



L1 Series CameraLink Industrial Line Scan Camera Specifications

V1.0.0

Preface

Overview

This paper briefly describes the contents of the CameraLink Industrial Line Scan Camera, including product introduction, basic parameters and fast operation of the application software.

Symbolic conventions

The following signs may appear in this document and they represent the following:

Symbol	Description
 危险	Indicates a high potential hazard that, if not avoided, could result in personal injury or serious injury.
 警告	Indicates a moderate or low hazard potential that, if not avoided, could result in minor or moderate injury to personnel.
 注意	Indicates a potential risk that, if ignored, could lead to device damage, data loss, reduced device performance, or unpredictable results.
 Anti-static	Indicates an electrostatic sensitive device.
 Protection against electric shock	Indicates high pressure hazard.
 窍门	Indicates that it can help you solve a problem or save you time.
 说明	The representation is additional information of the text, which is an emphasis and supplement to the text.

Notes on safe use



警告

- During the installation and use of the product, the electrical safety regulations of the country and the area must be strictly observed.
- Please use the power adapter provided by the regular manufacturer. Please refer to the product parameter table for the specific requirements of the power adapter.
- To reduce the risk of fire or electric shock, do not expose the product to rain or moisture.
- Easy-to-use power-off equipment should be incorporated into the building installation wiring.
- When installing in the use environment, please ensure that the product is firmly fixed.
- If the product does not work properly, please contact the nearest service center, do not disassemble or modify the product in any way.
- (the company does not assume any responsibility for the problems caused by unauthorized modification or maintenance).



注意

- Avoid installing the product in a vibration or shock environment, and keep the product away from electromagnetic interference. (Ignoring this item may damage the product).
- Do not directly touch the heat dissipation parts of the product to avoid scalding.
- Indoor products do not install in the environment may be showered with water or other liquid.
- Please do not use the product in extremely hot, cold, dusty, corrosive or high humidity environment. Please refer to the parameter table of the product for specific temperature and humidity requirements.
- Avoid aiming the lens at strong light (such as lighting, sunlight or laser beam, etc.), otherwise the image sensor will be damaged.
- Do not touch the image sensor directly. If necessary, please moisten a soft clean cloth with alcohol and gently wipe off the dust. When the product is not in use, please add a dust cover to protect the image sensor.
- Please keep all the original packaging materials of the camera properly, so that when there is a problem, use the packaging materials to pack the camera and send it to the agent or return to the manufacturer for processing. The company does not assume any responsibility for accidental damage during transportation caused by non-original packaging materials.



说明

Quality requirements for installation and maintenance personnel:

- Have the qualification certificate or experience in the installation and maintenance of weak current system, and have the experience and qualifications to engage in related work, in addition, must have the following knowledge and operation skills.
- Have the basic knowledge and operation skills of low voltage wiring and low voltage electronic circuit wiring.
- Have the ability to read the contents of this manual.

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Chapter 1 Product Overview

1.1. Product Introduction

CameraLink Industrial Line Scan Camera is the highly reliable and cost-effective line sweep industrial camera. It uses high-performance photosensitive chip, through the CameraLink line real-time transmission of non-compressed image data, can be compatible with any GenICam standard application development tools, the maximum 6.8 Gb/s transmission rate can meet the requirements of most industrial applications on the transmission rate, can work stably in a variety of harsh environments.

1.2. Product Features

Simple installation, easy operation, support:

- Support hardware trigger/free running and other modes.
- Support flat field correction.
- Support multiple image data format output, ROI, gain and mirror etc.
- Conform to GenICam standards.

1.3. Spectral graph and main technical parameters

The following spectral plot data is from the selected chip's manual:

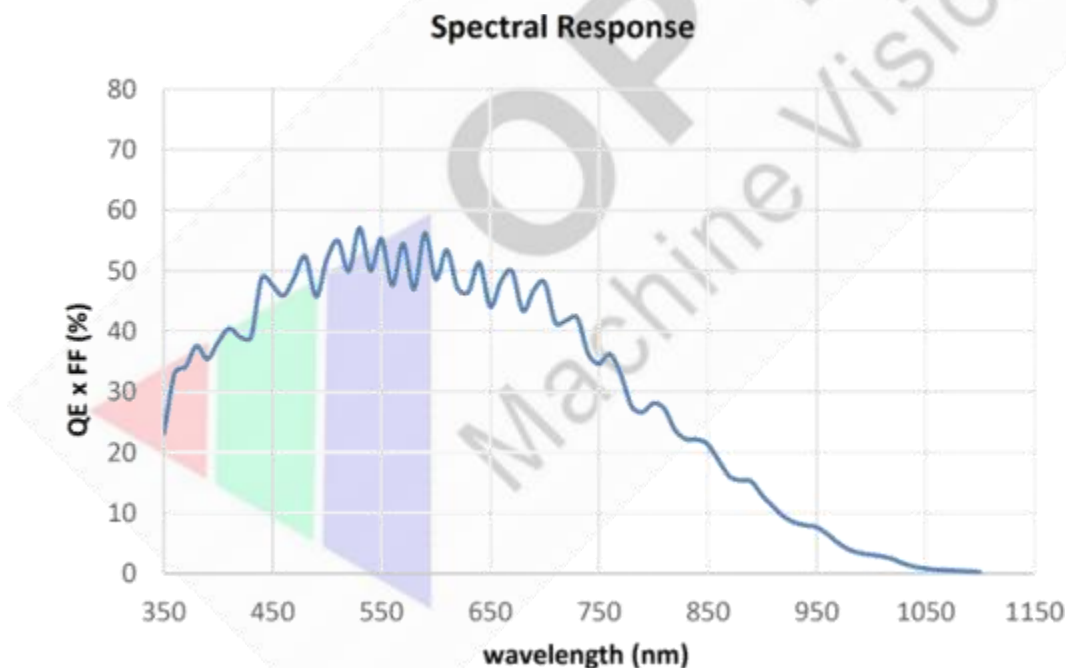


Fig.1 -1 Spectral response curve (OPT-CL1-M16-L3-01)

The main technical parameters of CameraLink Industrial Line Scan Camera are as follows

Table 1-1 OPT-CL1-M4-L3-01 Technical Parameters

4K Line Scan CameraLink interface black and white		
Sensor	Sensor Type	CMOS
	Color	black and white
	Shutter Type	Global Shutter
	Resolution	4096 (H) x 1 (V)
	Pixel	7.0μm×7.0μm
	Target Surface	28.672mm
	Bit depth	12bit
	Maximum line frequency	200kHz
Image	Dynamic range	69.4dB
	signal-to-noise ratio	40.2dB
	Digital Gain Range	1~15.75X
	Exposure time	1μs~50ms
	Image Format	Black and white: Mono8/Mono 12
Physical Interface	Data Interface	CameraLink interface
	Digital I/O	6-core Hirose interface: 3-way power supply, 3-way GND
	Optical Interface	M42 × 1.0-6H
POWER/TEMPERATURE DIMENSIONS/SPECIFICATIONS	Power supply	DC power supply via 6-pin Hirose interface
	Power consumption	6.50W@24V
	Temperature	Storage temperature:-30 °C ~ +80 °C; Working temperature: 0 °C ~ +50 °C
	Dimensions	62.0mm(W)x 62.0mm(H)x 30.6mm(D)(without lens mount and rear housing connector)
	Weight	<250g
	Specification	Meets GenlCam standards

Table 1-2 OPT-CL1-M8-L3-01 Technical Data

8K Line Scan CameraLink Interface Black & White		
Sensor	Sensor Type	CMOS
	Color	Black and White
	Shutter Type	Global Shutter
	Resolution	8192 (H) x 1 (V)
	Pixel	7.0μm×7.0μm
	Target Surface	57.344mm
	Bit depth	12bit
	Maximum line frequency	100kHz

Image	Dynamic range	63.3dB
	Signal-to-noise ratio	40dB
	Digital Gain Range	1.0~15.5X
	Exposure time	1 μ s~100ms
	Image Format	Black and White: Mono8/Mono 10/Mono 12
Physical Interface	Data Interface	CameraLink interface
	Digital I/O	6-cell Hirose interface: 3-way power, 3-way GND
	Optical Interface	M72 $\times$ 0.75-6H
POWER/TEMPERATURE DIMENSIONS/SPECIFICATIONS	Power supply	DC power supply via 6-pin Hirose interface
	Power consumption	8.0W@24V
	Temperature	Storage temperature: -30 $^{\circ}$ C~+80 $^{\circ}$ C; Operating temperature: 0 $^{\circ}$ C~+50 $^{\circ}$ C
	Dimensions	76.0mm(W)x76.0mm(H)x37.8mm(D)(without lens mount and rear housing connector)
	Weight	<370g
	Specification	GenlCam compliant

Table 1-3 OPT-CL1-M16-L3-01 Technical Data

16K Line Scan CameraLink Interface Black & White		
Sensor	Sensor Type	CMOS
	Color	Black and White
	Shutter Type	Global Shutter
	Resolution	16384 (H) x 1 (V)
	Pixel	3.5 μ m $\times$ 3.5 μ m
	Target Surface	57.344mm
	Bit depth	10bit
	Maximum line frequency	50kHz
Image	Dynamic range	56.6dB
	Signal-to-noise ratio	37.4dB
	Digital Gain Range	1.0~15.5X
	Exposure time	1 μ s~100ms
	Image Format	Black and White: Mono8/Mono 10
Physical Interface	Data Interface	CameraLink Interface
	Digital I/O	6-core Hirose interface: 3-way power, 3-way GND

POWER/TEMPERATURE DIMENSIONS/SPECIFICATIONS	Optical Interface	M72×0.75-6H
	Power supply	DC power supply through 6-pole Hirose interface, DC24V, current 0.313A
	Power consumption	7.50W@24V
	Temperature	Storage Temperature: -30°C~+80°C; Operating Temperature: 0°C~+50°C
	Dimensions	76.0mm(W)x76.0mm(H)x37.8mm(D) (without lens mount and rear housing connector)
	Weight	<370g
	Specification	GenlCam compliant

1.4. Environmental requirements

The environmental requirements for CameraLink Industrial Line Scan Camera are as follows:

Temperature and humidity

The ambient temperature should not exceed 50 °C, it is best to work in an air-conditioned environment.

Shell temperature during *operation: 0 °C ~ 60 °C.

*work environment humidity: 20% ~ 80% without condensation.

*storage temperature:-30 °C ~ +80 °C.

*storage humidity: 20% ~ 80% without condensation.

The equipment is installed indoors, the position is stable, and the front and back left and right have enough heat dissipation space.

Ensure certain air flow.

Chapter 2 Interface Description

2.1. Camera structure size

The structural dimensions of the product are as follows:

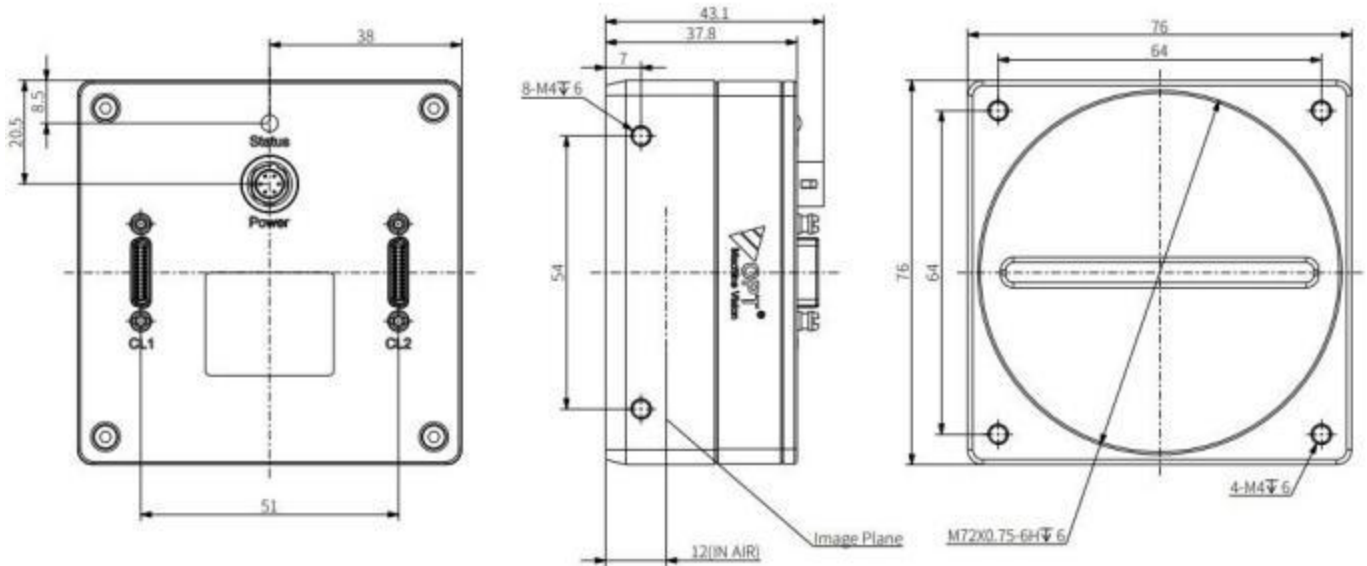


Figure 2-1 Size of L1 Camera

2.2. Interface Description

There are two interfaces on the back of the device, the CameraLink interface and the 6Pin power supply, as shown in the figure below.

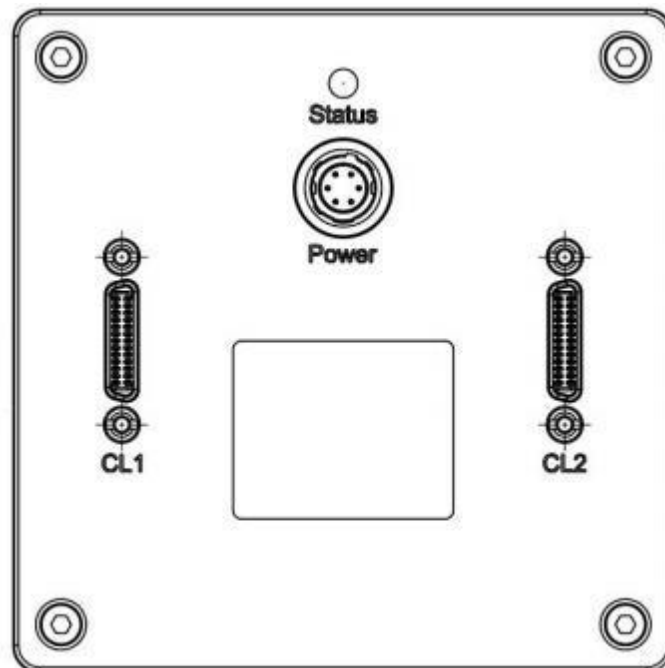


Figure 2-2 L1 Camera Appearance Interface

2.2.1. CameraLink Interface

CameraLink interface, the full name is: CameraLink transmission interface, used for camera control, data transmission.

In order to ensure the transmission quality, it is required to comply with Camera Link®Standard, and locking screws can also increase reliability in reciprocating motion scenes.

2.2.2. 6Pin Power Interface

The pin signals of the power interface are defined as shown in the following table.

Table 2-1 6Pin female pin wiring definition

Pin	Signal	Description
1	Power	DC 12V ~ 24V camera power supply
2	Power	DC 12V ~ 24V camera power supply
3	Power	DC 12V ~ 24V camera power supply
4	GND	Power ground
5	GND	Power ground
6	GND	Power ground

2.2.3. Pin Signal Definition

6Pin female pin bit ordering and wiring definitions are as follows:

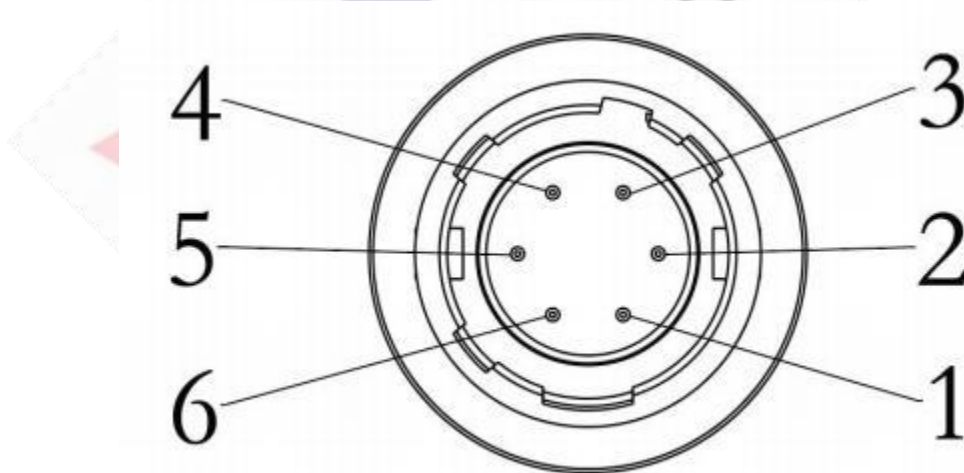


Figure 2-3 6Pin female pin bit ordering

2.3. Power Electrical Specifications

Table 2-2 Electrical Specifications of Power Supply

Parameters	Description
Camera Power Specifications	DC +12V ~ +24V, <1% ripple, powered by the camera's 6-core Hirose connector. A minimum of 26AWG cable is required.



- Support for DC +12V ~ +24V external power supply.
- power supply must meet the SELV, LPS specifications.

2.4. Status indicator light

The status indicator of the device is described in the following table.

Table 2-3 Description of Indicator Lights

Color and Status	Illustration	Description
Close		The device is not powered.
Red light flash		The camera is starting up.
Green Flash		The camera is connected and is in continuous acquisition mode or single frame acquisition mode during image acquisition.
Green light flashing slowly		The device is in triggered mode (both triggered and untriggered).
Red light/green light alternate		No codestream, firmware upgrade failure, or other fatal error.

Chapter 3 Product Installation



Installation is mainly divided into hardware installation and application installation.

3.1. Hardware Installation

Before installation, please check the equipment for obvious damage and confirm whether it is consistent with the matching list.

3.1.1. Installation and matching

The installation kit list is shown in the table below.

Table 3-1 Matching List

Serial Number	Accessory Name	Quantity	Description
1	Industrial Line Scan Camera	1	This manual refers to the Industrial Line Scan Camera
2	Power adapter or DC switching power supply (required)	1	Suitable power adapter or DC switching power supply, please see the corresponding technical specifications, to be purchased separately
3	CameraLink line (required)	2	CameraLink line of suitable length, to be purchased separately
4	Lens (Required)	1	According to the needs to choose the appropriate interface of the lens, to be purchased separately
5	CameraLink acquisition card (Must match)	1	Appropriate CameraLink network card needs to be purchased separately (except for the host)
6	adapter ring (optional)	1	When using a lens that is different from the camera lens interface, it needs to be purchased separately.

3.1.2. Camera Installation

When installing, consider static electricity, electromagnetic interference, lightning and surge at the same time also need to consider the camera heat.

3.2. Application installation.

The steps for the host to install the application are as follows:



Contact the relevant technical support personnel to obtain the application installation package.



Step 1 Open the software, double-click the desktop shortcut to open the application installation package.

Step 2 The license agreement window pops up as shown in Figure 3-1. After reading the license agreement carefully, confirm that you agree to the license terms, and then click One step button to continue the installation process.

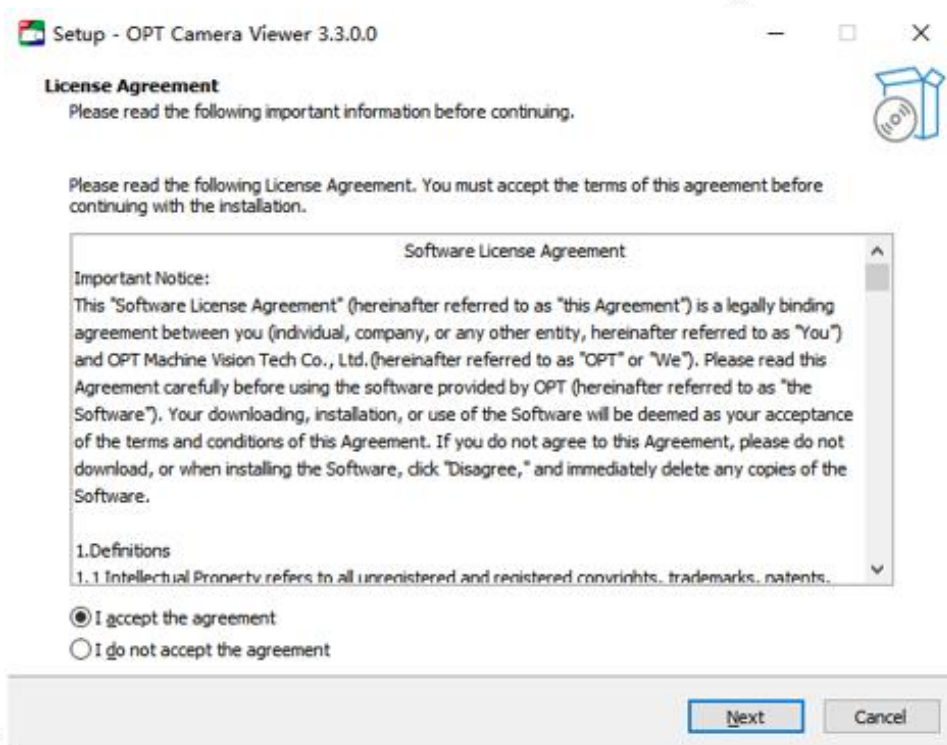


Figure 3-1 License Agreement Window

Step 3 Enter the installation folder window as shown in Figure 3-2, select the software installation path (the default path is: C:\Program Files \OPT\OPTCameraViewer) and click the Next button to continue the installation process.

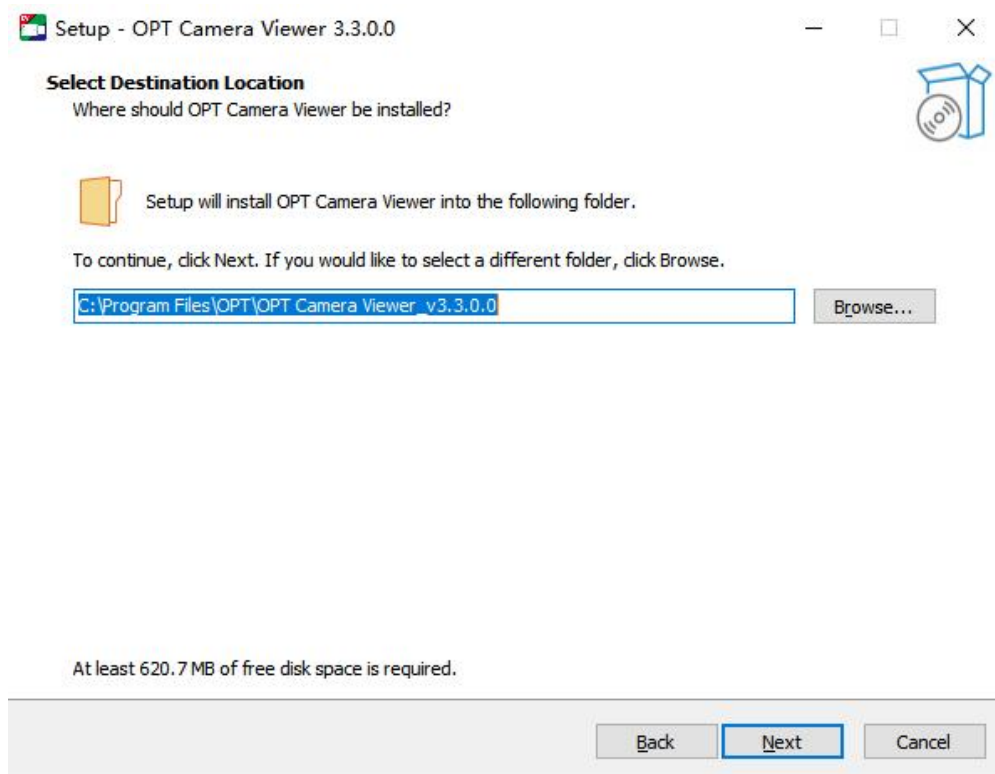


Figure 3-2 Installation folder window

Step 4 Enter the preparation installation window as shown in Figure 3-3, check the installation summary information and click the Next button to continue the installation process.

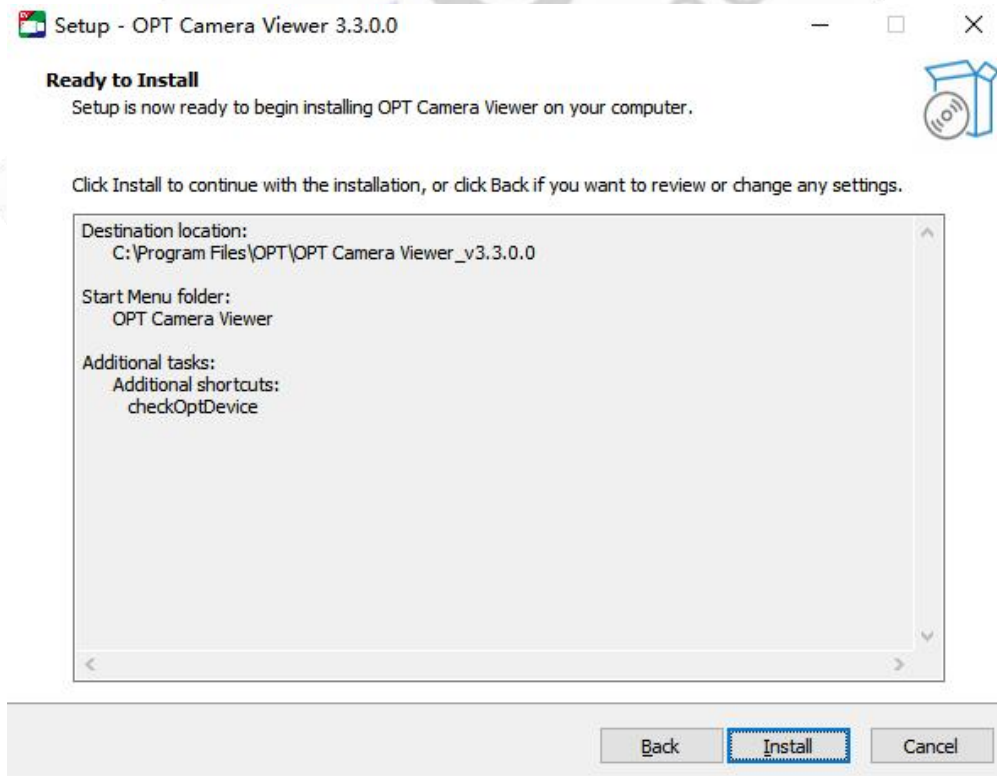


Figure 3-3 Preparing the installation window

Step 5 Enter the installation window as shown in Figure 3-4 and wait for installation.

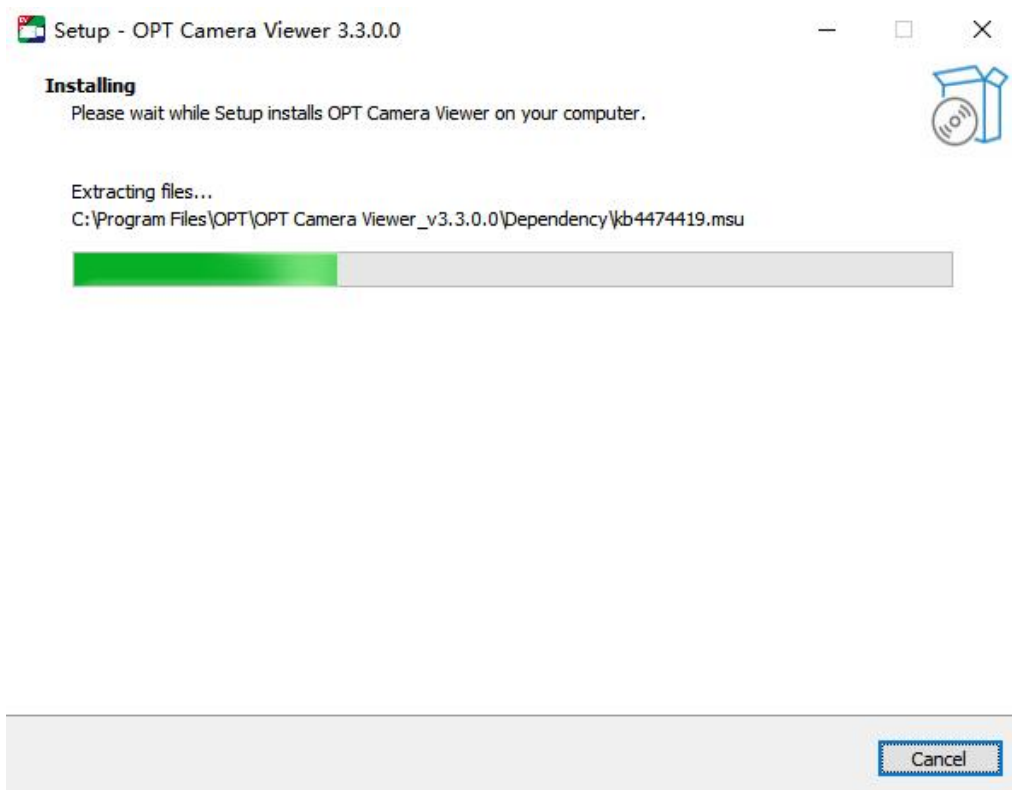


Figure 3-4 Installation window

Step6 The software installation success window pops up as shown in Figure 3-5. The software is OPTCameraViewer installed successfully. Click the Finish button to end the installation process.

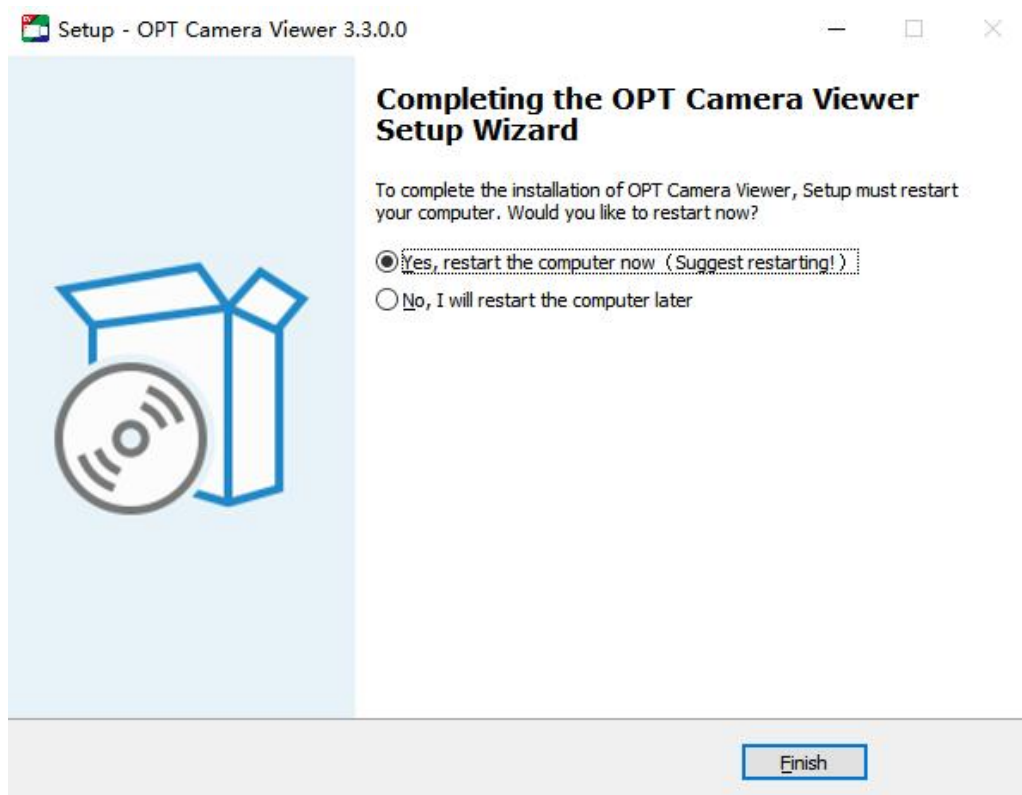


Figure 3-5 Software installation success window

Chapter 4 Camera Connection



- Please ensure that the CameraLink Industrial Line Scan Camera and PC connection is correct.
- PC to install the application, the specific operation please see "3.2 application installation".

After the CameraLink Industrial Line Scan Camera is connected to the cable, the application installed on the host can detect the online camera, click on the connection, and the camera can operate normally.

The specific operation steps of connection setting are as follows:

Step 1 Open the software.

Open the application software by double-clicking the desktop shortcut . The software will automatically detect all online devices, as shown in Figure 4-1 shown.

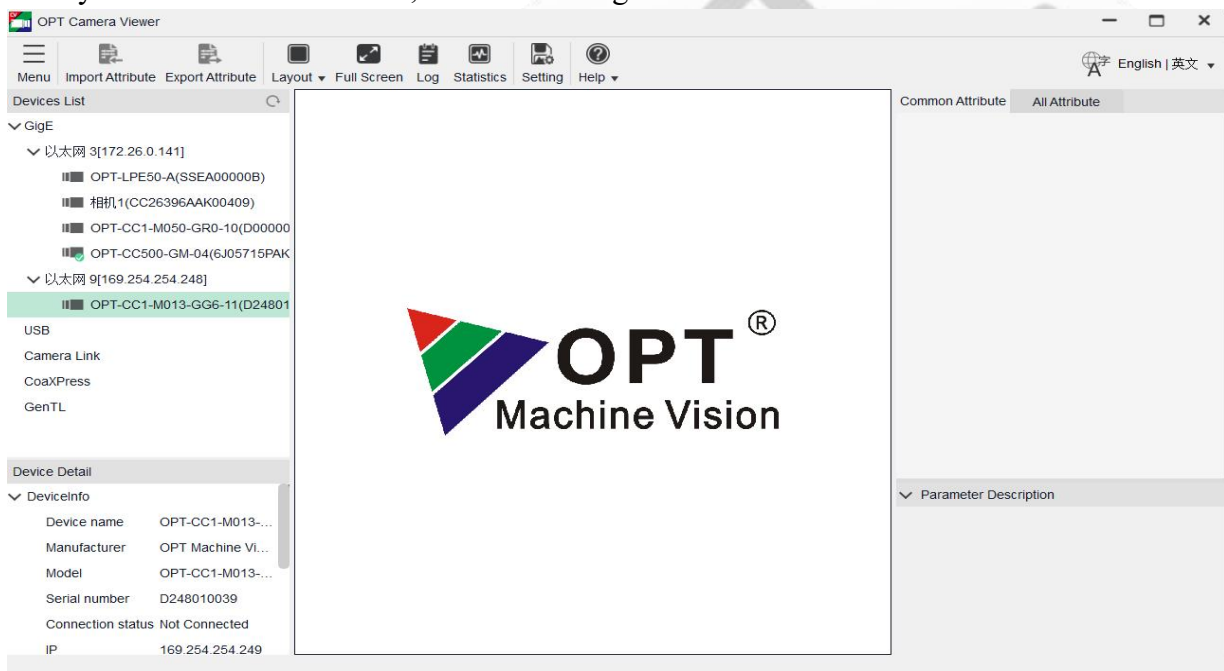


Figure 4-1 Software window

Step 2 Device connection.

select the target camera, click , connect the device. After the connection is successful, click . The device tab and the property tab are shown in Figure 4-2 shown.



You can click  to disconnect the device.

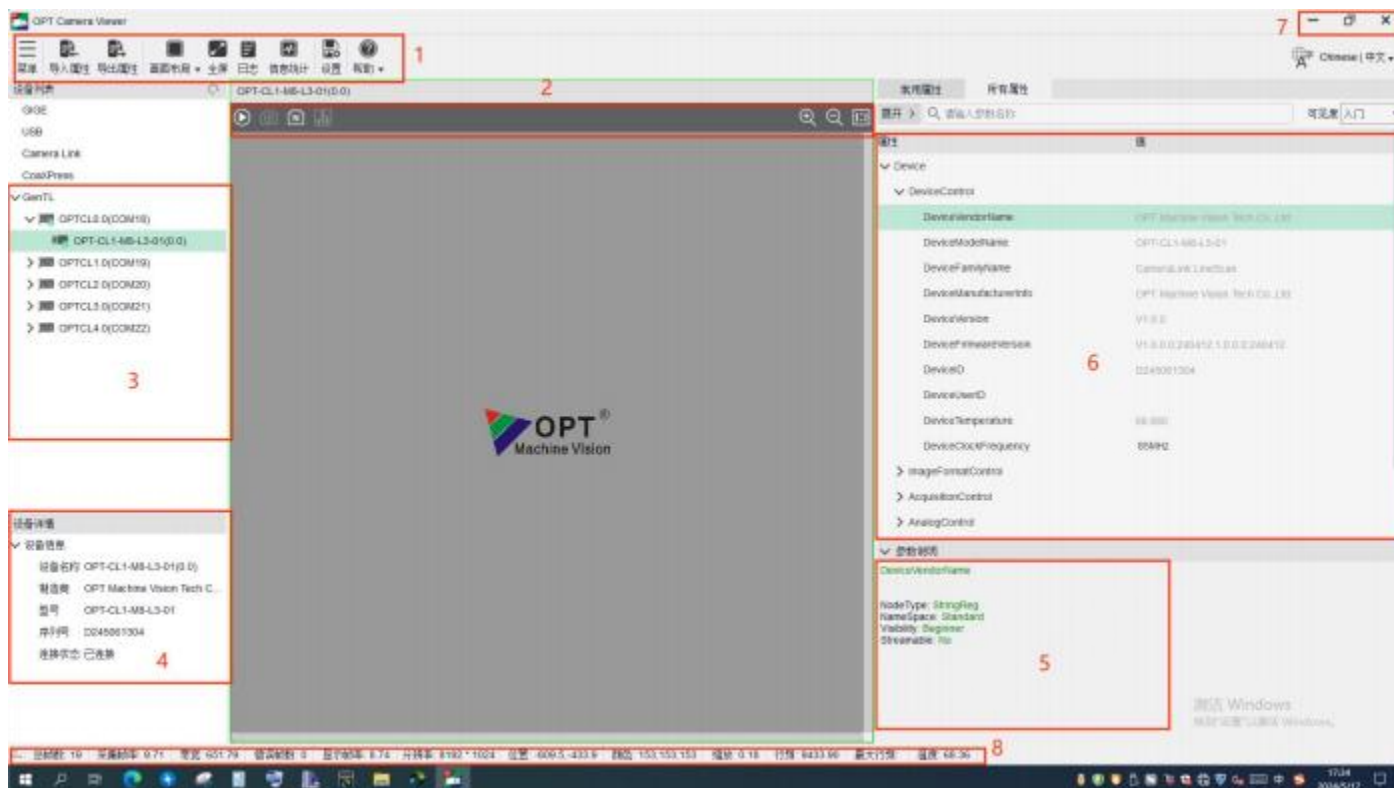


Figure 4-2 Successful device connection (Device tab)

Table 4-1 Parameter description

Serial Number	Parameter Description
1	Menu bar, see Table 4-2 for details.
1	●  Click this icon and the software will execute the instruction to connect with the target camera. (When the camera is connected, The icon appears gray.) ●  : Click on this icon and the software will execute the Disconnect from the target camera command. (This icon appears gray when the camera is not connected.) ●  : Click on the icon software will be based on the property module in the AcquisitionControl menu under the AcquisitionMode tab to execute a single acquisition or continuous acquisition instructions. (This command will be invalid when the camera is in trigger mode) ●  : Clicking this icon will abort the current continuous acquisition command. (This command is invalid when the camera is in trigger mode)

Serial Number	Parameter Description
2	 Clicking on this icon will execute a single acquisition command and save the image in the path you selected. (This command will be invalid when the camera is in trigger mode)  : Clicking on this icon will execute the continuous acquisition command and save the picture in the path you selected according to the set frequency. (This command will be invalid when the camera is in trigger mode)  : Click on the icon to set the maximum number of continuous shooting and width, height frame rate and other basic attributes of the camera in the pop-up window.  : Click this icon to enlarge the image captured by the camera.  : Click this icon to reduce the image captured by the camera.  : Click on the icon to make the image captured by the camera display in the original scale.  Chinese 中文 : Click this icon to select the software system display language.
3	Check the device list of all online devices, including GigE, USB, Camera Link, etc.  : refresh, click the icon, manually refresh online Camera Link device information. GIGE menu: Drop down to view cameras that are connected to the same network segment using the GIGE protocol. USB menu: Drop down to view the camera that is connected to the same network segment using the USB protocol.  Right-click the captured camera, the current camera parameters can be exported to the specified position, the camera stops At the time of acquisition, camera parameters can be imported.
4	The details of the camera and the connection information of the interface are displayed here.
5	Parameter interpretation area. Click a parameter item (Figure 4-2, serial number 5) to display the explanation of the parameter.

6	The parameters of the camera in different roles. : parameter visibility. You can click  to select an entry, professional, or master role from the drop-down menu as needed. The parameters for each role are slightly different.
7	● : Maximize the window. ● : Restore the window size down. ● : minimum speech window. ● : Close the application.
8	The frame rate, total frames, transfer rate, error frames, and display frame rate in the camera capture are shown here.

Table 4-2 Menu Bar-Parameter Interpretation

Menu		Description
Menu		Collected and sorted out the general functions, you can directly through the menu, find the function and deal with the problem.
Import Properties		Import the relevant properties file to configure the camera.
Export Properties		Export related property files to configure the camera.
Screen Layout		By setting the screen layout, you can make the demo appear at the same time several screen synchronization, easy to watch the screen.
Full Screen		Displays the camera picture in full screen.
Log		Save camera tips, warnings, errors, fatal information. NG phenomenon to facilitate backtracking.
Information statistics		The number of frames, frame rate, bandwidth, resolution and other information captured by the camera.
Setup		With image save and cache options, you can perform related operations.
Help	About	Opening provides the version number of the software and the camera manual.

Chapter 5 Description of Main Functions

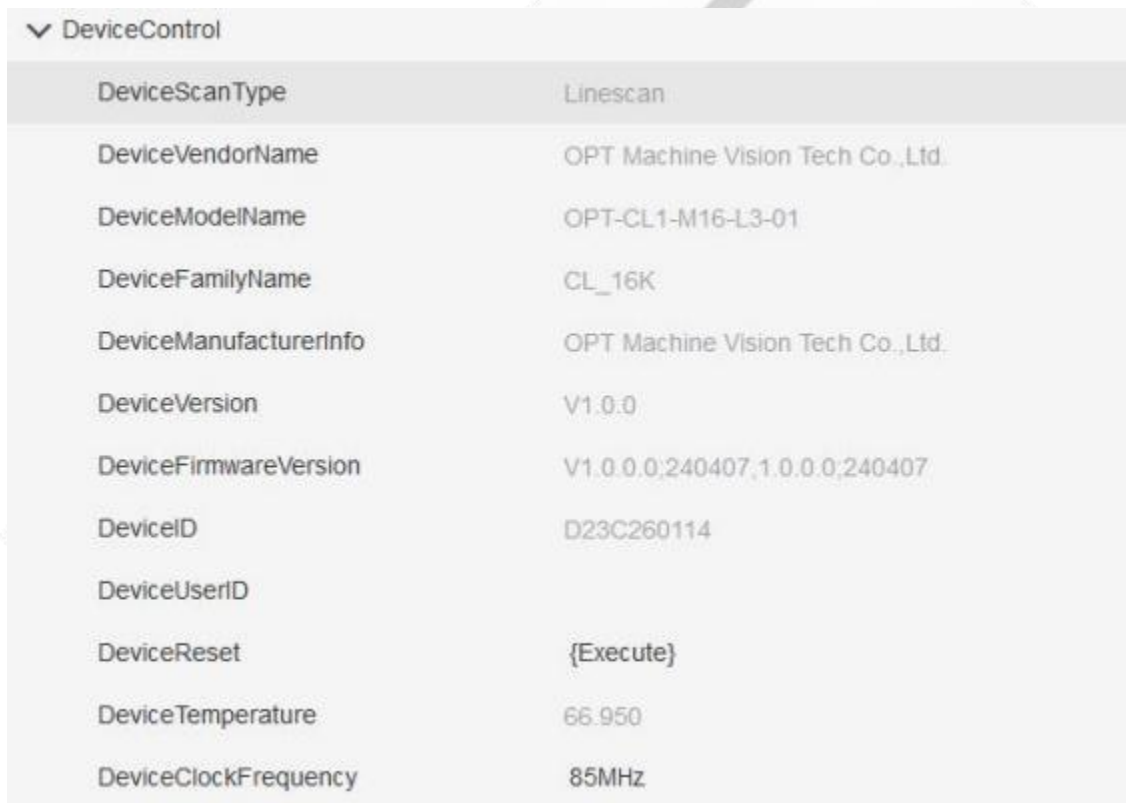
This chapter mainly explains the parameters related to industrial cameras.

说明

- Industrial cameras support entry (Beginner), professional (Expert) or master (Guru) three kinds of user level selection, each level corresponding to the property window parameter items slightly different, user level selection operation see Table 4-1 No. 6.
- the parameter item displayed in black indicates that the parameter can be modified or set, and the parameter item displayed in gray indicates that the parameter does not support modification or setting in the current operation mode.

5.1. DeviceControl

In the property, you can view the device information and modify the device name, as shown in Figure 5-1. Please refer to Table 5-1 for detailed parameter settings.



DeviceControl	
DeviceScanType	Linescan
DeviceVendorName	OPT Machine Vision Tech Co.,Ltd.
DeviceModelName	OPT-CL1-M16-L3-01
DeviceFamilyName	CL_16K
DeviceManufacturerInfo	OPT Machine Vision Tech Co.,Ltd.
DeviceVersion	V1.0.0
DeviceFirmwareVersion	V1.0.0.0;240407,1.0.0.0;240407
DeviceID	D23C260114
DeviceUserID	
DeviceReset	{Execute}
DeviceTemperature	66.950
DeviceClockFrequency	85MHz

Figure 5-1 Device Management

Table 5-1 Device Management-Parameter Interpretation

Parameters	Description
DeviceScanType	Scan type of Sensor, such as area scan or line scan.
DeviceVendorName	Equipment suppliers.
DeviceModeName	Equipment model.
DeviceFamilyName	Equipment series model.

DeviceManufacturerInfo	Equipment manufacturer.
------------------------	-------------------------

Parameters	Description
DeviceVersion	Device software version.
DeviceFirmwareVersion	Device hardware version.
DeviceID	Device serial number.
DeviceUserID	User-defined device name.
DeviceReset	Device restart button, call the API to restart the camera.
DeviceTemperature	The actual temperature value of the main board (°C).
DeviceClockFrequency	Device clock frequency.



5.2. ImageFormatControl

In this attribute, you can modify the image size, image pixel format, area of interest and test image mode collected by the current device, as shown in Figure 5-2, see Table 5-2 for detailed parameter settings.



说明

The image output format supported by the industrial camera is subject to the format supported by the camera.

ImageFormatControl	
SensorWidth	16384
SensorHeight	1
WidthMax	16384
HeightMax	1
Width	16384
OffsetX	0
ReverseX	False
PixelFormat	Mono8
PixelSize	Bpp8
SensorTaps	8tap
TestImageSelector	Testimage1

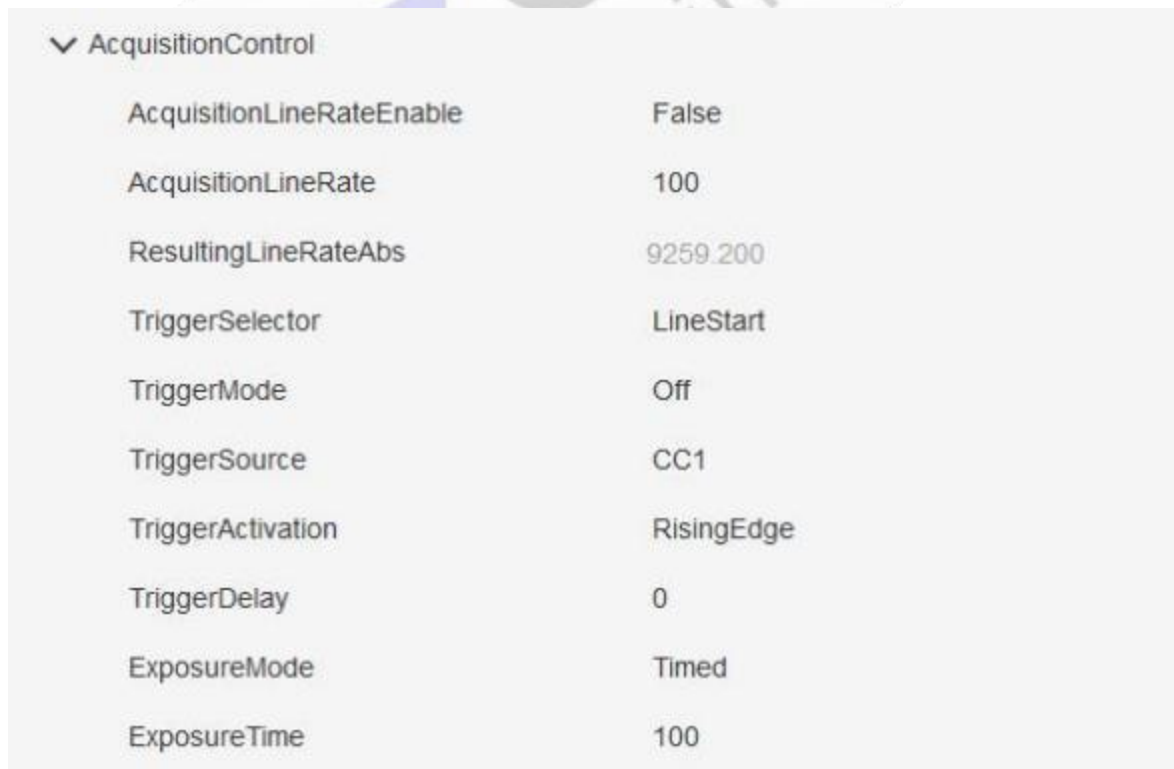
Figure 5-2 Image format management

Table 5-2 Image Format Management-Parameter Interpretation

Parameters	Description
SensorWidth	The maximum width of the Sensor sensor.
SensorHeight	The maximum height of the Sensor.
WidthMax	Maximum image width.
HeightMax	Maximum image height.
Width	The actual output image width.
OffsetX	The horizontal offset of the image, which is offset from the left, and the maximum value is determined by the value of Width.
ReverseX	The image is flipped horizontally.
PixelFormat	Image output format. Different models support different formats.
PixelSize	Image output size. Different formats correspond to different sizes.
SensorTaps	The image data output channel changes as Mono changes.
TestImageSelector	Select a test image to enable TestImageSelector mode.

5.3. AcquisitionControl

In this property, you can set the image acquisition mode, trigger mode, exposure time, etc. of the camera, as shown in Figure 5-3, see Table 5-3 for detailed parameter settings.



▼ AcquisitionControl	
AcquisitionLineRateEnable	False
AcquisitionLineRate	100
ResultingLineRateAbs	9259.200
TriggerSelector	LineStart
TriggerMode	Off
TriggerSource	CC1
TriggerActivation	RisingEdge
TriggerDelay	0
ExposureMode	Timed
ExposureTime	100

Figure 5-3 Acquisition Mode Management

Table 5-3 Acquisition Mode Management-Parameter Interpretation

Parameters	Description
AcquisitionLineRateEnable	Acquisition image line frequency enable.
AcquisitionLineRate	Set the acquisition image line frequency.
ResultingLineRateAbs	Actual line frequency absolute value.
TriggerSelector	Trigger type selection.
TriggerMode	Select LineStart (row trigger) in the TriggerSelector, and select On/Off in the TriggerMode to turn the trigger mode on or off.
TriggerSource	Trigger source. External input trigger sources CC1,CC2,CC3,CC4.
TriggerActivation	Trigger mode. Including rising edge, falling edge, double edge and high and low level five trigger mode.
TriggerDelay	Trigger delay. Refers to the time when the camera receives the trigger signal and the trigger takes effect.
ExposureMode	The exposure time mode is a timed mode.
ExposureTime	Exposure time.

5.4. AnalogControl

In this attribute, you can set the device-specific delay unit, as shown in Figure 5-4, see Table 5-4 for detailed parameter settings.



GainSelector	All
Gain	1
GammaEnable	False
Gamma	1

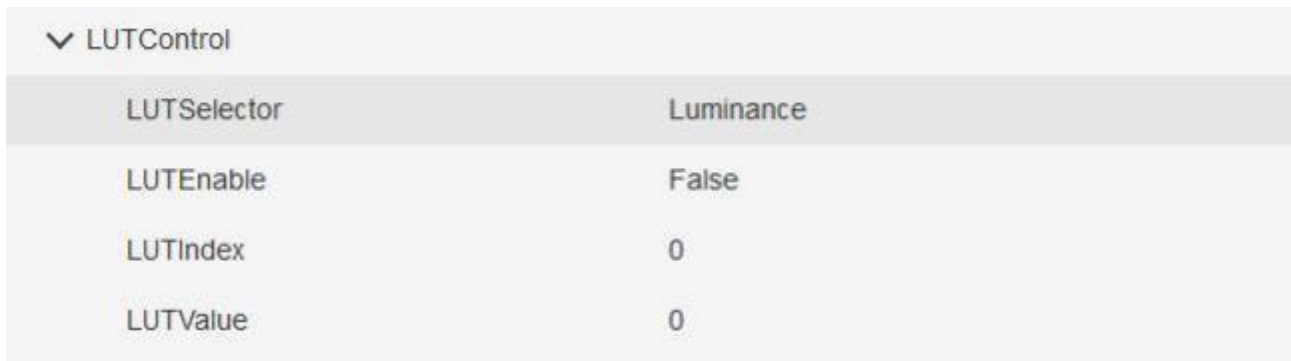
Figure 5-4 Analog control

Table 5-4 Analog Control-Parameter Explanation

Parameters	Description
GainSelector	The gain selection is ALL.
Gain	The larger the gain value, the brighter the image. The settable range of different models is different. Without special instructions, the default value of this parameter is 1.
GammaEnable	Set the gamma enable GammaEnable to ture, gamma 1 is a normal picture, gamma 1 → 0, the picture gradually brightens; gamma 1 → 3.999, the picture gradually darkens.
Gamma	

5.5. LUTControl

In this attribute, you can set the operation used to control the flat field correction, as shown in Figure 5-5. Please refer to Table 5-5 for detailed parameter settings.



▼ LUTControl	
LUTSelector	Luminance
LUTEnable	False
LUTIndex	0
LUTValue	0

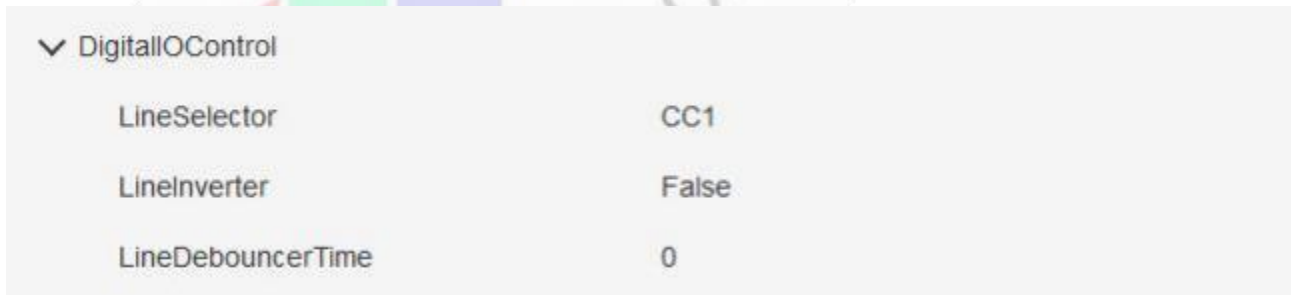
Figure 5-5 Lookup Table Control

Table 5-5 Lookup Table Control-Parameter Interpretation

Parameters	Description
LUTSelector	Lookup table selector.
LUTEnable	Lookup table enabled.
LUTIndex	The lookup table index (LUTIndex) setting value corresponds to the pixel gray value of the current picture, and the lookup table value (LUTValue) is assigned to modify the picture.
LUTValue	

5.6. DigitalIOControl

In this attribute, you can set the operation for the image preprocessing category, as shown in Figure 5-6. Please refer to Table 5-6 for detailed parameter settings.



▼ DigitalIOControl	
LineSelector	CC1
LineInverter	False
LineDebouncerTime	0

Fig. 5-6 Digital IO control parameter setting

Table 5-6 Digital IO Control Parameter Settings-Parameter Interpretation

Parameters	Description
LineSelector	Line trigger source selection, including CC1, CC2, CC3, CC4 options.
LineInverter	The level of the row trigger is flipped.
LineDebouncerTimer	Line trigger trigger signal to jitter time.

5.7. CounterControl

In this attribute, you can set the operation for configuring basic parameters, as shown in Figure 5-7. For detailed parameter settings, see Table 5-7.



Figure 5-7 Configure Count Control

Table 5-7 Counting Control-Parameter Interpretation

Parameters	Description
CounterSelector	Count selection.
CounterEventSource	Counts event sources.
CounterValue	Set the count value.
CounterCurrentValue	Count the number of signals in real time.
CounterResetSource	Counts the reset source.
CounterReset	Counting module reset.

5.8. ISPControl

In this attribute, you can set the operation for ISP parameter control, as shown in Figure 5-8. Please refer to Table 5-8 for detailed parameter settings.

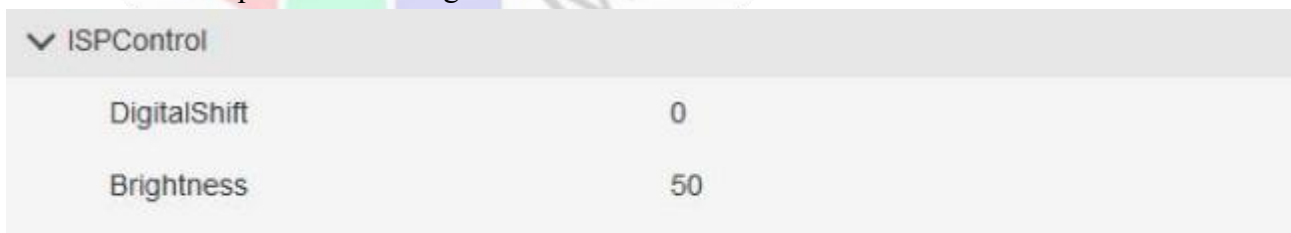


Figure 5-8 ISP Control Settings

Table 5-8 ISP Control Settings-Parameter Interpretation

Parameters	Description
DigitalShift	Digital shift.
Brightness	Brightness settings.

5.9. ShadingCorrection

In this attribute, you can set the operation of flat field correction function setting, as shown in Figure 5-9. Please refer to Table 5-9 for detailed parameter settings.

▼ ShadingCorrection	
CalibrateSelector	FPN Calibration
FPNEnable	False
PRNUEnable	False
FFCUserSetSelector	Factory
FFCUserSetLoad	{Execute}
PRNUTargetMode	Average
PRNUTarget	220
FFCROIOffset	0
FFCROIWidth	16384
CalibrateFPN	{Execute}
FFCReset	{Execute}
FPNCalibrateStatus	FPNNoCalibrate
PRNUCalibrateStatus	PRNUNoCalibrate

Figure 5-9 Setting the Flat Field Correction Function

Table 5-9 Flat Field Correction Function Settings-Parameter Interpretation

Parameters	Description
CalibrateSelector	Correction mode selection.
FPNEnable	Dark field correction effect enabled.
PRNUEnable	Bright field correction effect enabled.
FFCUserSetSelector	Flat field correction user settings.
FFCUserSetLoad	Flat field corrective user effect runs.
PRNUTargetMode	Bright field correction target value mode.
PRNUTarget	Bright field correction effect target value.
FFCROIOffset	Flat field correction ROI region shift setting.
FFCROIWidth	Flat field correction ROI area width setting.
CalibrateFPN(CalibratePRNU)	Dark field correction (flat field correction) enable setting.
FFCReset	Flat field correction reset.
FRNCalibrateStatus	Dark field correction effect status.
PRNUCalibrateStatus	Bright field corrective effect status.

5.9.1 Steps of flat field correction

Dark field correction (FPN correction):

The operation steps are as follows:

1. Select the FPN Calibration mode in the CalibrateSelector options.
2. Cover the lens cover or cover the target surface of the camera to take pictures. The gray scale value of the camera picture cannot exceed 30.
3. Click CalibrateFPN and wait for the FRNCalibrateStatus to appear FRNCalibrateFinish.
4. Set the FPNEnable to Ture, observe the image to see the effect of dark field correction, and see if the gray value of the image has decreased significantly.

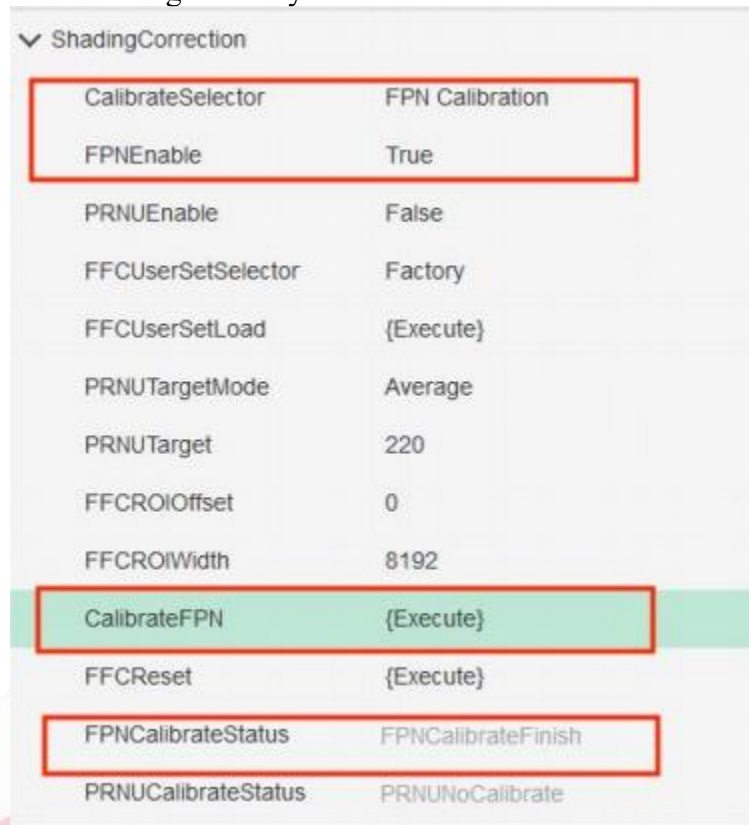


Figure 5-9-1 FPN correction

Bright field correction (PRNU correction):

PRNU correction mode can be selected in the CalibrateSelector options, including global correction and ROI correction two functions. The comparison chart of PRNU before and after calibration is shown in Figure 5-9-2 and Figure 5-9-3 for reference.

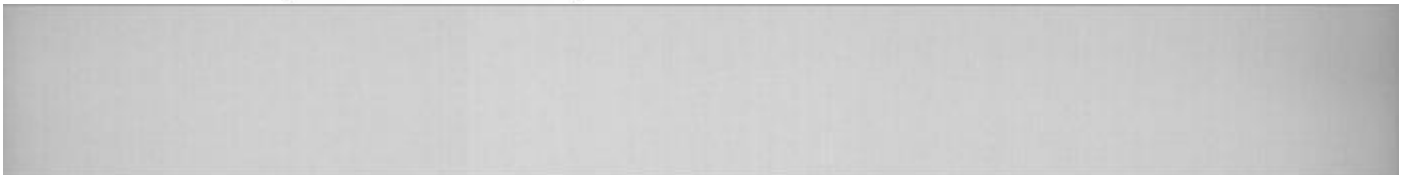


Fig. 5-9-2 Before Calibration



Fig. 5-9-3 After correction

Global PRNU Calibration:

Do the steps as follows:

1. Set the CalibrateSelector to PRNU Calibration mode.
2. Select the 1 group user settings via the FFC User Set Selector.
(The default user setting is Factory, with UserSet1/UserSet2 options)
3. According to the actual demand, for PRNUTargetMode selection mode (Average/Target/Maximum).

-- If the self-contained calibration standard is used, adjust the PRNUTargetMode to Average/Maximum.
At this time, the camera compares and corrects the average gray value of each 1 column with the average gray value of the entire image.

-- If you need to manually set the correction and calibration, adjust the PRNUTargetMode to Target, and the camera can be set by setting

The PRNUC Target parameter sets the target grayscale value. At this time, the average grayscale value of each 1 column of the camera is compared with the set grayscale value.

4. Remove the lens cover and take pictures to keep the gray value of the image evenly between 200 ± 20 .
5. Click on the CalibratePRNU, the image is corrected, and wait for the PRNUCalibrateStatus to appear PRNUCalibrateFinish.
6. Set the FPNEnable and PRNUEnable to Ture mode to enable flat field correction effect. Observe the image and you can see that there are no obvious vertical lines and obvious changes in the image.

▼ ShadingCorrection	
CalibrateSelector	PRNU Calibration
FPNEnable	False
PRNUEnable	False
FFCUserSetSelector	Factory
FFCUserSetLoad	{Execute}
PRNUTargetMode	Average
PRNUTarget	220
FFCROIOffset	0
FFCROIWidth	8192
CalibratePRNU	{Execute}
FFCReset	{Execute}
FPNCalibrateStatus	FPNCalibrateFinish
PRNUCalibrateStatus	PRNUCalibrateFinish

Figure 5-9-4 Global PRNU calibration

ROI area PRNU correction:

The operation steps are as follows:

When it is necessary to perform PRNUC correction on part of the image, the correction area can be set by the PRNUC Width and PRNUC Offset X parameters according to actual needs, and the PRNU correction can be performed on the set ROI area, as shown in Figure 5-9-5.

▼ ShadingCorrection	
CalibrateSelector	PRNU Calibration
FPNEnable	False
PRNUEnable	False
FFCUserSetSelector	Factory
FFCUserSetLoad	{Execute}
PRNUTargetMode	Average
PRNUTarget	220
FFCROIOffset	0
FFCROIWidth	8192
CalibratePRNU	{Execute}
FFCReset	{Execute}
FPNCalibrateStatus	FPNCalibrateFinish
PRNUCalibrateStatus	PRNUCalibrateFinish

Fig. 5-9-5 ROI region PRNU correction

5.9.2 Precautions for flat field correction

1. The average gray value of the Maximum mode is larger than that of the Average mode.
2. The gray value of the camera must be corrected within the range. The gray value of the image is between 0 -30 during dark field correction and between 32-240 during bright field correction, otherwise it will prompt FPNCalibrateOverFlow or PRNUCalibrateOverFlow.

5.10. UserSetControl

In this attribute, different I/O input or output signals can be managed, as shown in Figure 5-10. Please refer to Table 5-10 for detailed parameter settings.



Figure 5-10 Digital Input/Output Management

Table 5-10 Digital Input/Output Management-Parameter Interpretation

Parameters	Description
UsetSetSelector	User settings selection.
UsetSetLoad	Run user settings.
UsetSetSave	Save the user option settings.
UsetSetDefaultSelector	Default user settings.

Chapter 6 Frequently Asked Questions

You can solve the problems you may encounter here.

1. The application does not find the camera device.

Cause analysis:

The ➤ camera does not start properly.

➤ CameraLink line connection is abnormal.

Solution:

Restart the camera, check whether the CameraLink line connection is abnormal, whether the indicator light is normal, and whether the client can find the camera

2. In the application, the preview screen is all black.

Cause analysis:

➤ the lens aperture is closed.

The ➤ camera is working abnormally.

Solution:

Open the lens aperture, power off and restart the camera device.

3. External triggering cannot be enabled.

Cause analysis:

➤ external trigger connection error.

➤ trigger mode No external trigger is selected.

Solution:

Select the correct trigger mode and ensure that the external wiring is correct.

4. When the client software viewed the image, it was found that the image was upside down.

Cause analysis:

When installing the equipment, the installation direction is wrong.

Solution:

You can correct the image in the client software by using Properties> ImageFormatControl>ReverseX (Flip Horizontal).

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