X86 Smart Industrial Camera

User Manual

V2.0.0

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Overview

This document briefly describes X86 smart industrial camera, including product introduction, networking, basic parameter and quick operation of application software.

Symbol Definition

The following symbols may appear in this document. And their meanings are as follows:

Symbol	Note
 Danger	It indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 Warning	It indicates a moderate or low level of potential danger which, if not avoided, could result in minor or moderate injury.
 Caution	It indicates a potential risk that, if ignored, could result in damage to device, loss of data, degraded performance, or unpredictable results.
 Protection against electric shock	It means high-voltage danger.
 Laser radiation	It means intensive laser radiation.
 Anti-static	It means electrostatic-sensitive device.
 Machine may cause damage to human body	It means machine parts will cause damage to human body
 Tip	It means that it can help you to solve some problems or save your time.
 Note	It means the additional information, which is to emphasis or supplement.

Safeguards and Warnings

The following description is the correct application method of the device. Please read the manual carefully before use, in order to prevent danger and property loss. Strictly conform to the manual during application and keep it properly after reading.

Caution

- Please don’t place and install the device in an area exposed to direct sunlight or near heat generating device. Ensure that shell temperature is below 60°
- Please don’t install the device in a humid, dusty or fuliginous area. If the lens is not connected, please put on the lens cap, in order to prevent dust.
- Please install it stably, and prevent it from falling.
- Please don’t drip or splash liquids onto the device; don’t put on the device anything filled with liquids, in order to prevent liquids from flowing into the device.
- Please install the device at well-ventilated places; don’t block its ventilation opening.
- Use the device only within rated input and output range.
- Please don’t dismantle the device arbitrarily.
- Please transport, use and store the device within allowed humidity and temperature range.
- Products with category I structure shall be connected to grid power output socket, which is equipped with protective grounding.

About this document

- This document is for reference only. Please refer to the actual product for more details.
- Specifications and program will change according to product, and the revised contents will be added without prior announcement.
- The user shall undertake any losses resulting from violation of guidance in the document.
- The document may include technically inaccurate contents, inconsistencies with product functions and operations, or misprint. Final explanations of the company shall prevail.
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1 Product Description

1.1 Product Introduction

X86 platform smart cameras apply high-performance sensor. Data route based on PCIe interface supports maximum 20Gb/s bandwidth, which meets the demands of most of industrial environments and guarantees a stable operation in various harsh environments. It is a smart industrial camera with high reliability and high cost-efficiency.

1.2 Product Features

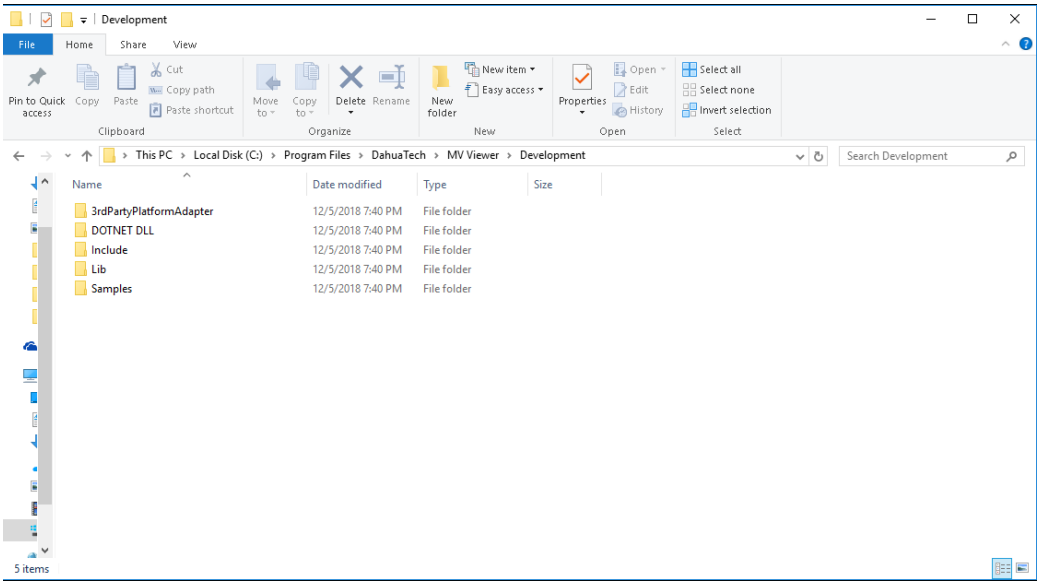
Easy installation and convenient operation, X86 camera series also support and provide:

- Ethernet interface provides 1Gbps bandwidth, with max transmission distance up to 100m;
- Optional 64G/128G SSD supports local storage;
- Support software trigger/external trigger/free run mode;
- Support edge enhancement, noise reduction, gamma correction, black-level correction, analog/digital gain and other ISP functions;
- Support C-mount lens, M12-mount lens and other optional LED modules;
- Industrial-grade M12 connector and IP67 protection level;
- DC12V~30V wide-range power supply(if LED modules is installed on X86 camera, DC24~30V power supply is recommended);
- Support secondary development;
- Conforms to CE，FCC，RoHS certifications;

1.3 Product Development Introduction

X86 smart cameras apply Intel processor with windows 10 system, so secondary development could be conducted based on the HuaRay SDK. Please refer to figure 1-1 for MV interface description and samples location.

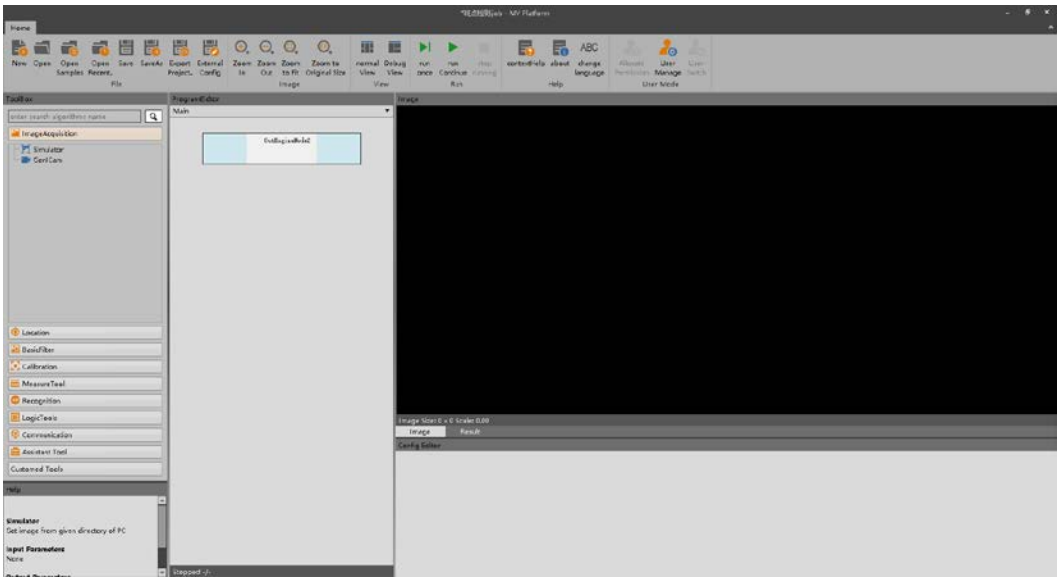
Figure 1-1 MV Development Documents



X86 camera can carry the Machine Vision Platform which is an algorithm platform developed by HuaRay technology. Abundant algorithm tools can be used directly for yes/no detection, template matching, measurement and many other applications;

Algorithm platform window is shown in Figure 1-2, please refer to development documents or contact technical engineer for some specific application.

Figure 1-2 Algorithm platform



1.4 Package List

When cover of package is removed, please check carefully whether there is damage on the device, and make sure accessories in the package comply with list, please refer to Table 1-1 Accessories list.

Table 1-1 Accessories list

Accessories list		
1	X86 smart camera	1
2	Cable-standard external line-(Power cable, M12 to naked wire)	1

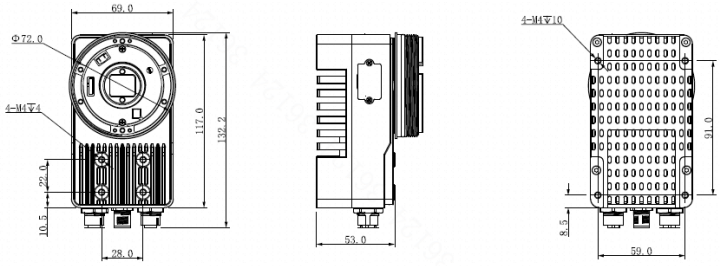
3	Cable-standard external line-(Network cable, Crystal head to M12, CAT5E)	1
4	Cable-standard external line-(M12 to VGA, USB-black-3000 mm	1
5	Desktop Adaptor, AC100V~240V-24V2.5A	1
6	Power cable -(International 3 ends, 10A250V)	1
7	4 to 1 USB hub	1
8	M4×10 bolts	4

1.5 Product Structure

1.5.1 Product Dimension

Product dimension is shown in Figure 1-3:

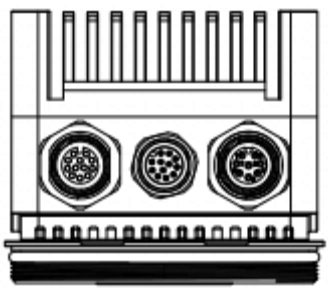
Figure 1-3 Dimensions (unit: mm)



1.5.2 Interface Description

There are 3 ports on the bottom of Basic X86 camera. From left side to right these 3 ports are: 12pin power & I/O, 12pin VGA and 8pin network, as shown in Figure 1-4.

Figure 1-4 Ports on basic X86 camera



Power supply & I/O definition:

I/0 definitions are shown in table 1-2:

Table 1-2 Pins definition

Pin	Color	Signal	Description
1	Yellow	OPT_IN1	Opto-isolated input 1
2	Yellow/white	OPT_IN2	Opto-isolated input 2
3	Brown	OPT_OUT1	Opto-isolated output 1
4	Brown/white	OPT_OUT2	Opto-isolated output 2
5	Violet	RXD RS232	Serial port receiving
6	Violet/white	OPT_IN_GND	Serial port GND
7	Red	Power	Power
8	Black	Power Ground	Power GND
9	Green	OPT_OUT_GND	Opto-isolated output GND
10	Orange	OPT_IN0	Opto-isolated input 0
11	Blue	OPT_OUT0	Opto-isolated output 0
12	Grey	TXD RS232	Serial port transmitting
Shield	White	Shielding GND	SGND

VGA & USB:

VGA & USB port applies one 12-pin cable to convert to 1 VGA port and 1 USB2.0 port. 4K video output and USB device such as key board, mouse or dongle can be supported.

Network

Network port, i.e. M12 to RJ45 port, 10M/100M/1000Mbps 3-step Ethernet interface. It is used for camera control and data transmission.

1.6 Electrical Specifications

Electrical specifications mainly introduce power supply, network and IO electrical specifications;

1.6.1 Power supply and Net Electrical Specifications

Table 1-3 Power supply and Net Electrical Specifications

Parameter	Description
Camera power supply	DC+12V～+30V(if LED module is installed, power supply should be higher than DC24V), ＜1% ripple, power on 12-pin M12 connector[1]; At least 26AWG cable is required;
EMS standard	Electrostatic discharge(GBT17626.2/IEC61000-4-2) Metal case contact: 6kV Surge(IEC61000-4-5) Power port: 1kV common mode(1.2/50us)
EMC standard	Class B

Note

External power supply shall conform to SELV and LPS specification;

1.6.2 IO Interface Electrical Specifications

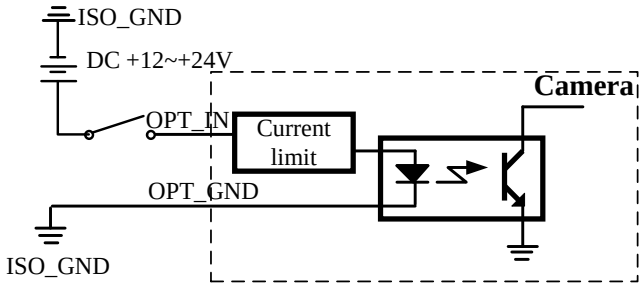
1.6.2.1 Opto-isolated input

Table 1-4 Opto-isolated input

Input Voltage	**Description**
DC 26V	Limit voltage: input voltage should not exceed this limit, otherwise it will cause damage to the device;
DC 0～24V	Safe input operating voltage range
DC 0～7V	Indicates logic 0
DC >7V～11V	Input status reverses and logic state is not certain;
DC >11V	Indicates logic 1

Isolated I/O sink current on input port: 5mA～15mA.

Figure 1-5 Opto-isolated input circuit



Typical input circuit

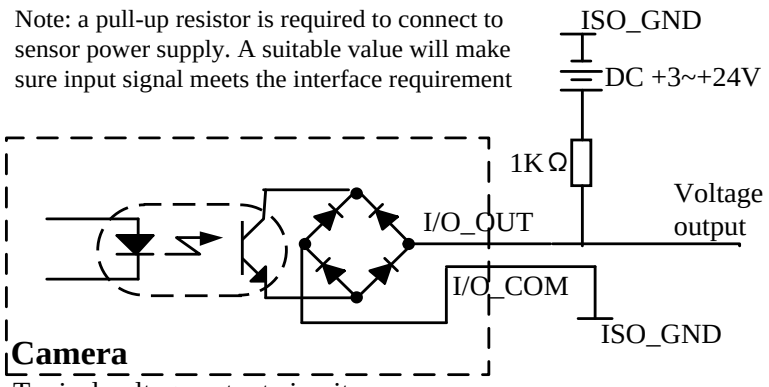
1.6.2.2 Opto-isolated output

Table 1-5 Opto-isolated output

Voltage	Description
DC 26V	Limit Voltage: input voltage should not exceed this limit, otherwise it will cause irreversible damage to the device
DC ＜3.3V	I/O output may operate erratically.
DC 3.3V～+24V	Safe I/O input operating voltage range

Isolated I/O maximum continuous current on output port is 50mA.

Figure 1-6 Opto-isolated output circuit:



Typical voltage output circuit

1.7 Indicator LED

Status and Descriptions are shown as below:

Table 1-6 Indicator LED description

Status		Description
POWER	On	Camera power works normally
	Off	Abnormal camera power or abnormal LED
STATUS	On	Network works normally
	Off	Abnormal network or abnormal LED
LAN ACT	On(or flashing)	Data on network port are transmitting
	Off	No data on network port or abnormal LED
USR0		UserSetMode indicator LED0
USR1		UserSetMode indicator LED1

1.8 Environment Requirements

Environment requirements of X86 camera are as following:

- Environment and humidity

  Environment temperature shall not exceed 50℃, it is best to work in an air-conditioned environment.

  ◇ Case temperature while operating: 0℃～80℃;

  ◇ Environment humidity while working: 20%～80% no condensation.

  ◇ Storage temperature: -30℃～+80℃;

  ◇ Storage humidity: 20%～80% no condensation;

- Device shall be indoor and installed stably, around the camera there shall be enough dissipating space;
- Ensure certain air flow to dissipate heat.

2 Typical Networking

Typical connection for X86 camera is to connect monitor, mouse and keyboard directly. After connected, installed application program and then regular operation could be operated.

X86 smart camera also supports connects to other GigE industrial cameras with Ethernet port, therefor multiple cameras control can be realized.

Remote control within net group including X86 smart camera and other PC equipment can also be realized by a simple net cable and Ethernet port on X86 camera

3 Product installation

Installation includes camera position installation and application installation.

3.1 Camera Installation

Before installing the camera, please check if there is obvious damage on the camera; While installing camera, electrostatic discharge, ESD, surge and heat dissipation shall be considered at the same time.

3.1.1 Electrostatic discharge, ESD, thunder and surge

Although HuaRay has designed built-in anti-thunder, anti-surge, EMI and ESD protection modules, considering about safety, we still recommends to reduce or avoid mentioned influences with perspective of environment and installation.

Following measures are suggested:

- Use SSTP cable. Please don't expect too more on the flexibility of cable if the cable has already met the requirement. Lots of cable will compromise the thickness of cooper wire, shielding aluminum foil, density of shielding net, protection performance of PVC shawl to make cable more flexible;
- Cable shall be as shorter as possible. If cable is redundant, please use S-shaped layer instead of loop, electromagnetic coupling condition will be reduce.
- Power supply wire could use wire with shield. Also please avoid looping the wire. Power supply wire can be paralleled with network cable and please avoid twisted together.
- Please avoid paralleling cable of camera with cable of the device with high current or frequent voltage switching (such as stepping motor and radio tube). These devices have strongly radiation and that is easily to be coupling with the cable of camera.
- Single point GND is suggested. Please connect protective GND of every device together. Multiple GND may cause voltage differences on different devices and the circuit current is possible to couple the with EMC interference.
- Switching power supply which is used for camera shall be connected to same AC sockets with PC. Therefor the protective GND could be connected together and multiple GND is avoided. Machine and other devices with high power consumption shouldn't connect to this socket.
- Magnet ring could be used on the power cable of camera, so electromagnetic interference can be absorbed.
- Keep certain of humidity and wear anti-static gloves, clothes and shoes. ESD may be reduced.

3.1.2 Heat Dissipation

When environment (temperature, humidity, air flowing, installation position) is relatively stable, camera will reach a temperature equilibrium state in about 1~1.5 hour and case temperature will stop increase.

Please keep temperature below 50℃ when camera is in equilibrium state. The difference between heat source of camera and case is about 25℃, when case temperature is below 50℃, inside chips and sensor won't be damaged.

Following measures are recommended to control the case temperature:

- Keep environment temperature is below 30℃, camera works in the space with air conditioner;
- Install camera on an object with excellent hear-conducting materials (contacting surface shall be large enough).
- Keep air flow around the camera;

3.2 Application Installation

Steps of installing application are as following:

step 1. Boot the camera;

step 2. Installing the application

Double click the installation package, and follow the instructions in the window to install MVViewer.

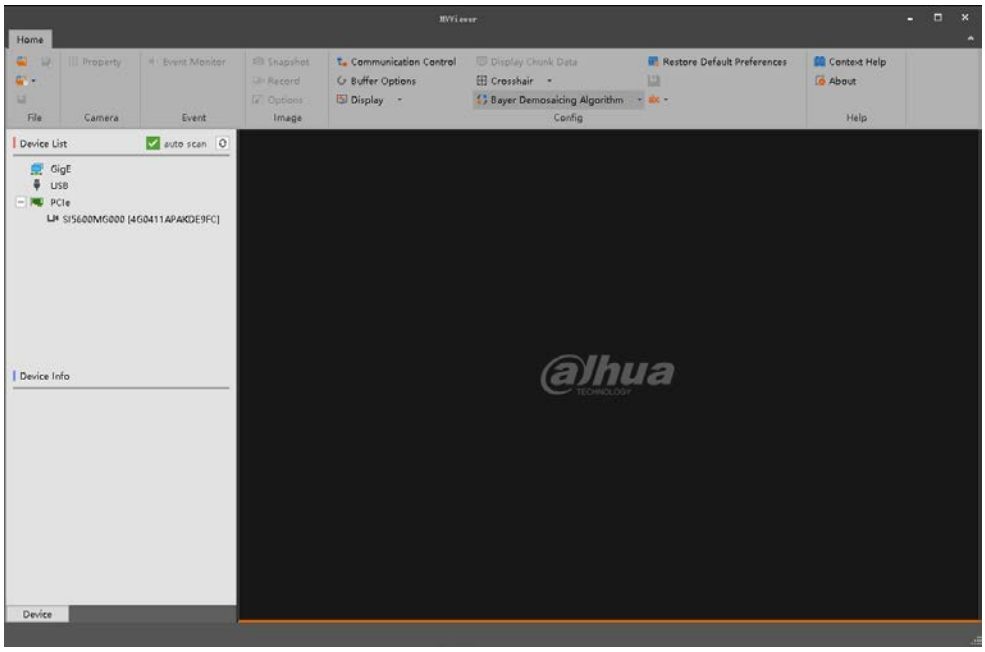
4 Software Introduction

- Please refer to 3.2 Application Installation to installing MVViewer on PC
- After camera installation and application installation are finished, on line camera will be found. Please refer to this chapter for parameters configuration.

step 1.Open Software

Double click quick start icon on the desktop, booting the application software. Software will auto-detect on line cameras and the window is shown as figure 4-1:

Figure 4-1 Software Window



step 2.Device connection

Click to connect the camera; after successful connection, click to display. Device tag and Parameters tag are shown in the figure 4-2 and figure 4-3.

Note

Click to disconnect the camera from PC.

Figure 4-2 Successful device connection (device tag)

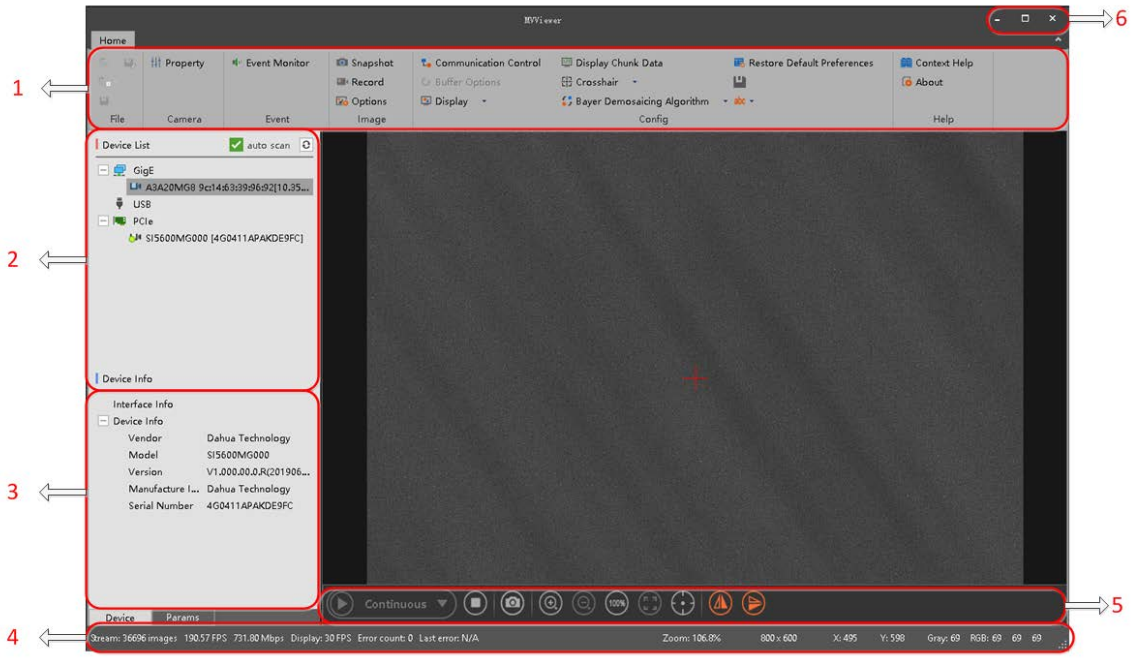


Figure 4-3 Successful device connection (Parameters tag)

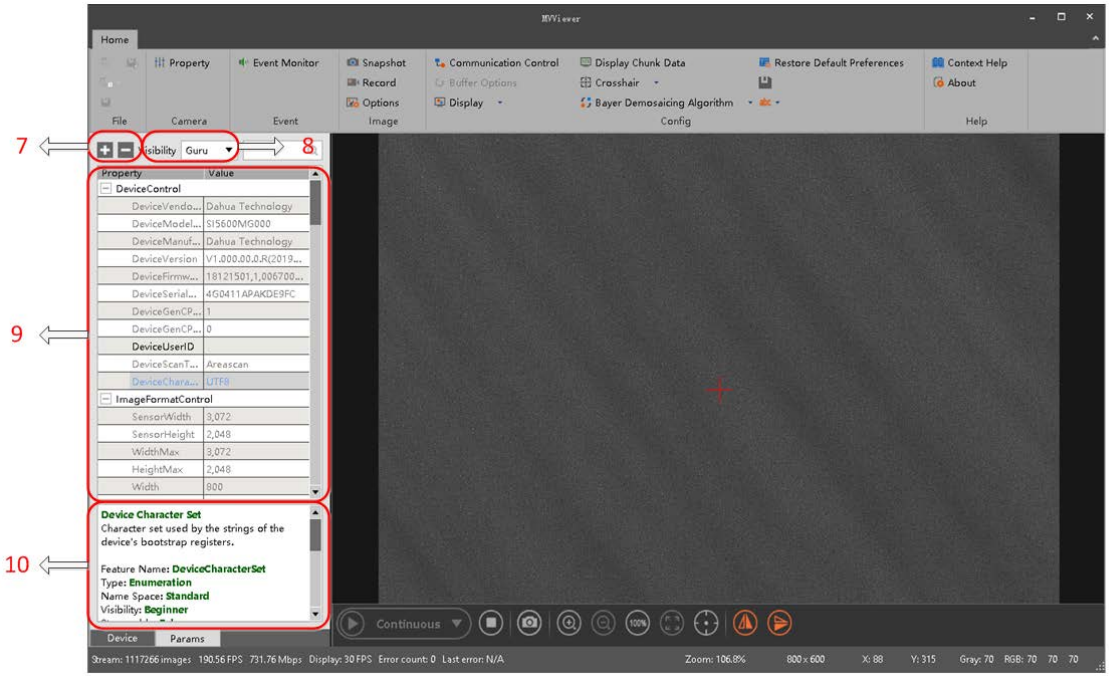


Table 4-1 Parameters Introduction

No.	Parameters Introduction
1	Please refer to Table 4-2 for more details about the menu column.

No.	Parameters Introduction
2	It is to detect the device list of all the online devices, which are GigE, USB and PCIE.  : Refresh, click the icon and manually refresh the info of online device.  : It means the device is in a connectable state.  : It means the device is in a non-connectable state; please make sure the device IP is added to the same network segment of the local computer IP.  : It means the device is in a connected state. MV Viewer can only connect and operate one camera.
3	It is to select port info and device info displayed by some device.
4	The setup info of the current image, which includes video stream, image stream, display stream, image location, gray level and RGB color value, etc.
5	It is to play the adjustment toolbar of the image.  : Display. Play Button. You can click  according to your needs, and select play mode of continuous, single-frame and multi-frame in the drop-down list.  Note Only when the image is paused can you switch the play mode in the drop-down list.  : Stop button;  : Save button:  : Zoom in button, it is to zoom in display image;  : Zoom out button; it is to zoom out the display image.  : Display the image in 100%.  : Display the video image according to the window size.  Note Click the icon to display video image according to the window size when the image is zoomed in or out.  : Up and down mirror for the image.  : Left and right mirror for the image.
6	 : Maximize the window.  : Restore the window size downwards  : Minimize the window  : Close the application.
7	 : It is to display all the combined parameter info.  : It is to combine all the displayed parameter info.

No.	Parameters Introduction
8	Parameter visibility. Click ▼ according to your needs. Select Beginner, Expert or Guru in the drop-down menu. The corresponding parameter items of each level are slightly different.
9	The parameter items of different role of the camera, Figure 4 3 shows the parameter items in the expert role.
10	Parameter explanation area. Click some parameter item(No.9 in Figure 4 3), and it will display the explanation of the parameter.

Table 4-2 Menu Column—Parameter Explanation

Menu		Description
File	Open file	Implement the order of “File > Open File”, pop out a dialogue box of “Open” to open it. It is not convenient to search if there are so many files. You can click ▼ button of “File Type” on the right and select a specific file format in the drop-down menu（such as mvcfg）. The dialogue box will only display the file of this format, which is to narrow search range. Note It can implement corresponding operations only when the image is paused or stopped.
	Open recent files	“File > Open the Recent Files” submenu includes 10 files which have been recently used in MV Viewer. Click a file name and you can open it directly. Note It can implement corresponding operations only when the image is paused or stopped.
	Save	Save the modification upon the current file. Note It can implement corresponding operations only when the image is paused or stopped.
	Save as	Save the current file into another location with another name, you can use the order of “File > Save As”. Note It can implement corresponding operations only when the image is paused or stopped.
Event	Event notice	It includes device parameter update, event message channel and pull stream cache, etc.
Picture	Save picture	Save the video stream data as picture file.
	Save current picture	Save the video stream data of last frame as picture file.
Config	Connection control	It is to set the time of connection timeout and detection interval.
	Cache option	It is to set the cache parameter of video stream data. Note It can implement corresponding operations only when the image is paused or stopped
	Display frame rate	It is to display the frame rate of current image.
	Display block data	It is to display the total frame quantity acquired in the current trigger mode.

Menu		Description
	Restore default parameter	It is to restore the default config of the menu bar.
	Save GenICamXML	Save GenICam protocol in XML language.
	Language	Select language, Chinese or English.
Help	User manual	Check the user manual of the current software.
	About software	Check the version info of current software.

5 Main Function Description

This chapter mainly introduces function parameters related to industrial camera. Please refer to "Properties" interface in MV Viewer for details of parameter information.

Note

- X86 camera supports three user levels which are Beginner, Expert and Guru. The parameter items in corresponding property interface of each level are slightly different. Please refer to No.8 in figure 4-3 for user level selection.

The parameter items displayed in black indicate that the parameter can be changed or set. The parameter items displayed in grey indicate that the parameter does not support change or setting in the current operating mode.

5.1 DeviceControl

You can check the device information and change the device name in Property, as shown in Table 5-1.

Table 5-1 Device Control—parameters introduction

Parameters	Description
Device Vendor Name	Device vendor name.
Device Model Name	Device model name.
DeviceManufacturerInfo	Device manufacture name.
Device Version	Device version, including updated date and SVN number in the bracket.
Device Firmware Version	Device firmware version, including updated date and SVN number in the bracket and the number following the semicolon represents the hardware version.
Device Serial Number	Device Serial Number.
Device GenCP Version Major	GenCP Version Major.
Device GenCP Version Minor	GenCP Version Minor.
Device User ID	User-programmable device identifier.
DeviceScanType	Device scan type.
DeviceCharacterSet	Display characters repertoire used by boot register, default is UTF8;

5.2 ImageFormatControl

In this property, you can change image size, image pixel format, region of interest (ROI) and test image mode etc., as shown in Table 5-2

Table 5-2 Image Format Control—parameters introduction

Parameters	Description
SensorWidth	Sensor raw image width in pixels.
SensorHeight	Sensor raw image height in pixels.
WidthMax	Maximum width of the image (in pixels).
HeightMax	Maximum height of the image (in pixels).
Width	The actual output image width (pixels).
Height	The actual output image height (pixels).
OffsetX	The vertical offset of the image from the top left. The max value is determined by the Width value.
OffsetY	The vertical offset of the image from the top left. The max value is determined by the Width value.
ReverseX	Flip the image horizontally based on the original size of the sensor but not the image after ROI.
ReverseY	Flip the image vertically based on the original size of the sensor but not the image after ROI. Note If original pixel format is Bayer in color model, vertical reverse would require a change from BayerRG to BayerGB or in reverse.
PixelFormat	Different model supports different pixel format (X86 smart camera supports Mono8\Mono10\Mono12).
PixelSize	Number of bits for each pixel under different pixel format.
PixelColorFilter	Filter model under current image format while image is processed; Note Only color camera supports this function;
PixelDynamicRangeMin	Minimum pixel value.
PixelDynamicRangeMax	Maximum pixel value.
TestImageSelector	Selects the test image type: Disable, TestImage1(Static Image)or TestImage2(Dynamic Image). Note The test image is not an actual image and is used for testing purposes only.
SensorColorType	Default: Mono
PixelSizeInput	Number of bits of each pixel which sensor inputs

5.3 AcquisitionControl

In this property, you can set the image acquisition mode, trigger mode and exposure time etc., as shown in table 5-3。

Table 5-3 Acquisition Control—parameters introduction

Parameters	Description
AcquisitionMode	Image Acquisition Mode: ● SingleFrame: Get 1 frame and then stop auto getting frame; ● MultiFrame: Get several frames and then stop auto getting frame; Number of frames depends on the setting in AcquisitionFrameCount; ● Continue: Continuously get frames till camera receives command of AcquisitionStop;
AcquisitionStart AcquisitionStop	SDK start/stop getting frame.
AcquisitionFrameCount	Number of frames each time in Multiframe mode.
AcquisitionFrameRate AcquisitionFrameRateEnable	Acquisition frame rate. The frame rate set in AcquisitionFrameRate is valid only when AcquisitionFrameRateEnable is True. Note If setting frame rate is beyond what camera could arrive under mode, the true frame rate is ResultingframeRateAbs instead of the setting in the AcquisitionFrameRate.
TriggerSelector TriggerMode	Trigger Selector: Select Frame Start or Acquisition Start in TriggerSelector, and then enable or disable the selection in TriggerMode. If both of modes are enabled, Acquisition Start needs to be triggered firstly, and then trigger Frame Start.
TriggerSoftware TriggerSource TriggerActivation	Software trigger: TriggerSource includes SoftwareTrigger and lineN trigger (hardware trigger) ● When choose software trigger, click command or call the API will trigger the camera to get one frame. ● When choose hardware trigger, set Rising Edge or Falling edge in Trigger Activation, switching of signal in the external trigger line will trigger the camera to get one frame. Note Acquisition Start and Frame Start could use separate trigger source.
TriggerDelay	Trigger Delay Indicates the time between when the camera receives the trigger signal and when the trigger takes effect. It is valid for both soft trigger and hard trigger.

Parameters	Description
ExposureMode	Exposure time mode, support Timed mode and TriggerWidth mode; ● Timed mode indicates the exposure time is the setting in ExposureTime. ● TriggerWidth mode indicates the exposure time is set by external trigger width.  Some of cameras model don't support TriggerWidth mode.
ExposureTargetBrightness	Target brightness of image under auto exposure mode. The larger value target brightness is, the brighter image will be.
ExposureTime	Exposure time
ExposureAuto	Auto exposure time: ● Off indicates disable exposure auto mode, value can be set in ExposureTime manually, ranging of 16us～1000000us. ● Once indicates camera can auto-change exposure time according to environment once. And then the exposure time auto will be disabled. ● Continue means camera can change the exposure time according to the brightness of environment, value will display on the ExposureTime box.
Exposure Meter Mode	X86 smart only support global shutter.
ResultingframeRateAbs	The max frame rate the camera can achieve. Note The max frame rate the camera can achieve depends on the network transmission bandwidth, pixel size, resolution and exposure time. The camera default exposure time takes precedence, which means that when the exposure time is greater than the reciprocal of the frame rate, the frame rate is preferentially reduced instead of limiting the max exposure time.

5.4 DigitalIOControl

In this property, you can control different I/O input or output signals, as shown in table 5-4:

Table 5-4 Digital IO Control—parameters introduction

Parameters	Description
LineSelector	Selects the external IO line for configuration.
LineMode	Configures the output mode of selected IO Line：Input/Output.
LineInverter	Controls the selected physical input or output line signal inversion, True is for the signal to invert, False for the signal not to invert.
LineStatus	Indicates the current status of the selected physical input or output

Parameters	Description
	line.
LineStatusAll	Returns the current status of all available lines.
LineSource	When IO line is selected to be the output, you can select the trigger source. Current supported trigger sources are as follows: ● Exposure Active: outputs the signal when exposure starts. ● Frame Trigger Wait; outputs the waiting signal for frame trigger. ● Timer0Active: outputs the signal when the Timer0 counts up. ● User Output: outputs the value user set in UsersetN (line3\line4\line5 are corresponding to UserOutpu0\ UserOutput1\ UserOutput2). ● AcquisitionTriggerWait: outputs the waiting signal for acquisition trigger. ● LightTrigger: outputs the light trigger signal. ● SoftwareCmd: Software trigger signal.
LineSoftwareCmd	Software command to output the IO signal on line
LineTriggerDelay	Used for setting trigger signal delay when IO outputs.
LineFormat	Used for setting current IO outputs mode as cycle output or pulse output.
OutputIODutyCycle	Used for setting duty ratio when IO outputs cycle signal.
LinePeriod	Used for setting cycle when IO outputs cycle signal.
LinePeriodCount	Used for setting number of cycles when IO outputs cycle signal.
LinePulseWidth	Used for setting signal width when IO outputs pulse signal.
LineDebouncerTime	Sets the absolute value of the selected line denouncer time in microseconds Note A pulse less than the set value will not be considered as a valid trigger input.
UserOutputSelector	When LineSource sets as UserOutput, choose user-defined output modes: UserOutpu0\ UserOutpu1\ UserOutpu2
UserOutputValue	Set output status under UserOutput mode. True indicates opto-coupler conductive, False indicates not.
UserOutputValueALL	Return all output status of UserOutput

5.5 BeeperControl

Table 5-5 Beeper Control—parameters introduction

Parameters	Description

Parameters	Description
BeeperSelector	Beeper selector
BeeperInputSource	Beeper input source
BeeperTriggerDelay	Beeper trigger delay
BeepTimes	Beeper times for each time
BeepDuration	Beeper duration for each time
BeepInterval	Interval between two sounds of beeper
BeepSoftwareCmd	Software command to trigger the beeper

5.6 UserLedControl

Table 5-6 User Led Control—parameters introduction

Parameters	Description
LedSelector	Select user Led
LedInputSource	Select input source of user Led
LedTriggerDelay	Select trigger delay of user led
LedTimes	Select flashing times of user led
LedDuration	Set led duration of user led
LedInterval	Set interval between two shines of led times
LedSoftwareCmd	Software command to trigger the user led

5.7 LightControl

In this property, you can control illumination parameters including light selector, brightness and pre-exposure setting, as shown in table 5-7:

Table 5-7 Light Control—parameters introduction

Parameters	Description
LightSelector	Light Selector InternalLight: built-in Led in camera; DriveOutput: external led on camera(through light port on camera) IoOutput0: light controlled by camera IO (corresponding to Line3) IoOutput1: light controlled by camera IO (corresponding to Line4)

Parameters	Description
	IoOutput2: light controlled by camera IO (corresponding to Line5)
LightMode	Light Mode Selector (off, flashing, constant on)
LightBrightness	Adjust light brightness
LightPrechargeTime	Turn on light in advance(turn on light before camera starts to exposure)
LightInvertEnable	Reverse the effective level of light

5.8 CounterAndTimerControl

In this property, time control can control the exposure according to user's logic, as shown in table 5-8:

Note

Before using this function, please set Acquisition Control and Trigger Source.

Table 5-8 Counter and Timer Control—parameters introduction

Parameters	Description
TimerSelector	Selects the counter needs to configure. The default is Timer0.
TimerTriggerSource	Selects the trigger source of starting a timer. The default is Exposure Start.
TimerTriggerActivation	Selects the trigger mode of starting a timer: RisingEdge, FallingEdge or AnyEdge.
TimerDelay	Sets starting timer delay when receiving the trigger.(μs)
TimerDuration	Sets the duration of the timing pulse.(μs)

5.9 AnalogControl

In this property, you can adjust the acquired analog signals, including gain, black balance, white balance and gamma correction etc., as shown in table 5-9:

Table 5-9 Analog Control—parameters introduction

Parameters	Description
GainSelector	The channel gain is not supported to set, the default is All.
GainRaw	The larger the gain, the brighter the image. The set range is different for different camera models. Default value is 1. Note Analog gain is at the first priority;
BlackLevelSelector	BlackLevelSelector is used to select the black balance channel

Parameters	Description
BlackLevel	BlackLevel correction is used for eliminating the impact from dark current in sensor. For example, pixel value may not be 0 (larger than 0) when the image is complete dark and this is result of dark current in the sensor. By setting a value of black level, pixel value can be compensated and brightness will close to the real situation. The range is from 0 to 255.  Black level will change with temperature rising, adjust black level value is suggested when environment gets at thermodynamic equilibrium.
Gamma	Gamma value setting: It is a non-linear correction for image data to correct the non-linear response of the monitor. Larger the Gamma value, brighter the image. The Gamma value setting range is 0～3.99998. The default value is 1 with no Gamma process.

5.10 ISPControl

In this property, you can adjust the image sharpness, brightness, saturation, contrast and so on, please refer to table 5-10 for detailed parameter settings.

Note

Hue and saturation are only available for the color camera.

Table 5-10 ISPControl—parameters introduction

Parameters	Description
Sharpness	Sharpness. 1. Selects On in SharpnessEnable to enable the sharpness adjustment. 2. Support range of 0~100;
SharpnessEnable	
Denoising	Denoising: Selects On in DenoisingEnable to enable the sharpness adjustment.
DenoisingEnable	
DigitalShift	Adjusts DigitalShift. The brightness can be doubled when the value increases by one.
Brightness	Brightness. Adjust the brightness value of the exposure target. The default value is 50. The greater the value, the brighter the image adjusted by exposure.
Contrast	Sets Contrast level. The greater the value, the more obvious the contrast. ContrastMode is used to control ContrastThreshold. It supports there modes: manual, single and continuous. ContrastThreshold is used to set the threshold of the contrast.
ContrastMode	
ContrastThreshold	

5.11 TransportLayerControl

In this property, you can set parameters related to camera's transport layer protocol, as shown in table 5-11:

Table 5-11 TransportLayerControl—parameters introduction

Parameters	Description
PayloadSize	Length of message
GevTimestampTickFrequency	Define the frequency of timestamp

5.12 UserSetControl

Table 5-12 UserSetControl—parameters introduction

Parameters	Description
UserSetSelector	Supports Default, UserSet1 and UserSet2. Selects which series to use for the subsequent UserSetLoad and UserSetSave operation.
UserSetLoad	Restores the camera configuration to the configuration that user selected.
UserSetSave	UserSetSave: saves the current configuration to the selected series, but the Default series does not support saving.
UserSetDefault	Default user set when the power is on. UserSet1 and UserSet2 need to execute UserSetSave before display.
UserSetLoadLastUserSet	The last user configuration the user used.

6 FAQ

You can solve problems that you may encounter with following instructions:

1. **Application fails to discover the device.**

   Reason analysis：

   - The camera fails to boot up normally.
   - Connection of network cable is abnormal.
   - The camera is occupied by some other software.

   Solutions：

   Reboot the camera, check if cable connection is abnormal, check if the indicator light is normal, and check if camera used by some other software.

2. **The preview interface is all black in the application.**

   Reason analysis：

   - Lens aperture is off.
   - Camera runs abnormally.

   Solutions：

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

3. **It fails to enable external trigger.**

   Reason analysis：

   - External trigger connection is wrong.
   - It fails to select external trigger in trigger mode.

   Solutions：

   Select correct trigger mode and make sure external connection is correct.

7 Cleaning and Maintenance

This chapter mainly introduces cleaning and replacement of color filter.

We have installed a fully transparent protective glass for the mono camera with the main purpose to prevent dust falling on the surface of image sensor. The color camera is equipped with a low-pass filter that cuts off to the near-infrared band. If you have special requirements, such as not using a color filter or using another light-transmitting filter, you can replace the entire filter mount of the image sensor (no need of removing the cover).

If the surface of the filter needs to clean, we recommend using the special cleaning agent for optical devices that can clean the surface without leaving a mark.

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