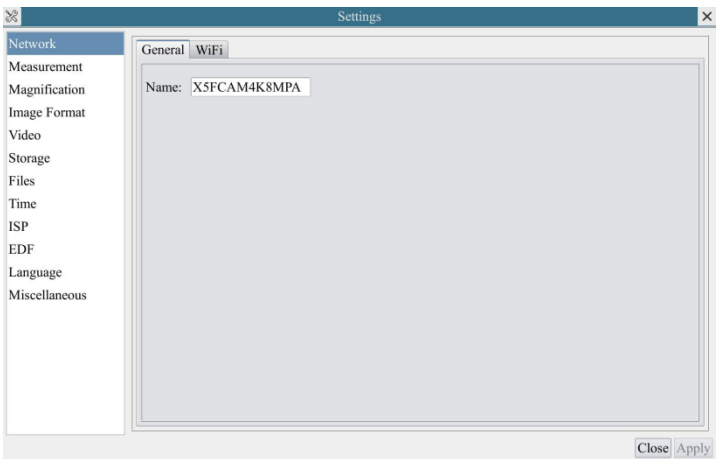


Figure 16 Comprehensive Network General Settings Page

|      |                                                        |
|------|--------------------------------------------------------|
| Name | The current camera name recognized as the network name |
|------|--------------------------------------------------------|

6.4.3 Settings>Network> WiFi

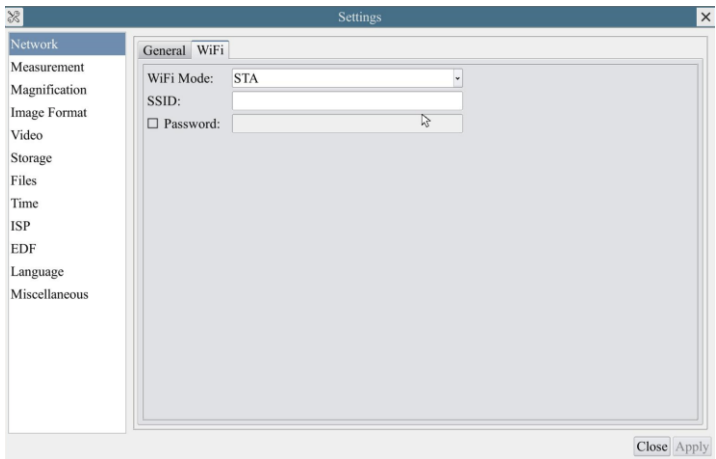


Figure 17 Network Setup

|              |                                                                                         |
|--------------|-----------------------------------------------------------------------------------------|
| Wi-Fi Mode   | AP/STA mode to select;                                                                  |
| Channel/SSID | Channel for the AP mode and SSID for the STA mode. Here, the SSID is the router's SSID; |
| Password     | Camera Password for the AP mode. Router Password for the STA mode                       |

6.4.4 Settings>Measurement

This page is used for the define of the Measurement Object properties.

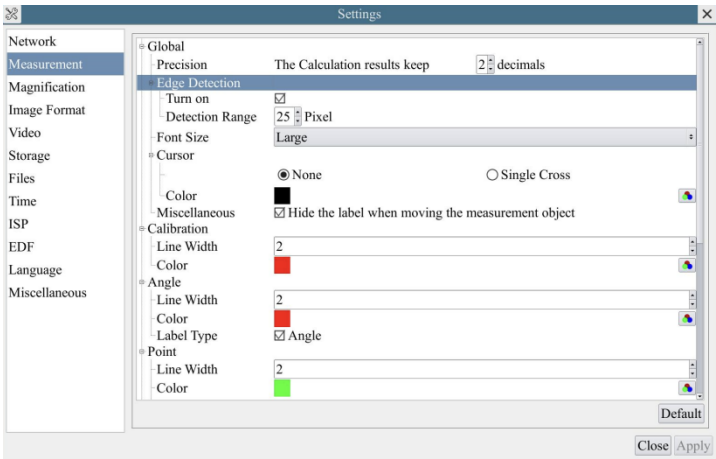


Figure 18 The Measurement Setup

|        |           |                                                                           |
|--------|-----------|---------------------------------------------------------------------------|
| Global | Precision | Used for setting digits behind the decimal point for measurement results; |
|--------|-----------|---------------------------------------------------------------------------|

|                                                                                                                      |                                                                                                                                                                                                                                                                 |                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                      | Edge Detection                                                                                                                                                                                                                                                  | Select whether to enable the automatic edge search function and set the detection range;                                                                                      |
|                                                                                                                      | Font Size                                                                                                                                                                                                                                                       | The font size of measurement data can be divided into three types: large, Middle, and Small;                                                                                  |
|                                                                                                                      | Cursor                                                                                                                                                                                                                                                          | Select whether the cursor is a single crosshair and set the color of the single cross;                                                                                        |
|                                                                                                                      | Miscellaneous                                                                                                                                                                                                                                                   | Whether to hide the label when moving the measurement objects;                                                                                                                |
| Calibration                                                                                                          | Line Width                                                                                                                                                                                                                                                      | Used for defining width of the lines for calibration;                                                                                                                         |
|                                                                                                                      | Color                                                                                                                                                                                                                                                           | Used for defining color of the lines for calibration;                                                                                                                         |
|                                                                                                                      | EndPoint                                                                                                                                                                                                                                                        | Type: Used for defining shape of the endpoints of lines for calibration: Null means no EndPoint, rectangle means rectangle type of endpoints. It makes alignment more easily; |
| Point, Angle, Line, Horizontal Line, Vertical Line, Rectangle, Circle, Ellipse, Annulus, Two Circles, Polygon, Curve |                                                                                                                                                                                                                                                                 |                                                                                                                                                                               |
|                                                                                                                      | Left-click the  along with the Measurement command mentioned above will unfold the corresponding attribute settings to set the individual property of the Measurement Objects. |                                                                                                                                                                               |

### 6.4.5 Settings>Magnification

This page's items are formed by the Measurement Toolbar's Calibration command.

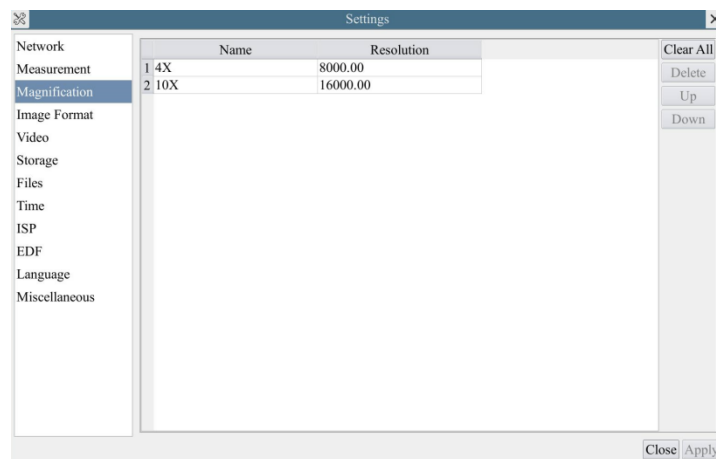


Figure 19 Comprehensive Magnification Settings Page

|            |                                                                                                                                                                                                                                                                                                                                                     |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name       | Names such as 10X, 40X, 100X are based on magnification of the microscopes. For continuous zoom microscopes, ensure that the selected magnification coincides with the scale alignment line on the microscope zoom knob; Users could also edit the name of the magnification with other information, for example, microscope mode, users name, etc. |
| Resolution | Pixels per meter. Image device like microscopes have high Resolution value;                                                                                                                                                                                                                                                                         |
| Clear All  | Click the Clear All button will clear the calibrated magnifications;                                                                                                                                                                                                                                                                                |
| Delete     | Click Delete to delete the selected magnification;                                                                                                                                                                                                                                                                                                  |
| Up         | Select a row in the magnification and click Move Up to move up the currently selected magnification;                                                                                                                                                                                                                                                |
| Down       | Select a row in the magnification and click Move Down to move up the currently selected magnification;                                                                                                                                                                                                                                              |

### 6.4.6 Settings>Image Format

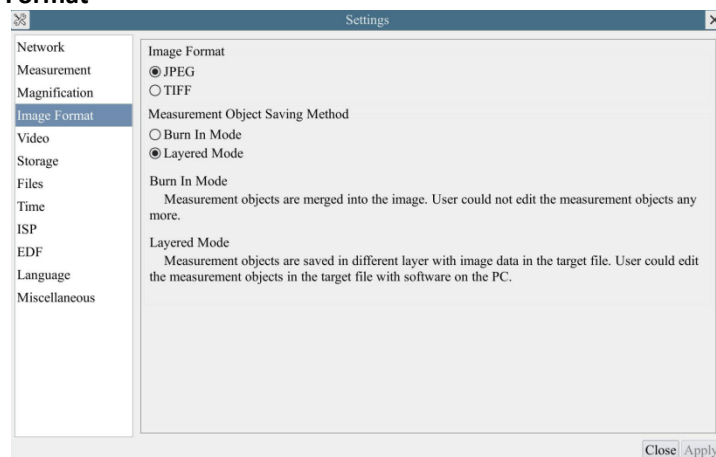


Figure 20 Comprehensive Image Format Settings Page

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Image Format              | JPEG: The extension of JPEG file can get very high compression rate and display very rich and vivid images by removing redundant images and color data. In other words, it can get better image quality with the least disk space. If measurement objects are available, the measurement objects will be burned into the image and the measurement cannot be edited.<br>TIFF: TIFF is a flexible bitmap format mainly used to store images including photos and artistic images. |
| Measurement Object Saving | Burn in Mode: The measurement objects are merged into the current image. User could not edit the measurement objects any more. This mode is not reversible.                                                                                                                                                                                                                                                                                                                      |

|        |                                                                                                                                                                                                                                  |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Method | Layered Mode: The measurement objects are saved in different layer with current image data in the target file. User could edit the measurement objects in the target file with some software on the PC. This mode is reversible. |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 6.4.7 Settings>Video



Figure 21 Comprehensive Setting of Video page

|                  |                                                                                                                                                                                                                                          |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Video Resolution | Select a Video Resolution of 1920x1080 or 3840x2160;                                                                                                                                                                                     |
| Video Playback   | Fast Forward/Reverse internal in second unite for Video Playback                                                                                                                                                                         |
| Video Encode     | Select the Video Encode format. Can be H264 or H265. Compared with H264, H265 has a higher H265 compression ratio which is primarily used to further reduce the design flow rate, in order to lower the cost of storage and transmission |

## 6.4.8 Settings>Storage

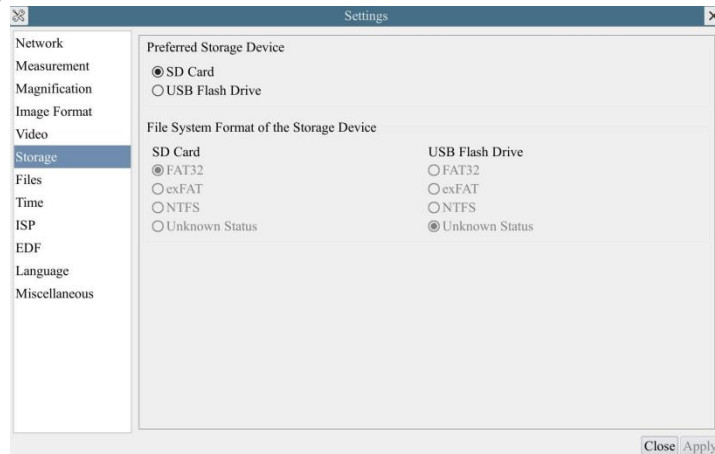


Figure 22 Comprehensive Setting of Storage Page

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Preferred Storage Page                   | SD Card: Select it to save the video and image to the SD Card.<br>USB Flash Drive: Select it to save the video and image to the USB Flash Drive.                                                                                                                                                                                                                                                                                                                                                      |
| File System Format of the Storage Device | List the file system format of the current storage device<br>FAT32: The file system of SD Card is FAT32. The maximum video file size of single file in FAT32 file system is 4G Bytes;<br>exFAT: The file system of SD Card is exFAT. The maximum video file size of single file in FAT32 file system is 16E Bytes;<br>NTFS: The file system of SD Card is NTFS. The maximum video file size of single file is 2T Bytes.<br>Unknown Status: SD Card not detected or the file system is not identified; |
| Note:                                    | For USB Flash Drive, USB 3.0 interface is preferred.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## 6.4.9 Settings>Files

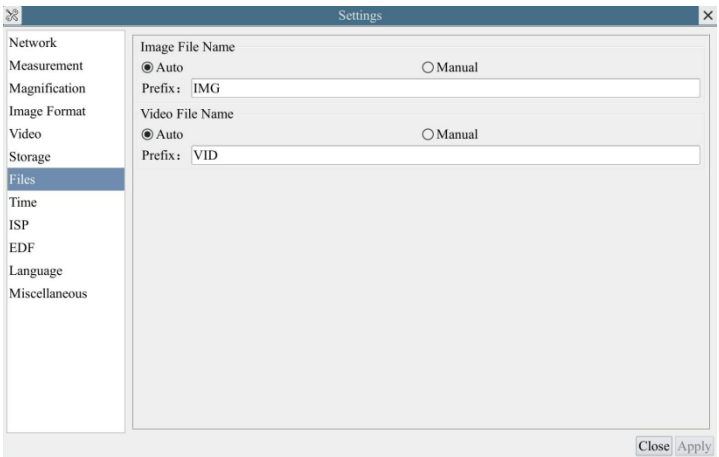


Figure 23 Comprehensive Setting of Files Name

|                                   |                                                                                                               |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------|
| Image or Video File Name Paradigm | Provide Auto or Manual naming paradigm for Image or Video file;                                               |
| Auto                              | With specified name as the Prefix and XCamView will add digital after the Prefix for the Image or Video file; |
| Manual                            | A file dialog will pop up to enter the Image or Video file name for the captured Image or Video.              |

6.4.10 Settings>Time

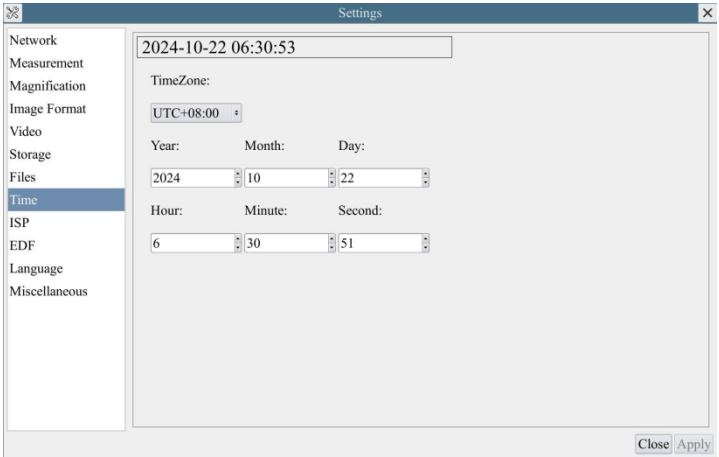


Figure 24 Time Setting

|      |                                                                           |
|------|---------------------------------------------------------------------------|
| Time | User can set Year, Month, Day, Hour, Minute and Second ital.in this page. |
|------|---------------------------------------------------------------------------|

6.4.11 Settings>ISP

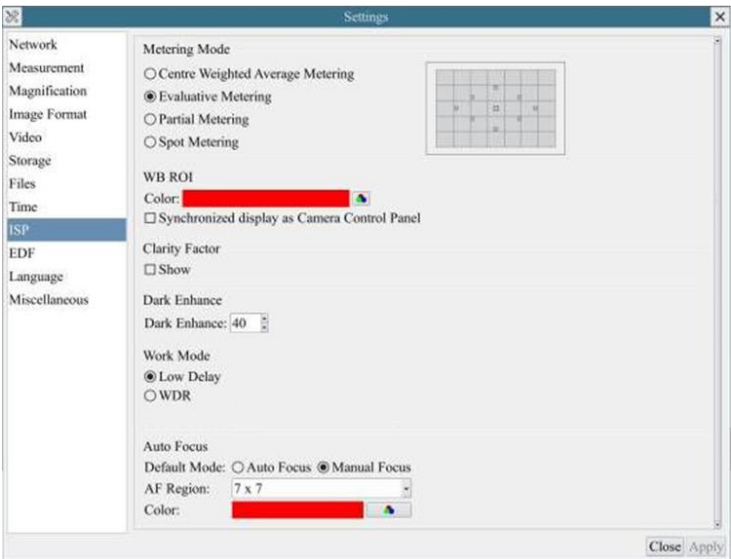


Figure 25 Comprehensive Setting of ISP Page

|                       |                                                                                                                                                                                                                                                                                                                                      |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Metering Mode</b>  | Select the Metering mode as the Central Weighted Average Metering, Evaluative Metering, Partial Metering, or Spot Metering;                                                                                                                                                                                                          |
| <b>WB ROI Color</b>   | Choosing the ROI rectangle line color and whether it is synchronized display as Camera Control Panel;                                                                                                                                                                                                                                |
| <b>Clarity Factor</b> | Select to display the clarity factor in the video window, otherwise the clarity factor will not be displayed;                                                                                                                                                                                                                        |
| <b>Dark Enhance</b>   | Define the intensity value of dark enhancement;                                                                                                                                                                                                                                                                                      |
| <b>Work Mode</b>      | Select the working mode as <b>Low Delay/WDR</b> , and adjust the exposure ratio when selecting the <b>WDR</b> mode;<br><b>Low Delay</b> : The average delay is 40ms, and the highest frame rate is 60fps;<br><b>WDR</b> : By synthesizing 2 frames into 1 frame, the dynamic range is improved, and the highest frame rate is 30fps; |
| <b>Auto Focus</b>     | Select the default mode for startup as <b>Auto Focus/Manual Focus</b> , and adjust the AF area and focus frame color;                                                                                                                                                                                                                |

## 6.4.12 Settings>EDF

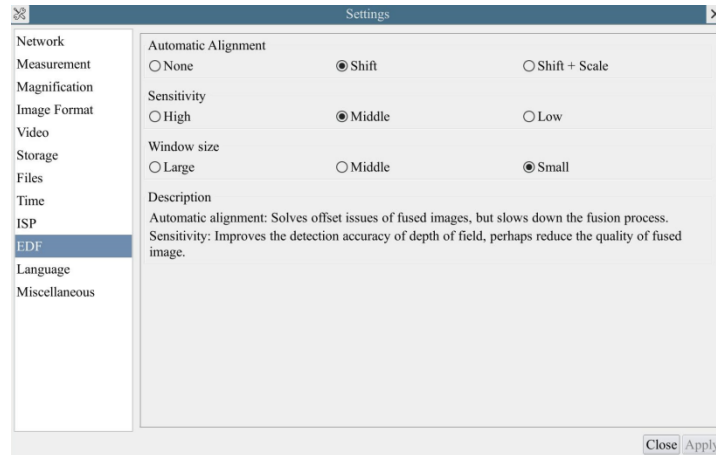


Figure 26 Comprehensive Setting of EDF

|                            |                                                                                                                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Automatic Alignment</b> | Optionally turn on auto-alignment when there is significant displacement or scaling between images;                                                                                                         |
| <b>Sensitivity</b>         | Select the sensitivity of EDF;                                                                                                                                                                              |
| <b>Window size</b>         | Select the window size for displaying real-time images during EDF;                                                                                                                                          |
| <b>Description</b>         | Automatic alignment: Solves offset issues of fused images, but slows down the fusion process.<br>Sensitivity: Improves the detection accuracy of depth of field, perhaps reduce the quality of fused image. |

## 6.4.13 Settings>Language



Figure 27 Comprehensive Setting of Language Selection Setting Page

|                            |                                                              |
|----------------------------|--------------------------------------------------------------|
| <b>English</b>             | Set language of the whole software into English;             |
| <b>Simplified Chinese</b>  | Set language of the whole software into Simplified Chinese;  |
| <b>Traditional Chinese</b> | Set language of the whole software into Traditional Chinese; |
| <b>Korean:</b>             | Set language of the whole software into Korean;              |
| <b>Thailand</b>            | Set language of the whole software into Thailand;            |
| <b>French</b>              | Set language of the whole software into French;              |
| <b>German</b>              | Set language of the whole software into German;              |
| <b>Spanish</b>             | Set language of the whole software into Spanish;             |
| <b>Japanese</b>            | Set language of the whole software into Japanese;            |
| <b>Italian</b>             | Set language of the whole software into Italian;             |
| <b>Russian</b>             | Set language of the whole software into Russian;             |
| <b>Dutch</b>               | Set language of the whole software into Dutch;               |

|            |                                                     |
|------------|-----------------------------------------------------|
| Portuguese | Set language of the whole software into Portuguese; |
|------------|-----------------------------------------------------|

#### 6.4.14 Settings>Miscellaneous

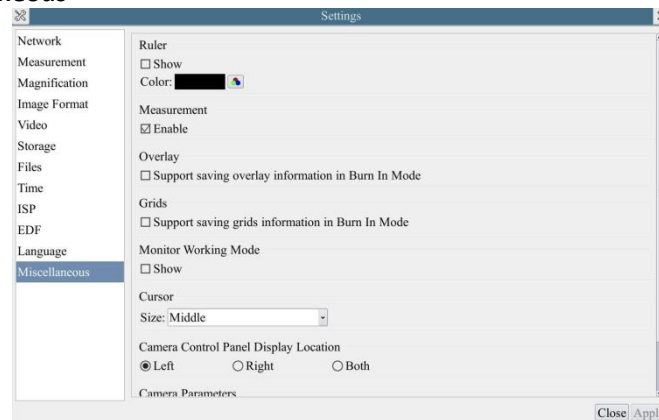


Figure 28 Comprehensive Miscellaneous Settings Page

|                                                       |                                                                                                                                                                                     |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">Ruler</a>                                 | Select to display the ruler in the video window, otherwise not to display the ruler. You can choose the ruler color;                                                                |
| <a href="#">Measurement</a>                           | Select to display the measurement toolbar in the video window, otherwise not to display the measurement toolbar;                                                                    |
| <a href="#">Overlay</a>                               | Select to support saving graphics overlay information in fusion mode, otherwise it will not support;                                                                                |
| <a href="#">Grids</a>                                 | Select to support saving mesh information in fusion mode, otherwise not to support;                                                                                                 |
| <a href="#">Monitor Working Mode</a>                  | Select to display the Monitor Working Mode in the video window, otherwise the Monitor Working Mode will not be displayed;                                                           |
| <a href="#">Cursor</a>                                | Choosing the <a href="#">Cursor</a> size according to the screen resolution or personal preference;                                                                                 |
| <a href="#">Camera Control Panel Display Location</a> | Select the camera control panel to display on the left, right, or both sides of the HDMI interface;                                                                                 |
| <a href="#">Camera Parameters Import</a>              | Import the <a href="#">Camera Parameters</a> from the <a href="#">SD Card</a> or <a href="#">USB flash drive</a> to use the previously exported <a href="#">Camera Parameters</a> ; |
| <a href="#">Camera Parameters Export</a>              | Export the <a href="#">Camera Parameters</a> to the <a href="#">SD Card</a> or <a href="#">USB flash drive</a> to use the previously exported <a href="#">Camera Parameters</a> ;   |
| <a href="#">Reset to factory defaults</a>             | Restore camera parameters to its factory status;                                                                                                                                    |

#### 6.5 Auto Focus Control Panel on the right side of the Video Window

|  |                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <a href="#">Auto Focus</a>           | With <a href="#">Auto Focus</a> button checked, the system will start autofocus according to status of the specimen till it stays in focus;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|  | <a href="#">Manual Focus</a>         | With <a href="#">Manual Focus</a> checked, users should reset position of the camera sensor by using the mouse to scroll up and down till the specimen stays in focus;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|  | <a href="#">AF+EDF</a>               | With <a href="#">AF+EDF</a> checked, system turns on the autofocus mode, which requires the user to change the focus area in sequence to focus on multiple different targets in the same scene. After all targets are successfully focused, move the mouse to the bottom of the video window, click  , and then the camera will perform EDF on the previously focused images and output the fused image.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|  | <a href="#">One Push AF</a>          | Click <a href="#">One Push AF</a> button can carry out autofocus operation for just once;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|  | <a href="#">Conjugate Correction</a> | Left-click the <a href="#">Conjugate Correction</a> button can reset the camera sensor to standard <a href="#">C-mount</a> position. <a href="#">Conjugate Correction</a> allows users to get sensor position calibrated while ensuring that the camera video window is clear as well as image seen from eyepiece is clear. Suggest users do <a href="#">Conjugate Correction</a> when using the camera for the first time to ensure the camera sensor at the standard <a href="#">C-mount</a> position. This ensures the object plane, eyepiece image plane and camera adapter image plane at the standard position;<br><b>Note:</b> 1) When height of the specimen changes, users must make sure the sensor at the standard <a href="#">C-mount</a> position while adjusting the coarse and fine focus knob of microscope to focus; 2) Before doing measurement please do <a href="#">Conjugate Correction</a> to make sure accuracy of the measurement results (please refer to Measurement <a href="#">Toolbar</a> > <a href="#">Conjugate Correction</a> for details). |

## 6.6 Focus Region in the Video Window

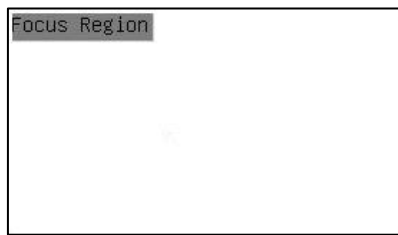


Figure 29 Focus Region

The [Focus Region](#) is used for selecting the region of interest for [Auto Focus](#) operation. When user clicks the  button on the [Synthesis Camera Control Toolbar](#), the [Focus Region](#) will show up as well with the [Auto Focus Control Panel](#). Users can click any part of video window to reset the focus region for [Auto Focus](#) operation.

## 7 BWHC4-4KAF8MPA Camera AF + EDF Function Description

AF + EDF is a new function that combines the camera's unique focus function with EDF. Users can focus on different areas in high-magnification scenes, and then fuse their respective clear areas to finally obtain a large depth-of-field image.

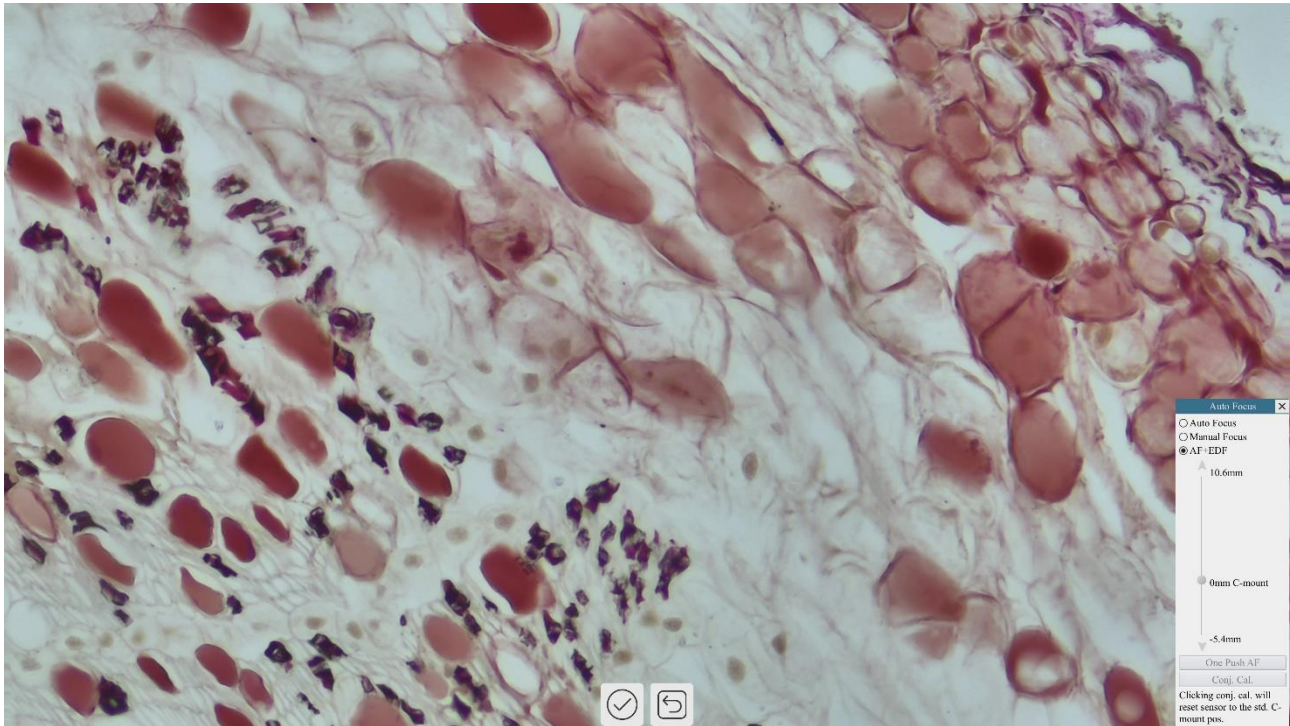


Figure 30 Auto Focus Control Panel

Specifically The usage steps are as follows:

- Click the **AF+EDF** option above the **Auto Focus Control Panel**. At this time, the word **"EDF"** will be displayed in the upper right corner of the video interface. The user clicks on the first focus area, and the system will perform an autofocus. If the focus is completed, **"FOCUSED"** will be displayed in the upper right corner. Once completed, the system will automatically obtain a frame of data containing the current clear area; use the mouse to switch to a different **Focus Region**, and the system will automatically focus again and obtain data. If the focus fails, **"DEFOCUS"** will be displayed in the upper right corner, and the system will not obtain the current frame data.
- Repeat the above steps. After obtaining clear data of multiple **Focus Region**, move the mouse to the bottom of the video interface and click . The camera will perform EDF on the cached frame data containing clear area information and output the fused picture. For use by users

The following are pictures obtained using the **AF+EDF** function of the BWHC4-4KAF8MPA camera:

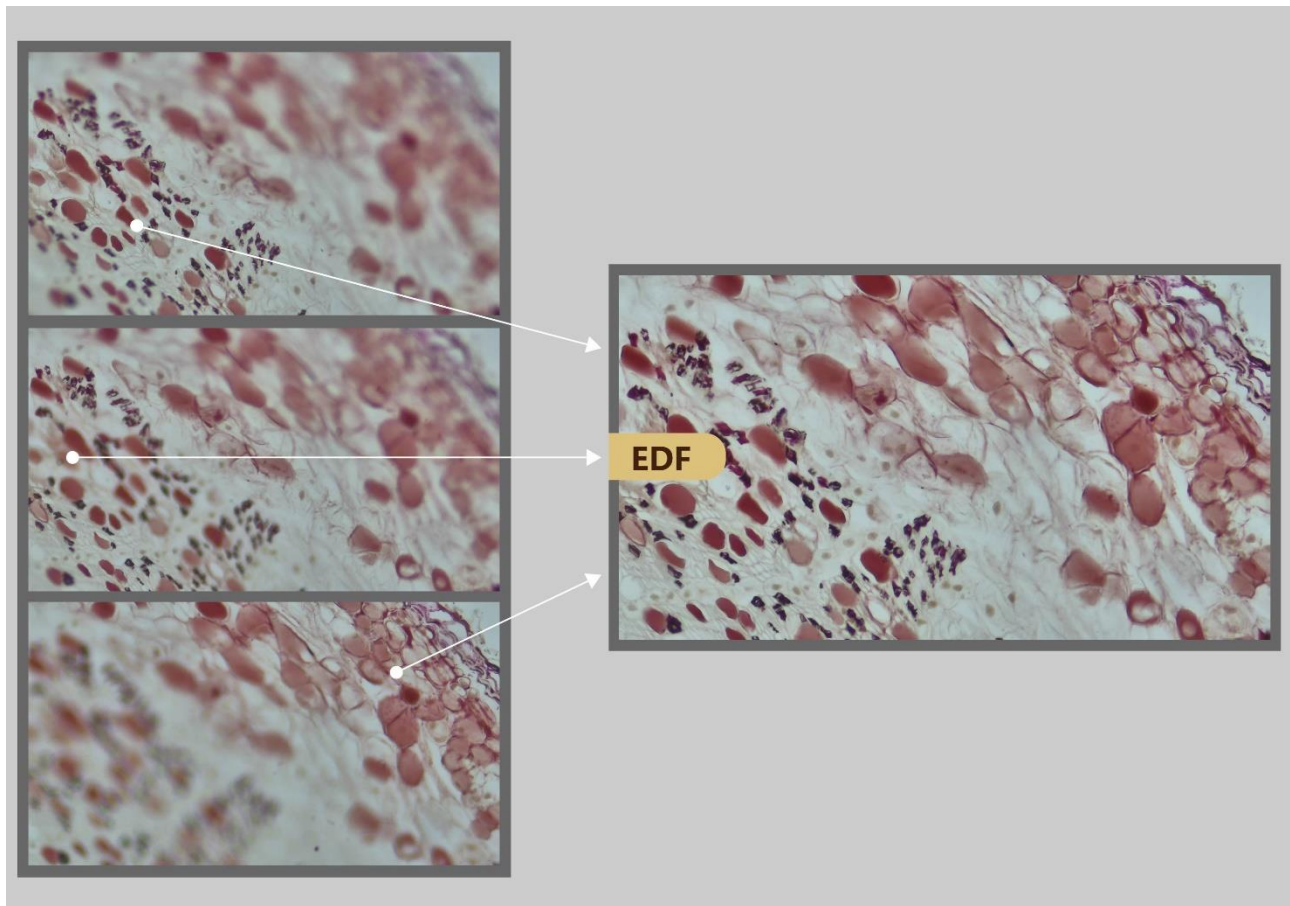


Figure 31 Cell Slice EDF Effect

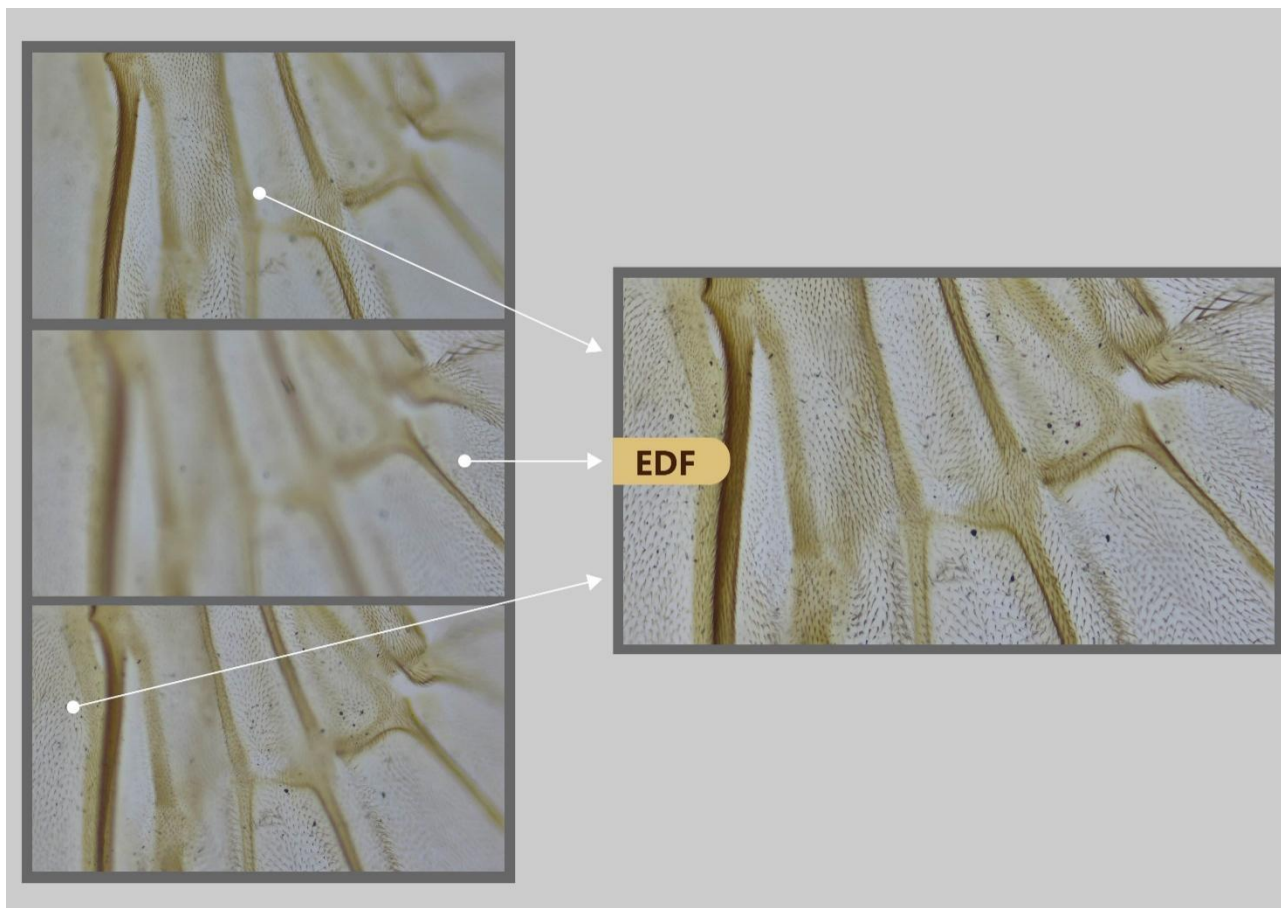


Figure 32 Insect Wings Slice EDF Effect

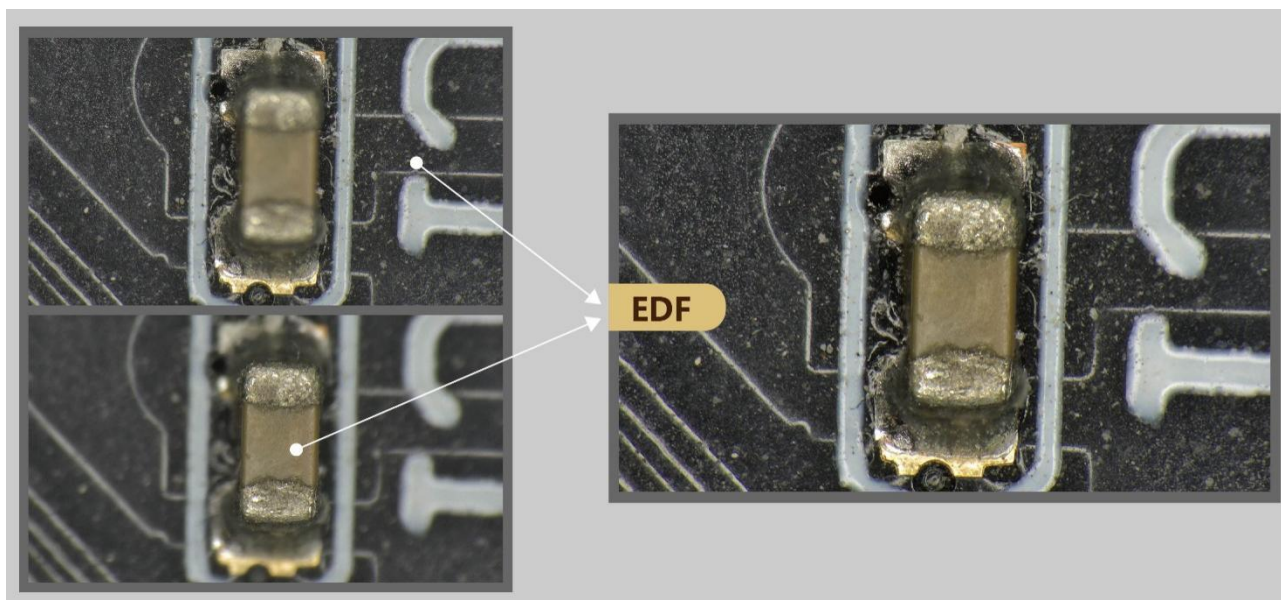


Figure 33 Circuit Board EDF Effect

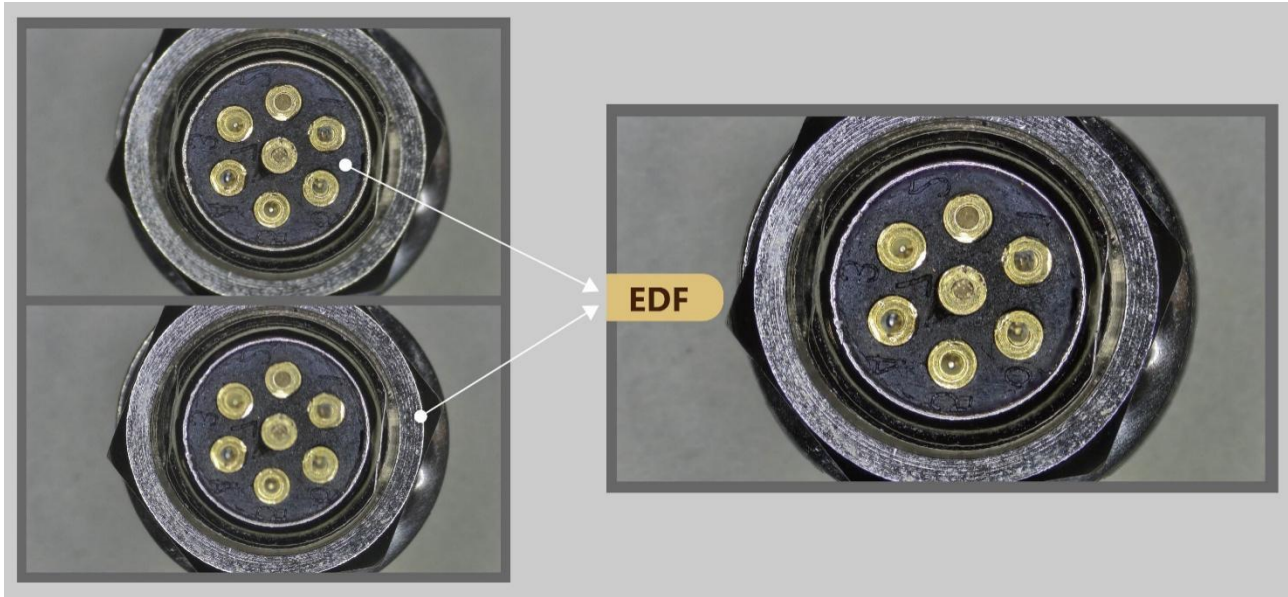


Figure 34 Artifact EDF Effect

## **8    Contacting Customer Service**

Please contact your local distributor if you have any questions about the product.