

The logo for HIKROBOT, featuring the brand name in a bold, italicized, sans-serif font. The text is white and is set against a red background that has a white diagonal stripe on the left side.

***HIKROBOT***

# SC7000 Series Smart Camera

User Manual

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The Manual includes instructions for using and managing the Product. Pictures, charts, images and all other information hereinafter are for description and explanation only. The information contained in the Manual is subject to change, without notice, due to firmware updates or other reasons. Please find the latest version of this Manual at the Hikrobot website (<https://en.hikrobotics.com/>).

Please use this Manual with the guidance and assistance of professionals trained in supporting the Product.

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## Regulatory Information

### FCC Information

Please take attention that changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC compliance: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

### FCC Conditions

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

### EU Conformity Statement



This product and - if applicable - the supplied accessories too are marked with "CE" and comply therefore with the applicable harmonized European standards listed under the EMC Directive 2014/30/EU, the RoHS Directive 2011/65/EU.



2012/19/EU (WEEE directive): Products marked with this symbol cannot be disposed of as unsorted municipal waste in the European Union. For proper recycling, return this product to your local supplier upon the purchase of equivalent new equipment, or dispose of it at designated collection points. For more information see: <http://www.recyclethis.info>



2006/66/EC (battery directive): This product contains a battery that cannot be disposed of as unsorted municipal waste in the European Union. See the product documentation for specific battery information. The battery is marked with this symbol, which may include lettering to indicate cadmium (Cd), lead (Pb), or mercury (Hg). For proper recycling, return the battery to your supplier or to a designated collection point. For more information see: <http://www.recyclethis.info>

## Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
<b>Danger</b>	Indicates a hazardous situation which, if not avoided, will or could result in death or serious injury.
<b>Caution</b>	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance degradation, or unexpected results.
<b>Note</b>	Provides additional information to emphasize or supplement important points of the main text.

## Available Model

This manual is applicable to the SC7000 Series Smart Camera.

## Safety Instruction

These instructions are intended to ensure that the user can use the product correctly to avoid danger or property loss.

### Laws and Regulations

The device should be used in compliance with local laws, electrical safety regulations, and fire prevention regulations.

### **Power Supply**

- When wiring or dismantling, make sure that the device power is cut off, and do not operate under electrification.
- Avoid contact with exposed circuit. When the device is powered on, avoid contact with exposed junctions and parts.
- DO NOT connect multiple devices to one power adapter, to avoid over-heating or fire hazards caused by overload.
- Make sure the plug is properly connected to the power socket.

### **Transportation**

- The product contains precision optical components and electronic components. During transportation, storage and installation, incorrect operations like heavy pressure and violent vibration should be avoided. Otherwise, the product may be damaged.
- Avoid sudden collision, and pack the product with the accompanied carton and cushioning material or similar package.

### **Using Environment**

- Do not touch the heat-radiating part of the device to avoid scalding.
- In order to reduce the risk of fire or electric shock, do not let the product get wet or damp.
- Do not drop objects onto the product and avoid vigorous vibration.
- Keep the product away from magnetic interference.
- Do not use the product in extremely heat, extremely cold, dusty environment, corrosive environment or high humidity environment.
- Do not aim the product lens at objects of strong light, such as the sun and incandescent lamp. Otherwise, the lens may be damaged.
- The product should be stored in dry environment without corrosive gas. Avoid placing the product in direct sunlight and poorly ventilated locations, or near heat sources such as heater or heating (ignoring this warning may lead to fire hazards).
- Do not operate in explosive environment.
- Keep the surrounding area well ventilated to avoid heat accumulation. Do not contact the radiator directly to avoid scald.

### **Electrostatic Protection**

- Remove all conductive objects (such as jewelry, watch, etc.) on the product body before touching the product, and touch the grounding metal bracket by hand to release the static electricity.
- It is suggested to wear anti-static suit to prevent damage to the equipment caused by static electricity.
- When installing or maintaining the product, please wear anti-static wrist band or anti-static gloves. Make sure that the wristband is tightly attached to the skin and is reliably grounded.
- It is forbidden to touch exposed circuit boards with bare hands. Static electricity generated by human body may damage electrostatic sensitive components on circuit boards.
- When touching electrostatic sensitive components or devices, proper grounding measures must be taken.

- Put electrostatic sensitive components into anti-static bags for protection.
- It is suggested to place humidifier in dry environment to maintain suitable humidity and reduce static electricity generation.

### **Maintenance**

- If the product is not working properly, contact the store or the nearest service center. Do not disassemble or modify the device in any way. (The company does not bear any liability for any problem arising from unauthorized modification or maintenance).
- Please properly preserve all the original packaging materials of the product so that when problems arise, the product can be packed with packaging materials and sent to the agent or returned to the manufacturer for processing. The company does not bear any liability for accidental damage during transportation caused by non-original packaging.
- This product is a precision electronic device, no components can be maintained by user, please do not disassemble the device arbitrarily.

### **Cleaning**

Please do not touch the image sensor directly. If the sensor needs to be cleaned, please use a clean rag and wet it with alcohol, then gently wipe off the dirt; if the camera is not in use, please cover the image sensor with dust cover for protection.

### **Installation**

Please do not install the product on vibrating surface or places that are vulnerable to impact.

### **Personnel Requirement**

Quality requirements for installation and maintenance personnel: qualification certificate or working experience in weak current system installation and maintenance, and relevant working experience and qualifications. Besides, the personnel must possess the following knowledge and operation skills:

- The basic knowledge and operation skills of low voltage wiring and Low voltage electronic circuit connection.
- The ability to comprehend the contents of this manual.

## **Contact Information**

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# Chapter 1 Overview

## 1.1 Introduction

SC7000 series smart camera uses the sensor and optical components to acquire images, and it supports vision tools and algorithm like the deep learning target detection, classification, and optical character recognition (OCR) algorithm. It is applicable to the automobile, consumer electronics, semiconductor, food and pharmaceutical packaging industry, etc.

## 1.2 Feature

- Built-in vision tool of deep learning to achieve the character and object recognition, and object sorting
- Supports automatic/semi-automatic focus to get clearer images.
- Adopts high speed and large capacity memory medium for saving images
- Supports multiple communication modes
- Adopts multiple IO interfaces for input and output signals
- Adopts independently controlled light sources at four directions (up, down, left, right)
- Supports RS-232 serial port and indicators displaying device status

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### Note

- The actual feature is subject to the specific model that you got.
  - Refer to the datasheet for specifications.
-

## Chapter 2 Appearance

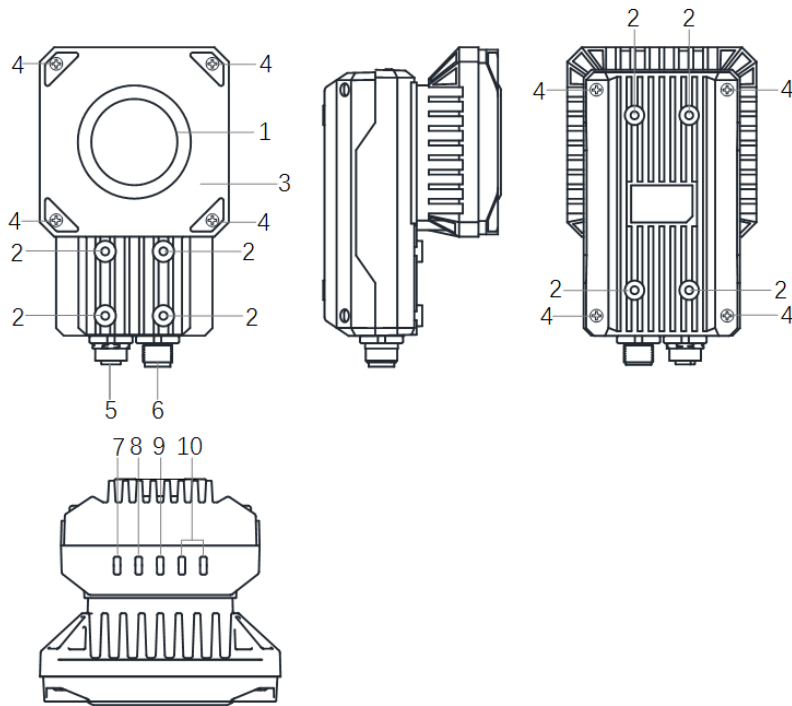


Figure 2-1 Appearance (Type I)

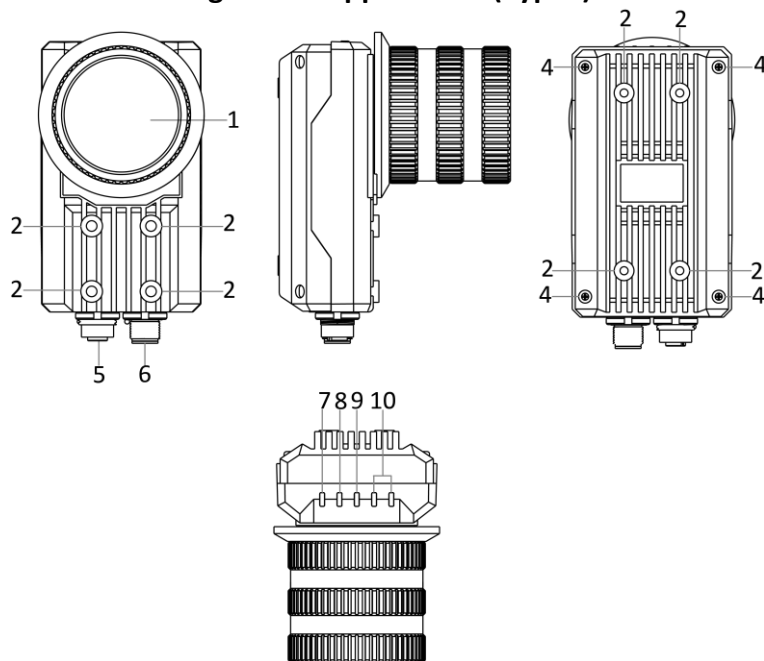



Figure 2-2 Appearance (Type II)

**Table 2-1 Description**

No.	Name	Description
1	Lens Cap	It is a transparent lens cap by default, and can be replaced with other lens cap. Polarization lens cap is optional.
2	Screw Hole	It is used to fix the device to installation position. It is recommended to use M4 screws.
3	Light Source	The device has 8 LED lamps to provide light. White lamp is default one, and red, blue, or near infrared lamp is optional.  <b>Note</b> The type II device does not have the internal light source.
4	Screw	For fixing the camera and the lens cap.
5	Gigabit Ethernet Interface	It refers to gigabit Ethernet interface for transmitting data. The interface is designed with screw threads to tighten connection between the device and cable, and thus avoiding influence caused by vibration.
6	12-Pin Interface	It provides power, input/output, and serial port signal. The interface is designed with screw threads to tighten connection between the device and cable, and thus avoiding influence caused by vibration.
7	PWR Indicator	It is the power indicator. The indicator is solid blue when the device operates normally.
8	LNK Indicator	It is network connection indicator. The indicator is solid green when the network transmission is normal.
9	ACT Indicator	It is network transmission indicator. The indicator is flashing yellow when the network transmission is normal. The indicator flashing speed is related with data transmission speed.
10	U1/U2 Indicator	The device has 2 user-defined indicators, U1 and U2. They are used to indicate whether some functions of the device are normal or not.

## Chapter 3 Interface and Indicator

### 3.1 Interface Description

Read the following section to get definitions of 12-pin interface.

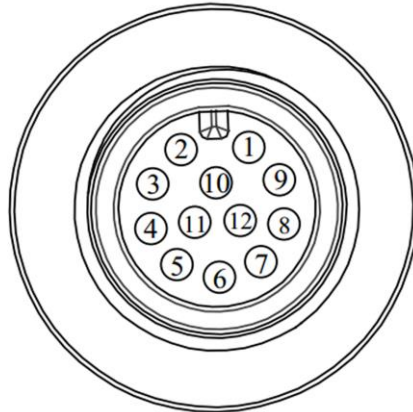


Figure 3-1 12-Pin Interface

Table 3-1 Pin Definitions

No.	Signal	I/O Signal Source	Description
1	DC-PWR	--	Direct current power supply positive
2	GND	--	Power supply ground
3	OPTO_OUT0	Line3 signal line	Opto-isolated output 3
4	OPTO_OUT1	Line4 signal line	Opto-isolated output 4
5	OPTO_OUT2	Line5 signal line	Opto-isolated output 5
6	OUT_COM	Line3/4/5 signal ground	Common-ended output
7	OPTO_IN0	Line0 signal line	Opto-isolated input 0
8	OPTO_IN1	Line1 signal line	Opto-isolated input 1
9	OPTO_IN2	Line2 signal line	Opto-isolated input 2
10	IN_COM	Line0/1/2 signal ground	Common-ended input
11	RS-232_R	--	RS-232 serial port input
12	RS-232_T	--	RS-232 serial port output

 **Note**

You should refer to the table above and the label attached to the power and I/O cable to wire the device.

### 3.2 Indicator Status

Read following sections to get the indicator status of the device.

**Table 3-2 LED Status Definition**

Status	Description
Solid	The indicator is in solid all the time.
Unlit	The indicator is unlit all the time.
Fast flashing	Flashing interval: 200 to 300 ms
Slow flashing	Flashing interval: 1000 ms
Super slow flashing	Flashing interval: 2000 ms

**Table 3-3 Description**

Device Status	PWR Indicator	LNK Indicator	ACT Indicator	U1/U2
The device is powered off.	--			
The device is powered on.	Solid blue	Solid green	Slow/fast flashing yellow	U1 is unlit, and U2 is slow flashing blue.
Power supply exception	Unlit			
Network exception	Solid blue	Unlit		U1 is unlit, and U2 is slow flashing blue.
Device software exception	Solid blue	Solid green	Flashing yellow	U1 and U2 are unlit.
Device exception	Solid blue	Solid green	Solid yellow	U1 and U2 are solid blue.

## Chapter 4 I/O Wiring

### 4.1 Input

The device's Line 0/1/2 is opto-isolated input, and their internal circuit is as follows.

**Note**

- The input voltage ranges from 5 VDC to 30 VDC.

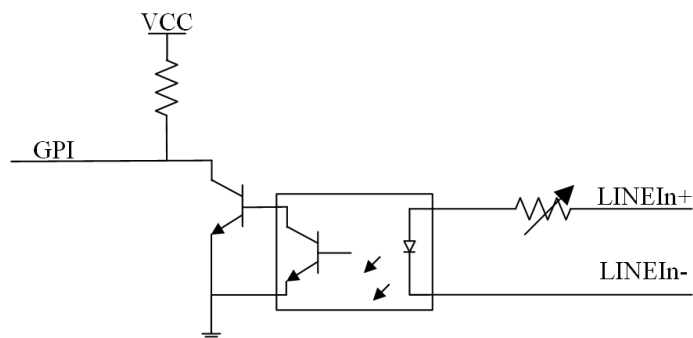


Figure 4-1 Internal Circuit of Input Signal

### 4.2 Output

The device's Line 3/4/5 is opto-isolated output, and their internal circuit is as follows.

**Note**

- The input voltage ranges from 5 VDC to 30 VDC.
- The maximum current is 200 mA.
- Do not directly connect with inductive load (e.g. DC motor, etc.) when outputting.

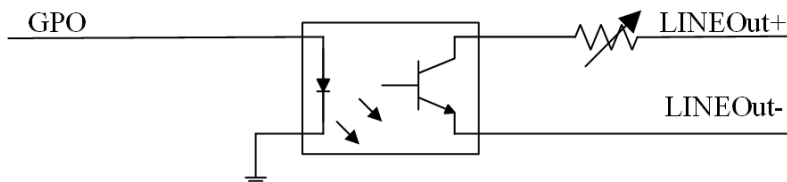


Figure 4-2 Internal Circuit of Output Signal

### 4.3 Input Wiring

The device can receive external input signal via I/O interface, and here we take type I device and Line 0 as an example to introduce input wiring.

**Note**

Input wiring may differ with different types of external devices.

#### PNP Device

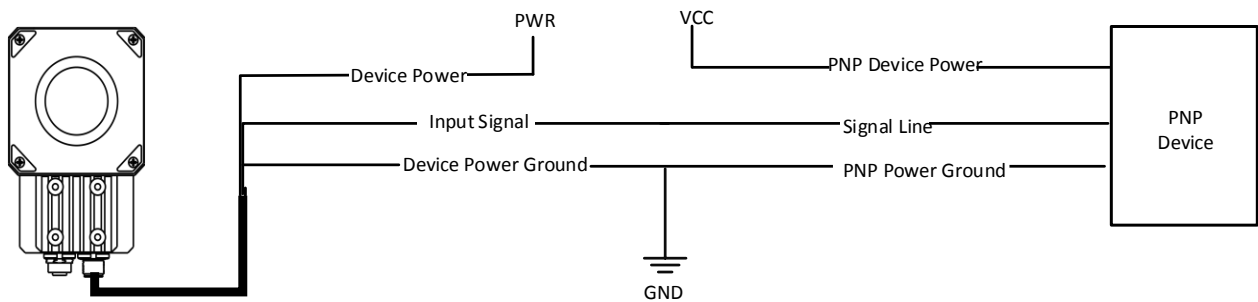


Figure 4-3 Input Signal Connecting to PNP Device

#### NPN Device

If the VCC of NPN device is 12 VDC or 24 VDC, it is recommended to use 1 KΩ pull-up resistor.

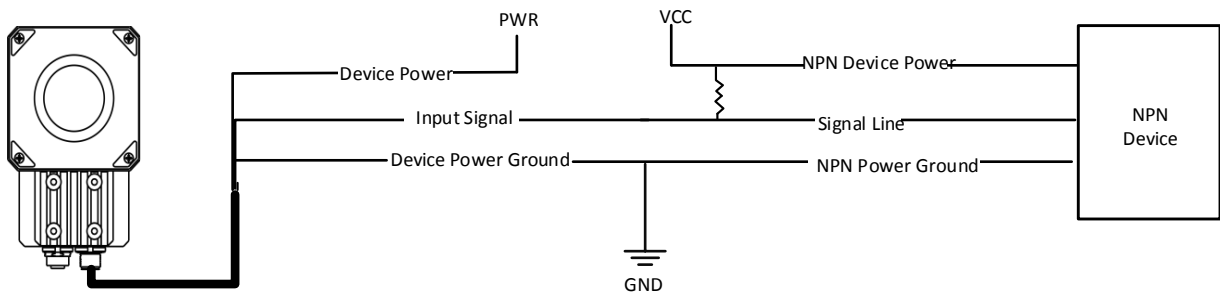


Figure 4-4 Input Signal Connecting to NPN Device

### 4.4 Output Wiring

The device can output signal to external device via I/O interface, and here we take type I device Line 3 as an example to introduce output wiring.

**Note**

- Output signal wiring may differ with different types of external devices.
- The voltage of VCC should not higher than that of PWR. Otherwise, the device's output signal may have exception.



### PNP Device

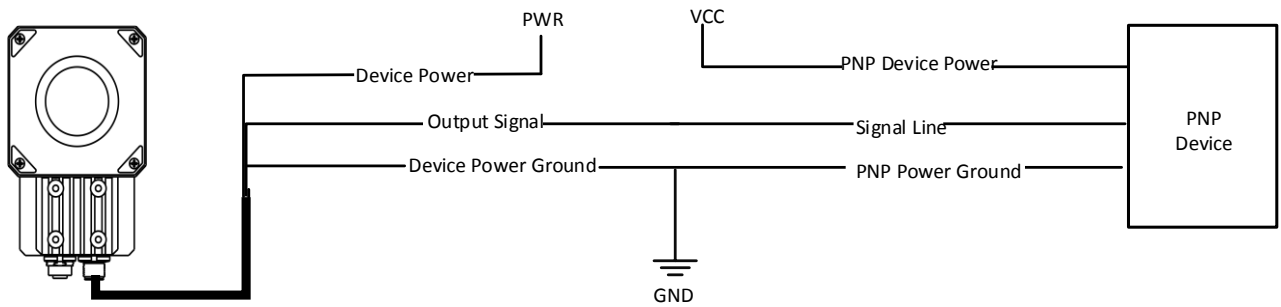


Figure 4-5 Output Signal Connecting to PNP Device

### NPN Device

If the VCC of NPN device is 12 VDC or 24 VDC, it is recommended to use 1 KΩ pull-up resistor.

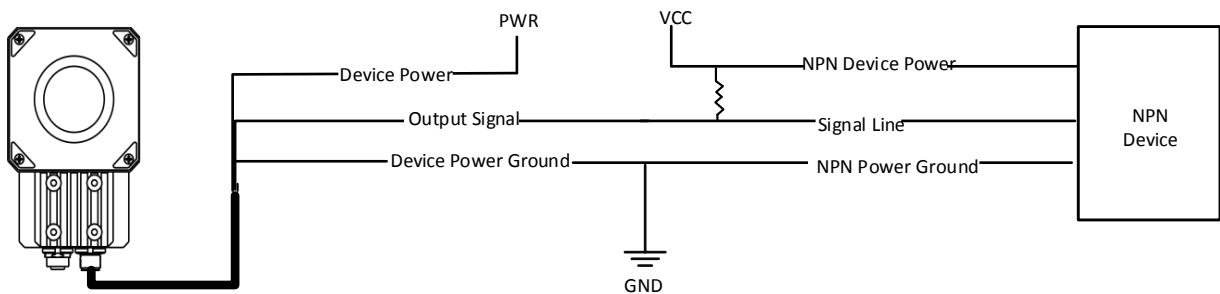


Figure 4-6 Output Signal Connecting to NPN Device

## 4.5 RS-232 Serial Port

The 9-pin male connector and 25-pin male connector are commonly used serial ports, as shown below. You can refer to the table below for the specific pin name and function.

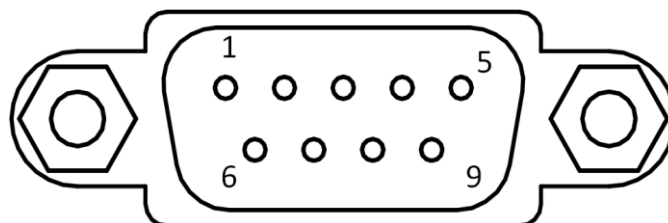


Figure 4-7 9-Pin Male Connector

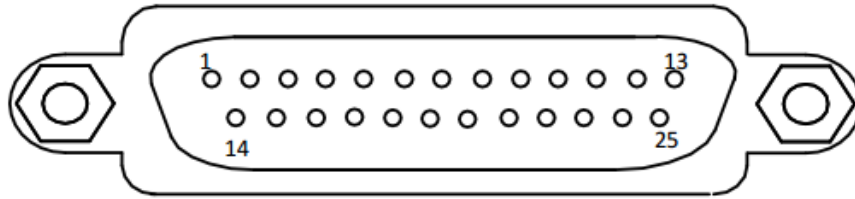


Figure 4-8 25-Pin Male Connector

Table 4-1 RS-232 Interface Description

Serial Port Type	Pin No.	Name	Function
9-Pin Interface	2	RX	Receive data
	3	TX	Send data
	5	GND	Signal ground
25-Pin Interface	2	TX	Send data
	3	RX	Receive data
	7	GND	Signal ground

You can refer to the serial port wiring below to connect the device with an external device.

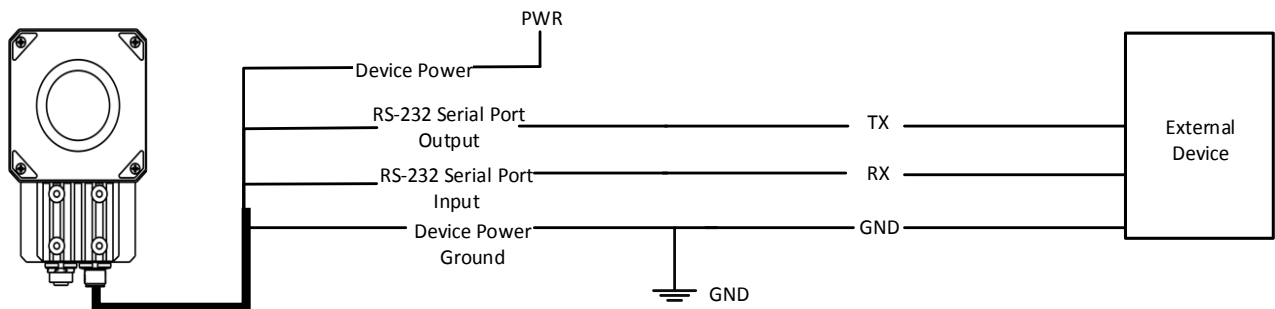


Figure 4-9 RS-232 Serial Port Wiring

## Chapter 5 Installation

### 5.1 Installation Preparation

You need to prepare following accessories before installation.

**Table 5-1 Accessories**

No.	Name	Quantity	Description
1	Power and I/O Cable	1	It refers to the 12-pin power and I/O cable.
2	Network Cable	1	It refers to the GigE network cable with an aviation connector.
3	DC Switch Power Supply	1	It refers to the DC switch power supply of 24 VDC with current above 1A/2A. You need to purchase it separately.
4	Lens	1	It refers to C-mount lens that you need to purchase it separately. The lens is used for the type II device.
5	Light Source	1	It is used to provide light during image acquisition. You need to purchase separately. The light source is used for the type II device.
6	Fixed Bracket	1	It is used to fix the device. You need to purchase it separately.
7	M4 Screw	4	It refers to the supplied M4 screw that is used to fix the device to the installation position.

### 5.2 Install Device

#### *Before You Start*

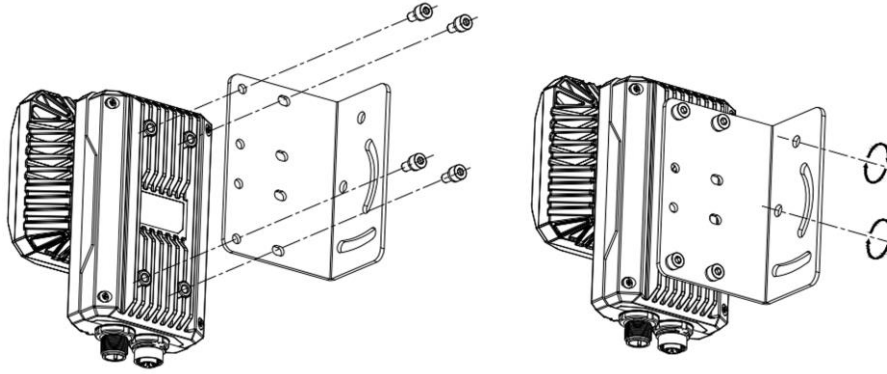
- Make sure the device in the package is in good condition and all the assembly parts are included.
- Make sure all the related equipment is powered off during the installation.

#### **Note**

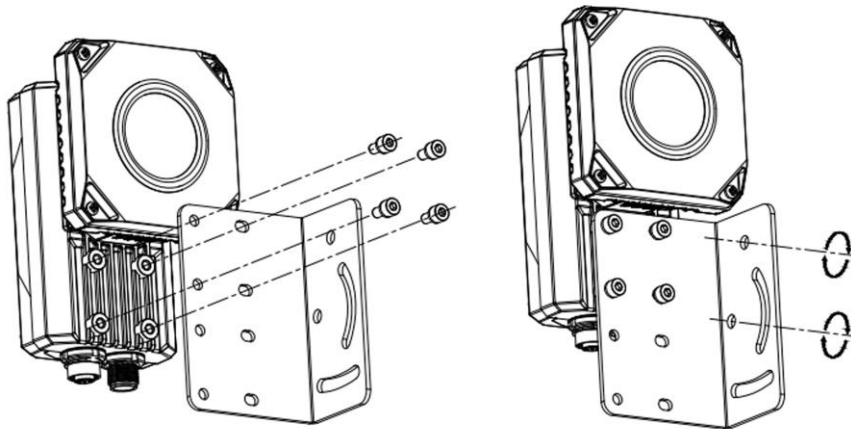
Here we take type I device as an example to introduce installation.

**Steps**

1. Use M4 screws to fix the device to the fixed bracket.
2. Select one of the installation methods, and install the device to the installation position.

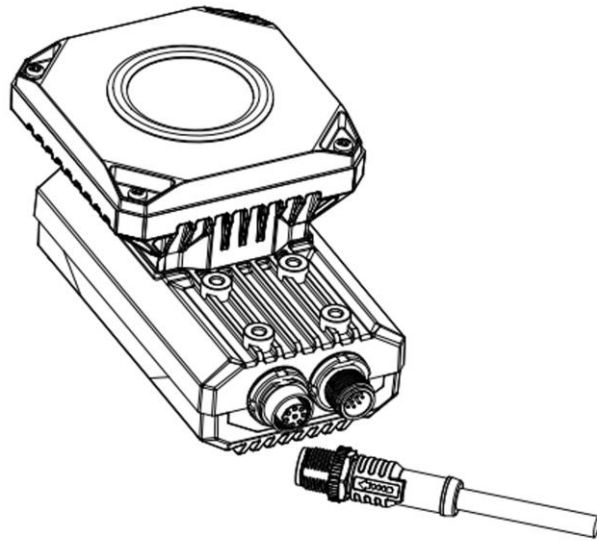


**Figure 5-1 Rear Installation**



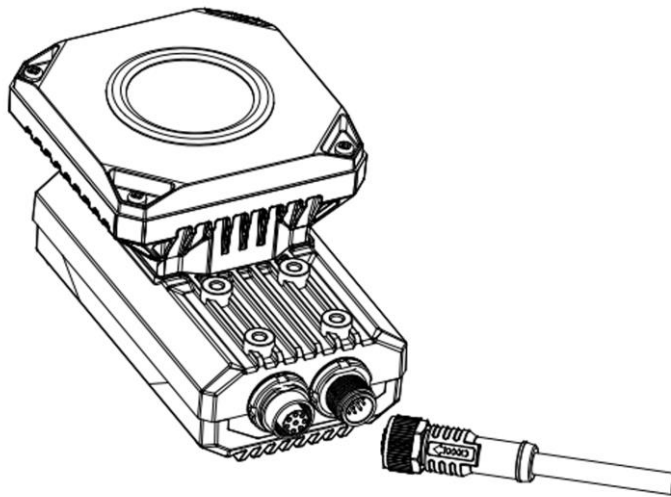
**Figure 5-2 Front Installation**

3. Use the GigE network cable with RJ45 aviation connector to connect the device to a switch or a network interface card.



**Figure 5-3 Gigabit Ethernet Interface Wiring**

4. Use the power and I/O cable to connect the device to a DC switch power supply.



**Figure 5-4 Power and I/O Wiring**

## Chapter 6 Access Device via Web Browser

2 ways are available to access the device via the web browser: You can enter the IP address of the device in the web browser to access the device, or use the Camera Search tool to search the device and access it via the web. In web, you can set device parameters, set and operate solutions, enable live view, etc.

### 6.1 Search Device via Camera Search Tool

The Camera Search tool allows you to search the device, view its information like model, serial No., MAC address, IP address, etc., and access the device via the web.

---

#### Note

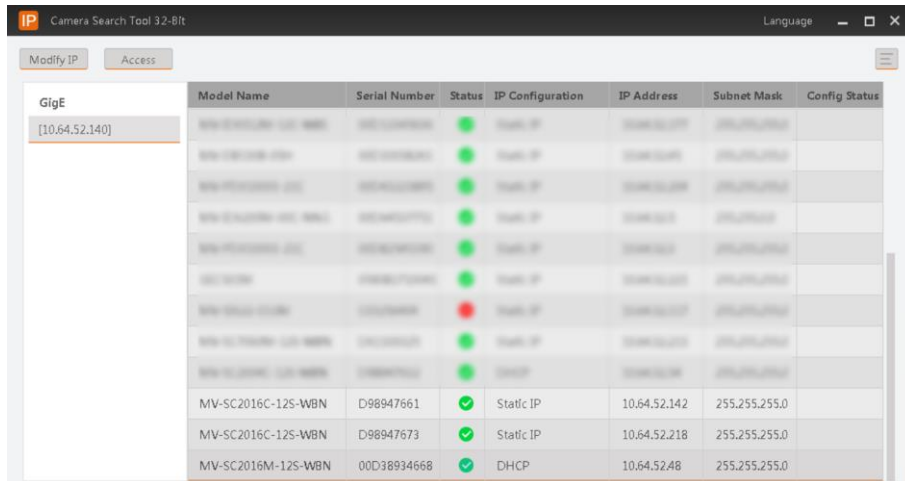
- You can download the Camera Search tool from <https://en.hikrobotics.com/>.
  - The Camera Search tool is compatible with 32/64-bit Windows 7/10 operating system.
  - Only when the device is in the same network segment with the PC where the Camera Search tool installed, you can search the device via the tool.
- 

### 6.2 Access via Web Browser

You can enter the IP address of the device in the web browser to access the device, or use the Camera Search tool to search the device and access it via the web.

#### **Steps**

1. Double click the Camera Search tool.  
Devices in the same network segment with the PC will be automatically listed.
2. Select the device in the list.
3. Click **Access** to access the device via the web.



The screenshot shows the 'Camera Search Tool 32-Bit' application window. It features a 'GigE' section on the left with a search box containing '[10.64.52.140]'. Below this are 'Modify IP' and 'Access' buttons. The main area is a table with the following columns: Model Name, Serial Number, Status, IP Configuration, IP Address, Subnet Mask, and Config Status. The table lists several camera models, with the last three rows highlighted in grey. The last three rows are:

Model Name	Serial Number	Status	IP Configuration	IP Address	Subnet Mask	Config Status
MV-SC2016C-12S-WBN	D98947661	✓	Static IP	10.64.52.142	255.255.255.0	
MV-SC2016C-12S-WBN	D98947673	✓	Static IP	10.64.52.218	255.255.255.0	
MV-SC2016M-12S-WBN	00D38934668	✓	DHCP	10.64.52A8	255.255.255.0	

**Figure 6-1 Access via Web Browser**

**Note**

The default browser in your PC will be opened, and you can see the device login page in the web.

## Chapter 7 Web Operation

The web end includes Basic, Solution, and System. It is integrated with the function of image capture, algorithm processing, and communication, which can adjust the imaging effects and help to build visual detection solutions.

### 7.1 Log in

---

#### Note

The browser should support HTML5 and Chrome is recommended.

---

#### Steps

1. Open the web browser, and enter the IP address of the device.

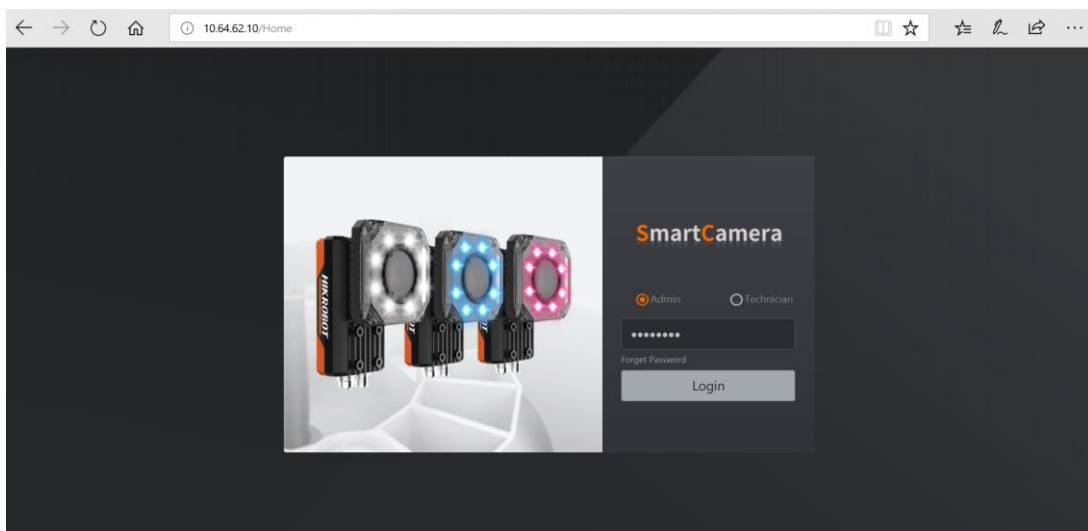


Figure 7-1 Login

2. Check **Admin**, enter password, and click **Login**.

---

#### Note

The default password of admin is Abc1234. When logging in for the first time, we highly recommend you to change the password in accordance with prompt below to increase security.

---



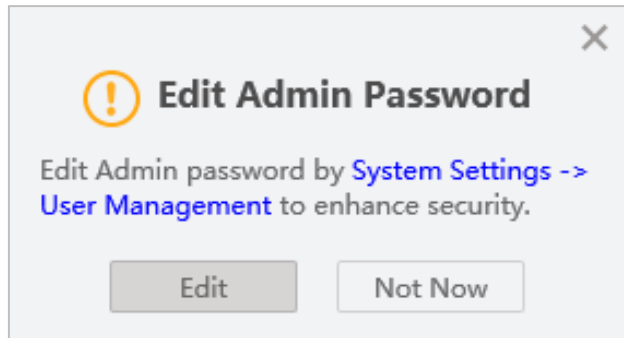


Figure 7-2 Edit Admin Password

3. Click **Edit**, and edit the admin password in **User Management** interface.

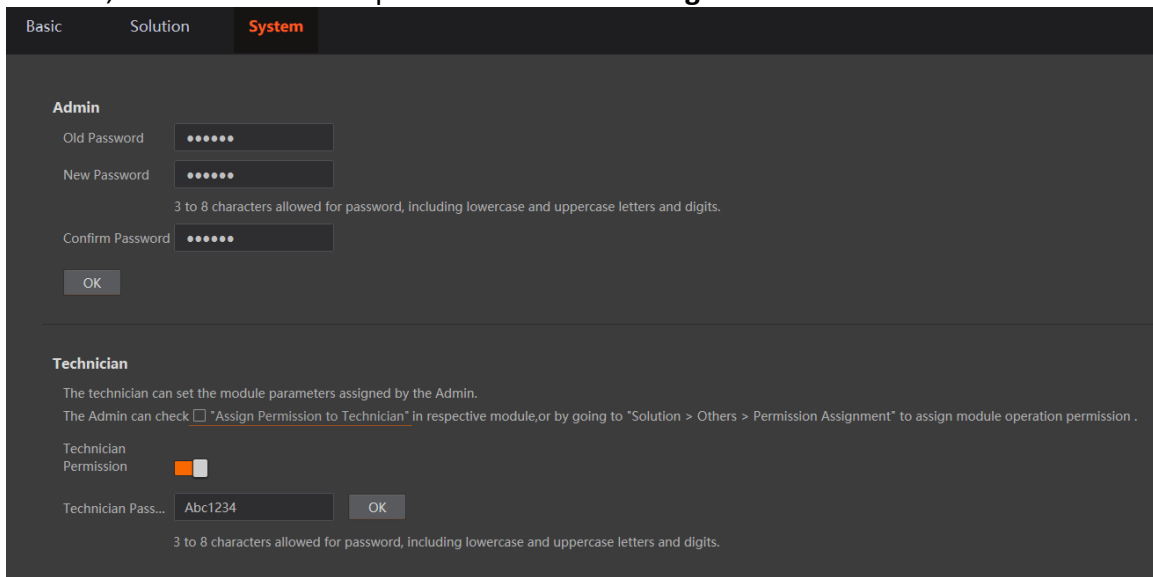


Figure 7-3 User Management Interface

 **Note**

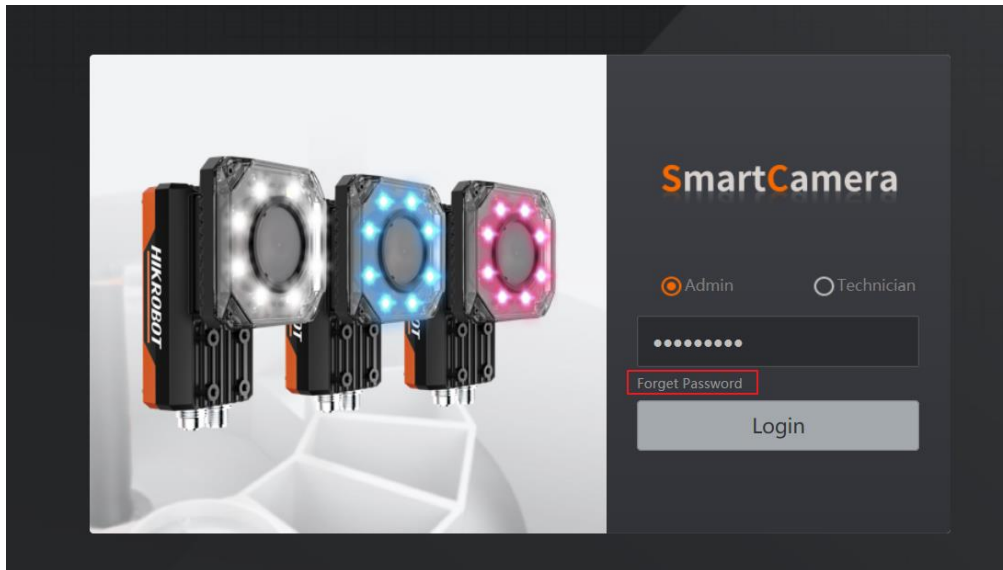
You can enable **Technician Permission** to log in as the technician. The default password of the technician is Abc1234.

## 7.2 Forget Password

If you forget the admin password, you can follow steps below to reset your password.

**Steps**

1. Click **Forget Password** to view device serial number.



**Figure 7-4 Forget Password**

2. Mail to the technical support personnel to get the corresponding resetting file.
3. Click **Import** to import the resetting file.
4. Set a new password according to the interface prompt.

## Chapter 8 Solution Settings

The smart camera is able to acquire, process and output images. You can log in the web interface to set camera parameters, tool parameters, output parameters, etc. After completing related settings, you can save and download the solution you configured.

### Note

The specific parameter names and values may differ by device models and firmware versions.

## 8.1 Camera Settings

### 8.1.1 Set Frame Rate

Go to **Common** to set frame rate and view actual frame rate.

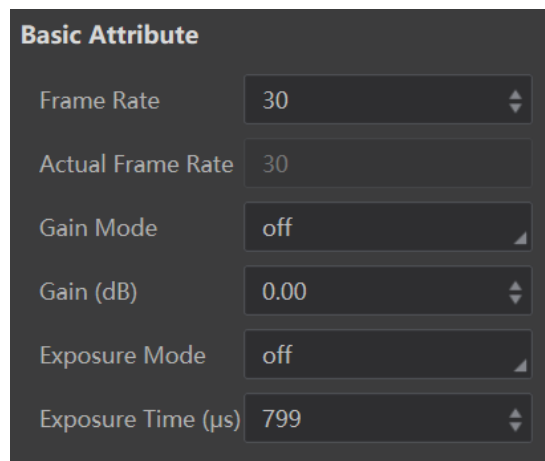


Figure 8-1 Set Frame Rate

### 8.1.2 Set Gain

The device supports 3 types of **Gain Mode**, including **OFF**, **ONCE** and **CONTINUOUS**.

**OFF**: When the gain mode is set as **OFF**, you can enter the gain value manually.

**ONCE**: When the gain mode is set as **ONCE**, the device adjusts the gain automatically once according to the image brightness.

**CONTINUOUS**: When the gain mode is set as **CONTINUOUS**, the device adjusts the gain continuously according to the image brightness.

 **Note**

- When setting **Gain Mode** as **ONCE** or **CONTINUOUS**, **Gain** parameter does not take effect.
  - When increasing the gain, the image noise will increase too, which will influence image quality.
- 

### 8.1.3 Set Exposure Mode

The device supports 3 types of **Exposure Mode**, including **OFF**, **ONCE** and **CONTINUOUS**.

**OFF**: When the exposure mode is set as **OFF**, you can enter the exposure time manually.

**ONCE**: When the exposure mode is set as **ONCE**, the device adjusts the exposure time automatically once according to the image brightness.

**CONTINUOUS**: When the exposure mode is set as **CONTINUOUS**, the device adjusts the exposure time continuously according to the image brightness.

---

 **Note**

When setting **Exposure Mode** as **ONCE** or **CONTINUOUS**, **Exposure Time** parameter does not take effect.

---

### 8.1.4 Set Brightness

When the gain mode or exposure mode is **CONTINUOUS** or **ONCE**, you can set brightness. Otherwise, the brightness is not available. The range of the brightness is from 0 to 255.

### 8.1.5 Set Light Source

The device has 8 light bulbs, and you can go to **Light Source Adjustment** to set light direction, flash mode, etc.

The device has 8 light bulbs, which are divided into up, down, left and right groups. You can select **UP**, **DOWN**, **LEFT** and **RIGHT** to control respective light bulbs. By selecting **ALL**, you can control all 8 light bulbs.

---

 **Note**

- Parameters of light source adjustment may differ by device models.
  - You need to enable **Enable** to turn on the light bulbs you selected in **Direction**.
- 

**Advance** refers to the time when the light source starting to light is early than that of exposure.

The light source has 2 flash mode, including **flash\_strobe** and **flash\_long**. You can select it according to actual demands.

**Duration** refers to the duration time of light source, and **Delay** refers to the time when light source starts to light is later than that of exposure.

---

 **Note**

The parameter of delay only takes effect when you select **flash\_strobe** as **Flash Mode**.

---

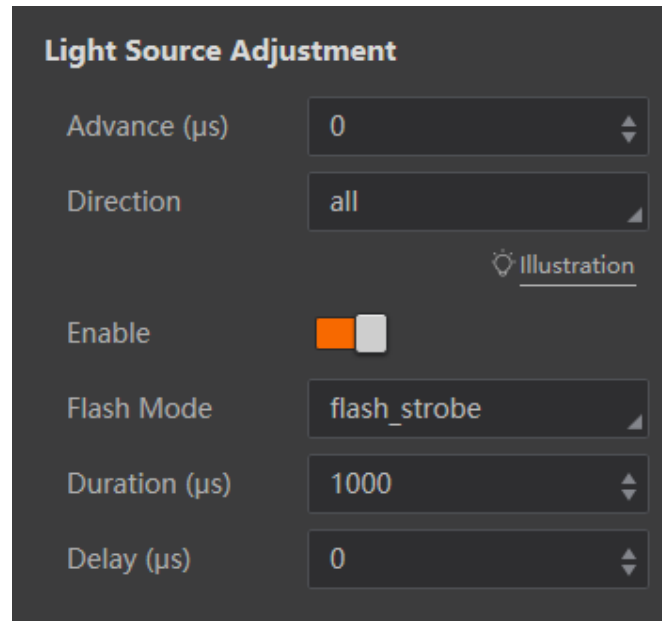


Figure 8-2 Set Light Source

### 8.1.6 Set Image

Go to **Image** to set image related parameters.

**Pixel Format:** The mono device supports Mono 8 only, and the color device supports Mono 8 and RGB.

**Width:** It refers to the image width, and you can adjust it according to actual demands.

**Height:** It refers to the image height, and you can adjust it according to actual demands.

**Width Deviation and Height Deviation:** It indicates the starting location of the upper left corner of the ROI area, that is, the deviation in the X direction and Y direction. This parameter adjusts the location of the ROI frame.

---

 **Note**

Image width + width deviation <= width max. value. Image height + height deviation <= height max. value.

---

**Gamma:** Gamma correction provides a non-linear mapping mechanism. When Gamma value is between 0 and 1, image brightness increases, and dark area becomes brighter. When Gamma value is between 1 and 4, image brightness decreases, and dark area becomes darker.

**Mirror Image:** If enabled, the image will be reversed in a horizontal way.

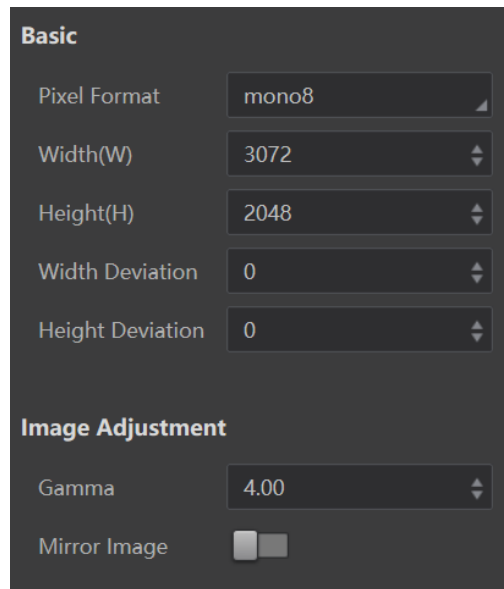


Figure 8-3 Set Image

**CCM Reset**



This parameter is only available for the color device and rgb is selected as pixel format.

CCM stands for Color Correction Matrix, and it is used to help improve inter-instrument agreement in display and light sources measurements.

You can click **Edit** to adjust R, G and B value according to actual conditions, and their range is from -15.99 to +15.99, and click **Apply** to apply. You can click **CCM Reset** to reset parameters.

CCM Reset		CCM Reset		
CCM Parameters		Edit		
	R	G	B	
R	1.37	-0.33	-0.04	
G	-0.44	1.11	0.33	
B	-0.05	-1.13	2.17	

Figure 8-4 Set CCM

## AWB Mode

### Note

This parameter is only available for the color device and `rgb` is selected as pixel format.

AWB stands for Automatic White Balance, and the device adjusts color according to different light sources. If you want to use AWB function, you should enable **AWB Enable** first.

There are 2 types of AWB mode, including manual and auto. If **AwbAuto** is selected as **AWB Mode**, the device will automatically adjust AWB parameters according to actual conditions. If **AwbManual** is selected, you can manual edit AWB parameters.

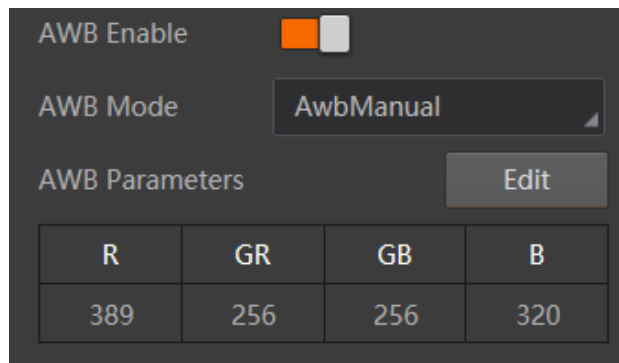


Figure 8-5 Set AWB Mode

## 8.2 Image Acquisition Settings

This section introduces how to set image acquisition related parameters, such as, trigger mode, trigger source, trigger cache, etc.

### Note

Make sure that the solution is in continuous operation status when you use external trigger mode to acquire images.

### 8.2.1 Set Trigger Mode

The device has 2 types of trigger mode, including internal trigger mode and external trigger mode. **OFF** refers to internal trigger mode, and **ON** refers to external trigger mode.

#### Internal Trigger Mode

In this mode, the device acquires images via its internal signals.

#### External Trigger Mode

In this mode, the device acquires images via external signals like software signal, hardware signal, communication string, etc.

## 8.2.2 Enable Internal Trigger Mode

Go to **Trigger Mode** to select **OFF** as **Trigger Mode**.

### Note

**OFF** refers to the internal trigger mode.

## 8.2.3 Enable External Trigger Mode

Go to **Trigger Mode** to select **ON** as **Trigger Mode**.

### Note

**ON** refers to the external trigger mode.

## Set and Execute Software Trigger Mode

### Steps

1. Select **ON** as **Trigger Mode**.
2. Select **SOFTWARE** as **Trigger Source**.
3. Click **Software Trigger** to send trigger commands.
4. Enter **Delay** time according to actual demands.

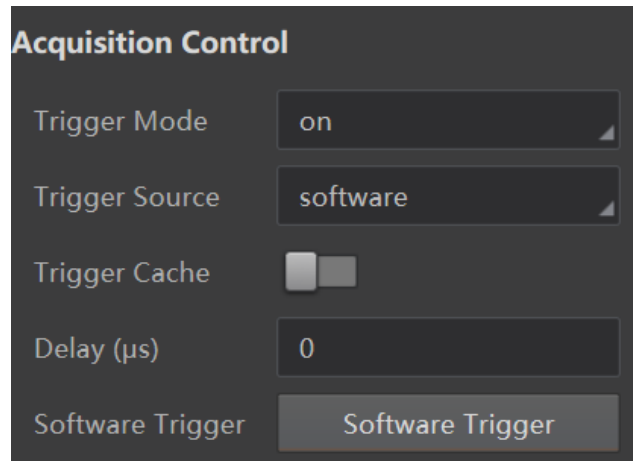


Figure 8-6 Set and Execute Software Trigger Mode

## Set and Execute Hardware Trigger Mode

### Steps

1. Select **ON** as **Trigger Mode**.
2. Select **Hardware** as **Trigger Source**.
3. Select specific line as **Trigger IO**.



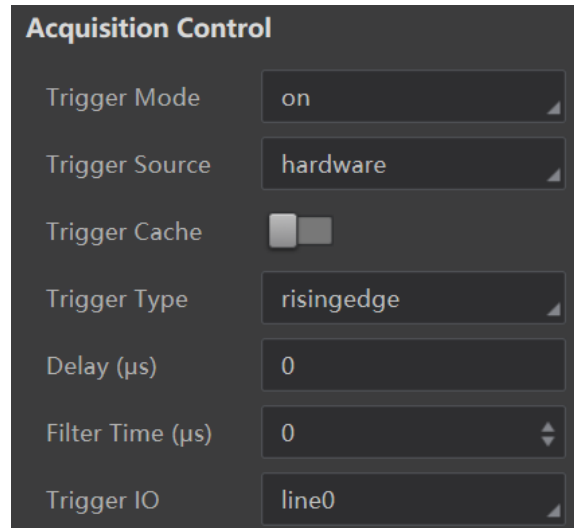


Figure 8-7 Set and Execute Hardware Trigger Mode

## 8.2.4 Set Related Parameters about External Trigger Mode

### Note

Parameter settings may differ when selecting different trigger sources.

In external trigger mode, you can also set related parameters, including trigger cache, trigger type, trigger delay, and filter time.

### Note

If select **SOFTWARE** as **Trigger Source**, you can also set trigger cache and trigger delay.

### Set Trigger Cache

After enable **Trigger Cache**, if the device receives a new trigger signal, it will save and process the signal during the triggering process. Trigger cache can save up to 3 trigger signals.

### Set Trigger Type

The device supports trigger acquisition in the rising edge, falling edge, level high, or level low of the external signal.

**Rising Edge:** It means that when the level signal sent by external device is in rising edge, the device receives trigger signal and starts to acquire images.

**Falling Edge:** It means that when the level signal sent by external device is in falling edge, the device receives trigger signal and starts to acquire images.

**Level High:** The level high of the trigger signal is valid. As long as the trigger signal is in level high, the device is in image acquisition status.

**Level Low:** The level low of the trigger signal is valid. As long as the trigger signal is in level low, the device is in image acquisition status.

## Set Trigger Delay

The trigger delay function allows the device to add a delay between the receipt of trigger signal and the moment the trigger becomes active. The range of this parameter is from 0 to 1000000  $\mu$ s.

---

### Note

This parameter is available only when selecting rising or falling edge as the trigger type. If level high or level low is selected as the trigger type, you can set trigger start delay or end delay according to actual demands.

---

## Set Filter Time

The external trigger input signal of the device may have signal bounce that may cause false trigger. Thus, it is necessary to set filter time. The range of this parameter is from 0 to 1000000  $\mu$ s.

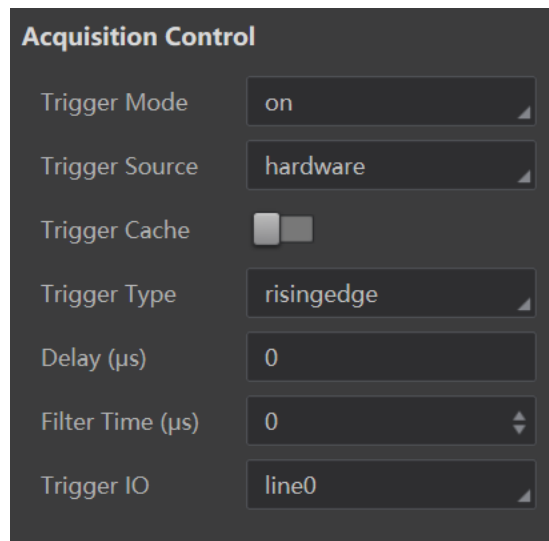


Figure 8-8 Set Related Parameters about External Trigger Mode

## 8.2.5 Enable Communication Trigger Mode

The device also supports triggering by receiving communication string.

Select **ON** as **Trigger Mode**, select **COMMUNICATION** as **Trigger Source**, and enter **String** and **Delay** according to actual demands.

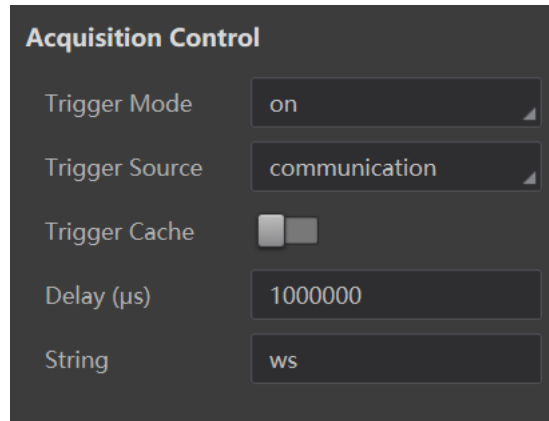


Figure 8-9 Enable Communication Trigger

## 8.3 Focus Control Settings

The device supports focus adjustment via the web-based interface. There are 2 ways to adjust focus, including manual and auto. It is recommended to use auto focus mode to adjust focus first, and then you can use manual mode to further adjust. During manual adjustment, you are recommended to use larger focus step to adjust focus first, and then use small focus step.

---

### Note

Make sure that the test mode is disabled and the image is in camera mode before adjusting focus automatically or manually. Regarding the image mode, refer to section Operate Image for details.

---

### 8.3.1 Set Auto Focus

Go to **Focus Control** to select **once** as **Focus Mode**, and the device will automatically adjust focus.

---

### Note

- Under auto focus mode, you cannot configure other parameters.
  - Make sure the camera is in continuous operation if once is selected.
-

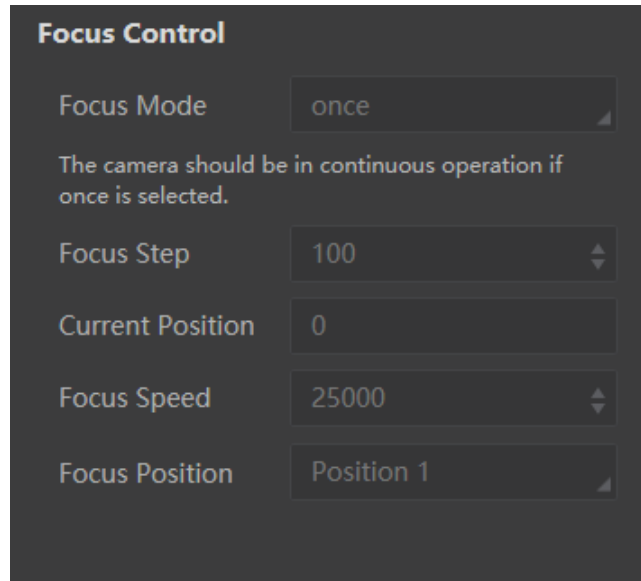


Figure 8-10 Set Auto Focus

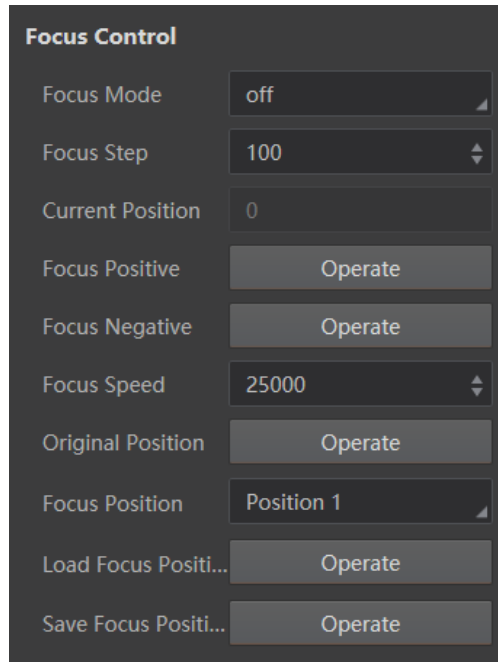
### 8.3.2 Set Manual Focus

#### Steps

1. Go to **Focus Control** to select **off** as **Focus Mode**, and enter **Focus Step** and **Focus Speed** according to actual demands.
2. Click **Operate** in **Focus Positive** or **Focus Negative**.

**Result:** If you click **Operate** in **Focus Positive**, the device will adjust lens in forward direction according to the **Focus Step** and **Focus Speed** you set. If click **Operate** in **Focus Negative**, the device will adjust lens in backward direction according to the **Focus Step** you set.

3. Select different focus positions from **Focus Position** (from **Position 1** to **Position 8**), and click **Operate** in **Save Focus Position** to save them.
4. (Optional) After saving, click **Operate** in **Load Focus Position** to load saved focus positions.
5. (Optional) Click **Operate** in **Original Position** to let the lens go back to the original position.



**Figure 8-11 Set Manual Focus**

## 8.4 Tool Settings

### Note

- Available tools may differ by device models.
- The tools of feature matching and blob require the image sources are mono ones.
- The specific parameter names and values may differ by device models and firmware versions.

Tool settings allows you to add different vision tools for DL character location, DL classification, DL object detection, DL character recognition, feature matching, fixture, blob, etc. After tool adding, you can set their corresponding parameters, save and download solutions.

### ROI Settings

For most tools, you need to set image source and ROI area in basic parameter interface before setting specific operating parameters.

Image source is the images acquired by the device by default. ROI area allows you to create or reuse certain areas, you can select different shapes to draw directly, or select different reuse

methods to determine the ROI.

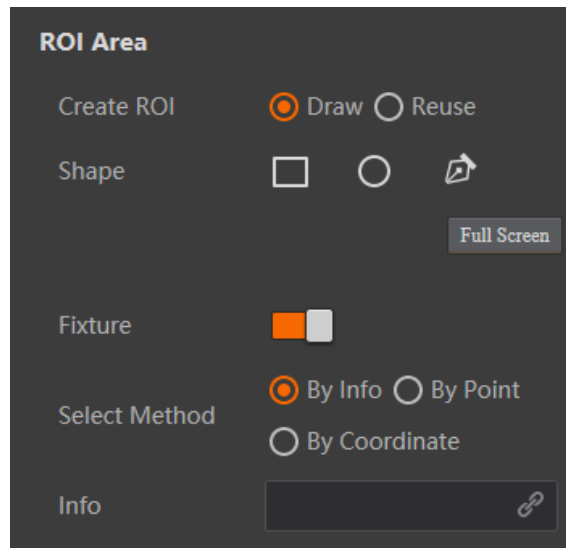


Figure 8-12 Set ROI Area

Regarding fixture, you can select different methods to fix positions after enabling it, including link specific information, by point or by coordinate.

### 8.4.1 Deep Learning Training Tool

The deep learning training tool is used to train samples before deep learning, and it needs large amount of data to achieve a higher accuracy. Deep learning training allows the PC to automatically learn patterns and features, and integrate them into the modeling process, thus reducing the incompleteness caused by the artificially designed features.

---

#### Note

- The tool of DL character location, DL classification, DL object detection, and DL character recognition has corresponding model files by default. You can also use the deep learning training tool to create new model files according to actual demands.
  - You can download the Deep Learning Tool V1.1.0 from <https://en.hikrobotics.com/>.
  - The PC should be equipped with the video memory of 6 GB or above, and it is recommended to use GTX1660Ti, GTX1080Ti, RTX2070, RTX2080, and RTX2080Ti.
- 

### Character Training

Character training is used to train samples for knowing characters before DL character recognition or location. In the training process, the more the sample quantity, the higher accuracy rate of the character recognition.





### Steps

1. Double click the Deep Learning Tool to run it.
  2. Select **SC Platform** as **Target Platform**, select **Character Training** as **Training Type**, and click **Next**.
- 

### Note

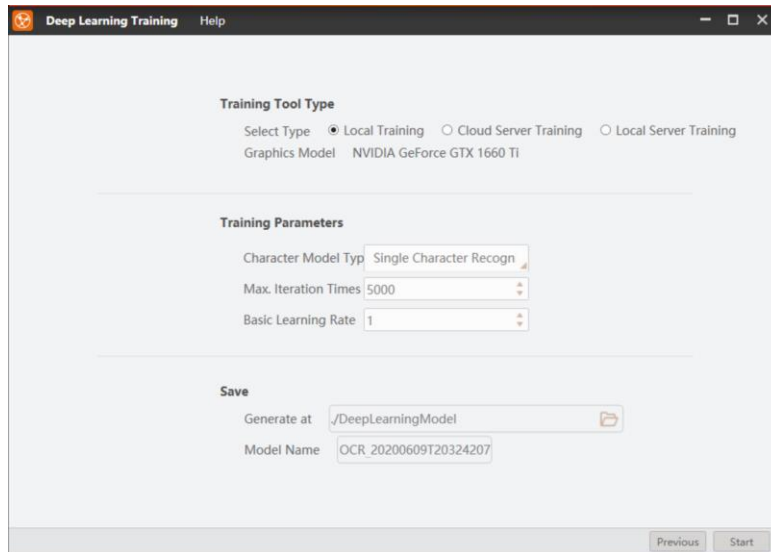
The SC platform currently only supports 2 training types, including character training and image classification.

---

3. Click  to add a single image or click  to add an image folder.
  4. Click  to select characters in the image or click  to select single character, and enter characters in the label box.
  5. Repeat the previous step to train more samples, and click **Next**.
  6. Set **Training Tool Type**, **Training Parameters**, and **Save** parameters according to actual demands.
- 

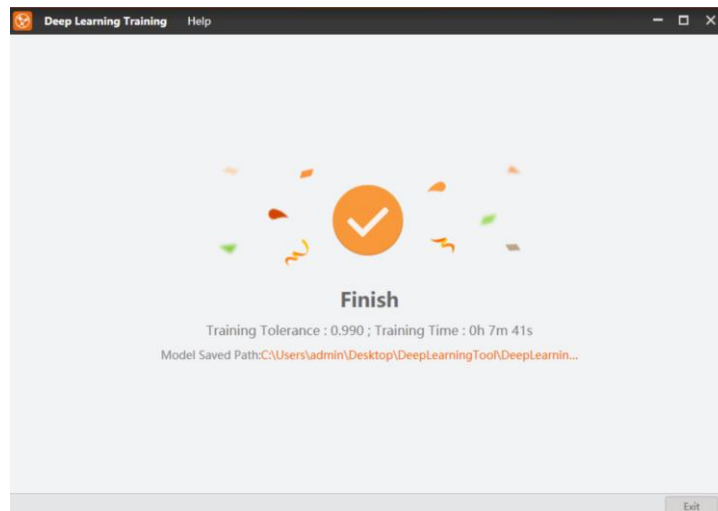
### Note

- **Character Model Type** has 3 types, including single character recognition, text positioning, and text line recognition. Single character recognition and text line recognition are used to train the recognition ability, while text positioning is used to train the location ability. You need to train them separately. Here we take the single character recognition as an example.
  - When selecting **Single Character Recognition** or **Text Positioning** as **Character Model Type**, you can set **Max Iteration Times** and **Basic Learning Rate**. **Max Iteration Time** refers to the times of character training. You can increase its value to improve train effect, but it will cost more time. **Basic Learning Rate** determines the training speed.
  - When selecting **Text Line Recognition** as **Character Model Type**, you can set **Max Iteration Times**, **Accuracy Threshold**, and **Pre-training Model**. **Accuracy Threshold** determines when to stop the train process, and it is recommended to set it as 0.98 and above. **Pre-training Model** is reserved, and you do not need to set it.
-



**Figure 8-13 Set Parameters**

7. Click **Start** to start character training.
8. (Optional) Click **Verify** to verify training results during training process, and click **Feature Calibration** to enter characters again to improve training accuracy.
9. (Optional) Click **Pause** to pause training process.
10. Click **End** to finish training.



**Figure 8-14 Train Finished**

## Image Classification

Image classification is used to train samples for identify various types of images. In the training process, each image will be given a label that represents a concept or category name. Given enough training data, the image classification model can decide whether new images belong to certain categories in training data or not.



### Steps

1. Double click the Deep Learning Tool to run it.
2. Select **SC Platform** as **Target Platform**, select **Image Classification** as **Training Type**, and click **Next**.

### Note

The SC platform currently only supports 2 training types, including character training and image classification.

3. Enter specific name in **Image Label Value**.
4. Repeat the previous step to train more samples, and click **Next**.
5. Set **Training Tool Type**, **Training Parameters**, and **Save** parameters according to actual demands.

### Note

**Max Iteration Time** refers to the times of image classification training. You can increase its value to improve train effect, but it will cost more time. **Basic Learning Rate** determines the training speed. **Model Capacity** has 2 types, including **Normal** and **High Accuracy**, and you can select it according to actual demands.

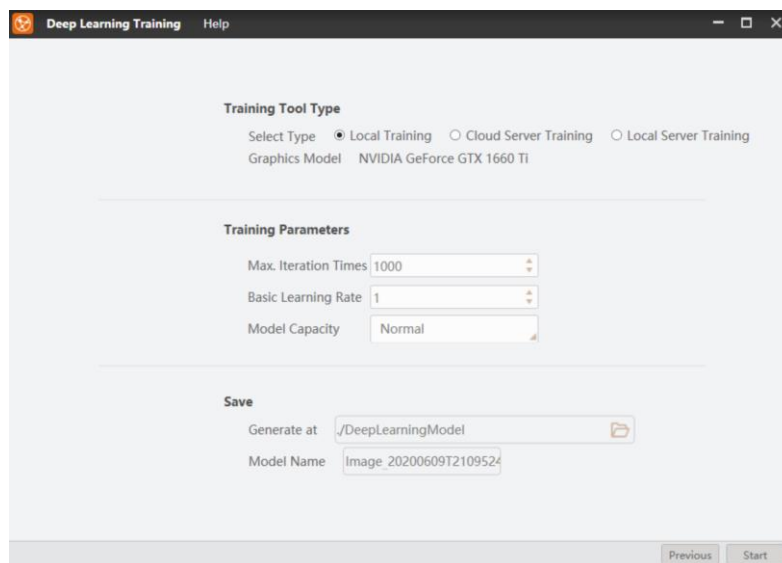


Figure 8-15 Set Parameters

6. Click **Start** to start training.
7. (Optional) Click **Verify** to verify training results during training process, and click **Feature Calibration** to enter specific name in **Image Label Value** again to improve accuracy.
8. (Optional) Click **Pause** to pause training process.
9. Click **End** to finish training.

## 8.4.2 Deep Learning Character Location

The tool of DL character location can accurately locate characters in images when the character background is complex.

Double click the **DL Character Location**, select specific model in **Model Settings**, and set operating parameters.

### Note

- Refer to **ROI Settings** for setting **Image Input** and **ROI Area**.
- This tool has a default model file in **Model Settings**. You can also click **Upload** to upload new model files created by the deep learning training tool.



## Parameter Settings

**Table 8-1 Parameter Description**

Parameters	Description
Max. Number to Find	It refers to the max. character quantity to be searched. Its range is from 1 to 100.
Min. Confidence	It refers to the min. score for the character location box. Its range is from 0.01 to 0.99.
Overlap Rate	It refers to the overlap rate of character location boxes. Its range is from 0.01 to 1.
Link Threshold	This parameter sets the ability to link single character location box to form a location box for text lines. The larger the value, and it is harder to form a location box for text lines. Its range is from 0.01 to 1.
Sort Type	It refers to the character's sorting order, including X Desc, Y Desc and Confidence Desc.
Character Angle Enable	It sets the relative angle range tolerance for target characters. To search a target with rotation change, you need to set it accordingly, and angle range is from -180° to 180°.
Character Width Enable	If it is enabled, characters whose width are within this range can be detected. The range is from 1 to 4000.
Character Height Enable	If it is enabled, characters whose width are within this range can be detected. The range is from 1 to 4000.

## Result Display

In **Judge Method**, you can set different judge methods for character location result, including **Judge by Quantity** and **Confidence Check**.

In **Image Display**, click  to display or not display detection area and target box. Click  to edit OK color, NG color, and transparency.

In **Show Text**, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

## 8.4.3 Deep Learning Classification

Deep learning classification is an image processing method for distinguishing the targets of different types according to the different features reflected in image information. It uses the PC to analyze images, and classifies each pixel or region in an image into several categories so as to replace human beings' visual judgment. It has been widely applied into object recognition and sorting.

Double click the **DL Classification**, select specific model in **Model Settings**, and set operating parameters.



### Note



- Refer to **ROI Settings** for setting **Image Input** and **ROI Area**.
  - This tool has a default model file in **Model Settings**. You can also click **Upload** to upload new model files created by the deep learning training tool.
- 

## Parameter Settings

**First K Categories:** It outputs the index number and corresponding confidence of the highest confidence score of K categories.

## Result Display

In **Judge Method**, you can set different judge methods for classification results, including **Judge by Quantity**, **Judge by Probability**, **Judge by Category No.**, **Judge by Category Name**, and **Judge by Confidence**.

In **Image Display**, click  to display or not display detection area and target box. Click  to edit OK color, NG color, and transparency.

In **Show Text**, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

### 8.4.4 Deep Learning Object Detection

The aim of object detection is to identify and locate target objects we need from images, and object detection lays a foundation for subsequent image applications. While DL object detection overcome shortcomings of poor adaptability of traditional detection algorithm, high requirements for updating the background model, and poor feature extraction robustness, etc. The DL object detection greatly improves the detection model in terms of accuracy and efficiency.

Double click the **DL Object Detection**, select specific model in **Model Settings**, and set operating parameters.

 **Note**

- Refer to **ROI Settings** for setting **Image Input** and **ROI Area**.
- This tool has a default model file in **Model Settings**. You can also click **Upload** to upload new model files created by the deep learning training tool.



### Parameter Settings

**Table 8-2 Parameter Description**

Parameters	Description
Max. Number to Find	It refers to the max. quantity of objects to be searched. Its range is from 1 to 100.
Min. Confidence	It refers to the min. score for target objects. Its range is from 0.01 to 0.99.
Max. Overlap Rate	It refers to the max. overlap rate of two target objects. Its range is from 0.01 to 1.
Angle Enable	It sets the relative angle range tolerance for target objects. To search an object with rotation change, you need to set it accordingly, and angle range is from -180° to 180°.
Width Enable	If it is enabled, target objects whose width are within this range can be detected. The range is from 1 to 4000.
Height Enable	If it is enabled, target objects whose height are within this range can be detected. The range is from 1 to 4000.

### Result Display

In **Judge Method**, you can set different judge methods for classification results, including **Judge by Quantity**, **Judge by Confidence**, **Judge by Category No.**, and **Judge by Category Name**.

In **Image Display**, click  to display or not display detection area and target box. Click  to edit OK color, NG color, and transparency.

In **Show Text**, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

### 8.4.5 Deep Learning Character Recognition

Character recognition is a process of converting image information into symbols that can be represented and processed by the PC. With features of low rejection rate, low error rate, fast recognition speed, high stability, friendly user interface, etc., DL character recognition is widely applied to dot and matrix character recognition, IC chip character recognition, inkjet character recognition, etc. Character training is required before character recognition, and it is recommended to use character recognition tool together with character location tool.

Double click the **DL Character Recognition**, select specific model in **Model Settings**, and set operating parameters.

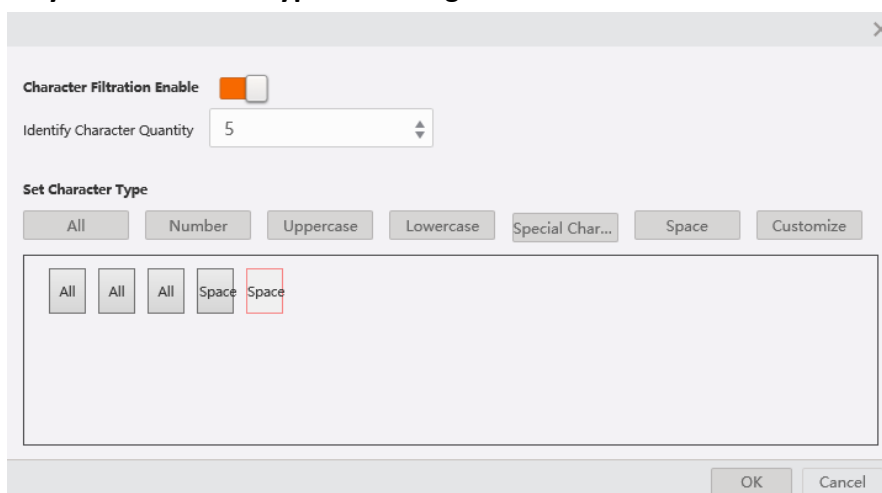
#### Note

- Refer to **ROI Settings** for setting **Image Input** and **ROI Area**.
- This tool has a default model file in **Model Settings**. You can also click **Upload** to upload new model files created by the deep learning training tool.

### Parameter Settings

**Character Filtration:** It is used to set character types you want to let DL Character Recognition recognize and filter unwanted types to improve recognition accuracy.

Click **Character Filtration**, enable **Character Filtration Enable**, set **Identify Character Quantity** and **Character Type** according to actual demands.




**Figure 8-16 Enable Character Filtration**

**Min. Confidence** refers to the min. score for recognizing characters. Its range is from 0 to 0.99.

### 8.4.6 Image Savings

This tool is used to save image caches into the device, and saved images can be downloaded to the local or be exported to the test library for the device debugging. Refer to Section **Image Saving Management** for details.

**Image Source:** By default, the image source is the images acquired by the device.

**Input Status:** Click  to link the previous module status, and image saving is decided by the linked data result.

After **Image Source** and **Input Status** are entered, you should select the **Save Mode, Picture Format** (RAW, BMP, JPG), and **Image Saving** according to actual demands.

---

 **Note**

**Save Mode** has 2 types, including stop\_save and cover\_save. If you select stop\_save, images will not be saved when max. save number is reached. If cover\_save is selected, current images will be saved but previous saved image will be covered.

---

You can enable **Frame No.**, **Trigger No.**, and **Result** to save the current image's related information. **Start Tag and End Tag** allows you to set the start and end characters of the image name, and uppercase and lowercase letters, digits, as well as ! @ # ^ & ( ) - \_ = + . , ; ' are allowed.

**Delimiter** refers to the content you used to separate the image name, and uppercase and lowercase letters, digits, as well as ! @ # ^ & ( ) - \_ = + . , ; ' are allowed.

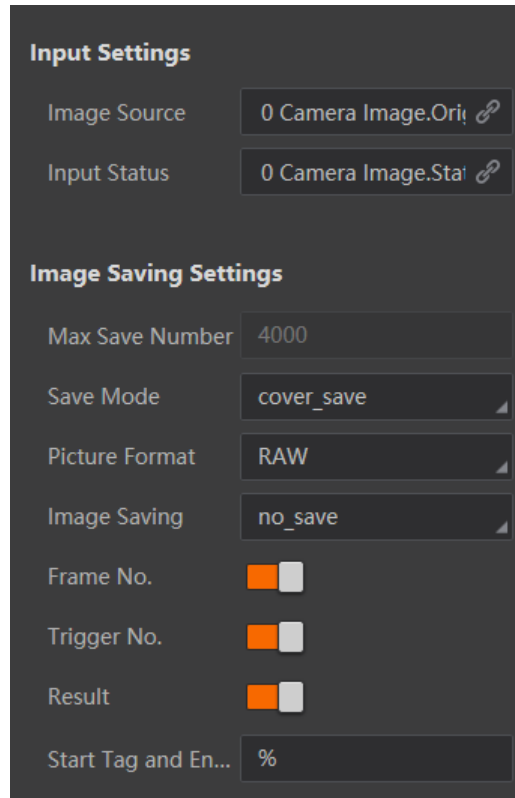


Figure 8-17 Image Saving Settings

### 8.4.7 Feature Matching

This tool uses the edge feature of the image as a template to determine the search space in accordance with the preset parameters, and to search targets that are similar to the template in images.

---

 **Note**

Make sure that the pixel format is mono 8 when using this tool.

---

#### Feature Template

There are 2 ways to create feature template for feature matching. Go to **Template**, and click **Upload** to upload local template to create feature template. Or click **Create** to create feature template.

---





 **Note**

For new solution, it is recommended to click **Create** to create feature template.

---

## Create Feature Template

### Steps

1. Click **Create** to create template.
2. Click **Select Current** or **Select Other** as template.
3. Click  to create rectangle mask.
4. Click  to select the matching point location, and move the blue cross in the image to the ideal location.
5. Click  and **OK** to create a template.
6. Optional: Set **Scale Mode** and **Threshold Mode** according to actual demands.
  - **Scale Mode** refers to the fineness level of the feature, and it includes manual and auto modes. Under auto mode, the device will automatically adjust fineness level of the feature. Under manual mode, you can manual set its range between 1 and 20 in **Roughly Adjust Scale**. The larger the feature scale, the sparser the extracted feature edge points are.
  - **Threshold Mode** refers to the gray value difference between the feature point and the surrounding background, and it includes manual and auto modes. Under auto mode, the device will automatically adjust. Under manual mode, you can manual set its range between 0 and 255 in **Contrast Threshold**.
7. Optional: Click  to download the current template to the PC.

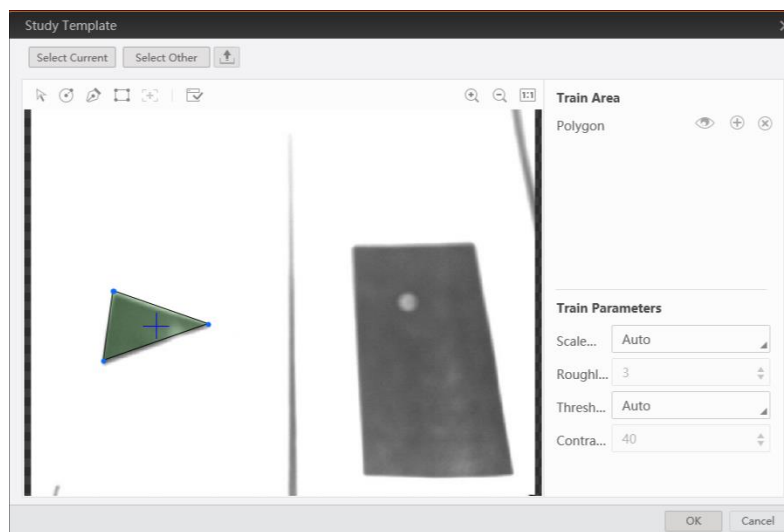


Figure 8-18 Create Feature Template

### Parameter Settings

**Min. Match Score:** The match score refers to the similarity between feature template and targets in the searched images. The min. match score refers to the similarity threshold. The searched target will be searched when the similarity reaches this threshold. This parameter also affects the search speed.

**Max. Match Quantity:** It is the max. target quantity that can be searched.



**Match Polarity:** It includes **No Polarity** and **Polarity**.

**Angle:** It is the angle range of searched targets. The edited template is the reference.

**Scale:** Zoom in and zoom out with same scale. It is applied for the target and template with certain percentage.

**Max. Overlap Rate:** The higher the overlap rate, the larger the overlap area that can be tolerated. The increase of overlap rate may reduce the search speed, and introduce false detections.

**Extension Threshold:** The portion of missing features compared with the complete feature when the image is incompletely displayed at the edge of the image. When the searched target displayed at the edge of the image is incomplete, you can use this parameter to find the image.

**Sort:** You can specify the order in which the target is searched.

**Overtime Control:** When the time exceeds the time set by overtime control, the search will stop and no search result will be returned. If it is set as 0, the overtime control function is disabled.

**Threshold Type:** It indicates contrast threshold mode in the matching stage, and it has 3 type, including **Auto**, **Model** and **Manual**. **Auto:** It automatically determines the threshold parameter according to the target image. **Model:** It uses the contrast threshold of the template as the contrast threshold in matching phase. **Manual:** It uses the threshold set by the user as the threshold parameter for searching.

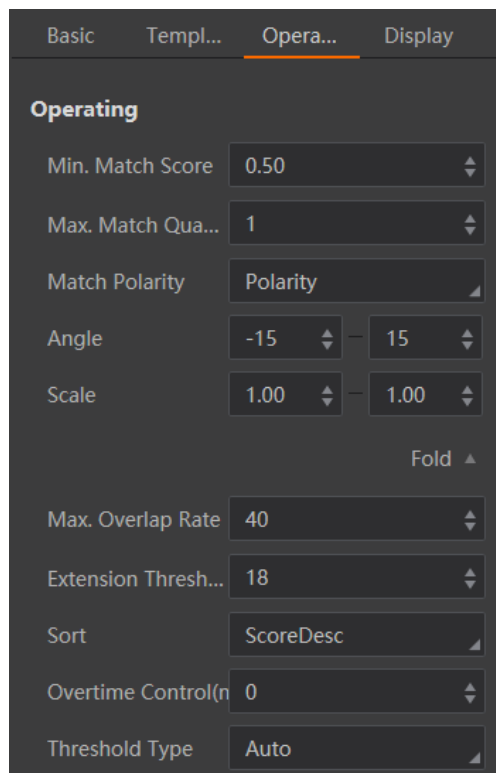




Figure 8-19 Set Operating Parameters

## Result Display

In display area, you can set different judge methods of image detection result, including quantity, angle, scale, etc.

In **Judge Method**, enable **Judge by Quantity**, **Judge by Angle**, **Judge by Scale**, **Judge by Score**, **Judge by Match Point X**, **Judge by Match Point Y**, **Judge by Center Point X**, **Judge by Center Point Y**, and enter corresponding range according to actual demands.

In **Image Display**, click  to display or not display image detection area, fuzzing match results, and fuzzing match point. Click  to edit OK color, NG color, and transparency.

In **Show Text**, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

### 8.4.8 Fixture Settings

Fixture is a tool for assisting the positioning and correcting the target motion deviation. The position deviation reference can be set up according to the matching point and the matching frame angle in the template matching result. Then the coordinate and rotation deviation of ROI detection frame can be realized according to the relative deviation of feature matching result and reference position.

**Origin X** and **Origin Y** Link the matching point of template to the origin point of position deviation.

**Reference Angle** links the matching frame angle to the angle of position deviation.

You need to click **Initialize Reference** before creating a reference, and click **Create Reference** to create a reference.

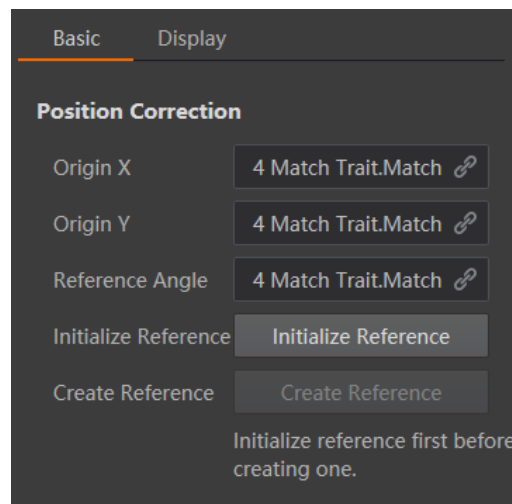




Figure 8-20 Fixture Settings

## Result Display

In **Image Display**, click  to display or not display running point and reference point. Click  to edit OK color, NG color, and transparency.

### 8.4.9 Blob

Blob analysis means that the process of detecting, locating, or analyzing the target object in an image region where the pixel is a finite grayscale. The Blob analysis tool provides certain features of the target object in the image, such as presence, quantity, position, shape, direction, and topological relation between Blobs.

---

#### Note

Make sure that the pixel format is mono 8 when using this tool.

---

## Parameter Settings

**Threshold Method:** It includes 4 methods, including **No Binarization**, **Single Threshold**, **Double Threshold**, and **Auto Threshold**.

**Polarity:** It has 2 modes, including **Darker than Background**, and **Brighter than Background**. **Darker than Background** means that the feature image pixel value is lower than the background pixel value. **Brighter than Background** means that the feature image pixel value is higher than the background pixel value.

---

#### Note

This parameter takes effect when selecting **Single Threshold** or **Auto Threshold** as **Threshold Method**.

---

**Searching Quantity:** It searches the quantity of Blob image.

**Min. Size of Hole:** It refers to the min. non-Blob area size in Blob area. If the parameter is not larger than this value, the hole will be filled with Blob.

**Enable Area:** After enabling area, you can set the area range where Blob will be searched.

**Enable Circumference:** After enabling circumference, you can set the circumference range where Blob will be searched.

**Enable Minor Axis:** After enabling it, you can enter the range of short axis.

**Enable Major Axis:** After enabling it, you can enter the range of long axis.

**Enable Circularity:** After enabling circularity, you can set circularity range where Blob will be searched.

**Enable Rectangularity:** After enabling rectangularity, you can set rectangularity range where Blob will be searched.

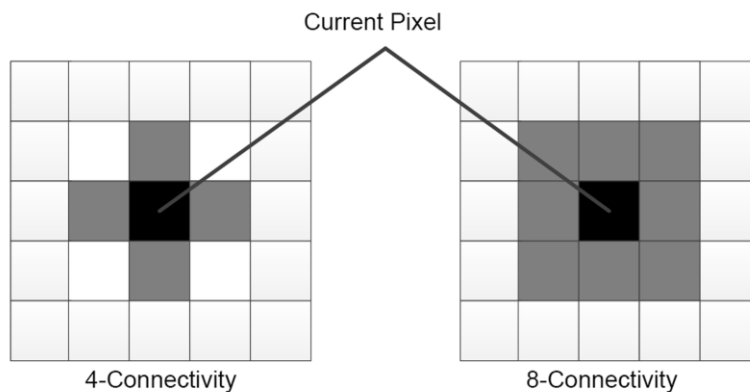
**Enable Centroid Offset:** It refers to the absolute pixel offset between the Blob centroid and the minimum area of the Blob circumscribed rectangle.

**Axis Range Enable:** After enabling axis range, enter range according to actual demands.

**Sort Feature:** It includes **Area**, **Perimeter**, **Circularity**, **Rect**, **Centroid X**, **Centroid Y**, **Box Angle**, **Box Width**, **Box Height**, etc.

**Sort:** It includes **Grade Up**, **Grade Down**, and **Not Grade**.

**Connectivity:** In image processing, the object we are interested in is usually a combination of interconnected pixels. Therefore, in order to obtain an area, we must calculate all the connected areas that are contained in the area after division. On a rectangular pixel grid, there are two definitions of connectivity. The first one is that the two pixels have a common edge, that is, one pixel is above, below, to the left or to the right of the other pixel, which is called 4-connectivity. The second definition is the extension of the first definition. The adjacent pixels on the diagonal line are also included, which is called 8-connectivity.



**Figure 8-21 Connectivity**

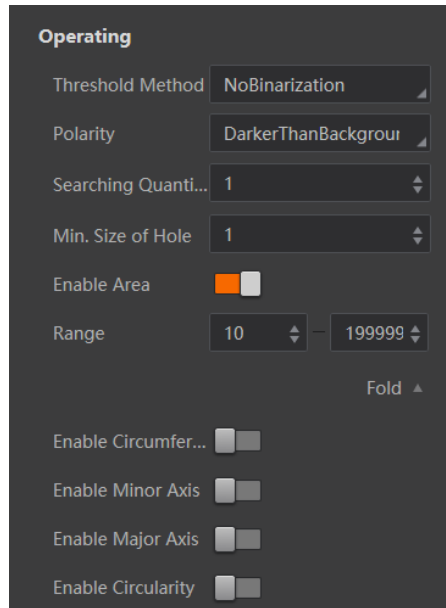



Figure 8-22 Set Operating Parameters

## Result Display

In display area, you can set different judge methods of image detection result, including Blob quantity, Blob area, centroid X, centroid Y, angle, center X, center Y, etc.

In **Judge Method**, enable **Judge by Blob Quantity**, **Judge by Blob Area**, **Judge by Centroid X**, **Judge by Centroid Y**, **Judge by Angle**, **Judge by Center X**, **Judge by Center Y**, etc., and enter corresponding range according to actual demands.

In **Image Display**, click  to display or not display Blob and detection area. Click  to edit OK color, NG color, and transparency.

In **Show Text**, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

---

### Note

After applying Blob tool, you can view and select output results in the image display area. Refer to section Operate Image for details.

---

## 8.4.10 Color Conversion

---

### Note

This tool is available for color vision sensors only.

---

This tool is used to convert the color space in the specified area of the color image, and output the

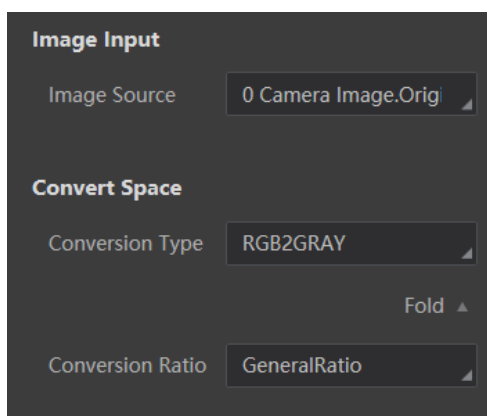
gray image of this area after color conversion.

Select **Input Source**, and select **RGB2GRAY**, **RGB2HSV** or **RGB2HSI** as **Conversion Type** according to actual demands. If **RGB2GRAY** is selected as **Conversion Type**, you can set **Conversion Ratio** that includes **General Ratio**, **Average Ratio**, **Channel Min**, **Channel Max**, **User Ratio**, **R Channel**, **B Channel**, and **G Channel**.

**Table 8-3 Conversion Type Description**

Conversion Type	Description
General Ratio	$0.299r + 0.587g + 0.114b$ . r stands for the gray value of the R channel, g stands for the gray value of the G channel, and b stands for the gray value of the B channel.
Average Ratio	$(r + g + b) / 3$ .
Channel Min	Min (r, g, b)
Channel Max	Max (r, g, b)
User Ratio	You can enter R/G/B conversion ratio according to actual demands.
R Channel	$r + 0*g + 0*b$ .
B Channel	$0*r + 0*g + b$ .
G Channel	$0*r + g + 0*b$ .

If **RGB2HSV** or **RGB2HSI** is selected as **Conversion Type**, you can set **Display Channel** to select the specific channel to display.






**Figure 8-23 Color Conversion**

**Note**

After applying color conversion tool, you can view and select output results in the image display area. Refer to section Operate Image for details.

### 8.4.11 Format Tool

This tool is used to integrate and format data, and output string. In basic interface, you can click  to subscribe data that is needed formatting, click  to add text information, click  to add semicolon, and then click **OK**.

#### Note

When configuring multiple data, if one of data cannot be obtained, format exception may occur.

In display interface, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

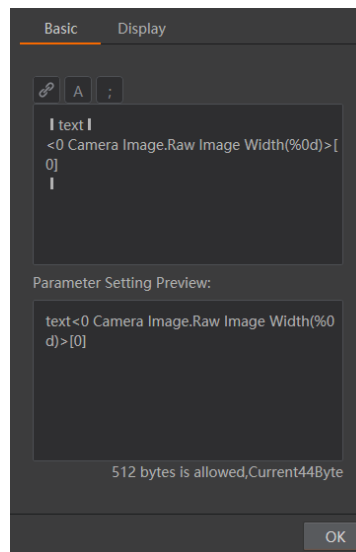




Figure 8-24 Format Tool

### 8.4.12 Logic Tool

This tool allows you to select different logical operation types and execute logic operation. Select **AND**, **OR**, **NOT**, **NAND** or **NOR** as **Logical Operation Type**, and click  to link data source or enter data directly. You can also click  to add multiple data.

#### Note

If there is logic module in the solution, you can go to **Solution** → **Others** → **Solution Result** to link the result of logic tool to the solution.

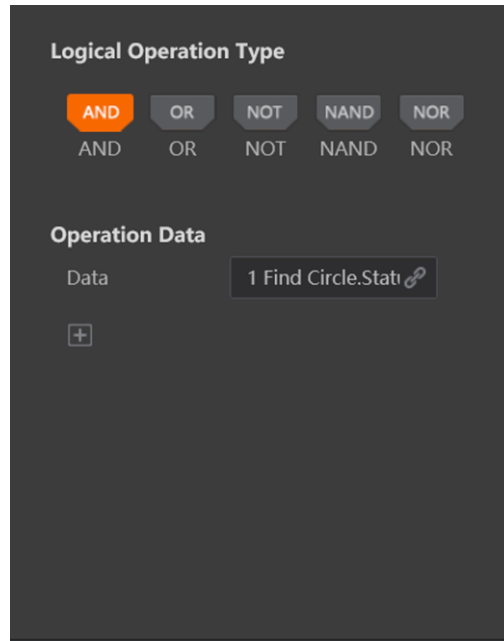


Figure 8-25 Logic Tool

### 8.4.13 String Comparison Tool

This tool is used to compare and verify the output information of the character recognition tool.

You need to link the result of the character recognition in **Input Character** first, set **Field Classification** (including date, time and custom), select **Standard Value**, enter **Increased Value**, **Decreased Value**, and **Comparison Type** according to actual demands.

#### Note

- If you select **Full** as **Comparison Type**, only when characters are same with **Standard Value**, and **OK** will be output. If **Range** is selected as **Comparison Type**, when characters are within the range of **Increased Value** and **Decreased Value**, **OK** will be output.
- If you select custom as **Field Classification** and the **Standard Value** is not number, only the full comparison type is valid.
- If you enable the function of filter special character, this tool will filter the special character you entered before comparison.



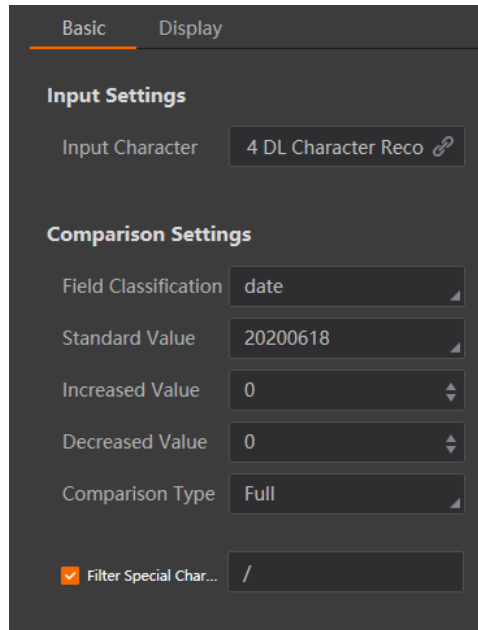


Figure 8-26 String Comparison Tool

## 8.5 Communication Settings

The communication settings determines how the device outputs data, and you can go to **Solution** → **Output** to select different communication tools according to actual demands.

### 8.5.1 UDP

In basic parameter interface, set output information as **Input Variable**, and enter **Local IP**, **Local Port**, **Target IP** and **Target Port** according to actual demands.

---

#### Note

**Input Variable** currently supports format result data only.

---

In display interface, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

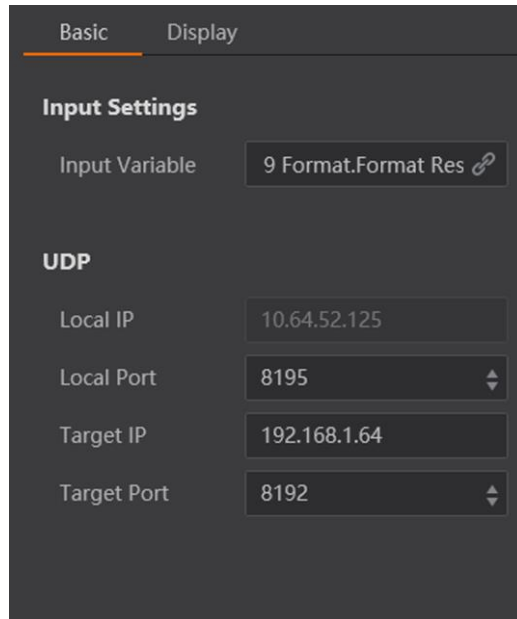


Figure 8-27 UDP

### 8.5.2 TCP Client

In basic parameter interface, set output information as **Input Variable**, and enter **Target IP** and **Target Port** according to actual demands.

**Note**

**Input Variable** currently supports format result data or result of other communication tools.

In display interface, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

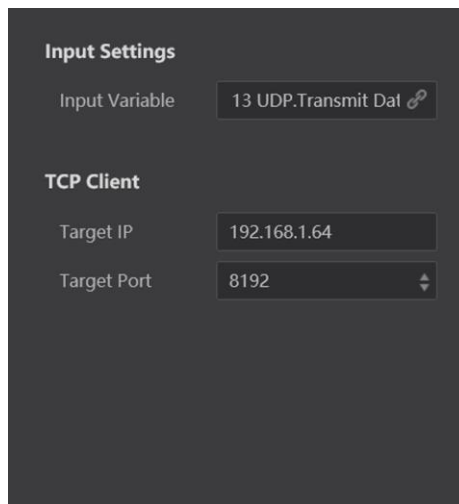


Figure 8-28 TCP Client

### 8.5.3 TCP Server

In basic parameter interface, set output information as **Input Variable**, and enter **Local IP** and **Local Port** according to actual demands.

 **Note**

**Input Variable** currently supports format result data or result of other communication tools.

In display interface, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

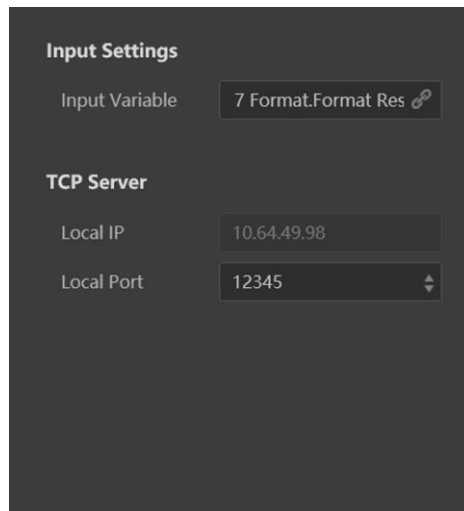


Figure 8-29 TCP Server

### 8.5.4 Serial

In basic parameter interface, set output information as **Input Variable**, and enter **Serial Port Mode**, **Baud Rate**, **Parity Bit** and **Stop Bit** according to actual demands.

 **Note**

- **Data Bit** is 8 by default, and it can be read only.
- **Input Variable** currently supports format result data or result of other communication tools.

In display interface, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

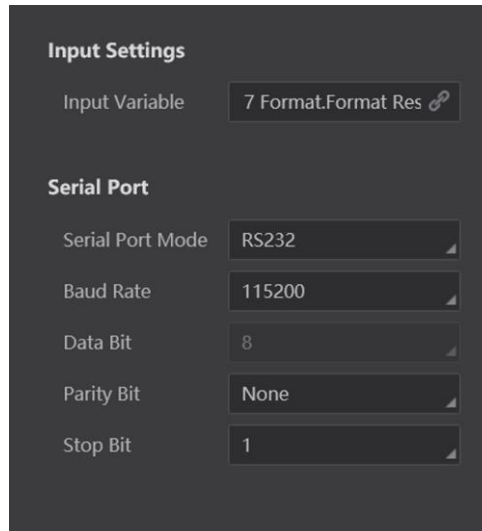


Figure 8-30 Serial

### 8.5.5 IO Communication

The IO communication allows you to output solution result via IO. The device has 3 outputs, including IO3, IO4, and IO5.

#### Note

One IO module can set multiple IO statuses, but one solution supports one IO module at most.

**Output Type:** It includes **NG\_Output**, **OK\_Output**, and **exp\_event**. **NG\_Output** means that when the solution result is NG, the device will output data. **OK\_Output** means that when the solution result is OK, the device will output data. **exp\_event** means that once the device exposures and acquires images, the device will output data.

#### Note

- If **exp\_event** is selected as **Output Type**, you can set advance time of exposure in **Advance**.
- The **Advance** parameter may differ by device models.

**Output Condition:** It links the results of previous module.

#### Note

If **exp\_event** is selected as **Output Type**, **Output Condition** and **Cache Enable** are unavailable.

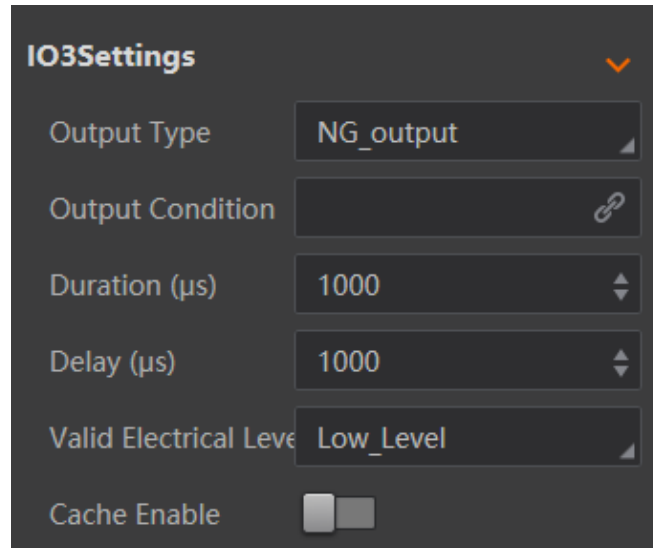
**Duration** refers to the duration of outputting IO signal. **Delay** refers to the waiting time before the device outputs IO output signal. **Valid Electrical Level** sets what electrical level is valid, and you can select low level or high level according to actual demands.

You can also enable **Cache Enable** to output trigger cache, and the device can save up to 32 output

trigger signals.

**Note**

The trigger signal within the delay you set can use **Cache Enable** function only.



**Figure 8-31 IO Communication**

In display interface, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

### 8.5.6 FTP

In FTP communication, set the image file of the device as **Image Source**, and set the previous module status as **Input Status**.

When using FTP as communication tool, you need to set target IP, target port, user name, password, image saving, frame index, result, start tag and end tag, and separator according to actual solution demands.

**Table 8-4 Parameter Description**

Parameters	Description
Target IP and Port	It refers to the IP and Port of FTP server.
User Name	Enter user name to log in FTP.
Password	Enter password to log in FTP.
Image Saving	It sets when to save images. It includes <b>no_save</b> , <b>ok_save</b> , <b>ng_save</b> , and <b>ok&amp;ng_save</b> .
Frame No.	If you use image saving function, you can enable frame index to save the image frame number.

Parameters	Description
Result	If you use image saving function, you can enable result to link input status result.
Start Tag and End Tag	It refers to the start and end tag of image name. You can enter lowercase and uppercase letter, digit, and @ # ^ & ( ) - _ = + . , ; '.
Delimiter	It is used to separate each content like image frame number, start and end tag. You can enter lowercase and uppercase letter, digit, and @ # ^ & ( ) - _ = + . , ; '.
FTP Connection Detection	You can click <b>Connection Detection</b> to detect FTP connection status.

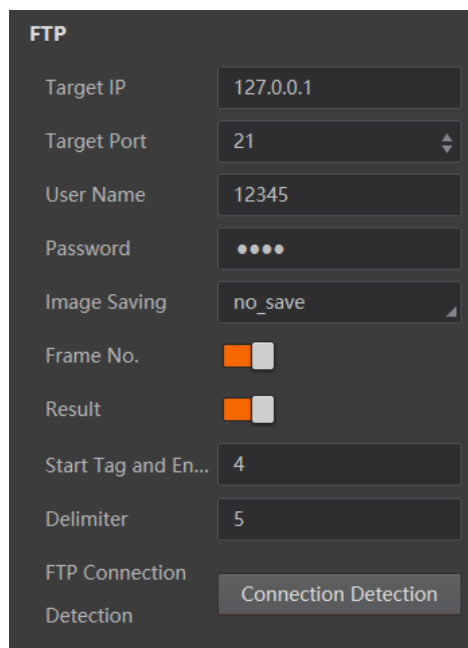


Figure 8-32 FTP

### 8.5.7 Modbus

Modbus is a communication protocol developed by Modicon systems. In simple terms, it is a method used for transmitting information over serial lines between electronic devices. The device requesting the information is called the Modbus Master and the devices supplying information are Modbus Slaves.

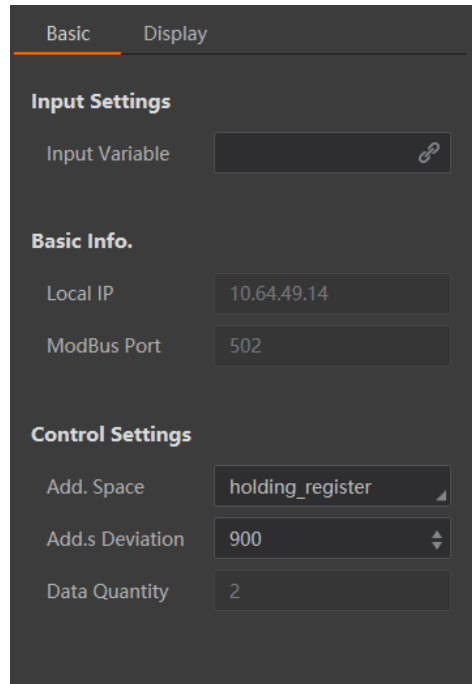
#### Note

The device is Modbus slave, and its port is 502.

Refer to the table below for specific parameter description.

**Table 8-5 Parameter Description**

<b>Parameter</b>	<b>Description</b>
Input Settings	
Input Variable	It currently supports format result data or result of other communication tools.
Basic Info.	
Local IP	It refers to the IP address of the device.
Modbus Port	It is 502 by default.
Control Settings	
Add. Space	It is holding_register by default.
Add. Deviation	It refers to the address deviation, and ranges from 0 to 900.
Data Quantity	It is 2 by default.
Status Settings	
Add. Space	It is input_register by default.
Add. Deviation	It refers to the address deviation, and ranges from 0 to 900.
Data Quantity	It is 2 by default.
PLC Input Settings	
Add. Space	It is input_register by default.
Add. Deviation	It refers to the address deviation, and ranges from 910 to 2000.
Data Quantity	It is 2000 by default.



**Figure 8-33 Modbus**

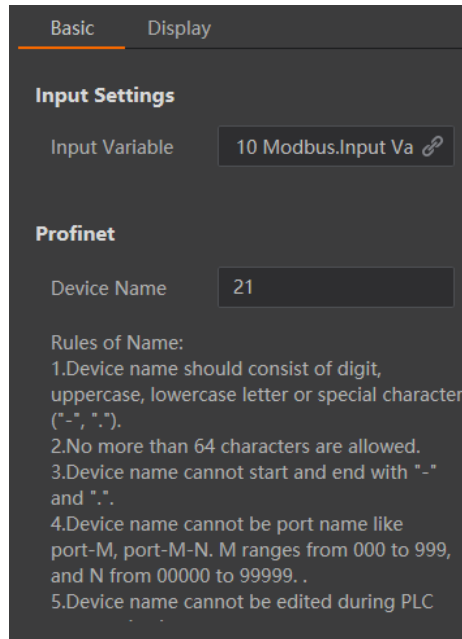
In display interface, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

### 8.5.8 Profinet

Profinet is an industry technical standard for data communication over industrial Ethernet, designed for collecting data from, and controlling equipment in industrial systems, with a particular strength in delivering data under tight time constraints.

In basic parameter interface, you should enter **Device Name** according to actual demands.





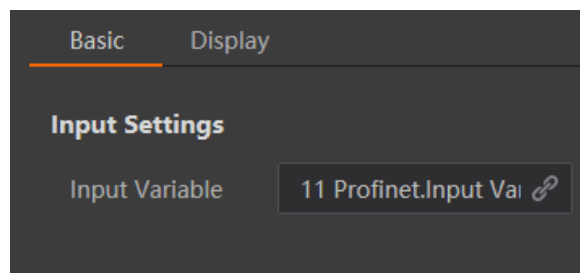
**Figure 8-34 Profinet**

In display interface, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

### 8.5.9 Ethernet/IP

Ethernet/IP is a network communication standard capable of handling large amounts of data at speeds of 10 Mbps or 100 Mbps, and at up to 1500 bytes per packet. It is an application layer protocol, and is especially popular for control applications.

After completing settings in PLC (Programmable Logic Controller), you can use the Ethernet/IP communication to link the result data, and run the solution continuously.



**Figure 8-35 Ethernet/IP**

In display interface, enable **Display Text** to set text's color, front size, transparency, position X, and position Y.

## 8.6 Solution Completion

The others module, you can set solution name and save solution, set solution running interval and permission assignment, etc.

In **Save Solution**, you can enter a solution name.

---

### Note

After creating a new solution, if you do not change the default solution name (**Untitled**), you cannot save it.

---

In **Enable Running Items**, you can set the solution continuous running interval.

---

### Note

It only takes effect when the **Trigger Mode** is **OFF**.

---

If you have enabled technician permission, you can check **All in Permission Assignment** to open all modules to technician, or check specific ones to assign them to technician.

---

### Note

You need to go to **System** → **User Management** → **Technician** → **Technician Permission** to enable technician permission first.

---

In **Solution Result**, if you have used a logic tool in your solution, you can view and link the result of logic module to the solution.

---

### Note

You can link only one logic module result at one time.

---

After editing solution name, setting continuous running interval, and so on, you can click **Save** to save the solution, or click **Download** to download the solution to the PC.

The screenshot displays a dark-themed user interface with a top navigation bar containing four tabs: '1 Camera', '2 Tool', '3 Output', and '4 Others'. The '4 Others' tab is highlighted in orange. Below the navigation bar, the interface is divided into several sections:

- Save Solution:** A section with a 'Solution Name' label and a text input field containing the text 'Untitled'.
- Enable Running Items:** A section with a 'Running Interval (ms)' label and a numeric input field containing the value '34'.
- Permission Assignment:** A section containing a list of checkboxes for various permissions: 'All', '0Camera Image', '1DL Character L...', '2DL Character...', '3Match Trait', '4UDP', '5TCP Client', '6TCP Server', '7Serial', and '8IO'. All checkboxes are currently unchecked.
- Solution Result:** A section with a 'Solution Result' label and a 'View' button.

At the bottom of the interface, there are two buttons: 'Save' and 'Download'.

**Figure 8-36 Solution Completion**

## Chapter 9 Solution Operation

In basic information module, you can operate and switch different saved solutions, view device information, etc.

### 9.1 Control Solution

The solution control is used to control solution operation or not, and display solution result.



Figure 9-1 Control Solution

Table 9-1 Icon Description

Icon	Description
	Click it to start solution operation for once only.
	Click it to start solution operation continuously.
	Click it to end solution operation.
	<p>It displays the operation status of the solution.</p> <ul style="list-style-type: none"> <li>When logic tool is not selected, the system displays the result of all modules operation and calculation. If the result is 0, the system displays NG. Otherwise, the system displays OK.</li> <li>When logic tool is selected, the system displays the result of logic tool you selected.</li> </ul>

### 9.2 View Solution Status


The solution operation information module records and displays the solution name, running time, detection quantity, and NG quantity in real-time.

You can view and edit the solution name. Click to edit solution name.

#### Note

If it is a newly created solution, the solution name is **Untitled** by default. You cannot edit unnamed solution name here.

**Run Time** refers to the device running time from powering on to current solution operation. When the solution is not operating, operating time stops. When the solution continues to operate or load other solutions, it continues to operate.

**Total** refers to the total quantity of detected image from device powering on to now. Click  to reset total quantity and NG quantity. If the device is acquiring images, and resetting will stop device acquisition.

**NG** refers to the total quantity of image with NG result from device powering on to now.

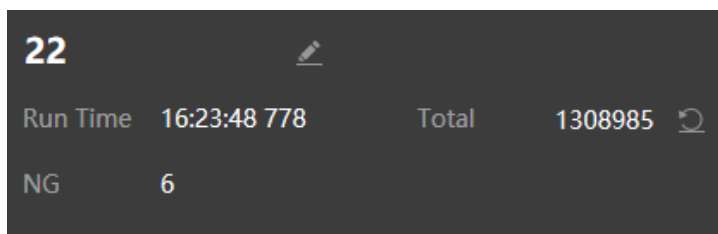


Figure 9-2 View Solution Status

### 9.3 Manage Solution

The solution management module can set and switch among multiple solutions.

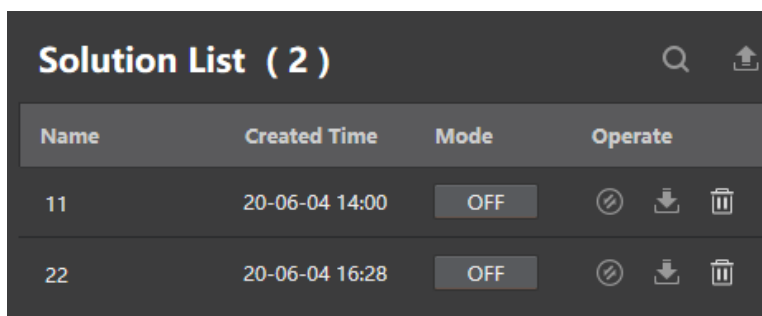






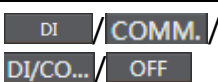


Figure 9-3 Manage Solution

Table 9-2 Icon Description

Icon	Description
	You can search the solution here if there are many solutions.
	Click it to upload local solutions to the device.
	Click it to create a new solution.
	Click it to execute the selected solution.
	Click it to download the current solution to the PC.
	Click it to delete the selected solution. You cannot delete the executing solution.
	The device has 4 ways to switch solution, including <b>DI</b> , <b>COMM.</b> , <b>DI/COMM.</b> , and <b>OFF</b> .

The **DI** stands for digital IO, and it switches solution via external trigger signal. The trigger source includes line 0, line 1, and line 2. After enabling **DI**, set **Trigger Source** and **Trigger Type**, and enter **Filter Time** according to actual demands.

 **Note**

Each trigger source can link one solution only.  
 If the duration of trigger signal is smaller than filter time, and this trigger signal is ignored.  
 When specific trigger source is used in DI for switching solutions, you cannot use it as a trigger source for triggering device to acquire images.

**COMM.** stands for communication, and it switches solution via communication string. Go to **Output** to select communication tool to receive strings, and set related parameters. **DI/COMM.** refers to use both digital IO and communication string to switch solution. **OFF** refers to disable solution switch function.

## 9.4 View Camera Info

In device information area, you can view the device serial number, MAC address, subnet mask, firmware, and edit user ID or IP address.

 **Note**

Before editing IP address, you need to stop solution operation first. After editing, the device will reboot automatically, and you may enter new IP address in web browser to log in again.

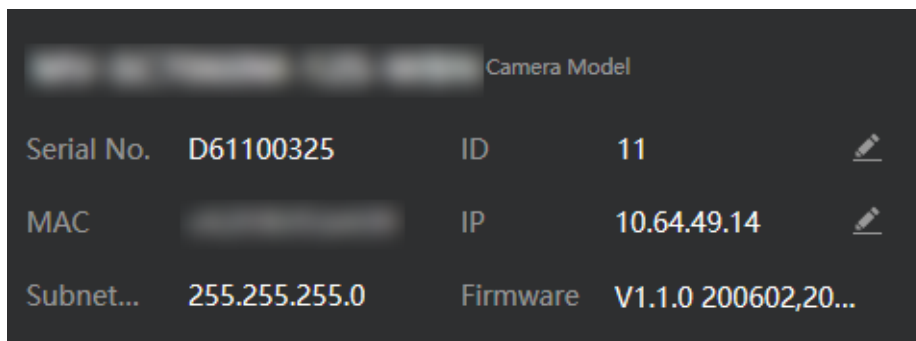
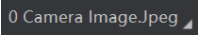
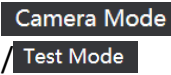







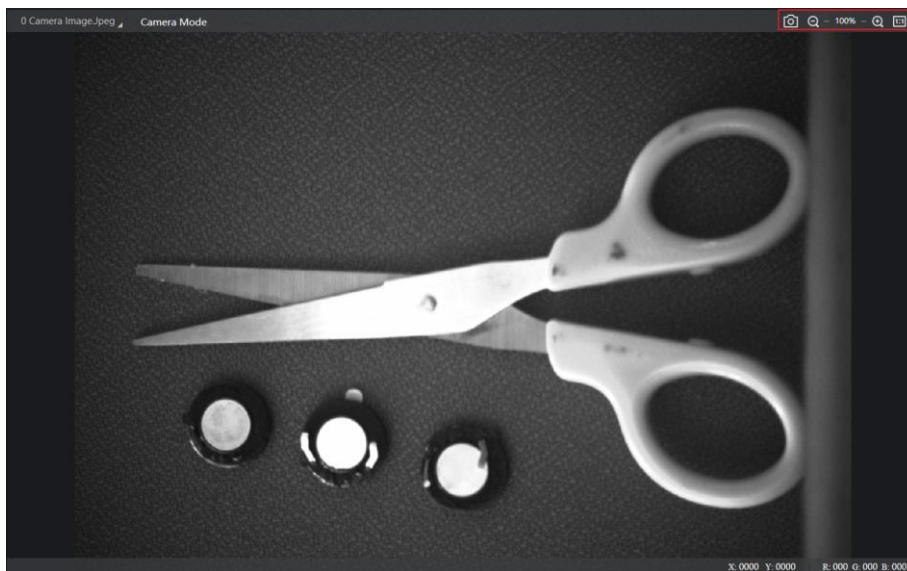
Figure 9-4 View Camera Info

## 9.5 Operate Image

After setting device parameters, click  or  to run a solution, and the device starts to acquire images. The function of different icons in the image display area is shown below.

**Table 9-3 Icon Description**

Icon	Description
	It displays output results after applying different tools. Currently, only Blob and color conversion tools support this function.
	It displays the current image mode that includes camera mode and test mode, and the default image mode is camera mode. If you enable <b>Image Test</b> in the test library, it will display test mode. Refer to section <b>Test Library Management</b> for details.
	Click it to download the image to the PC. The default format is JPG.
	Click it to zoom out the displayed image.
	It displays the current image-scaling ratio.
	Click it to zoom in the displayed image.
	Click it to set image size as 1:1.



**Figure 9-5 Image Display Area**

## Chapter 10 System and Maintenance

### 10.1 Permission and Password Management

In user management module, you can edit administrator password, set technician password and permission, etc.

#### 10.1.1 Set Admin Password

User management module allows you to edit admin password, set technician password and its permission to different operation modules.

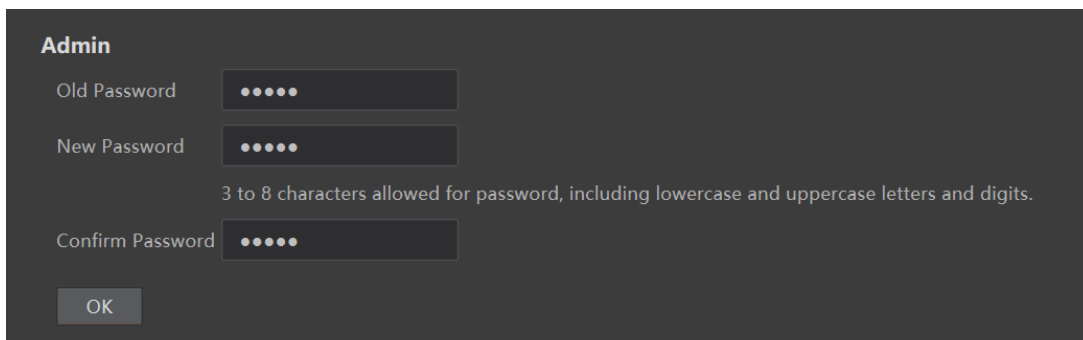
##### Note

- Only the admin has the permission to access to user management module. If you log in as technician, there is no this module.
- The admin can access to all operation and tool modules via web, and assign module operation permission to technician, while technician can access to and set module parameters assigned by the admin only.
- The default admin password is Abc1234.

Click **User Management**, enter **Old Password**, **New Password**, **Confirm Password**, and Click **OK**.

##### Note

After editing admin password, you need to log in again.



**Admin**

Old Password

New Password

3 to 8 characters allowed for password, including lowercase and uppercase letters and digits.

Confirm Password

OK

Figure 10-1 Set Admin Password

#### 10.1.2 Set Technician Permission and Password

When logging in as admin, you have the permission to set technician password and its permission



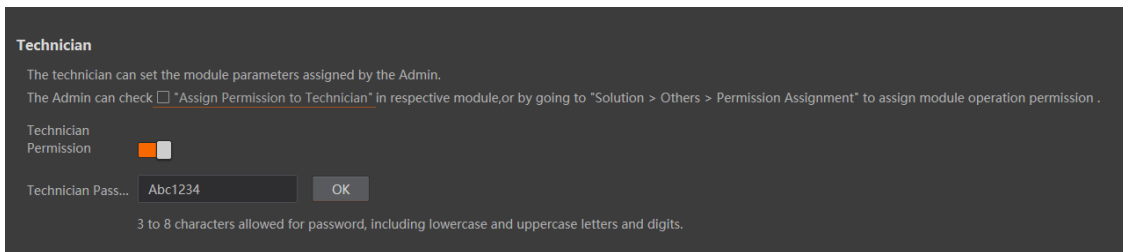
to different operation modules.

## Note

- The admin can access to all operation and tool modules via web, and assign module operation permission to technician, while technician can access to and set module parameters assigned by the admin only.
- If the technician permission is not enabled, you cannot log in as technician via web.
- The default technician password is Abc1234.

Click **User Management**, enable **Technician Permission** to enable technician permission, enter **Technician PWD**, and click **OK**.

You can check **Assign Permission to Technician** in respective module to assign module operation permission to technician, or go to **Solution** → **Others** → **Permission Assignment** to assign permission to the technician.

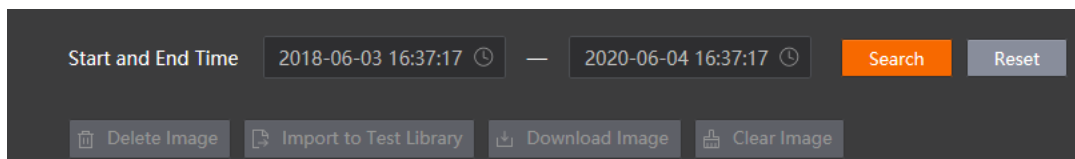


**Figure 10-2 Set Technician Permission and Password**

## 10.2 Image Saving Management

Image saving management allows you to search, delete, download, and import images that are saved via the image saving tool.

You can set specific time range to search images, and click **Search** to search images. If you want to delete, download or import images to test library, check images first, and click **Delete Image**, **Download Image** or **Import to Test Library** correspondingly. You can also click **Clear Image** to clear all images.



**Figure 10-3 Image Saving Management**

## 10.3 Test Library Management

Test library management allows you to use test images when run different solutions, and set image related parameters.

There are 2 ways to import test images, uploading local images and importing camera images. Click **Upload Local Image** to upload images from the local PC, and images of RAW, BMP and JPEG format are supported. Or click **Import Camera Image** to import camera images into the test library.

After importing images, you can select image types, click **Search** to search images, or click **Reset** to reset image types.

You can enable **All** to let all searched images be used as test images, or enable images separately to be used as test images. After that, you should enable **Image Test** and the device will use the images you selected to run solutions.

### Note

After **Image Test** is enabled, the camera mode displayed in the live window will become **Test Mode**. The default image mode is camera mode.

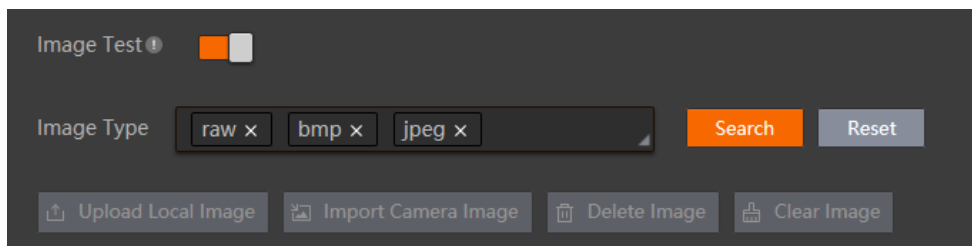


Figure 10-4 Test Library Management

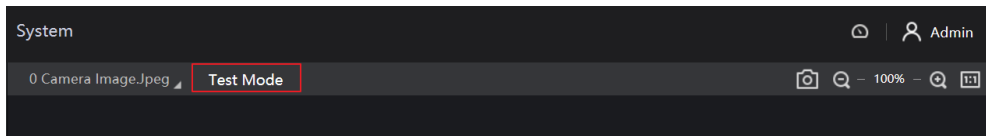


Figure 10-5 Test Mode

## 10.4 Display Settings

After checking **Open SmartView**, the device can be connected with SmartView Box device.

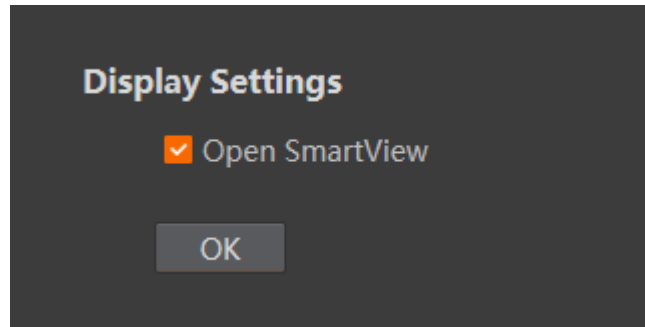


Figure 10-6 Show Settings

## 10.5 Synchronize Time

Time synchronization allows you to synchronize device time with that of local PC or server. It consists of auto mode by Network Time Protocol (NTP) server and manual mode.

### Steps

1. Click **System** → **Time Sync**.
2. Select time synchronization method.
  - Click **Manual**, select date and time from the calendar, or check **Sync. With PC** to synchronize the time of the device with that of the local PC.
  - Click **NTP**, enter **Server Add.**, **NTP Port**, and **Interval (Hour)**.
3. Click **Save**.

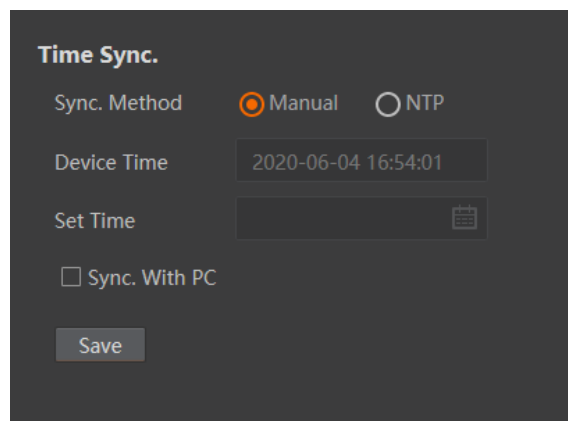


Figure 10-7 Time Synchronization

## 10.6 System Maintenance

System maintenance allows you to update firmware, restore factory settings, and reboot the

device.

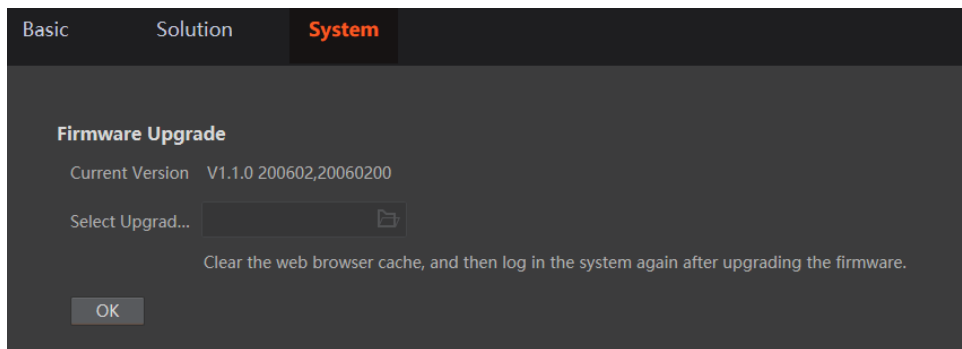
Firmware updating allows you to view current device firmware version, and update firmware.

---

### Note

- Make sure the device and solution stop operation when updating the firmware.
  - After updating, the device will automatically reboot, and the web will automatically jump to login interface.
  - Only the admin can update firmware and restore factory settings.
- 

You can select update file from the local PC, and click **OK** to update firmware.



**Figure 10-8 Update Firmware**

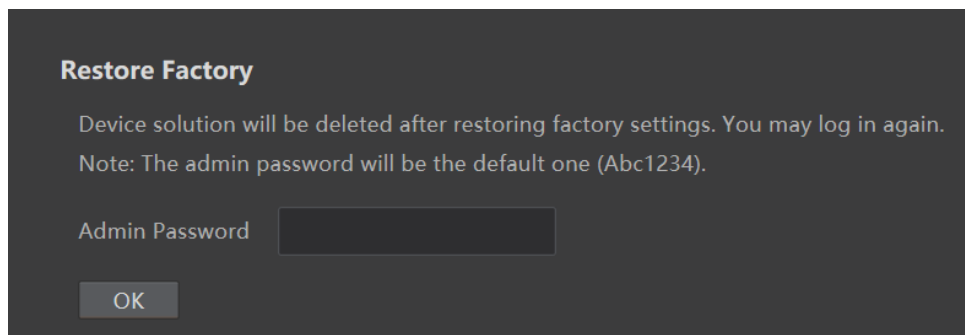
If you want to restore the device to factory settings, enter **Admin Password** and click **OK**.

---

### Note

Device solutions will be deleted after restoring defaults. You may log in again, and the admin password will be the default one (Abc1234).

---



**Figure 10-9 Restore Factory**

You can also click **Reboot** to reboot the device.

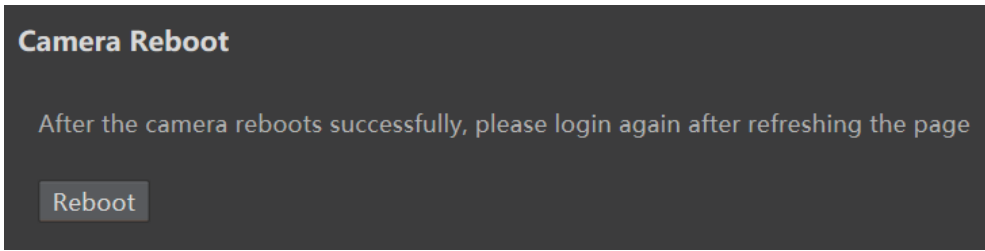


Figure 10-10 Reboot Device

## 10.7 View Log

Log module allows you to view device and web operation records, and search and download logs.

No.	Time	Type	Event
1		▲	Module permission list obtained.
2		▲	Module created. 5Match Trait
3		▲	Module created. 4Match Trait
4		▲	User configuration configured.
5		▲	User configuration configured.
6		▲	User configuration configured.
7		▲	Module deleted. 4Save Image
8		▲	Operated continuously.
9		▲	Subscribed data configured. 4
10		▲	Operation stopped.

Figure 10-11 View Log

## 10.8 View System Version

About and help module allows you to view the firmware version, and web version.

## Chapter 11 FAQ (Frequently Asked Question)

### 11.1 Why the camera search tool cannot list cameras?

#### Reason

- Device is not started up normally.
- Network connection exception occurs.

#### Solution

- Check device power wiring (observe PWR indicator).
- Check network connection (observe LNK indicator and ACT Indicator). For specific indicator status description, refer to Section **Indicator Status** for details.

### 11.2 Why the image is not clear during live view?

#### Reason

Focus is not adjusted properly.

#### Solution

Adjust focus according to Section **Focus Control Settings**.

### 11.3 Why the image is very dark?

#### Reason

- The brightness of light source is not enough.
- Exposure and gain values are too small.

#### Solution


- Increase the brightness of light source.
- Increase exposure and gain values according to actual demands.

### 11.4 Why there is no image after triggering?

### Reason

- Incorrect wiring.
- The solution is not running continuously.

### Solution

- Check wiring according to Section **Input Wiring**.
- Click  in the solution control to let solution run continuously.

## 11.5 What can I do if I forget the login password?

### Solution

Click **Forget Password** in login window to view the device serial No., and mail it to the technical support personnel to get the corresponding resetting file. After that, click **Import** to import the resetting file and reset the admin password.

## 11.6 How to debug the device via the tool of image saving?

### Solution

1. Add the image saving tool, and set **Image Source**, **Input Status**, **Save Mode**, **Picture Format** and **Image Saving** according to actual demands.
2. Go to **System** → **Image Saving**, select images and import them to the test library.
3. In the test library, search and select images, and enable **Image Test**. The device will use the images you selected to run solutions.
4. Disable **Image Test** after debugging the device.



See Far, Go Further