The O5CAM4K Series HDMI Camera Help Manual

Contents

1 O5CAM4K Series HDMI Camera Application

Figure 1 The O5CAM4K Series HDMI Camera

The O5CAM4K Series HDMI Camera is intended for acquisition of digital images from stereo microscopes, biological microscopes. Here are basic characteristics of the camera:

- Sony STARVIS 2 back-illuminated CMOS sensor
- 4K/1080P auto switching according to monitor resolution
- Support 4K 60fps low delay HDMI output mode, with an average delay of 40ms
- USB flash drive for captured image and video storage, support local preview and playback
- Support the capture and display of RAW format images
- Supports USB voice control module, enabling real-time control of the camera through voice commands for taking photos, recording videos, freezing, and other operations
- Supports scanning gun to capture images
- New browsing function, providing rich file operation functions, image to image comparison, image to real-time video comparison, multi-image EDF function, multi-image Stitch function
- Excellent ISP with local tone mapping and 3D denoising
- Provide real-time video EDF function and real-time video WDR output function
- Provide real-time Stitch function to obtain higher quality images through real-time processing
- 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

2 O5CAM4K Series HDMI Camera Datasheet and Functions

Order Code	Sensor & Size(mm)	Pixel(μm)	G Sensitivity Dark Signal	FPS/Resolution	Binning	Exposure(ms)
O5CAM4K8MPA	Sony IMX678(C) 1/1.8"(7.68x4.32)	2.0x2.0	3541mv with 1/30s 0.15mv with 1/30s	60@3840*2160(HDMI)	1x1	0.019~1000

Figure 2 O5CAM4K Series HDMI Camera Interface Panel Diagrams

Interface or Button	Function Description
DC12V	Power adapter connector (12V/1A)
LED	LED status indicator
USB3.0(2)	Connect USB mouse for easy operation with embedded XCamView software Connect USB flash drive to save pictures and videos Connect USB microphone to record audio and video Connect USB voice control for enable real-time control of camera snap, recording, freezing, and other operations
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
Video Output Interface	**Function Description**
HDMI Interface	Comply with HDMI2.0 standard;60fps@4K or 60fps@1080P
Other Function	**Function Description**
Video Record	Video format：8M (3840*2160) H264/H265 encoded MP4 file Video saving frame rate：60fps in Low Delay Mode 30fps in WDR Mode
Image Capture	8M (3840*2160) JPEG/TIFF/RAW image in USB flash drive
Measurement Saving	Measurement information saved in different layer with image content in layered mode. Measurement information is saved together with image content in burn in mode
ISP	Exposure (Automatic / Manual Exposure) / White Balance, Sharpness, 3D Denoising, Saturation Adjustment, Gamma Adjustment, Contrast Adjustment, Brightness Adjustment, Dark Enhance, Color to Gray, 50HZ/60HZ Anti-flicker Function
Image Operation	Zoom In/Zoom Out (Up to 10X), Mirror/Flip, Freeze, EDF, Stitch, Cross Line, PIP, Browser (including Picture Browsing, Video Playback, Video Compare, Picture Compare, EDF, Stitch, 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
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 O5CAM4K Series HDMI Camera

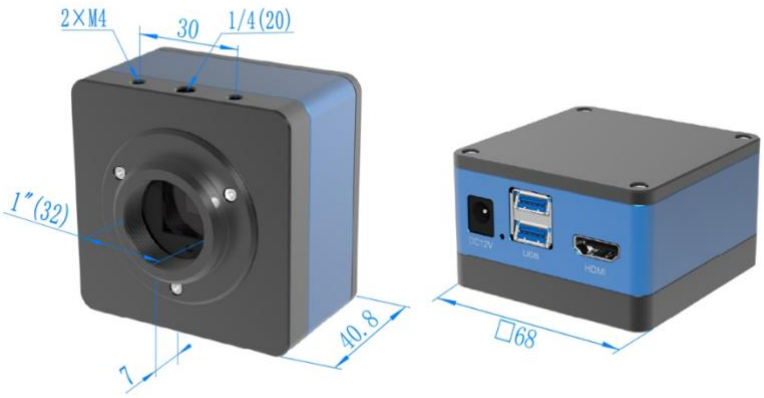


Figure 3 Dimension of O5CAM4K Series

4 O5CAM4K Series HDMI Camera Packing Information

Figure 4 O5CAM4K Series HDMI Camera Packing Information

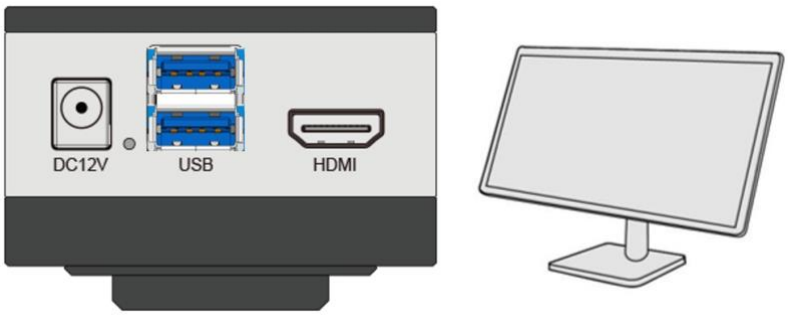
Standard Packing List			
A	Gift box: L:18.4cm W:17.8cm H:8.1cm		
B	O5CAM4K Series HDMI Camera		
C	Power Adapter: Input: AC 100~240V 50Hz/60Hz, Output: DC 12V 1A American standard: Model: POWER-U-12V1A(MSA-C1000IC12.0-12W-US) European standard: Model: POWER-E-12V1A(MSA-C10001C12.0-12W-DE)		
D	USB Mouse		
E	HDMI 2.0 Cable		
Optional Accessory			
F	USB flash drive		
G	Adjustable lens adapter	C-Mount to Dia.23.2mm Eyepiece Tube (Please choose 1 of them for your microscope)	108001/AMA037 108002/AMA050 108003/AMA075
H	Fixed lens adapter	C-Mount to Dia.23.2mm Eyepiece Tube (Please choose 1 of them for your microscope)	108005/FMA037 108006/FMA050 108007/FMA075
	Note: For G and H optional items, please specify your camera type (C-mount, microscope camera or telescope camera), ToupTek engineer will help you to determine the right microscope or telescope camera adapter for your application;		
I	108015(Dia.23.2mm to 30.0mm Ring)/Adapter rings for 30mm eyepiece tube		
J	108016(Dia.23.2mm to 30.5mm Ring)/ Adapter rings for 30.5mm eyepiece tube		
K	Calibration kit		106011/TS-M1(X=0.01mm/100Div.); 106012/TS-M2(X, Y=0.01mm/100Div.); 106013/TS-M7(X=0.01mm/100Div., 0.10mm/100Div.)

5 O5CAM4K Series HDMI Camera Configurations

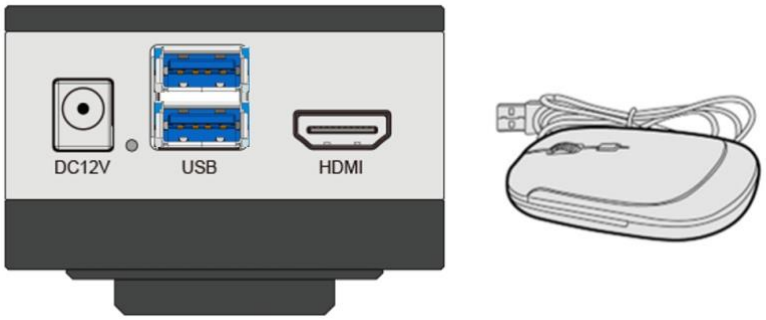
Camera working standalone with built-in XCamView software

This application requires an O5CAM4K Series HDMI Camera monitor with HDMI interface HDMI cable, USB flash drive (Optional), USB mouse supplied with the camera, and power adapter. The setting steps are as follows:

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

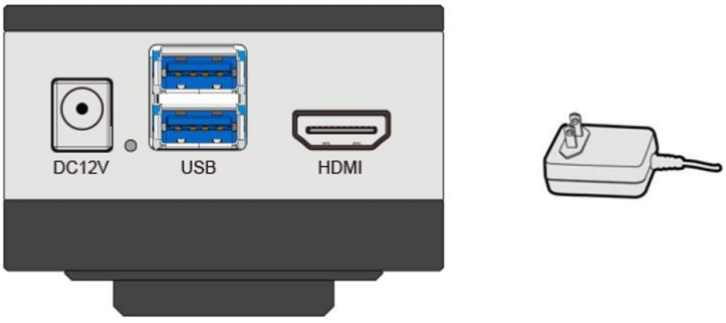


Insert the supplied USB mouse to the camera's USB3.0 port;



Insert the supplied USB flash drive into the O5CAM4K Series HDMI Camera's USB3.0 port;

Connect the camera to the power adapter;



Turn on the monitor and view the live video in the XCamView software.

6 Brief Introduction of O5CAM4K UI and Its Functions

6.1 XCamView UI

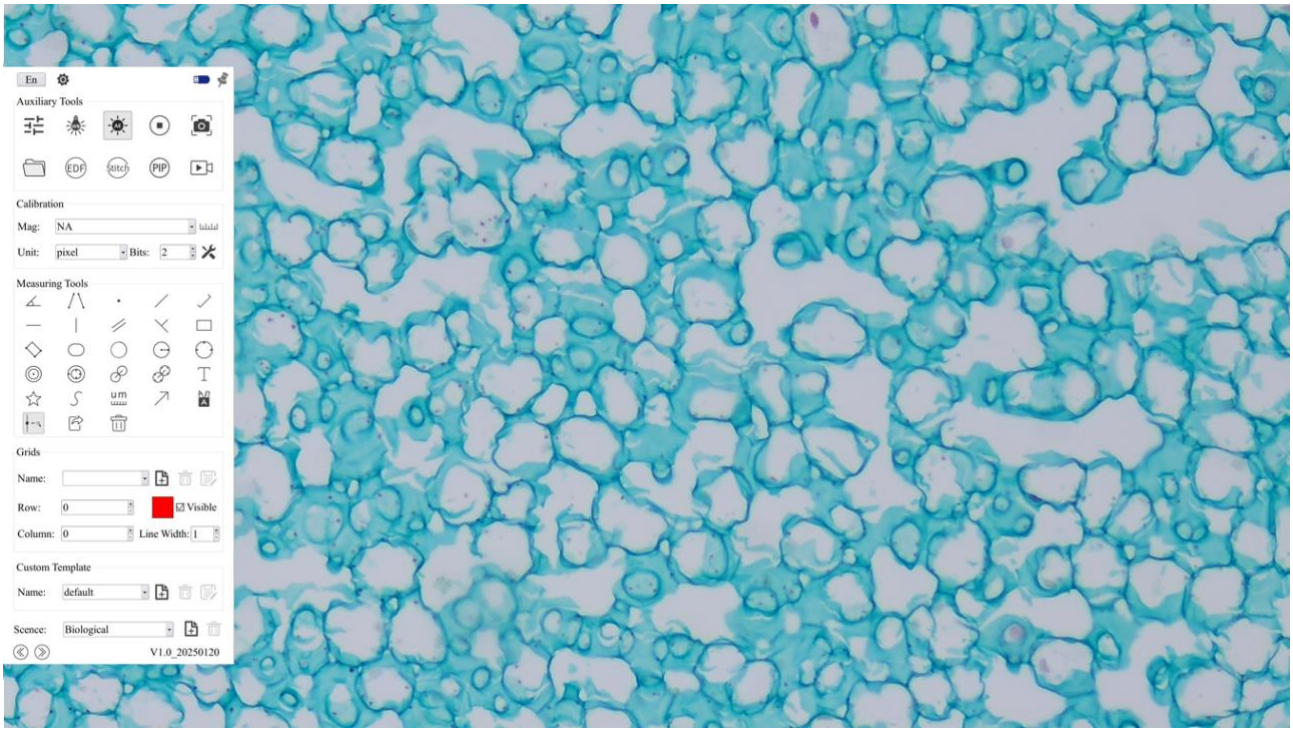
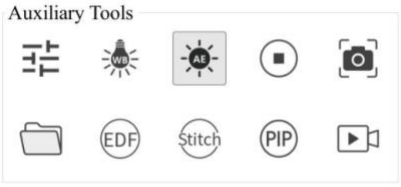


Figure 5 O5CAM4K Series HDMI Camera Main Interface

- Click on the En to switch between English and Chinese;
- will turn into blue after the USB flash drive is inserted into the camera;
- Float/Fix switch button;
- The scene can be switched between biological and stereoscopic views;
- can make the control bar switch between left and right side on the screen;
- The text input box supports bilingual input in both Chinese and English;

Note: Right click mouse on the screen can bring up the control bar, please refer to section 6.2~6.7 for more details.

6.2 Auxiliary Tools

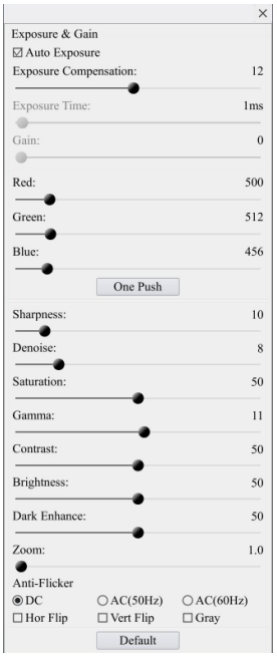


Icon	Function	Icon	Function
	Image Settings		White Balance, each time light source is changed please make the white balance again
	Auto Exposure		Freeze
	Snap		Browser the captured images or recorded videos from USB flash drive
	EDF		Stitch
	Picture in Picture		Record

The Image Settings functions are quite complex, for detailed introduction, please refer to Section 6.2.1.

The Browsing function, for detailed introduction, please refer to Section 6.2.2

6.2.1 Image Settings

Image Settings Panel	Function	Function Description
	Auto Exposure	When Auto Exposure is checked, the system will automatically adjust exposure time and gain according to the value of exposure compensation
	Exposure Compensation	Available when Auto Exposure is checked. Slide to left or right to adjust Exposure Compensation according to the current video brightness to achieve proper brightness value
	Exposure Time	Available when Auto Exposure is unchecked. Slide to left or right to reduce or increase Exposure Time, adjusting brightness of the video
	Gain	Adjust Gain to reduce or increase brightness of video. Noise will be reduced or increased accordingly
	Red	Slide to left or right to decrease or increase the proportion of Red in RGB on video
	Green	Slide to left or right to decrease or increase the proportion of Green in RGB on video
	Blue	Slide to left or right to decrease or increase the proportion of Blue in RGB on the video
	One Push	White balance adjustment according to the window video every time the button is clicked
	Sharpness	Adjust Sharpness level of the video
	Denoise	Slide left or right to denoise the video
	Saturation	Adjust Saturation level of the video
	Gamma	Adjust Gamma level of the video. Slide to the right side to increase Gamma and to the left to decrease Gamma
	Contrast	Adjust Contrast level of the video. Slide to the right side to increase Contrast and to the left to decrease Contrast
	Brightness	Adjust Brightness level of the video. Slide to the right side to increase Brightness and to the left to decrease Brightness
	Dark Enhance	Adjust Dark Enhance level of the video. Slide to the right side to increase Dark Enhance and to the left to decrease Dark Enhance
	Zoom	Adjust magnification level of the video. Slide to the right side to increase Magnification and to the left to decrease Magnification.(Or controlled by the mouse wheel)
	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
	Hor Flip	When checked the current video will Flip Horizontally
	Vert Flip	When checked the current video will Flip Vertically
	Gray	When checked the current video will switch from Color to Gray
	Default	Restore all the settings in the Camera Control Panel to default values

6.2.2 Browse

Clicking the to browse the dxf, images, videos, and other files saved on the USB Flash Drive, as shown in the following figure.

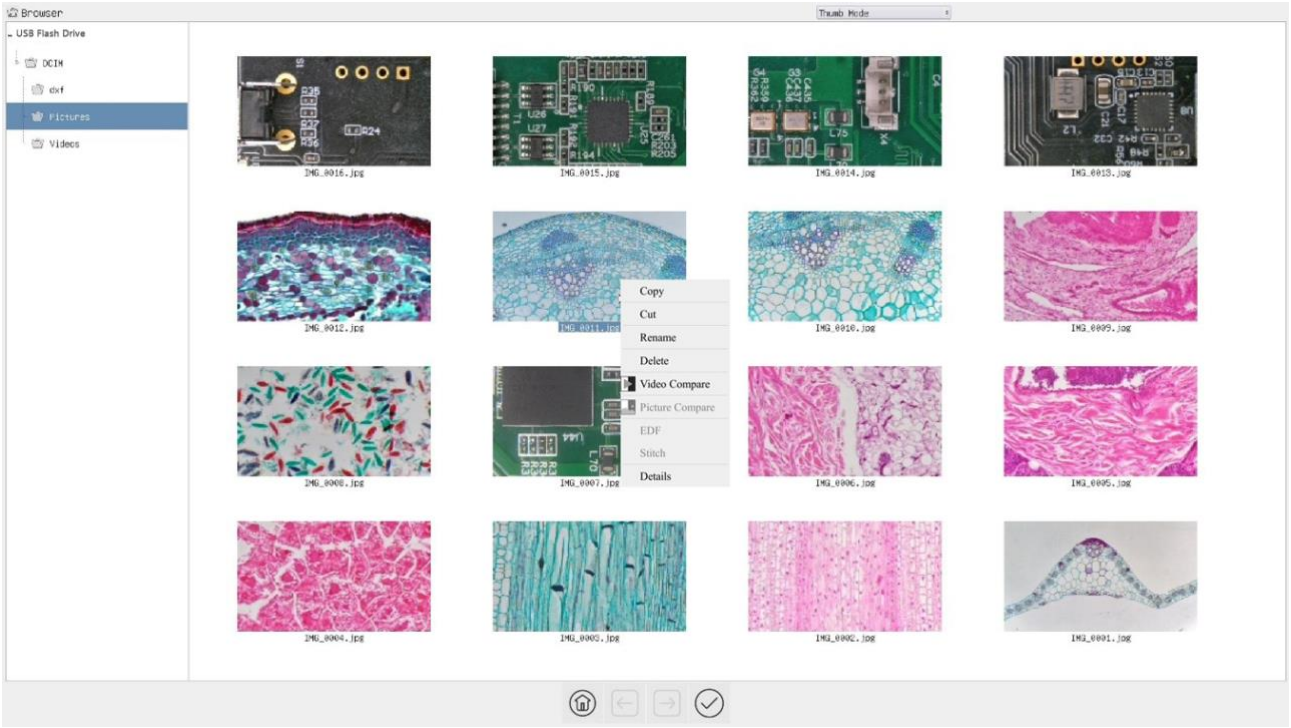


Figure 6 Browsing UI

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 1st image, and clicking on another thumb to select the 2nd 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. Clicking on a thumb to select 2~32 (or box select 2~32) pictures, The selected images can be stitch in ascending order of the numerical numbers in the file name.

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

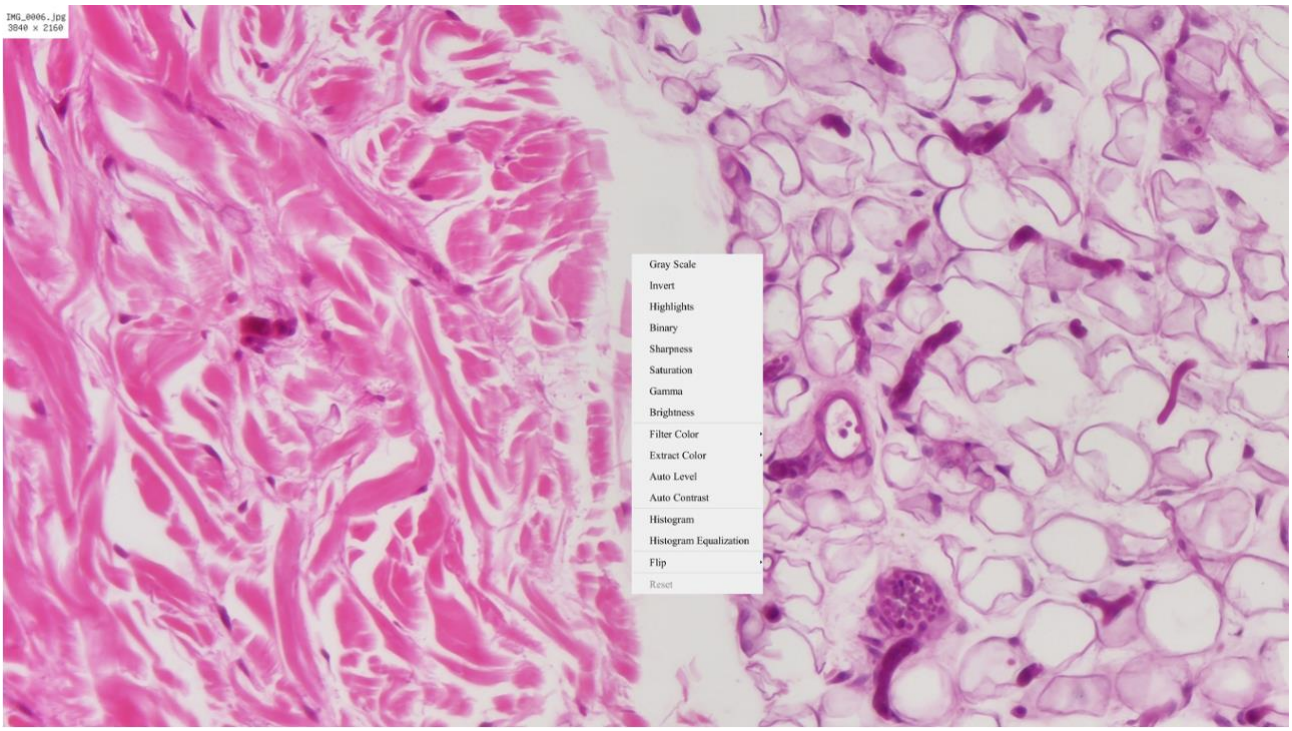


Figure 7 Image Processing

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 , Sharpness , Saturation , Gamma , Brightness , 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:

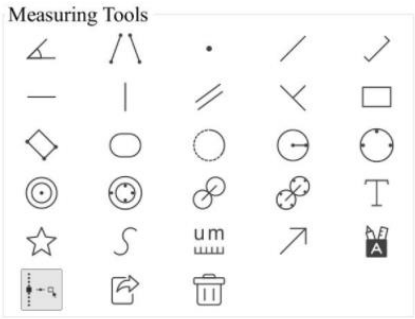
Gray Scale	Choose Gray Scale command to convert a color image to a Gray Scale image
Invert	Choose Invert command to reverse the pixel values of the active image
Highlights	Choose Hightlights command to adjust the Hightlight parts of the images
Binary	Binary is a kind of gray level process. If the gray 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
Sharpness	Adjust the Sharpness of the image
Saturation	Adjust the Saturation of the image
Gamma	Adjust the Gamma of the image
Brightness	Adjust the Brightness of the image
Filter Color	Choose Filter Color 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.
Extract Color	Choose Extract Color 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.
Auto Level	The Auto Level 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
Auto Contrast	The Auto Contrast command automatically adjusts the overall contrastin an RGB image
Histogram	Used to show the distribution of brightness, R, G, B of an image over an image
Histogram Equalization	Used to improved image contrast
Flip	Flip image Horizontally/Vertically

6.3 Calibration

Icon	Function
Mag: NA	Select Magnification for Measurement after Calibration. Make sure actual magnification of the microscope is the same as the selected magnification. Ensure accurate results when measuring in non pixel units

	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 should be done with the help of a micrometer
Unit pixel	Select the desired Measurement Unit
Bits 2	Used to set the number of digits after the decimal point in the measurement result
	This setting can manage calibration results

6.4 Measuring Tools



Icon	Function	Icon	Function
	Angle		4 Points Angle
	Point		Arbitrary Line
	3 Points Line		Horizontal Line
	Vertical Line		Parallel
	3 Points Vertical Line		Rectangle
	3 Points Rectangle		Ellipse
	Arc		Circle
	3 Points Circle		Annulus
	3 Points Annulus		Two Circles and its Center Distance
	3 Points Two Circles and its Center Distanc		Text
	Polygon		Curve
um	Scale Bar		Arrow
	Auto Measurement		Edge Detection
	Export measurement data in CSV format (*.CSV)		Delete all the measurement objects
	When the measurement completes, left-click on a single measuring object the Object Location & Properties Control Bar 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 Move Left, Move Right, Move Up, Move Down, Color Adjustment and Delete respectively		

Note: 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.

6.5 Grids

Icon	Function
Name:	Select Custom Grid
	Add Custom Grid
	Delete Custom Grid
	Save the current Custom Grid settings
Row: 0	Set the Row grid number
Col: 0	Set the Column grid number

	Set the Color of the grid, and display the current color used
☑ Visible	Set grid object Visible/Invisible
Line Width: 1	Set the grid Line Width

6.6 Custom Template

Icon	Function
Name default	Select Custom Template
	Click "Add" to enter Custom Template mode, adjust or draw measurement graphics
	Delete the current Custom Template
	Save the current Custom Template settings

6.7 Settings

6.7.1 Settings>Measurement

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

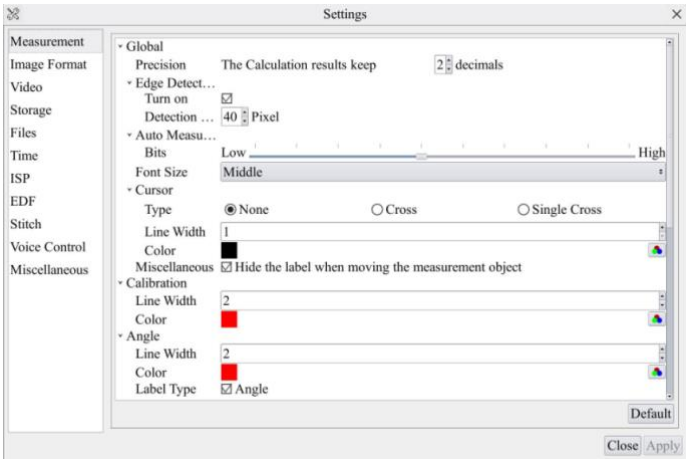


Figure 8 The Measurement Setup

Global	Edge Detection	Select whether to enable the Edge Detection and set the detection range;
	Auto Measurement	Adjustable precision for Auto Measurement;
	Font Size	The Font Size of measurement data can be changed to Super Large,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;
Angle	Line Width	Used for defining Line Width for calibration;
	Color	Used for defining Line Color for calibration;
	Lable 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.	

6.7.2 Settings>Image Format

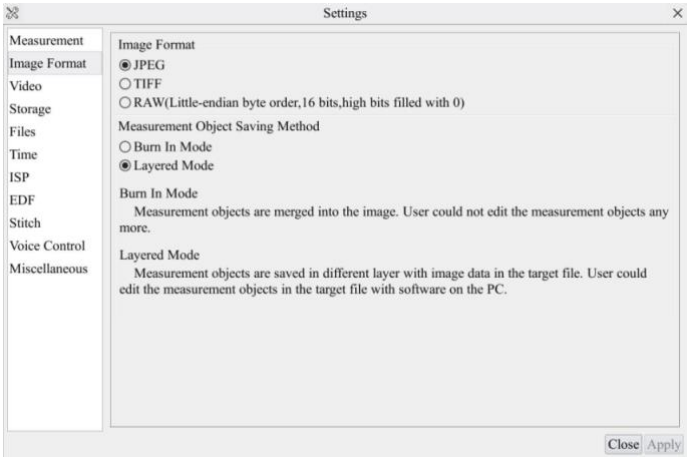


Figure 9 Comprehensive Image Format Settings Page

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; TIFF: TIFF is a flexible bitmap format mainly used to store images including photos and artistic images; RAW (Little-ending byte order,16bits, high bits filled with 0): RAW is an uncompressed and unprocessed image format that preserves all raw data directly obtained from the sensor of a digital camera;
Measurement Object Saving Method	Burn in Mode: The measurement objects are merged into the current image. User could not edit the measurement objects any more. In this mode the measurement info is not editable; 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. In this mode the measuremnent info is editable;

6.7.3 Settings>Video

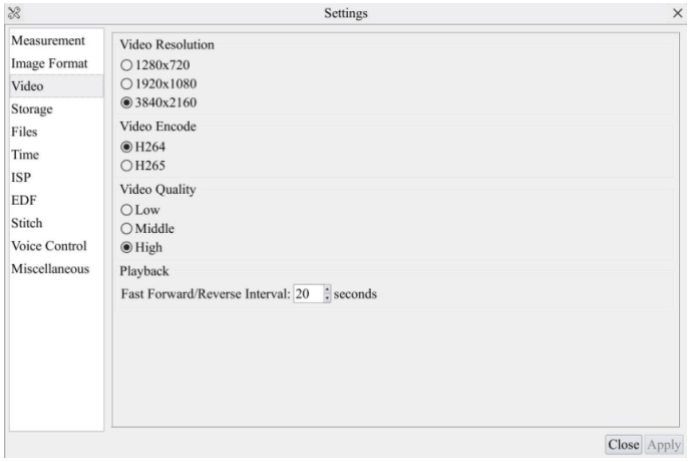


Figure 10 Comprehensive Settings of Video page

Video Resolution	Select a Video Resolution of 1280 x 720, 1920x1080 or 3840x2160;
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;
Video Quality	Select Video Quality as low, medium, or high;
Video Playback	Fast Forward/Reverse internal in second unite for Video Playback;

6.7.4 Settings>Storage

Figure 11 Comprehensive Settings of Storage page

File System Format of the Storage Device	List the file system format of the current storage device FAT32: The file system of USB Flash Drive is FAT32. The maximum video file size of single file in FAT32 file system is 4G Bytes; exFAT: The file system of USB Flash Drive is exFAT. The maximum video file size of single file in FAT32 file system is 16E Bytes; NTFS: The file system of USB Flash Drive is NTFS. The maximum video file size of single file is 2T Bytes. Unknown Status: USB Flash Drive not detected or the file system is not identified;
Note: For USB Flash Drive, USB 3.0 interface is preferred;	

6.7.5 Settings>Files

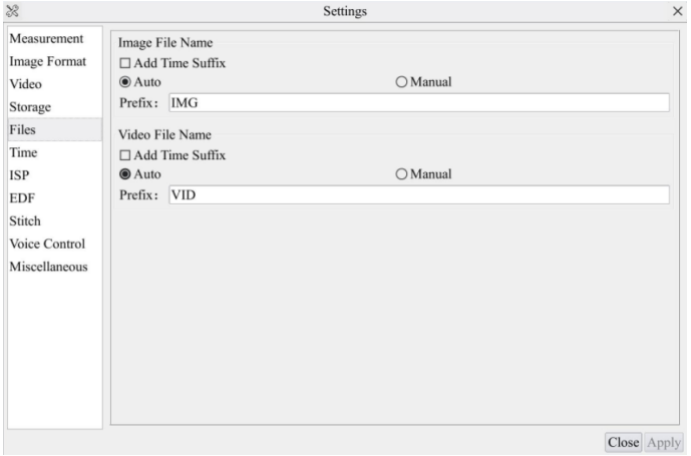


Figure 12 Comprehensive Setting of Files Name

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 allow users to enter the Image or Video file name for the captured Image or Video;

6.7.6 Settings>Time

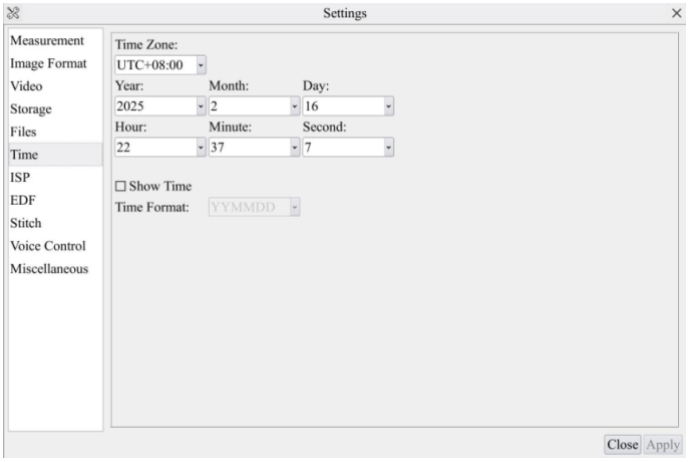


Figure 13 Time Setting

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

6.7.7 Settings>ISP

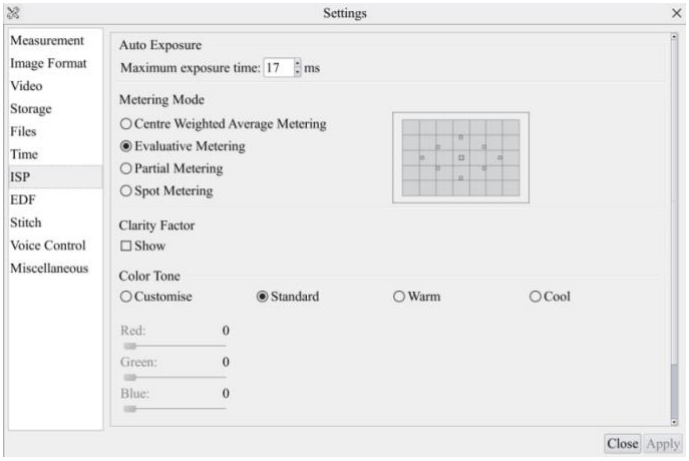


Figure 14 Comprehensive Setting of ISP Page

Auto Exposure	Define the maximum automatic exposure time;
Metering Mode	Select the Metering mode as the Central Weighted Average Metering, Evaluative Metering, Partial Metering, or Spot Metering;
Clarity Factor	Select to display the clarity factor in the video window, otherwise the clarity factor will not be displayed;
Color Tone	Select color styles as custom, standard, warm, or cool;
Work Mode	Select the working mode as Low Delay/WDR, and adjust the exposure ratio when selecting the WDR mode; Low Delay: The average delay is 40ms, and the highest frame rate is 60fps; WDR: By synthesizing 2 frames into 1 frame, the dynamic range is improved, and the highest frame rate is 30fps;

6.7.8 Settings>EDF

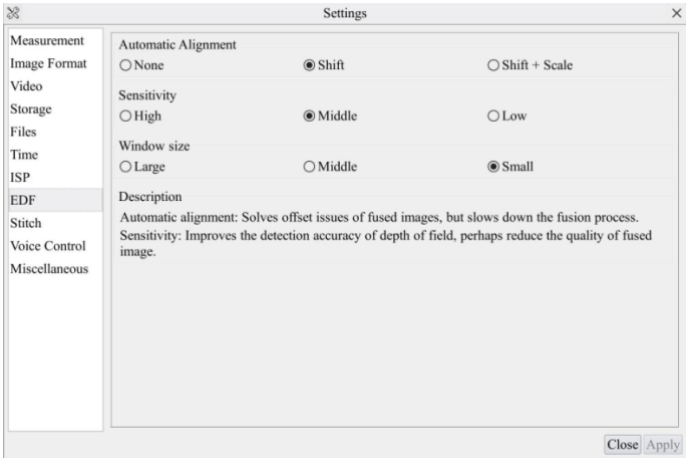


Figure 15 Comprehensive Settings of EDF

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

6.7.9 Settings>Stitch

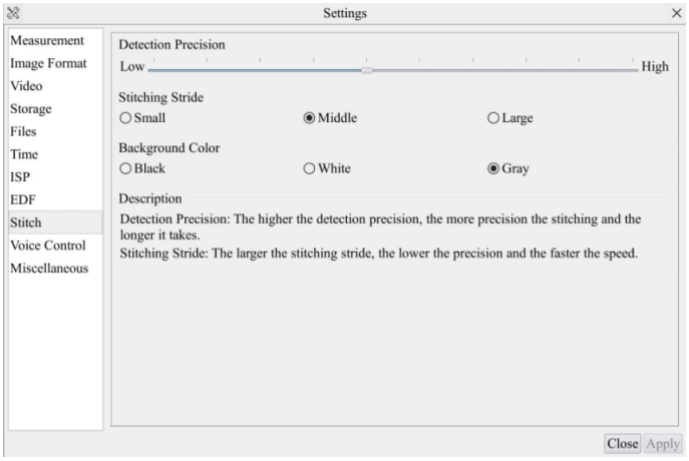


Figure 16 Comprehensive Settings of Stitch

Detection Precision	Define the level of detection precision;
Stitching Stride	Select the stitching stride;
Background Color	Select the background color of stitch;
Description	Detection Precision: The higher the detection precision, the more precision the stitching and the longer it takes Stitching Stride: The larger the stitching stride, the lower the precision and the faster the speed;

6.7.10 Settings>Voice Control

Figure 17 Comprehensive Setting of Voice Control

Voice Control	Select whether to enable or not;
Key Words	Provide Key Words for “snap”;
	Provide Key Words for “freeze”, “unfreeze”;
	Provide Key Words for “record/begin record”, “end/end record”;
Note: After the camera is turned on, if the voice control module is not plugged in, the Key Words information will not be displayed by default;	

6.7.11 Settings>Miscellaneous

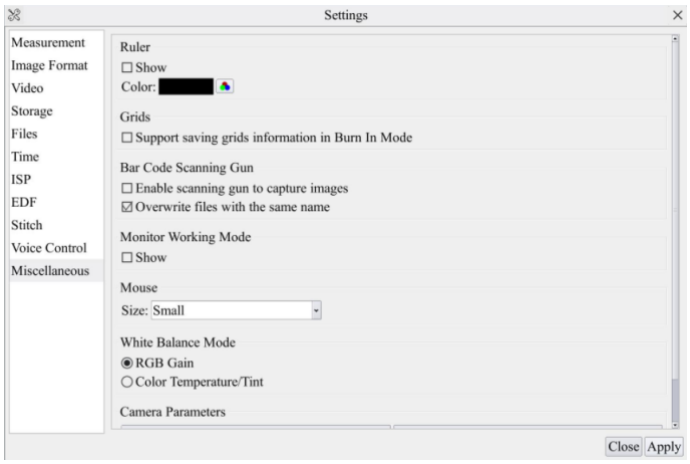


Figure 18 Comprehensive Miscellaneous Settings Page

Ruler	When checked, the Ruler will be on the side or center of the video window, or choose not to display it;
Grids	When checked, the Grids info will be saved in Burn in Mode, otherwise grids info will not be saved in Burn in Mode.
Bar Code Scanning Gun	Selecting to enable Bar Code Scanning Gun, otherwise not to support; Selecting to support scanning gun overwrite files with the same name, otherwise not to support;
Monitor Working Mode	Select to display the Monitor Working Mode in the video window, otherwise the Monitor Working Mode will not be displayed;
Mouse	Choosing the Cursor size according to the screen resolution or personal preference;
White Balance Mode	Optional RGB Gain or Color Temperature/Tint;
Camera Parameters Import	Import the Camera Parameters from the USB flash drive to use the previously exported Camera Parameters;
Camera Parameters Export	Export the Camera Parameters to the USB flash drive to use the previously exported Camera Parameters;
Reset to factory defaults	Restore camera parameters to its factory status;

7 Sample Images Captured with O5CAM4K Series HDMI Camera

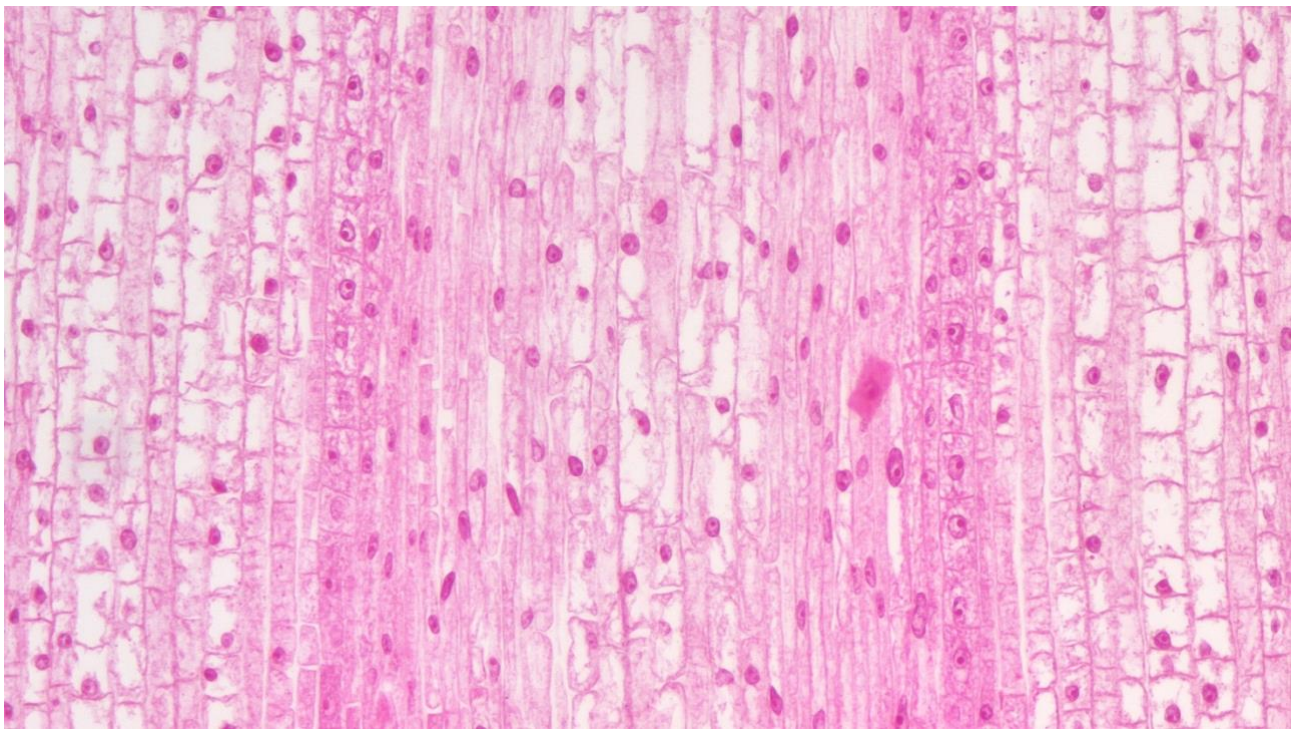


Figure 19 Sunflower Stem.C.S. Captured with O5CAM4K8MPA

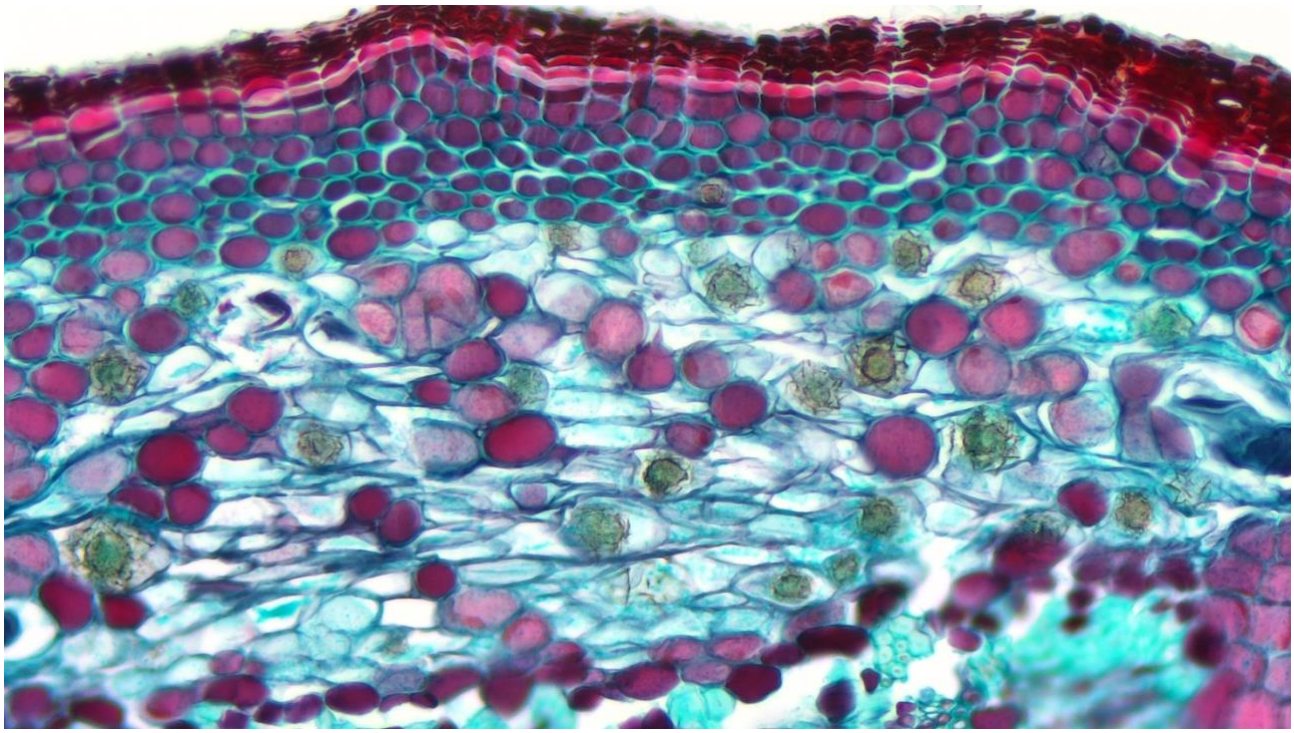


Figure 20 Paramecium.WM. Captured with O5CAM4K8MPA

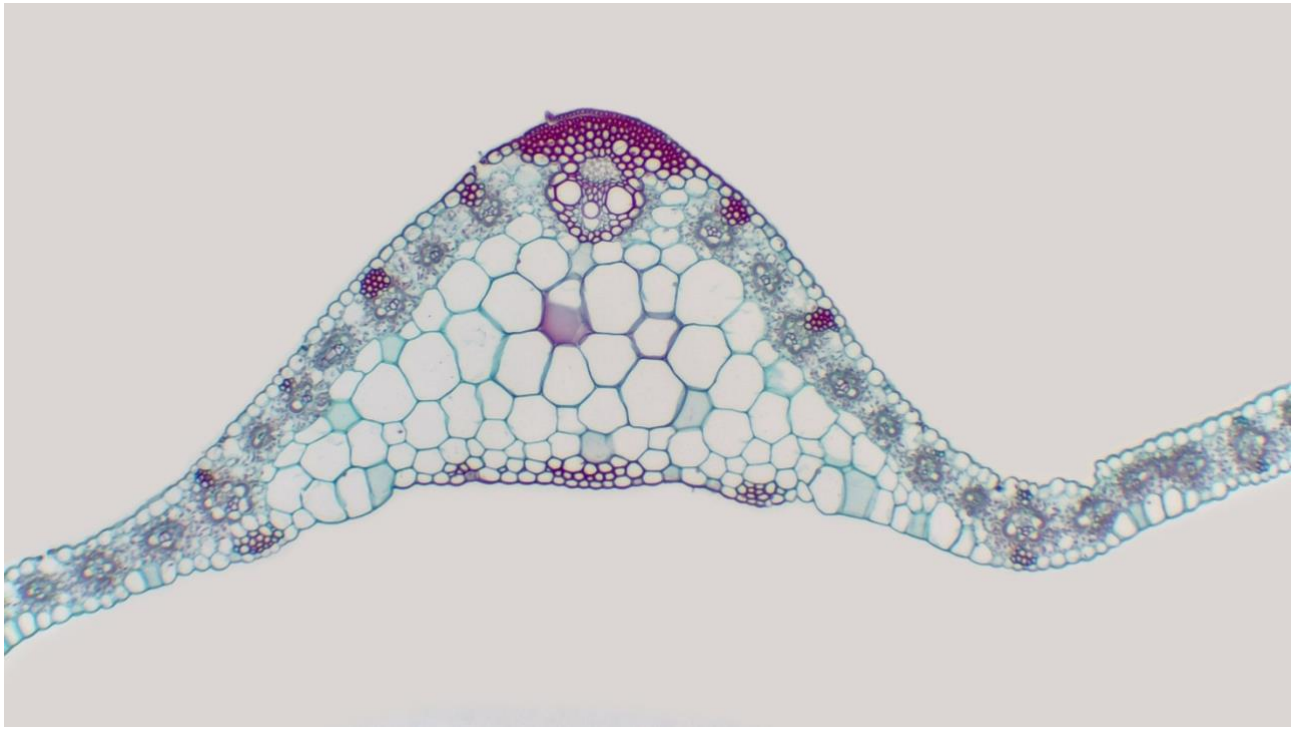


Figure 21 Fiber Connective Tissue.Sec. Captured with O5CAM4K8MPA

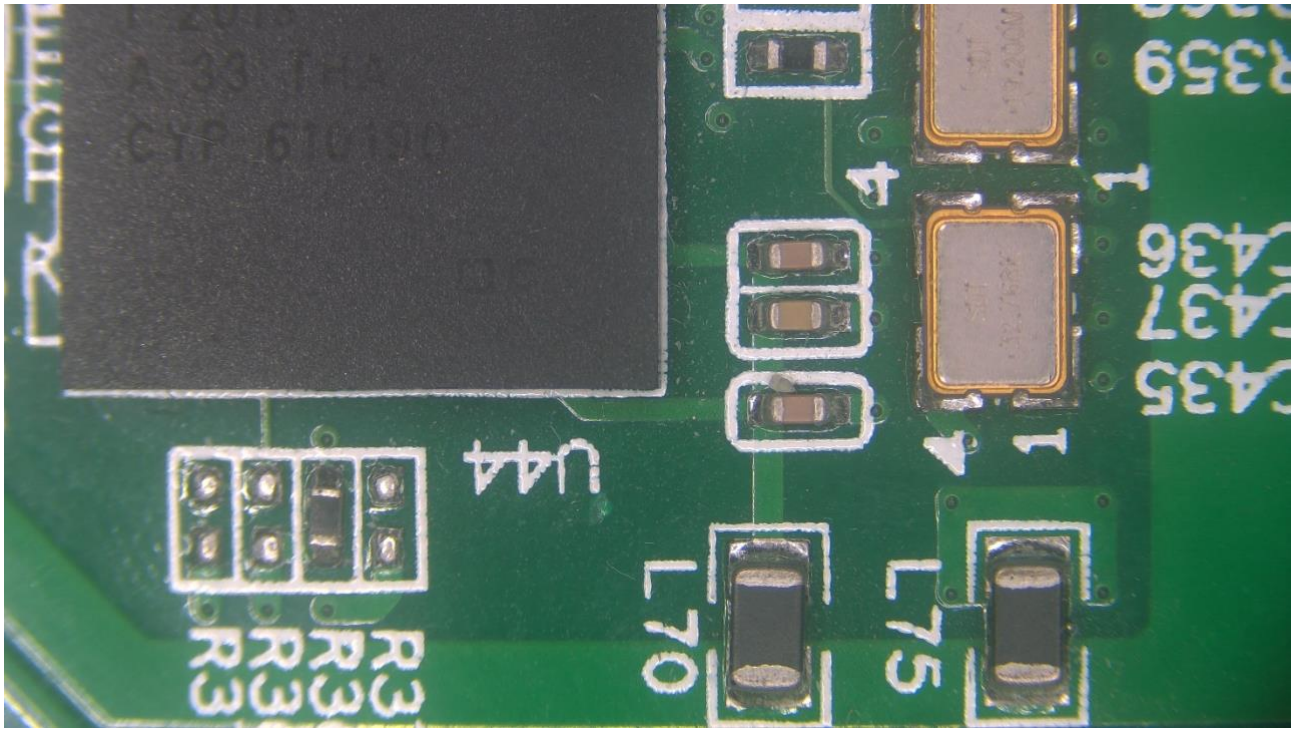


Figure 22 Circuit Board Captured with O5CAM4K8MPA

8 ToupTek®-- 联系信息

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