

SWIR Industrial Camera

Product manuals

CAMYU (CHONGQING) VISION TECHNOLOGY CO. LTD
2023.03.07

Copyright © CAMYU (CHONGQING) VISION TECHNOLOGY CO. LTD. All right reserved.

Without the written permission of the Company, no entity or individual is allowed to extract or copy the contents of this document in part or in whole, and it is not allowed to disseminate in any form.

Notice

The purchased products, services or features are subject to the commercial contract and terms of Camyu. All or part of the products, services or features described in this document may not be within the scope of your purchase or use. Unless otherwise agreed herein, Camyu makes no representations or warranties regarding the contents of this document. This document may be updated from time to time due to product version upgrade or other reasons. Unless otherwise agreed, this document is intended as a guide only and all statements, information and recommendations in this document do not constitute a warranty of any kind.

Contents

| | |
|--|----|
| Foreword | 1 |
| Safety Instruction for Use | 2 |
| Chapter 1 Product Overview | 3 |
| 1.1 Product introduction | 3 |
| 1.2 Product series list | 3 |
| 1.3 Product features | 3 |
| 1.4 Product detailed parameter table | 3 |
| 1.5 Spectral response curve | 4 |
| 1.6 Technical support and service | 5 |
| Chapter 2 Hardware Introduction | 6 |
| 2.1 Camera Mechanical Specifications | 6 |
| 2.2 Nearby | 6 |
| 2.3 Interface Description | 6 |
| 2.3.1 PWR I/O interface | 6 |
| 2.3.3 Electrical Connectivity | 8 |
| 2.4 Interface Operation Instruction | 8 |
| 2.5 Indicator light description | 9 |
| 2.6 Optical interface Description | 9 |
| Chapter 3 Using Camera Software (USB3.0 Interface) | 9 |
| 3.1 Overview (OS Requirements) | 9 |
| 3.2 Install software | 10 |
| 3.3 Software interface | 10 |
| 3.4 Device connection and disconnection | 14 |
| 3.5 Parameter settings | 14 |
| 3.6 Image and video data collection | 17 |

Foreword

Adapt to the models

This product manual is suitable for the company's USB3.0 interface short-wave infrared industrial camera.

Version History

| Version Numbering | Contents | Change date |
|-------------------|-----------------|-------------|
| 1.0 | Initial Release | 2022.10.11 |
| 1.1 | Minor Fix | 2023.03.07 |

Safety Instruction for Use

The following is the correct use method of this product. In order to prevent danger and prevent property damage, please read this manual carefully before using this product and strictly abide by it during use. After reading, keep the manual properly.

Operational Requirement



Notice

- Please check whether the power supply is correct before running the device.
- Do not drop, disassemble, repair or replace the internal parts by yourself, otherwise it may damage the camera or cause electric shock.
- Do not unplug the device side power cord while the adapter is powered on.
- Please use the device within the rated power input and output range.
- Please transport, use and store the product within the allowable humidity and temperature range.
- Do not drip or splash liquids on the device. If liquids or chemicals enter the device, please stop using it and contact Camyu for technical support.
- Do not allow children to touch the device without supervision.

Installation requirement



Warning

- Do not install and operate in extreme environments where vibration, high temperature, humidity, dust, strong magnetic field, explosive or corrosive gases exist.
- Installation of equipment under unstable lighting conditions is prohibited.
- It is forbidden to provide two or more power supply methods to the device at the same time, otherwise the device may be damaged.
- Please strictly abide by the power requirements of the equipment.

Warranty Notes

Please do not open the camera case without authorization. If the camera case is opened, the warranty will be void, please contact Camyu for warranty details.

Chapter 1 Product Overview

1.1 Product introduction

SAP-0035SW-U3 is a nationally produced industrial camera developed by Camyu. It adopts the leading image sensor (**15 μ m 640 \times 512 InGaAs**) in the camera industry. The equipment has the characteristics of small size, high reliability and strong environmental adaptability. In addition, the product can be programmed and updated in the field, supports the USB interface standard, and users can quickly drive the camera to obtain images.

1.2 Product series list

| Model | Size | Resolution | Pixel | Fps | Data Interface | Spectrum |
|-----------------|------|--------------------------|------------|---------|----------------|----------|
| SAP-0036SW-U3-H | 1" | 640(H) \times 512(V) | 15 μ m | 432 fps | USB3 | SWIR |
| SAP-0030VSW-U3 | 1" | 640(H) \times 512(V) | 15 μ m | 432 fps | USB3 | VSWIR |
| SAP-0130VSW-U3 | 1/2" | 1280(H) \times 1024(V) | 5 μ m | 135 fps | USB3 | VSWIR |

1.3 Product features

- Excellent image quality
- Support a variety of image data format output, ROI and other functions
- Automatic gain, exposure time control
- High frame rate
- Flexible and configurable IO functions
- Excellent environmental adaptability
- Support USB3.0 interface configuration

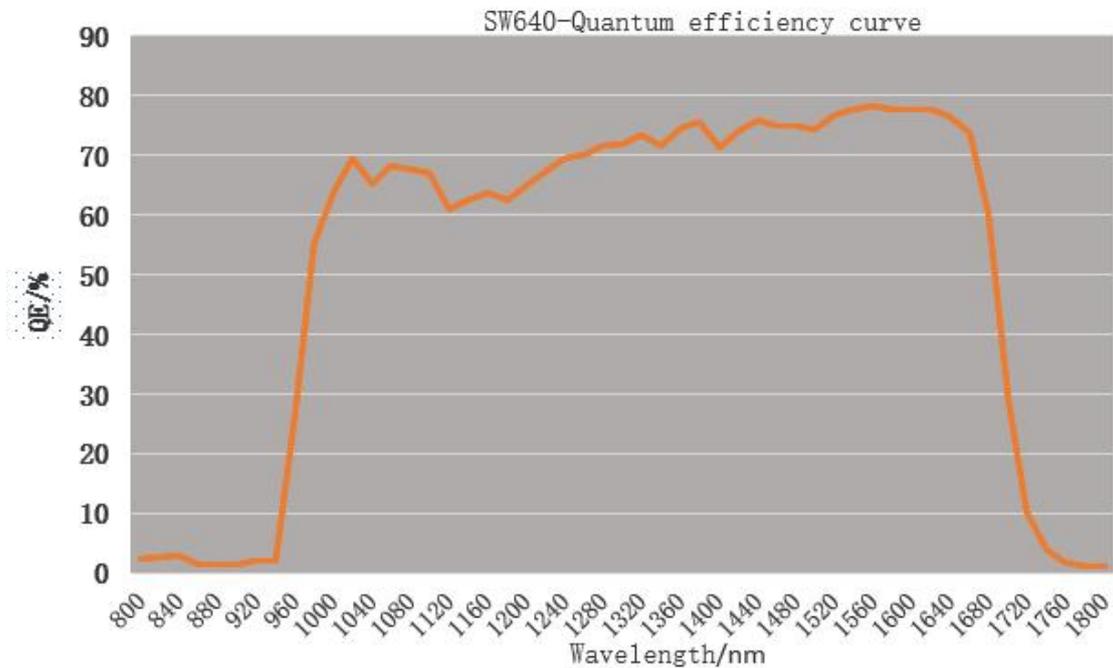
1.4 Product detailed parameter table

| Model | SAP-0036SW-U3-H | SAP-0030VSW-U3 | SAP-0130VSW-U3 |
|--------------------|-------------------------|-------------------------|-----------------------|
| Sensor | InGaAs FPA | InGaAs FPA | InGaAs FPA |
| Resolution | 640 x 512 | 640 x 512 | 1280*1024 |
| Pixel size | 15 μ m x 15 μ m | 15 μ m x 15 μ m | 5 μ m x 5 μ m |
| Spectral range | 900nm~1700nm | 400nm~1700nm | 400nm~1700nm |
| Maximum frame rate | 432 | 432 | 134 |
| AD | 14 | 14 | 12 |

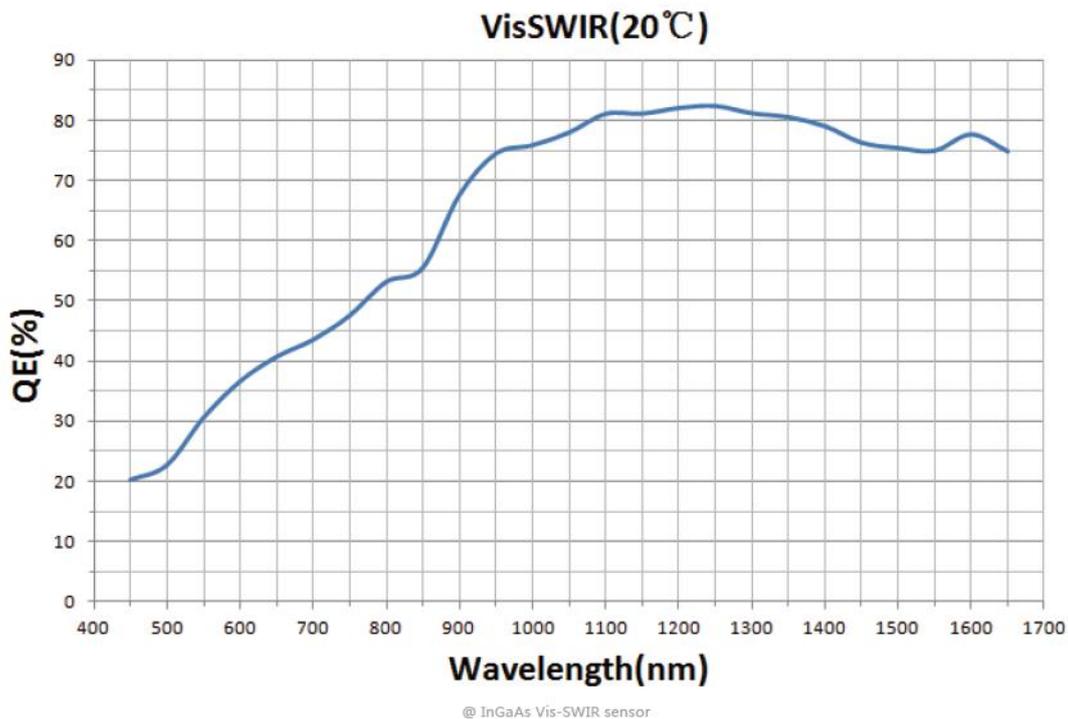
| | | | |
|--------------------------------|-----------------------|-----------------------|-----------------------|
| Exposure time | 40 μ s~1s | 40 μ s~1s | 40 μ s~1s |
| Data interface | USB3.0 | USB3.0 | USB3.0 |
| Data connector | Type-B | Type-B | Type-B |
| Power source | 8~28V | 8~28V | 8~28V |
| Power requirements | 12V@0.44A | 12V@0.44A | 12V@0.44A |
| Outer ruler (L x W x H) | 55x55x67.4 | 55x55x67.4 | 55x55x67.4 |
| Lens interface | C-Mount | C-Mount | C-Mount |
| Weight | 250g | 250g | 250g |
| Storage temperature | -55~85 $^{\circ}$ C | -55~85 $^{\circ}$ C | -55~85 $^{\circ}$ C |
| Operating temperature | -40~70 $^{\circ}$ C | -40~70 $^{\circ}$ C | -40~70 $^{\circ}$ C |
| Operating humidity | 5~90% No condensation | 5~90% No condensation | 5~90% No condensation |

1.5 Spectral response curve

QE curve of SWIR detector



QE curve of extended wavelength version detector



1.6 Technical support and service

SWIR cameras are fully tested before leaving the factory to ensure proper use. If the composition camera cannot be used normally for some reason, please refer to the following steps to troubleshoot:

- (1) Confirm whether the camera IO interface cable is connected correctly;
- (2) Confirm whether the output of the power supply meets the requirements of the camera;
- (3) Check whether the camera indicator light is green, if not, please refer to the LED indicator information to judge the camera working status;
- (4) Reset the camera to its factory settings and power it up again;

If the above methods cannot use the camera normally, please contact Camyu support

E-Mail: support@camyu.net

Web: <http://www.camyu.net/>

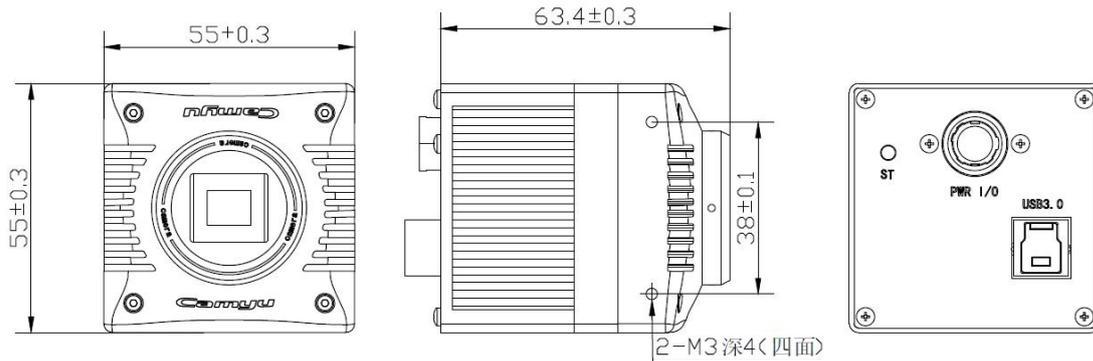
Tel: 023-68602036

Address: 6th Floor, Gate 1, Venus B District, No. 60 Xingguang Avenue, Liangjiang
New District, Chongqing

Chapter 2 Hardware Introduction

2.1 Camera Mechanical Specifications

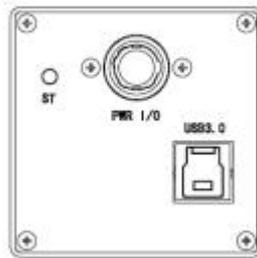
SWIR camera dimensions are shown in the figure below, in millimeters (mm). 8 M3*0.5mm mounting holes, optional tripod mounting plate, no obvious scratches, burrs, crack deformation, mechanical damage.



2.2 Nearby

Nearby camera products: USB3.0 cable (Type-B to Type-A), power IO cable, lens, power supply, tripod mounting plate. The configuration of other accessories will be determined by the marketing department according to the demand.

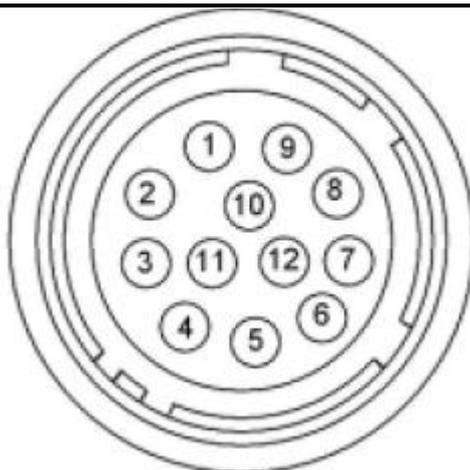
2.3 Interface Description



| Interface | Introduction |
|-----------|--|
| PWR I/O | 12-pin Hirose socket(power and IO interface) |
| USB3.0 | USB3.0 interface |
| ST | Camera working status indicator |

2.3.1 PWR I/O interface

The power and IO ports on the rear panel of the camera use Hirose sockets #HR10A-10R-12PB (71). Please use the corresponding matching #HR10A-10P-12S (73) for power supply input and IO signal transmission. Pin assignment and configuration as shown



The detailed definition of interface signal is shown in the following table

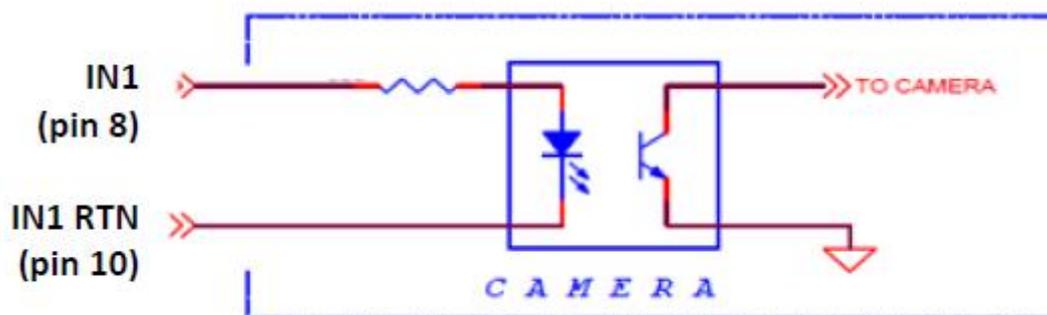
| Pin | Signal | Instruction | Indicators |
|-----|---------------|--|--|
| 1 | 12 VDC RTN | 12V DC Return | -- |
| 2 | +12 VDC | +12V DC | 10V~14V |
| 3 | Reserved | Reserved for future RS-232 | -- |
| 4 | Reserved | Reserved for future RS-232 | -- |
| 5 | OUT2 RTN | General Purpose Output2, Contact1(Opto-isolated) | -- |
| 6 | OUT1 RTN | General Purpose Output1 Return (TTL) | -- |
| 7 | OUT1 | General Purpose Output1(TTL) | Voltage 5V, Max current 8mA |
| 8 | IN1 | General Purpose Input1(Opto-isolated) | Voltage range 3.3V~24V, Max current 5mA |
| 9 | IN2 | General Purpose Input2(TTL/LVTTL) | Voltage range 3.3V~5V, Max current 2mA |
| 10 | IN1 RTN | General Purpose Input1 Return (Opto-isolated) | -- |
| 11 | IN2 RTN | General Purpose Input2 Return (TTL/LVTTL) | -- |
| 12 | OUT2 | General Purpose Output2, Contact2(Opto-isolated) | Voltage range 25V, Max current 50mA |

2.3.3 Electrical Connectivity

The SWIR camera has two external inputs, IN1 and IN2. Input IN1 is optically isolated while input IN2 accepts low voltage TTL(LVTTL). The camera provides two general-purpose outputs. Output OUT1 is 5V TTL compatible signal and output OUT2 is opto-isolated. The following figures show the external input electrical connections and the external output electrical connection:

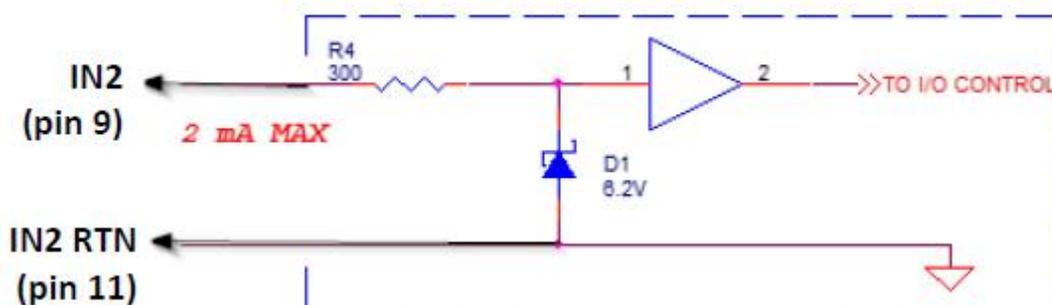
Opto-isolated input IN1

Input signal IN1 and IN1 RTN are optically isolated, and the voltage difference between the two must be positive between 3.3 and 24 V. The minimum input current is 3.3 mA.



TTL/LVTTL input IN2

Input signals IN2 and IN2 RTN provide interfaces to a TTL or LVTTL input signal. The signal level (voltage difference between the inputs IN2 and IN2 RTN) must be LVTTL(3.3V) or TTL(5.0V). The total maximum input current must not exceed 2.0 mA.



2.4 Interface Operation Instruction

The premise of the following operating instructions is that the camera-related software has been installed on the computer. To connect the camera to a computer, follow the steps below:

- Make sure the camera is not connected to the camera and the computer is turned off.
- Insert one end of the USB cable into the USB3.0 Type-A interface, and insert the other end of the USB cable into the USB3.0 interface of the computer.
- Connect the plug of the power adapter to the power/trigger input socket on the camera
- Plug the power adapter into a working electrical outlet.
- Make sure all cables are securely connected.

2.5 Indicator light description

The camera has a multi-color LED indicator, which is used to indicate the current operation of the camera, which is convenient for quick troubleshooting (the priority increases from top to bottom).

| LED Condition | Status Indication |
|--|--|
|  Green steady ON | Normal |
|  Green blinks at ~2.0Hz | Programmable frame rate time |
|  Amber steady ON | Test mode |
|  Red steady ON | RS-232 connection error or firmware loading error, need to restart the camera and factory settings |
|  LED OFF | The power supply is not displayed, maybe the power supply fails or the external DC adapter is faulty |
|  Red blinks at ~2.0Hz | High temperature |
|  Red Green 1Hz | Upgrading |

2.6 Optical interface Description

The optical interface of camera and lens adopts standard C-Mount interface (C interface). It is recommended to choose an industrial lens that is compatible with the C-mount for use with it.

Chapter 3 Using Camera Software (USB3.0 Interface)

3.1 Overview (OS Requirements)

Software operating environment requirements:

| Project | Configuration advice |
|----------|--|
| CPU | Main frequency above 3.0GHz |
| Memory | 8G and above |
| OS | Windows7/8/8.1/10 ×64 |
| Software | Visual C++ Runtime 2015,QT 5.14.0, Python3.8.0 |

3.2 Install software

Start the app file in SapViewer_Vxx by decompressing the installation package provided by the

GHOPTO company.



After installing the software, install the corresponding camera driver to make the camera work smoothly, as shown in the figure.



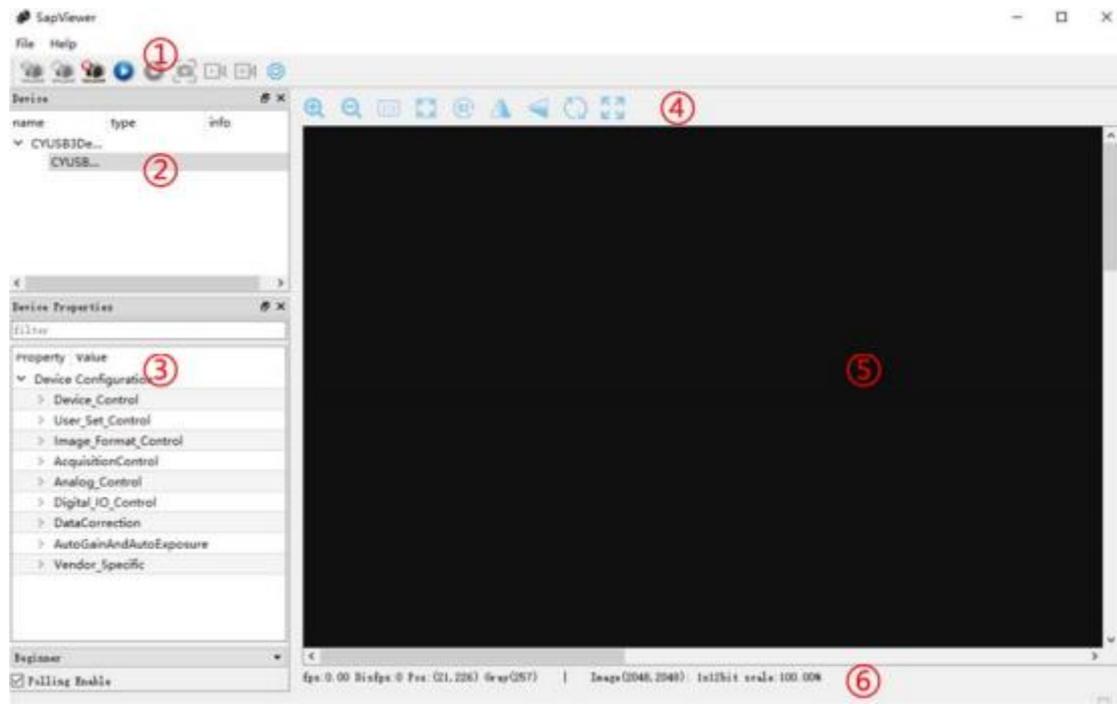
3.3 Software interface

After the software is installed, the icon of the software appears.



Find SapViewer, double-click to start the software.

After the software is successfully started, the software preview interface appears, and the entire interface is mainly divided into six functional areas.



| Number | Instruction |
|--------|--------------------------|
| 1 | Menu bar |
| 2 | Search device |
| 3 | Camera parameter control |
| 4 | Image control |
| 5 | Image display |
| 6 | Information bar |

I **The menu bar** shortcut button contains Find Devices, Connect Devices, Disconnect Devices,

Start Capture, Stop Capture, Snap Image, Record Raw Video, Stop Record and Settings.



| Shortcut icon | button | Name | Function Description |
|---------------|--------|------|----------------------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| | | |
|---|--------------------|--|
|  | Find Devices | Search for camera devices |
|  | Connect Devices | Connect the camera device |
|  | Disconnect Devices | Disconnect the camera device |
|  | Start Capture | Start acquiring image data |
|  | Stop Capture | Stop acquiring image data |
|  | Snap Image | Screenshot |
|  | Record Raw Video | Start recording |
|  | Stop Record | Stop recording |
|  | Settings | Set the storage path and storage format of image or video data |

- | **Setting search function** provides camera device driver selection.
- | **Camera parameter control function** is used to set camera parameters.
- | **The image control bar** is used to display the image data collected by the camera, and at the upper end of the image display area, the function contains Zoom in, Zoom out, 1:1 display, Adaptive display, Rotate, Flip horizontal, Flip vertically, Reset, Full screen.

| Icon | Name | Function Description |
|---|------------------|-------------------------|
|  | Zoom in | Zoom in image |
|  | Zoom out | Zoom out image |
|  | 1:1 display | Display in 1:1 scale |
|  | Adaptive display | Display in proper scale |
|  | Rotate | Rotate the image |
|  | Flip horizontal | horizontal flip |
|  | Flip vertically | Vertically flip |



Reset

Reset



Full screen

Full-screen display

| **Image display** for displaying image or video data.

| **Information bar** provides camera frame rate, mouse coordinates, resolution, scale, etc.

3.4 Device connection and disconnection

The specific steps are as follows to connect and disconnect the device and the software:

| Connect the camera to the computer via the power cable and USB3.0 cable, make sure the ST indicator of the camera is green.

| Double click to start the software.

| The software automatically searches for connected devices, and the menu area **Connect**

Device becomes operable . If the **Connect Device** does not change, please check whether the device connection is in good condition.

| Click **Connect Device** to connect the device. If the menu area **Disconnect Device** , **Start Capture**  becomes operable, it means that the device has been connected successfully.

| Click **Start Capture**, the device starts to collect, at this time, the image area will appear, and the user can take **screenshots** , **record videos** , and **store data** .

| Click **Stop Capture** , the device stops collecting work.

| Click **Disconnect Device** , the software disconnects the device.

3.5 Parameter settings

Camera setting parameter control, the specific steps are as follows:

| Connect the camera to the computer via the power cable and USB3.0 cable, make sure the ST indicator of the camera is green.

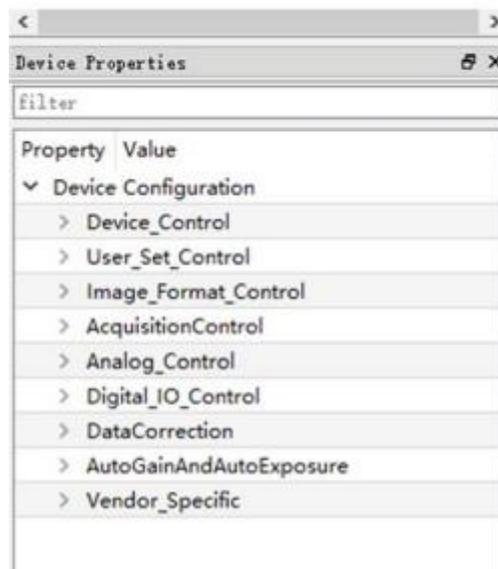
| Double click to start the software.

| The software automatically searches for connected devices, and the menu area **Connect**

Device becomes operable . If the **Connect Device** does not change, please check whether the

device connection is in good condition.

I Click **Connect Device**  to connect the device. Setting control area parameters



I Click Device Configuration.

| Parameter | Instruction |
|----------------------|---|
| Device_Control | Equipment control, software automatically reads camera parameters |
| User_Set_Control | Users set specific parameter sets according to their needs |
| Image_Format_Control | Set image format |
| Acquisition_Control | Exposure, trigger, time control |
| Analog_Control | Analog setting |
| Digital_IO_Control | IO data control |
| Data_Correction | Data correction |

| | |
|-----------------------------|-----------------------------------|
| Auto Gain and Auto Exposure | Auto gain, auto exposure settings |
|-----------------------------|-----------------------------------|

| | |
|-----------------|-----------------------------|
| Vendor_Specific | Supplier parameter settings |
|-----------------|-----------------------------|

I Click Disconnect Device  , the software disconnects the device.

3.6 Image and video data collection

Camera image, video data collection operation, the specific steps are as follows:

I Connect the camera to the computer via the power cable and USB3.0 cable, make sure the ST indicator of the camera is green.

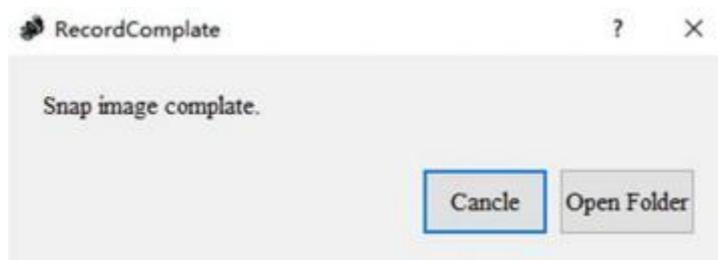
I Double click to start the software.

I The software automatically searches for connected devices, and the menu area **Connect Device** becomes operable  . If the **Connect Device** does not change, please check whether the device connection is in good condition.

I Click **Connect Device** to connect the device. If the menu area **Disconnect Device**  , **Start Capture**  becomes operable, it means that the device has been connected successfully.

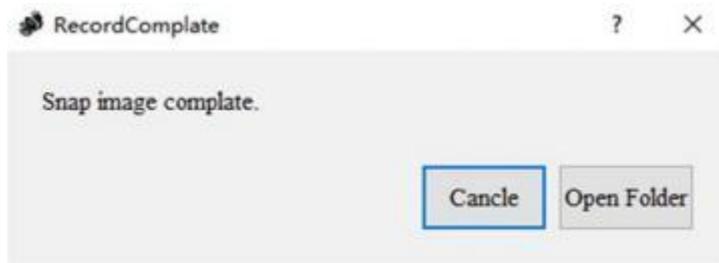
I Click **Start Capture**  , the device starts to collect, and the image area displays the collected data.

I Click **Snap image**  , start taking screenshots, and the **Record Complete** window will pop up. Click **Open Folder** to open the screenshot storage folder.

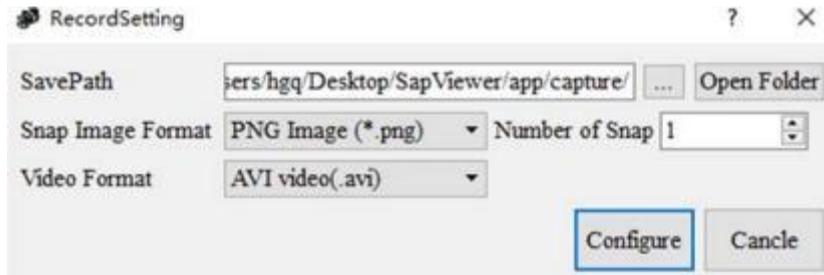


I Click **Record Raw Video**  , start taking video. Click **Stop Record**  , end video, and the

Record Complete window will pop up. Click **Open Folder** to open the screenshot storage folder.



1 Click **Setting** , turn on storage settings. The user sets the file storage path in SavePath. **Snap Image Format** sets image format (support PNG and RAW), Video Format sets video format (support AVI and RAW).



3.7 Trigger Control

Trigger Control lets you configure the camera's trigger options and trigger strobe options.

| | |
|---------------------|----------------------|
| TriggerMode | Off |
| TriggerSoftware | --> Show command <-- |
| TriggerSource | PulseGenerator |
| TriggerActivation | RisingEdge |
| TriggerDebounceTime | 1 |
| TriggerFilterTime | 1 |
| TriggerOverlap | Off |
| TriggerType | Standard |
| TriggerNumFrames | 1 |
| TriggerDelay | 1 |

Trigger control Settings:

| Settings | Name | Function Specification |
|--------------------|-----------------------|---|
| Trigger Mode | Trigger switch | It can be ON or OFF |
| Trigger Software | Ways of triggering | Click "Execute command" to trigger |
| Trigger Source | Source of trigger | It can be "Software" or "pulse Generator" |
| Trigger Activation | Trigger edgeselection | When hardware trigger is selected, set Rising Edge or Falling Edge, the external cable generates rising edge signal and |

| | | |
|-----------------------|------------------------------------|--|
| | | falling edge signal |
| Trigger Debounce Time | Eliminate the shaking trigger time | This is designed to prevent multiple triggering from ringing on the trigger input pulses. The camera ignores additional triggers received during the de-bounce time. Set the de-bounce time between 0 and 65535 microseconds |
| Trigger Type | type | It can be "Standard" or "Fast" |
| Trigger Delay | delay | Sets the delay between the trigger pulse active edge and beginning of the exposure. |

3.7.1 Trigger Mode

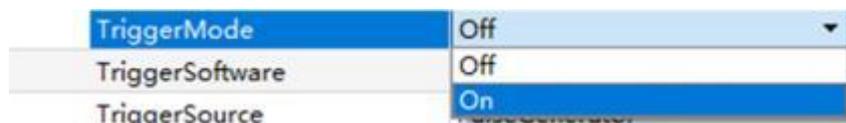
The camera trigger mode is generally divided into software trigger and hardware trigger.

- I Software trigger : the trigger signal is output by software
- I Hardware trigger : trigger signals are input by external devices through the I/O interface.

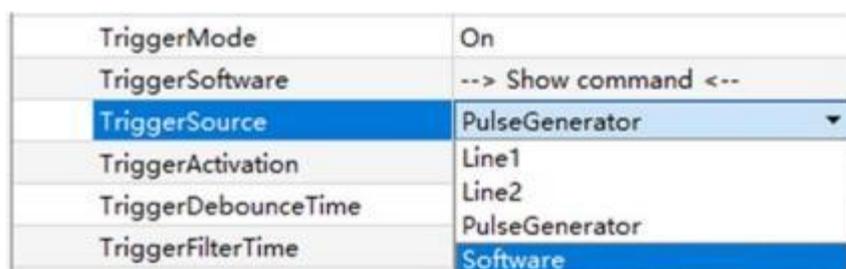
3.7.1 Trigger operation

The software triggers the operation as follows:

- I Click "Trigger Mode" and select "ON".



- I Click "Trigger Source" and select "Software".



- I Click "Trigger Software" and select "Execute command!". The software

outputs the contact signal and obtains the picture.

| | |
|-------------------|----------------------|
| TriggerMode | On |
| TriggerSoftware | --> Show command <-- |
| TriggerSource | --> Show command <-- |
| TriggerActivation | Execute command! |

The hardware triggers the operation as follows:

I Click "Trigger Mode" and select "ON".

| | |
|-----------------|-----|
| TriggerMode | Off |
| TriggerSoftware | Off |
| TriggerSource | On |

I Click the trigger source and select "Lin1" or "Lin2". Get the picture when the external output triggers the signal.

| | |
|---------------------|----------------------|
| TriggerMode | On |
| TriggerSoftware | --> Show command <-- |
| TriggerSource | PulseGenerator |
| TriggerActivation | Line1 |
| TriggerDebounceTime | Line2 |
| | PulseGenerator |

I When click (Lin1 or Lin2), user can select option "Trigger Activation" to determine the hardware trigger mode. "Rising Edge" indicates the trigger after holding down, "Falling Edge" indicates the trigger after releasing.

| | |
|---------------------|----------------------|
| TriggerMode | On |
| TriggerSoftware | --> Show command <-- |
| TriggerSource | Software |
| TriggerActivation | RisingEdge |
| TriggerDebounceTime | RisingEdge |
| TriggerFilterTime | FallingEdge |