



Camera Technology  
Focused on Scientific Imaging  
and Challenging Inspection

[www.tucsen.com](http://www.tucsen.com)

# GT Series Cameras User Manual

V1.0.0



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# 1. Preface

## 1.1. Disclaimer

To safeguard the legitimate rights and interests of users, kindly ensure to review our enclosed instructions, disclaimers, and safety guidelines thoroughly before utilizing our products. This user manual provides fundamental information, installation instructions, product features, and maintenance tips, aiming to facilitate the use of TUCSEN cameras. Please adhere to the provided instructions and safety guidelines when operating this product.

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**Tucsen Photonics Co., Ltd.**

## 1.2. Cautions

### Proper Usage and Precautions



**Caution**

- Never attempt to drop, disassemble, repair, or replace internal components on your own. This could cause irreparable damage to the camera or pose a risk of electric shock.
- If any liquids such as water, beverages, or chemicals make contact with the equipment, immediately stop using it and seek technical assistance from the nearest distributor or manufacturer.
- Avoid touching the device with wet hands to prevent electric shock.
- Supervision is essential when children are around the equipment. Do not allow them to touch it unattended.
- Ensure that the camera is used within the specified temperature range. Exposure to extreme temperatures may cause damage to the equipment.

### Installation & Maintenance



**Caution**

- Avoid installing the camera in dusty or dirty areas, or near air conditioners or heaters to minimize the risk of damage.
- Do not operate in extreme environments where there is vibration, extreme temperatures, high humidity, dust, strong magnetic fields, explosive/corrosive gases, or other harmful substances.
- Minimize exposure to excessive vibration and shock as this may cause damage to the equipment.
- Ensure stable lighting conditions when installing the equipment to avoid impacting the quality of the images captured.
- Avoid using solvents or thinners to clean the surface of the equipment as this may damage the housing material.
- Please ensure that there is at least a 20cm gap around the vents to allow proper airflow. Blocking the vents may cause overheating and damage to the unit.

## Power Supply

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### Caution

- Please use the original power adapter provided with the camera. Using a mismatched power supply may cause damage to the camera.
  - If the voltage applied to the camera is higher or lower than the rated voltage, it may result in damage to the camera or cause it to malfunction.
  - Please refer to the specification sheet included with the camera for the rated voltage.
-



## 2. Product Specifications

### 2.1. Packing list



#### 2.1.1. GT 2.0

Name of standardized items	Specification	Imagery
Camera	GT 2.0	
USB cable	Standard USB 2.0 Cable, A to B	
USB flash disk	512MB capacity	

#### 2.1.2. GT 5.0

Name of standardized items	Specification	Imagery
Camera	GT 2.0	
USB cable	Standard USB 2.0 Cable, A to B	
USB flash disk	512MB capacity	

#### 2.1.3. GT 12.0

Name of standardized items	Specification	Imagery
Camera	GT 2.0	
USB cable	Standard USB 2.0 Cable, A to B	
USB flash disk	512MB capacity	



## 2.2. Camera introduction

The GT series cameras utilize Xintu Image Acceleration Technology, which can dramatically increase the USB 2.0 frame rate under the premise of guaranteeing the original image output, making them an excellent choice for simple and economical microscope cameras.

## 2.3. Quartz Window Slice Curve

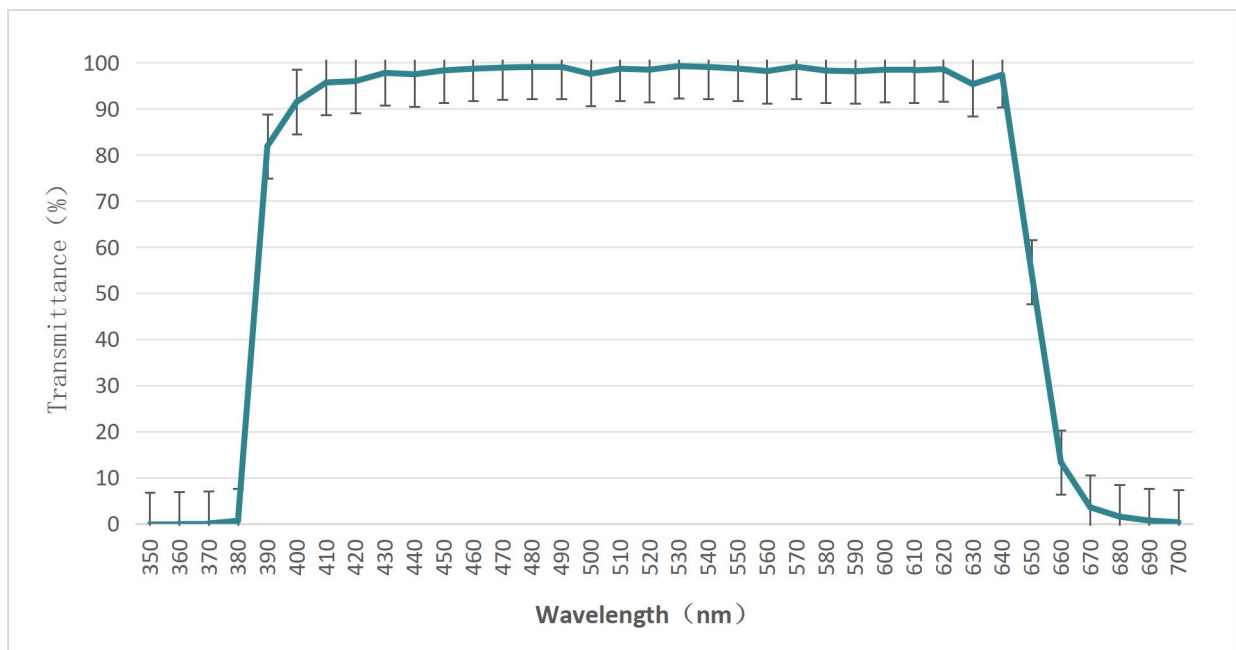


图 2-1 Window Slice Curve

## 2.4. CMOS structure and operation

CMOS cameras work on the principle that when light strikes a CMOS sensor, each photosensitive unit in the photosensitive unit array generates an electrical charge. These charges are amplified, sampled and converted into digital signals through digital circuitry. These digital signals can then be processed by a processor for further operations such as image enhancement, noise reduction, etc. CMOS cameras offer many advantages, including fast scanning speeds, low power consumption, and low heat generation. In addition, CMOS sensors can integrate other circuits such as image processors, autofocus, and HDR (High Dynamic Range) functions, making the camera even more powerful.

The structure of a CMOS camera usually consists of the following parts:

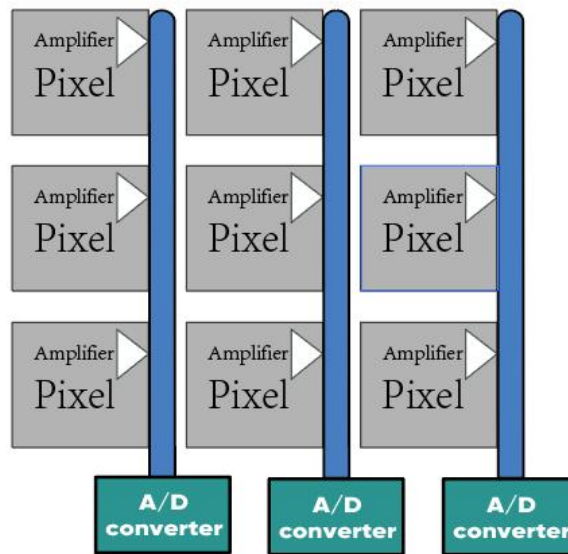


Fig 2-2 CMOS Sensor Structure Diagram

### 2.4.1. CMOS Sensor Components

1) Photosensitive Sensor Array: The photosensitive unit array is the main part of the CMOS sensor, which consists of a group of tiny photosensitive units, each photosensitive unit corresponds to a pixel point in the image, and is responsible for receiving light signals and converting them into electrical signals.

2) Light-sensitive unit: The light-sensitive unit is a unit in the photosensitive unit array, responsible for receiving light signals. When light strikes the photosensitive unit, photons generate electron-hole pairs to form an electric charge.

3) Signal amplifier: The signal amplifier is responsible for amplifying the weak charge signal generated by the photosensitive unit to increase the sensitivity of the sensor.

4) Gain control circuit: The gain control circuit is used to control the gain size of the signal amplifier to adapt to different light conditions.

5) Sampling circuit: The sampling circuit is responsible for capturing and maintaining the amplified signal for subsequent digitization.

6) AD converter: The AD converter is used to convert analog signals into digital signals for subsequent digital processing and storage by a computer or image processor.

7) Image processing unit: the image processing unit is responsible for processing the digital image output from the sensor, including denoising, sharpening, color correction and other operations.

### 2.4.2. CMOS Camera Work Process

- 1) Photoelectric conversion: converts optical signals into electrical signals;
- 2) Charge accumulation: collecting the generated charge as signal charge;
- 3) Signal transfer: moving the signal charge to the detection node;
- 4) Signal detection: converting the signal charge into an electrical signal (voltage);
- 5) Analog-to-digital conversion: converting the voltage signal into a digital signal;
- 6) ISP module: CMOS image sensor acquisition of the original image (usually Bayer format) through the ISP pipeline processing process into a higher quality and can be displayed in the YUV format image.

### 2.5. Camera Power and Signal Connection



图 2-3 GT camera

serial number	designation	functionality
1	USB 2.0	Can be used directly after connecting to computer. Support USB direct power supply, no need to install additional power supply.

## 3. Related parameters description

### 3.1. Camera parameters

#### ● Resolution

The resolution of an image sensor describes the total number of pixels used to detect an image. From the perspective of the image sensor, it is often possible to count the image and describe it as the product of the number of horizontal pixels multiplied by the number of vertical pixels to obtain the total number of pixels.

*Note: The smaller the chip, the clearer the image in the case of a certain resolution, and conversely, the higher the resolution, the clearer the image when the chip size is fixed.*

#### ● Chip Size

Camera chip size, also known as photoreceptor size, is the physical size of the photoreceptor inside the camera that is used to convert light signals into electrical signals.

It is related to the field of view of the microscope:

The optimal field of view of a microscope is:  $FN = \text{chip diagonal} * \text{objective lens magnification} * \text{adapted magnification}$

The maximum field of view of the microscope is:  $FN = \text{short side of the chip} * \text{objective lens magnification} * \text{fit magnification}$

**Note:** Adaptive magnification refers to the magnification matching relationship between the optical system of the microscope and the camera. When using a camera for microscopy, the objective magnification of the microscope needs to be matched to the camera's adapted magnification in order to obtain a clear and properly magnified image.

#### ● Pixel size

Pixel size, is the physical size of each pixel on an image sensor (CMOS chip). It represents the amount of physical space occupied by each pixel on the sensor. Pixel size is usually measured in micrometers ( $\mu\text{m}$ ). For example, a camera with a pixel size of  $1.5 \mu\text{m}$  means that the side length of each pixel is  $1.5 \mu\text{m}$ .

Pixel size directly affects the resolution and ability to capture detail in an image. A

smaller pixel size means that more pixels can be placed on the sensor, which increases the resolution and the ability to capture detail. However, a smaller pixel size can also result in more noise and lower dynamic range. Alternatively, a larger pixel size may provide better low-light performance and dynamic range, but may result in a slight loss in resolution and detail.

### ● Rolling Shutter

All models of HDMI cameras are roll shutters. Rolling shutter exposure means that when the aperture is open, there are also rolling shutters with certain intervals to control the exposure time of the sensor. At the beginning of the exposure, the sensor scans line by line until all pixel points are exposed. All the actions are done in a short time, but the exposure time will be different for different rows of pixels.

## 3.2. Software interface parameters

### ● Framerate

Frame rate (Framerate) is the number of frames displayed per unit of time, the number of frames per second captured or exposed by a face-frame camera (HDMI cameras are all face-matrix cameras) (FramesperSecond), abbreviation: FPS.

#### Frame Rate Calculation for Rolling Shutter Chips

Standard mode frame rate: (frame rate constant is a left/right draw on the readout rectangle box)

1: exposure time is less than the readout time:  $\text{frame rate} = 1s / \text{readout time}$

2: exposure time is greater than readout time:  $\text{frame rate} = 1s / \text{exposure time}$

**Note:** Therefore, the frame rate calculation in auto exposure mode is usually:  $1s/\text{exposure time}$ .

To determine whether the frame rate is normal, you can refer to the frame rate data of each camera model in the parameter table. The data in the table refers to: the frame rate that can be reached by setting the most exposure time to the minimum when the resolution

is full resolution under the respective connection mode. If you find that the real-time picture is stuttering, you can first check the exposure time to see if the relationship between the exposure time and the frame rate is appropriate, and then see if you can reach the theoretical frame rate by adjusting to the minimum exposure, and if not, you can follow the steps in 7.2 to troubleshoot the problem.

### ● **Exposure time**

The length of time from when the camera opens the shutter to when it closes it, i.e. the length of time that the sensor chip senses the photons. The exposure time and aperture size determine the total exposure. .o

### ● **Gain**

The meaning of gain is the increment of gray value of the output image caused by each effective photoelectron, and its unit is DN/e- or e-/DN . For color cameras, in a lower brightness environment, the exposure time can be appropriately adjusted down to increase the gain to achieve a better imaging effect.

### ● **White balance**

By adjusting the proportionality of the red, green, and blue components of the image, the camera is able to restore the true color of the image under various lighting conditions. In new lighting conditions, observing new samples, or when you find that the current image is inconsistent with what you observe under the microscope, you need to adjust the white balance of the screen, which is done by moving the screen to a blank space to lock the white balance and then moving it back.

### ● **Image format**

JPG: JPEG (known as Joint Photographic Experts Group) is a common image format that is particularly useful for storing photographs and color images. It uses a lossy compression algorithm that allows for a significant reduction in image file size while maintaining relatively high image quality. The JPEG format can be displayed and edited on most devices and software.

TIF: TIFF (Tagged Image File Format) is a lossless image format capable of storing a large amount of pixel information and maintaining the precise details of an image. It supports multi-channel (RGB, CMYK, etc.) and depth images and has good scalability.

**PNG:** PNG (known as Portable Network Graphics) is a lossless image format designed to replace the GIF format. It supports transparency and multi-channel images with better image quality and compression efficiency. The PNG format is commonly used for web images and icons because it provides crisp edges and transparent backgrounds with no loss of image quality after multiple edits and saves.

**DICOM:** DICOM (known as Digital Imaging and Communications in Medicine) is the international standard format for medical images. It is a file-based format for storing and transmitting medical images (e.g., X-rays, CT scans, MRIs, etc.). The DICOM format contains not only the image data, but also metadata related to the medical image, such as patient information, scanning parameters, etc. Files in the DICOM format can be exchanged and shared between medical devices and software, and support subsequent processing and analysis of medical images.

## 4. Installation

### 4.1. Recommended computer configuration

Camera interface	USB2.0
CPU	i5 and above performance, main frequency 2.6GHz or above, 4 cores or above processor
Operation system	Windows7/10 (32bit&64bit)
RAM	4GB and above

### 4.2. Camera Installation

GT series cameras, the body has only one USB2.0 port, which can be used directly after connecting to a computer.

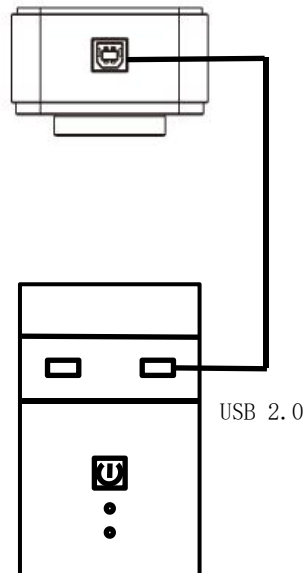


图 4-1 2.0 Camera Connection Diagram



## 4.1. Software installation and uninstallation

### 4.1.1. Installation of software

**Procedure:**

- 1) Open the companion USB flash drive and double-click it to run the Mosaic 3.0 software;
- 2) Select the installation path, the default C disk, users can customize the installation path according to demand;

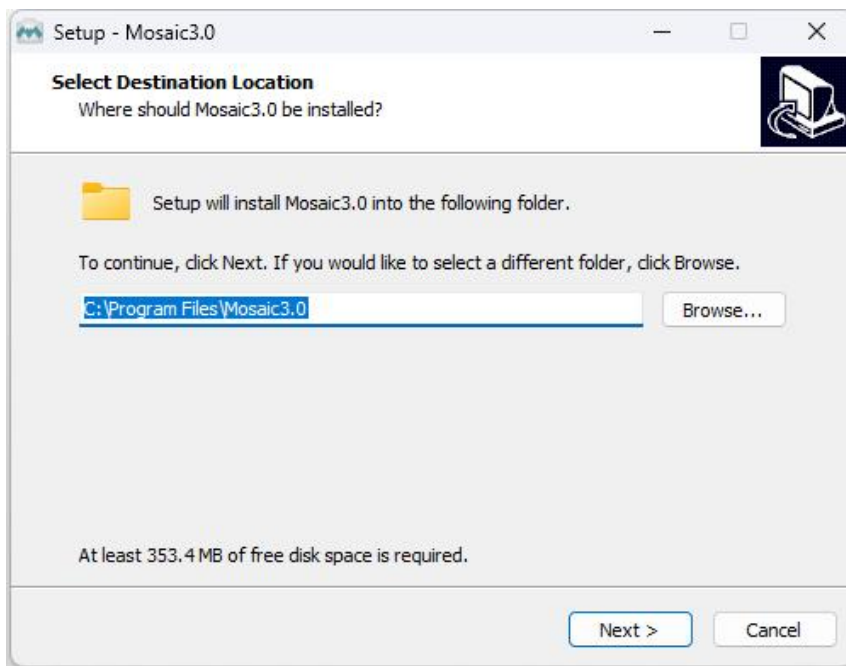


Fig 5-3

- 3) Driver installation is checked by default and can be unchecked. Truechrome cameras are drive-free.

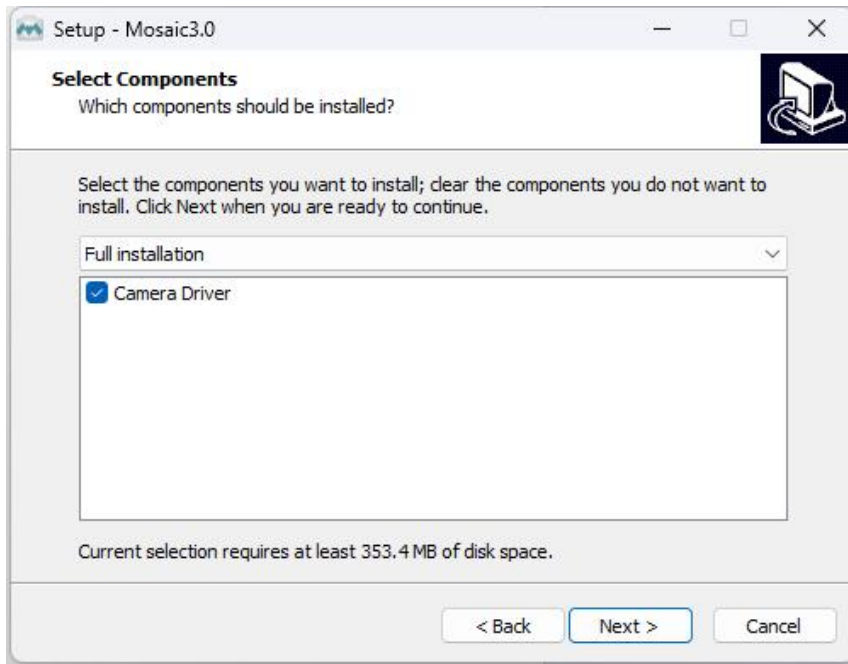


Fig 5-4

- 4) Configure the installation parameters and choose whether to generate a desktop shortcut.;

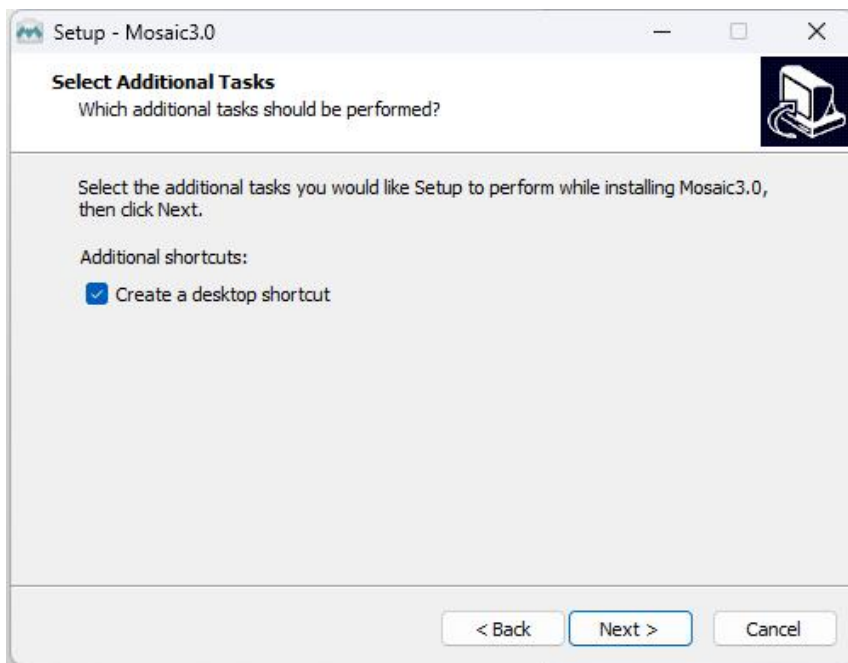


Fig 5-5

- 5) After confirming all the installation parameters, click "Install" to start the installation.;

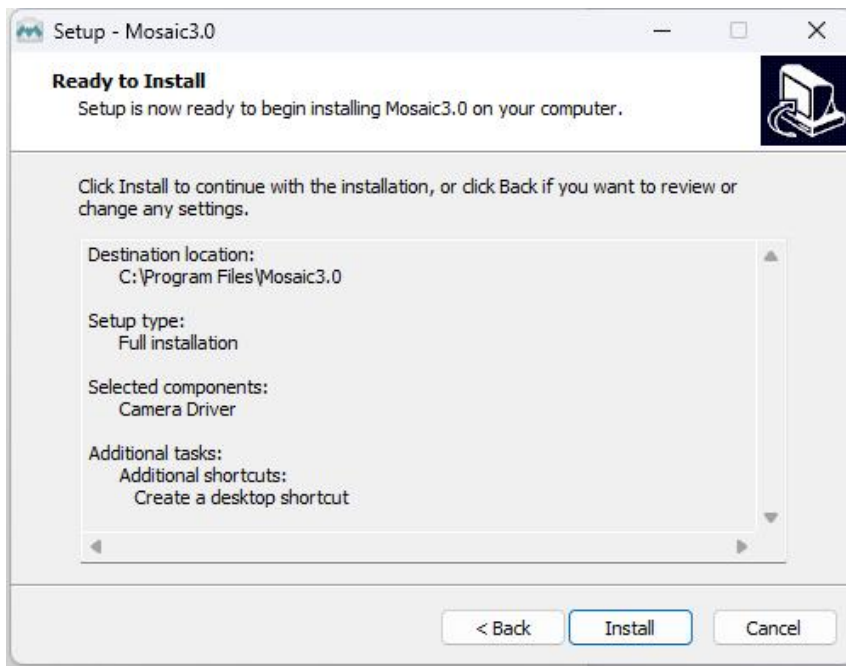


Fig 5-6

6) Wait for the installation to complete. ;

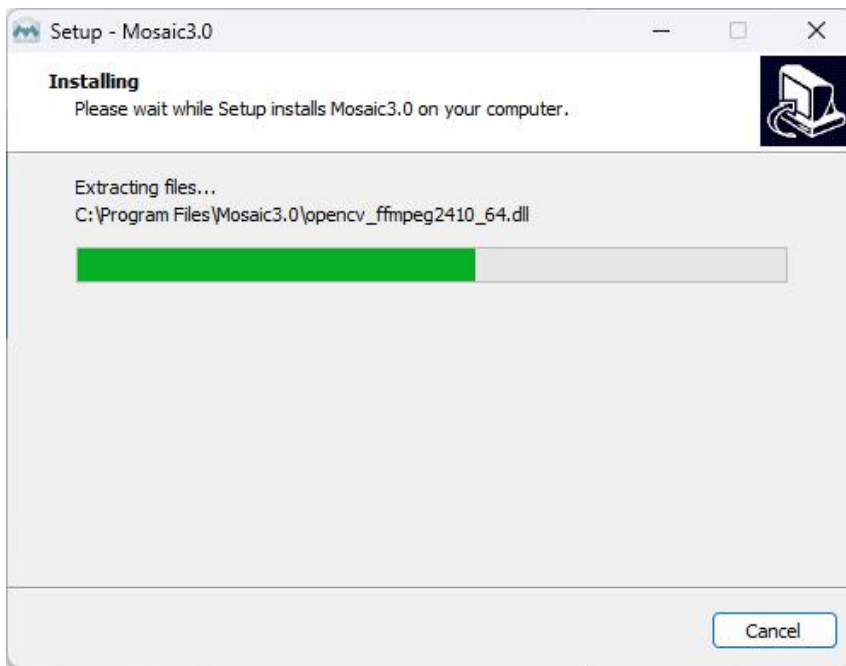


Fig 5-7

### 4.1.2. Uninstallation of software

Mosaic software can be uninstalled in the following three ways;

- 1) Uninstallation through the installation package, the installation package will uninstall

the existing version on the computer when running, the default C disk path to take effect;

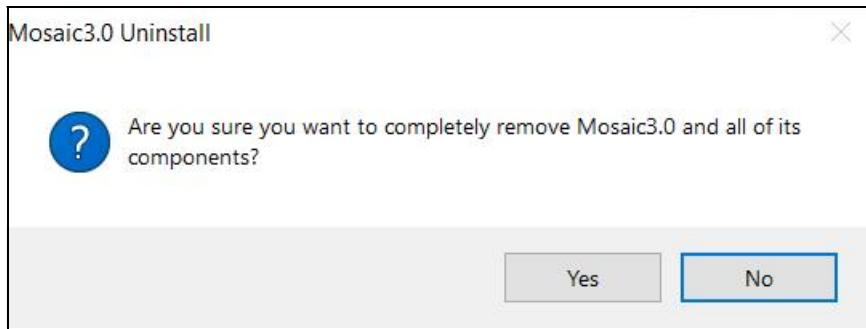


Fig 5-8 Uninstallation via installation package

2) Under the installation path, find unins000.exe uninstall, double-click to uninstall it;

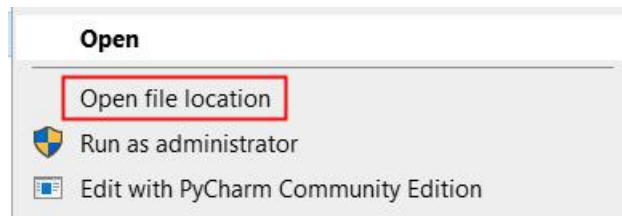


Fig 5-9 Open file location

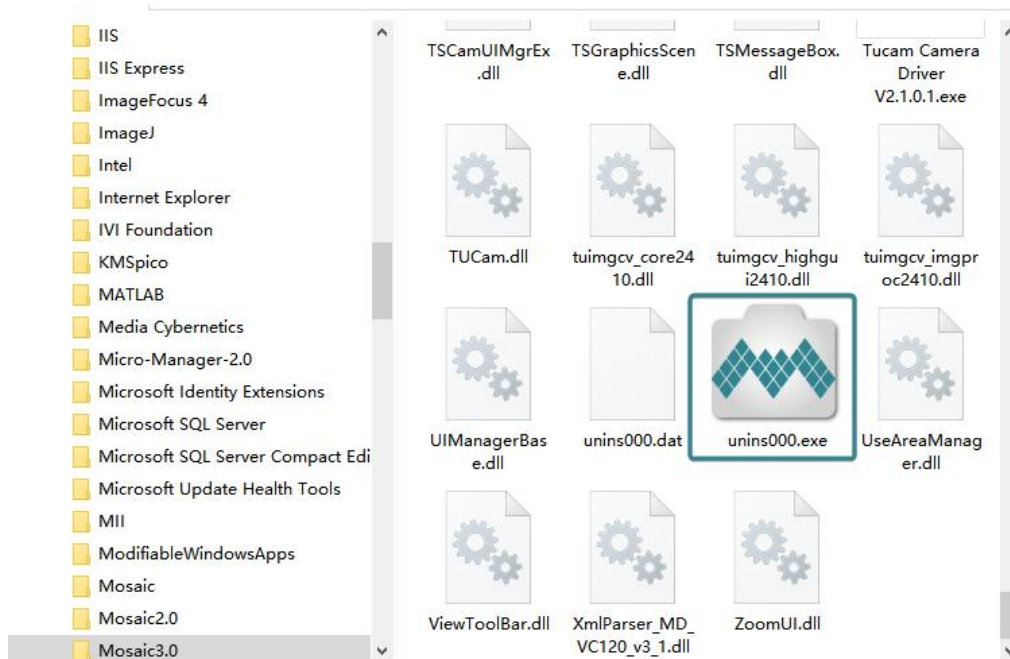


Fig 5-10

3) Uninstallation in the computer program management interface;

**Caution:**

*After uninstalling and reinstalling the software, all software configuration information and calibration table data will be deleted ;*

## 4.2. GT Camera Firmware Upgrade

### Preparation of materials and documents

- 1) Update Toolkit ;
- 2) .hex update file ;

### Procedures

- 1) Connect the camera to the computer and make sure the camera is properly recognized by the computer;
- 2) Unzip yhw\_usb.zip, open it and run yhwusbload.exe;
- 3) Check the camera model, PID & VID at the top of the interface to make sure the camera model is correct (take GT2.0 for example);
- 4) Click the [Firmware] button and select the [.hex] update file;

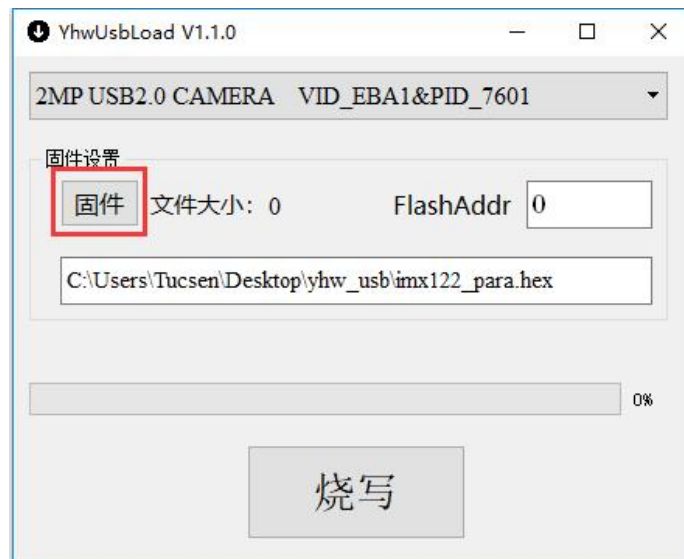


图 4-10

- 5) Click [烧写], prompted to burn successfully, complete the firmware burning. As shown in Figure 4-11

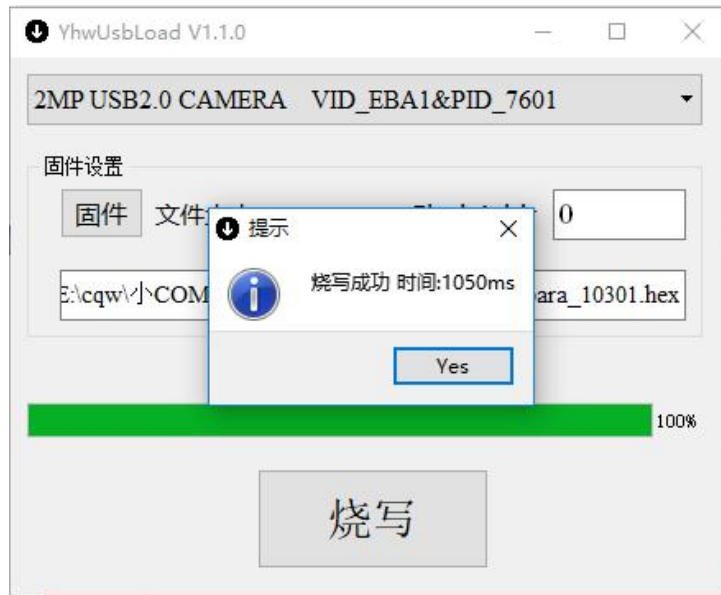


图 4-11 Programming complete.

6) After successful burning, relink the camera and the update takes effect;

**Attention:**

*Due to iterative product updates, compatibility issues may result, so please contact technical support to confirm the correct firmware version before updating the camera firmware each time.*

## 5. Mainance

- ① Avoid opening the lens dust cap in dusty environments;
- ② Open the lens dust cap or install the lens with the camera port facing down to avoid dust on the lens surface;
- ③ When not in use for a long period of time, attach the dust cover and place the camera lens down.;
- ④ If there is dust on the camera filter, need to use a professional dusting tool;
- ⑤ Priority is given to the use of air blowing to remove dust, which can removes general dust:
  - I For stubborn oily dust, gently wipe the surface with a dust-free cotton swab moistened with anhydrous ethanol;
  - II If you are unable to clean it, please contact the after-sales service. Unauthorized use of non-professional tools may cause scratches on the surface of the filter;
- ⑥ Please use the original USB cable, do not subject the USB cable to heavy pressure or sharp objects scratched, so as not to affect the use of data transmission. When the USB cable is damaged, please contact the supplier for replacement;

## 6. Troubleshooting

### 6.1. Software does not recognize the camera

Open the software, the camera is not recognized without display

- 1) Check the device manager, whether there is camera access information, the camera is usually in the device manager within the camera list. If not, check whether the camera is connected to the computer normally, try to plug and unplug the camera to solve the problem;
- 2) If you can see the camera in the device manager, check whether the camera device is displayed normally.
- 3) Try to quit the antivirus software of the computer to confirm whether it is because the antivirus software intercepts the recognition of the camera by the software. If it is confirmed that the antivirus software interception caused by the software can be added to the antivirus software whitelist.
- 4) Confirm whether the Windows Security Center has opened the permission of the software to access the camera. You can try to use the camera module that comes with Windows to call the camera;
- 5) Open the privacy settings to confirm whether the desktop software call camera permission is open;
- 6) Replace the computer to see if the software can recognize the camera normally;

If there is any abnormality in the above, please contact our professionals for technical support.

### 6.1. Frame rate not up to nominal

- 1) Confirm whether to use the correct data transmission interface, generally need to be connected to the interface on the back of the computer host;
- 2) Confirm the exposure time settings, exposure time settings longer frame rate is not enough to nominal;
- 3) If you are using a laptop to turn on the camera, you need to connect the power to use,





and turn on the high-performance mode;

## 7. FAQs

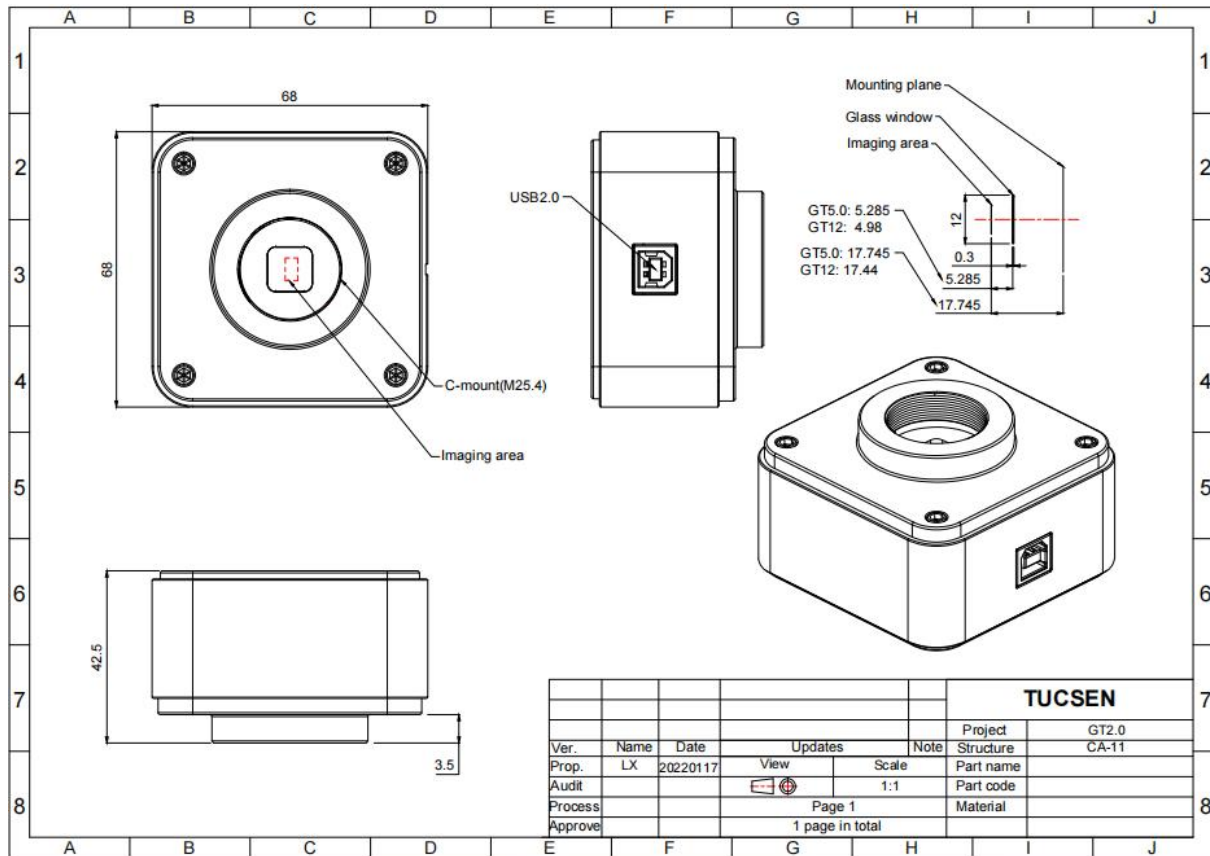
### 7.1 Why can't I adjust the G parameter in White Balance?

GT cameras are drive-free cameras and the G value is fixed and cannot be adjusted.

## 8. After-sales

- 1) Login to the official website and click on the [Technical Support] module to get the FAQ.
  
- 2) Warranties:
  - The warranty period for the product starts from the date of shipment and lasts for 24 months. During this period, any damage that meets the warranty requirements will be repaired free of charge;
  - The scope of the warranty is limited to defects in the materials and manufacture of the product. Self-disassembly, water ingress, throwing and other human damage, as well as damage caused by natural disasters, are not covered by the warranty.
  
- 3) Contact a professional for technical support:
  - Tel: 400-075-8880 +86 591-88194580-811
  - Email: [service@tucsen.com](mailto:service@tucsen.com)
  - Tucsen's website to leave a message: <http://www.tucsen.com> .
  
- 4) Please prepare the following information in advance:
  - Camera model and S/N (product serial number);
  - Software version number and computer system information;
  - A description of the problem and any images related to the problem.

# Appendix 1: Structural line drawing



GT Camera Line Drawing

## Appendix 2: GT 2.0 Camera Parameter List

Model	GT 2.0
Sensor type	CMOS
Chip Type	Sony IMX323LQN-C
Chip Size	1/2.9 inch
Light-sensitive area	Color
Color Type	2.8 μ m x 2.8 μ m
Pixel size	1920(H)x1080(V)
Preview Resolution	30fps
Frame rate	1 μ s-2s
Exposure time	roll-up shutter
automatic configuration	Exposure, Color Level, White Balance
Manual configuration	Exposure, Gain, Gamma, Flat Field Correction
Software	Mosaic V2/V3
Image format	TIFF/JPG/PNG/DICOM
Operating system	Support Windows 7/10 (32 Bit/64 Bit)/Mac
Configuration Requirement	CPU: Intel i5 4-core and above RAM: 8G and above
multi-camera	C/C++, C#, Directshow/Twain
Software	Support for running 4 cameras at the same time on the SDK
Data interface	USB2.0
Optical interface	Standard C interface
Work environment	temperature: -10~45°C ; humidity: 10%~85%
Size	68x68x42.5mm
Weight	236g

## Appendix 3: GT 5.0 Camera Parameter List

Model	GT 5.0
Sensor type	CMOS
Chip Type	Sony IMX335LQN-C
Chip Size	1/2.8 inch
Light-sensitive area	Color
Color Type	2.0 $\mu$ m x 2.0 $\mu$ m
Pixel size	2560(H)x1920(V) 1600(H)x1200(V)
Preview Resolution	29fps (2560x1920) 29fps (1600x1200)
Frame rate	1 $\mu$ s-2s
Exposure time	roll-up shutter
automatic configuration	Exposure, Color Level, White Balance
Manual configuration	Exposure, Gain, Gamma, Flat Field Correction
Software	Mosaic V2/V3
Image format	TIFF/JPG/PNG/DICOM
Operating system	Support Windows 7/10 (32 Bit/64 Bit)/Mac
Configuration Requirement	CPU: Intel i5 4-core and above RAM: 8G and above
multi-camera	C/C++, C#, Directshow/Twain
Software	Support for running 4 cameras at the same time on the SDK
Data interface	USB2.0
Optical interface	Standard C interface
Work environment	temperature: -10~45°C ;



	humidity: 10%~85%
Size	68x68x42.5mm
Weight	236g

## Appendix 4: GT 12.0 Camera Parameter List

Model	GT 12.0
Sensor type	CMOS
Chip Type	Panasonic MN34120 The second generation camera is Sony IMX206CQC
Chip Size	1/2.33 inch
Light-sensitive area	Color
Color Type	1.335 $\mu$ m x 1.335 $\mu$ m
Pixel size	4000(H)x3000(V) 2592(H)x1944(V)
Preview Resolution	15fps (4000x3000) 15fps (2592x1944)
Frame rate	1 $\mu$ s-2s
Exposure time	roll-up shutter
automatic configuration	Exposure, Color Level, White Balance
Manual configuration	Exposure, Gain, Gamma, Flat Field Correction
Software	Mosaic V2/V3
Image format	TIFF/JPG/PNG/DICOM
Operating system	Support Windows 7/10 (32 Bit/64 Bit)/Mac
Configuration Requirement	CPU: Intel i5 4-core and above RAM: 8G and above
multi-camera	C/C++, C#, Directshow/Twain
Software	Support for running 4 cameras at the same time on the SDK
Data interface	USB2.0
Optical interface	Standard C interface





Work environment	temperature: -10~45°C ; humidity: 10%~85%
Size	68x68x42.5mm
Weight	236g

## Appendix 5: Third-party applications

Plug-ins for calling third parties (TWAIN, Directshow) are provided, please click the link to download the configuration: [第三方软件-鑫图光电 \(tucsen.net\)](http://www.tucsen.net)

## Appendix 6: Third-party certification



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GLOBAL TESTING AND CERTIFICATION INDEPENDENT SERVICE CLASS FACILITY

### Certificate of Compliance

**Certificate No.** : BSTXD190612582801EC

**Applicant** : FUZHOU TUCSEN PHOTONICS CO., LTD  
 6F NO.1 building Cai mao Zone, 756# Qi'an Road Gaishan Town, Cangshan Area, Fuzhou, Fujian, PR CHINA

**Manufacturer** : FUZHOU TUCSEN PHOTONICS CO., LTD  
 6F NO.1 building Cai mao Zone, 756# Qi'an Road Gaishan Town, Cangshan Area, Fuzhou, Fujian, PR CHINA

**Product Name** : MICROSCOPE CAMERA

**Trade Name** : TUCSEN

**Main Test Model** : GT2.0

**Additional Model** : GT5.0, GT12, ISH130, ISH300, ISH500, ISH1000, HD Lite, Truechrome Metrics, Truechrome AF

**Test Standard** : EN 55032:2015  
 EN 61000-3-2:2014  
 EN 61000-3-3:2013  
 EN 55035:2017

**As shown in the Test Report No.** : BSTXD190612582801ER

The EUT described above has been tested by us with the listed standards and found in compliance with the council EMC directive 2014/30/EU. It is possible to use CE marking to demonstrate the compliance with this EMC Directive.  
 The certificate applies to the tested sample above mentioned only and shall not imply an assessment of the whole production.







**Christina Deng**  
 Manager  
 Jul. 02, 2019

**BST Testing (Shenzhen) Co.,Ltd.**  
 Add: No.7, New Era Industrial Zone, Guantian, Bao'an District, Shenzhen, Guangdong, China  
 Certificate Search: <http://www.bst-lab.com>, Tel:400-882-9628, 8009990305, E-mail:christina@bst-lab.com

## Appendix 7: Update Log

Version	date	Updated content
V1.0.0	2024.03.10	Creating Documents