www.visiondatum.com

Getting Started with SM-Datum

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Vision System

Perfect

Perfect

Purpose of This Guide

This guide describes the function of the SM-Datum and how to use it and gives a detailed description of each tools. 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 Vision Datum website.Please read this guide before use.

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Disclaimer

The information and specifications described in this guide are subject to change without notice.

Latest Version

For the latest version of this guide, see the Download Center on our web site at:www.visiondatum.com.

Technical Support

For technical support, e-mail: support@visiondatum.com.

Do not remove the camera's serial number label
If the label is removed and the serial number can't be read from the camera's registers, the warranty is void.

Do not open the camera housing
Do not open the housing. Touching internal components may damage them.

Prevent ingress or insertion of foreign substances into the camera housing
Prevent liquid, flammable, or metallic substances from entering the camera housing. If operated with any foreign substances inside, the camera may fail or cause a fire.

Avoid electromagnetic fields
Do not operate the camera in the vicinity of strong electromagnetic fields. Avoid electrostatic charging.

Clean with care
Avoid cleaning the sensor if possible.

Handle this camera with care.
Do not abuse the camera. Avoid striking, shaking, etc. The camera could be damaged by improper handling.

Read the manual
Read the manual carefully before using the camera.

Overview

Introduction

SM-Datum is an application software designed for smart cameras. It is compatible with the SM2 series visual sensor and requires the firmware of version 2.0 or later.
After logging in to cameras via the Software, you can manage the cameras' projects, including creating, editing, deleting, copying, and switching projects. While editing projects, you can configure the camera parameters, base images, tools, and output parameters. Meanwhile, you can configure the I/O settings, communication settings, time settings, and password of the camera as well as upgrading its firmware. In addition, the Software supports monitoring the status of multiple cameras simultaneously.
The Software supports conducting visual detection on both the images stored in and imported into cameras.

Key Features

Key Features

- Easy installation: Requires no additional drivers.
- High compatibility: Compatible with 32/64-bit Windows 7, Windows 10, or Windows 11 operating system.
- User-oriented UI design: Guides users to edit projects with the Wizard.
- Camera Management: Supports managing multiple cameras and monitoring their working status.
- Mode division: Displays detection results in the running mode, displays function settings in the configuration mode.
- Visual detection: Conducts visual detection on the real-time images from cameras or the images imported into cameras.

System Requirements

The SM-Datum requires that one of the following operating systems is installed on your computer:

Recommended

- Operating system: 32/64-bit Windows 7, Windows 10, or Windows 11 operating system
- CPU: Intel i3-8100T
- RAM: 8 GB or more
- Graphics card: a dedicated graphics card with 1366×768 or higher resolution, the integrated graphics card is not supported
- NIC: Intel Pro1000, I210, and I350 series gigabit network interface card

Minimum system requirements

- Operating system: 32/64-bit Windows 7 or Windows 10 operating system
- CPU: Intel E3845 1.91GHz
- RAM: 4 GB
- Graphics card: a 1366×768 dedicated graphics card, the integrated graphics card is not supported
- NIC: Intel Pro1000, I210, and I350 series gigabit network interface card

i	● The Software has been installed with the drivers required by the hardware. No others drivers are needed. ● Some anti-virus software might recognize the Software as a virus. Hence, it is recommended to add the Software into the allowlist of the anti-virus software or exit the anti-virus software before running the Software.

Network Settings

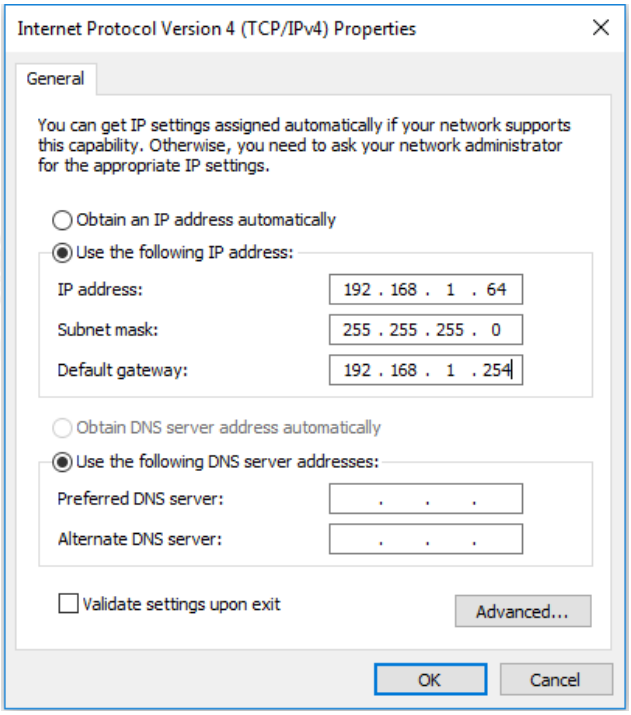
To make sure that the Software can run smoothly so that data can be transmitted stably, you need to configure the network before running it.

For SM2 Series

To make sure that the Software and SM2 Series cameras can run smoothly so that data can be transmitted stably, you need to configure the network before running it.

Steps

1. On your PC, open Control Panel, click Network and Internet > Network and Sharing Center > Change Adapter Settings, select the corresponding network port, and click Properties to enter the property settings page.
2. Double-click Internet Protocol Version 4 to set the IP address of your PC. It is recommended to set a static IP address for the network port so as to accelerate device search and connection. See the figure below for details.



3. Click Settings, select Link Speed or Advanced, set Speed and Duplex to Auto-negotiation or 100 Mbps full duplex to ensure that the network speed is above 100 Mbps.

Login Page

The login page will show up after launching the Software. You need to log in to a camera before controlling it.

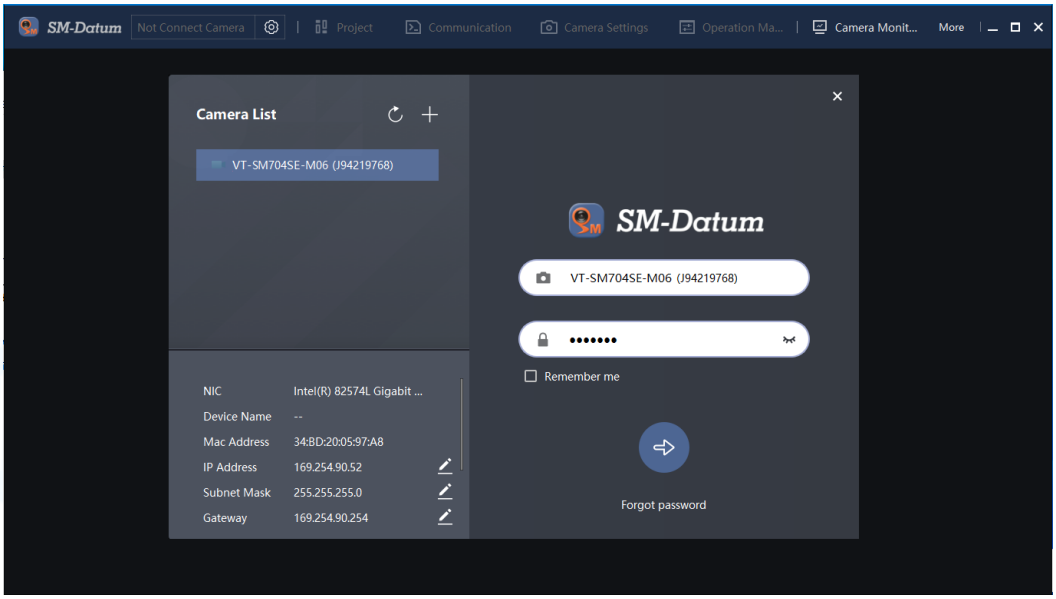
You can refresh the camera list to show the enumerated cameras. You can select a camera to view basic information, edit IP address, reset password, etc.

Camera List

The camera list is on the left side of the login page. All enumerated cameras will be listed.

Right-click a camera and click Stick on Top to stick the camera on the top of the list.

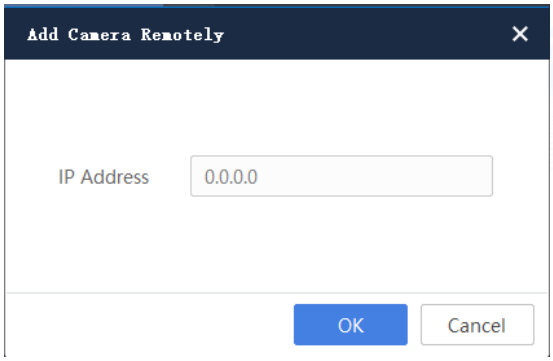
Select a camera to view the basic information about the camera, including the NIC that connects the camera, camera name, MAC address, IP Address, subnet mask, gateway, manufacturer, model, serial number, and firmware version. See the picture below.



Enumerate Camera

The Software refreshes the camera list automatically. You can also click to refresh the list manually.

To add a remote camera, click ⊕ , type in the IP address, and click OK. See the picture below.



ⓘ	Make sure the connection between the remote camera and the PC is established when adding remote cameras.

Camera List

Camera Status

Different icons of the camera represent different camera status.

Icon	Status	Definition
	Available	The camera is available. You can log into the camera.
	Occupied	The camera is occupied by another process. Log out the camera from the current process before you can log into the camera via the Software.
	Unreachable	The camera's IP address is not reachable on the LAN. Edit the IP address before you can log into the camera.

Edit IP Address

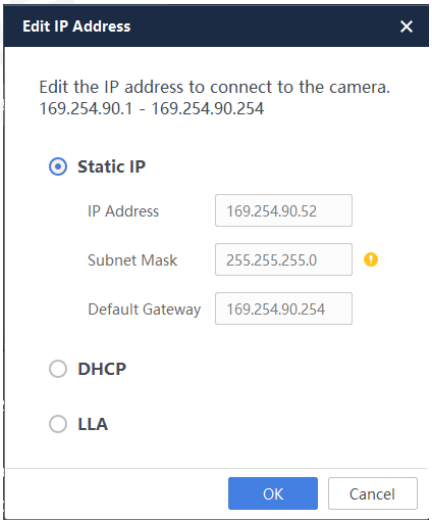
You can edit the IP address of a camera.

Before You Start

Camera status is Available or Unreachable.

Steps

1. Right-click the camera you want to edit IP address.
2. Click Edit IP Address or click beside the IP address, subnet mask, or gateway information to show the Edit IP Address window.
3. Select an IP type according to actual needs.
4. Click OK.



IP Type	Description
Static IP	The camera will communicate with the PC via the IP address, subnet mask, and default gateway you specify. Recommended.
DHCP	Camera IP address is negotiated with the PC and allocated automatically. Factory default.
LLA	Camera IP address is negotiated with the PC and the network segment is 169.254.

	If you change the IP type, the camera will reboot automatically to make it effective.

Log Into Camera

Before you can control a camera, you need to log in to the camera.

Before You Start

Make sure the camera status is Available.

Steps

1.Select the camera you want to log in.

2.Select a role you want to log in as. You can choose from Administrator, Technician, Maintainer, and Operator.

3. Enter the password in .

	The default password is Abc1234. We highly recommend you to change the password after the first login to ensure the security of your device.

	The password strength of the device can be automatically checked. We highly recommend you change the password of your own choosing (using a minimum of 8 characters, including at least three kinds of following categories: upper case letters, lower case letters, numbers, and special characters) in order to increase the security of your product. And we recommend you change your password regularly, especially in the high security system, changing the password monthly or weekly can better protect your product. Proper configuration of all passwords and other security settings is the responsibility of the service provider and/or end-user.

4. Optional: Check Remember me to remember the password.

	If you forget the password, you can click Forgot password to reset a password. See details in Reset Password.

5. Click or hit the Enter key to log in to the camera.

6. Optional: Click to switch the camera.

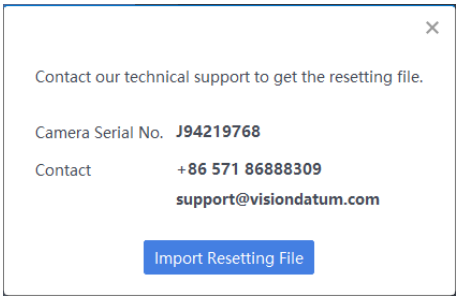
Reset Password

If you forgot the password of a camera, you can reset the password.

Steps

1.Select the camera you want to reset password.

2.Click Forgot password to show the password reset window.



3.Contact our technical support to get the password reset file. If you choose to send an email, please include the serial number of the camera in the content.

4.After getting the password reset file, click Import Resetting File.

5.Click Open to load the key file and reset the password.

	The camera password will be restored to Abc1234. We highly recommend you change the password after login to ensure the security of your device.

Interface Introduction

After login, the Software will load the last running project by default. If there is no project in the camera, the Software will create a blank project and run it. See the introduction of the main interface below.

No.	Name	Description
1	Menu Bar	Project management, communication settings, camera settings (basic information, time synchronization, etc.), IO settings, operation management (device and software logs), and camera monitoring.
2	Project Control Panel	View project running status in real time, reset project statistics, run/stop project, and edit project.
3	Tool List	View the real-time status of each tool in the project and edit tools.
4	Live View Panel	View the image of the camera in Camera Mode or imported image in Image Mode.
5	Current Role	Display the current role, modify password, switch roles, and manage roles.
6	Resource Information	View the memory usage, smart memory usage, and the CPU usage. Memory usage refers to system memory usage, and smart memory usage refers to usage of MMZ (Media Memory Zone) for the algorithm.
7	More	Check user manual and software version. Minimize, maximize, and exit the Software.

i	You can run multiple instances of the Software at the same time, but each instance can log into one camera only.

Menu Bar

Before using GigE Vision cameras, you should make sure that the cameras and the PC are on the same subnet, and that the Jumbo Frame functionality has been enabled in the Windows system.

Camera Management

Log in to the camera, and switch the camera. See details in Log Into Camera.

Project

Add, delete, import, export, and switch projects in the camera. See details in Project Management.

Communication

Add, set, or delete different communication tools for the camera. See details in Communication Settings.

Camera Settings

View camera basic information, synchronize time, etc. See details in Camera Settings.

IO Settings

Allocate IO signals, and configure project switch and project output. See details in IO Settings.

Operation Management

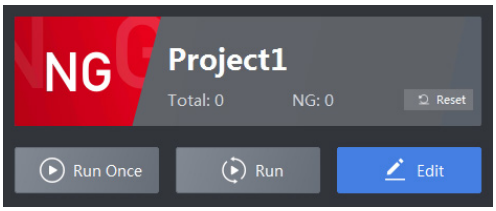
Search and export camera or software logs. Search, export, or delete images stored in the camera or imported to the camera. See details in Operation Management.

Camera Monitoring

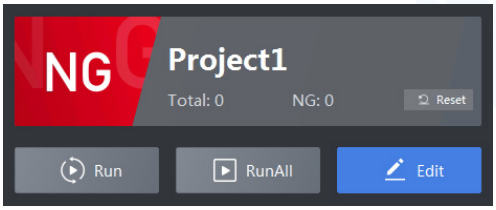
Start live view of one or multiple connected cameras in a window. And manage cameras, including displaying camera list, logging in to the camera, switching the live view window division and so on. See details in Camera Monitoring.

Project Control Panel

Project control panel shows the running result of the current project. You can control the project here
When in Camera Mode:



When in Image Mode:



Description:

OK/NG (upper-left)

Real-time running result of the current project.

Total

Total running times of the current project.

NG

Total NG times of the current project.

Reset

Reset the count to zero.

Run Once (Camera Mode)

Run the project one time.

Run/Stop

Run the project continuously or stop running.

RunAll (Image Mode)

Run the project for all imported images.

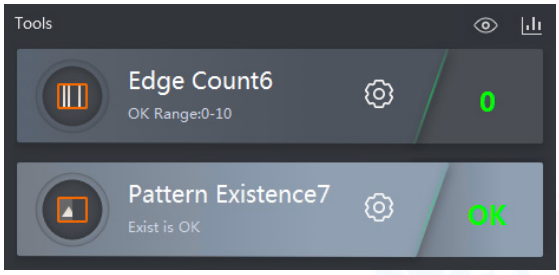
Edit

Enter the project configuration page to edit the project. Refer to Create a Project for details.

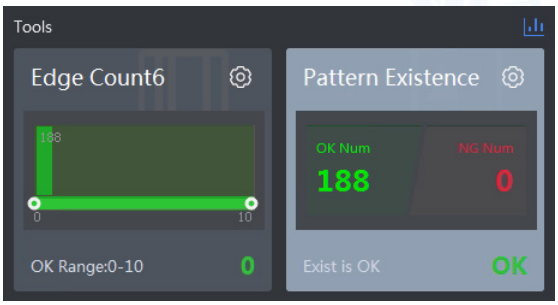
Tool List

Tool list shows the tools of the current project and their running status. You can quick edit each tool here.

Click in the upper-right corner to switch the view between list view and statistic view. List View:



Left: tool name and OK condition; Right: tool settings and running result Statistic View:



Upper-left: tool name; Lower-left: OK condition; Upper-right: tool settings; Lower-right: running result; Center: statistics data

Different types of tools have different statistic graph:

- If the result is judged by the count or similarity, the x-axis is the judging range and the green area is OK. You can drag to adjust the OK range.
- If the result is judged by existing or not, the statistic graph will show the count of OK and NG.

Click to edit the tool.

Click to show the Result Display window. You can select tool(s) to always display tool results in the live view panel.

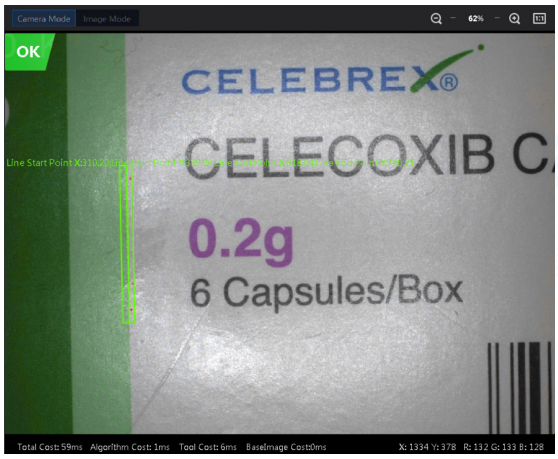
	The logic of saving result display configurations varies according to different series cameras. For some devices, the configuration will be saved, while for other devices, the configuration will be restored to defaults once you exit the Software.

Live View Panel

You can select the mode from Camera Mode and Image Mode in the upper-left corner of the live view panel.

Camera Mode

When you select Camera Mode, the live view panel will show the real-time image of the camera after you run the project. Select a tool in the tool list to show the real-time running result on the live view panel. See the picture below.



You can adjust the image in the upper-right corner.

- / : Zoom in/out on the image.
- / : Zoom in/out on the image.
- : Click → Path Setting to set a local path for saving image. After setting, click to save the current image in the local path you set. Click Saving Status to view the process of saving images.

Basic information is displayed at the bottom.

Total Cost Time

Total cost time for running the project once.

Algorithm Cost Time

Algorithm cost time for running the tool you select in the tool list once.

Tool Cost Time

Total cost time for running the tool you select in the tool list once.

BaseImage Cost Time

Base image cost time for running the project once.

X/Y

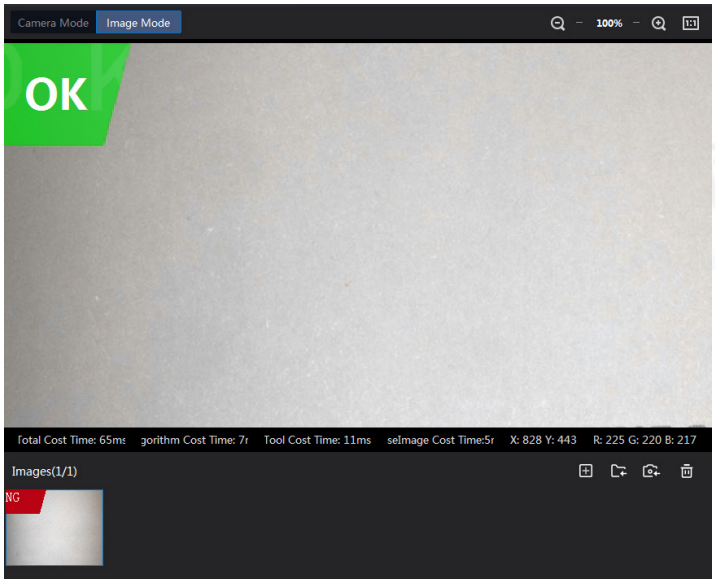
The coordinates of the cursor's position on the image.

R/G/B

The RGB value of the image at the cursor's position.

Image Mode

When you select Image Mode, the live view panel will show the imported images after you run the project. Select a tool in the tool list to show the real-time running result on the live view panel. See the picture below.



The supported image formats are PNG, JPG, and BMP. Icon description:

- : Import a single image from PC.
- : Import all images in a folder from PC.
- : Import images from the camera. Refer to Acquired Image Management for details.
- : Clear all imported images.

i	● The SM2 series devices cannot store images in the camera, and thus they do not support importing images from the camera. ● For the image search during importing acquired image(s), see Acquired Image Management for details. ● For the management of imported images, see Imported Image Management for details.

Add a Role

Different roles have different permissions for various operations. The roles include administrator, operator, technician, and maintainer. The administrator has the biggest range of permissions, and can create other roles and set permissions for them.

Administrator

The administrator can change the password of all roles, switch roles, and configure roles. Click Administrator on the upper right of the Client first to conduct the following operations:

Change Password

Click Change Password, enter the old password and the new password, then confirm the new password. Click Save to finish changing the password.

Switch Roles

Click Switch Roles to switch to operator, technician, or maintainer. Enter the corresponding password to finish switching roles.

Role Management

The administrator can create the roles of operator, technician, and maintainer, and set corresponding passwords for them. The technician can be given the permissions of editing the project, global settings, or both.

Technician

The operating permissions of technician is set by the administrator. The permissions of a technician include:

- Edit camera settings if the permmission is given.
- Edit communication settings if the permmission is given.
- Create, copy, import, export, and delete a project if given the permission of creating a project, which means the permission of configuring camera parameters, base image, tools application, and output settings are also given.
- Edit a project if given any of these permissions: configuring camera parameters, base image, tools application, and output settings. If given all these permissions, the permission of creating a project will also be given automatically.
- Edit a tool via  in the tool list on the main page if given the permission of tool application.

Click Technician on the upper right of the Client to switch to other roles.

Operator

The operator can only view the monitoring page and cannot configure the settings. Click Operator on the upper right of the Client to switch to other roles.

Maintainer

The maintainer can edit a tool via  in the tool list on the main page.

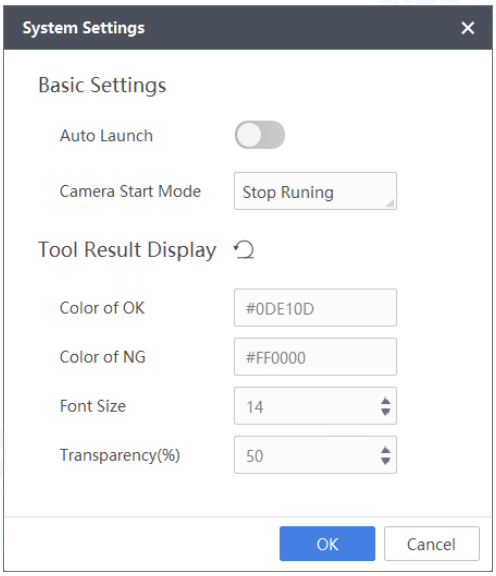
	● The maintainer cannot edit communication settings and camera settings. ● The maintainer cannot edit project on camera running page. ● The maintainer cannot edit, create, copy, import, export, or delete a project on project management page.

Click Maintainer on the upper right of the Client to switch to other roles.

More

Click ▼ to configure language and system settings, and view the user manual and software information.

Language	Change the language of the Software.
User Manual	Check the user manual of the Software.
System Settings	Configure the basic settings and tool result display (see the following picture). ● Auto Launch: Switch on to launch the Client automatically when the computer starts up. ● Camera Start Mode: Set the camera startup mode after exiting the editing mode. You can choose from the following three options: Stop Running, Run Continuously, and Run Once. ● Tool Result Display: You can set the color of OK, the color of NG, the front size, and the transparency. Click to reset the settings to default.
About	Check the version of the Software and the SDK. Read copyright information.



Project Operation

After creating a project, you can run the project for measurement or detection. By default, the running page of a project shows after login.

Create a Project

Perform the following steps to create a project:

1.Set Parameters for Cameras: Set cameras' parameters related to triggering mode and image display. See Set Parameters for Cameras for details.

2.Configure Base Image: A base image provides a reference for the measurement. You can select the image acquired currently or a historical image, or import an image from the PC. You can enable the Position Correction function so that the Software can perform the measurement based on the base image even if the measured object is not put rightly. See Configure Base Image for details.

3.Configure Tools: For objects with different features, you can select different features and measuring tools for the project. See Configure Tools for details.

4.Output Settings: Set the related parameters for project output, including measuring results, image saving, results output, I/O settings, etc. See Output Settings for details.

Set Parameters for Cameras

Set trigger method and adjust image parameters such as brightness, mechanical focus, light source, image color, etc.

Trigger Settings

Set parameters including trigger mode, trigger source, trigger cache, trigger delay, etc.

● Trigger Mode: you can select Off or On as the trigger mode. If you select Off, the camera will acquire images continuously and the Software will output images automatically; if you select On, the camera will acquire images according to the signal sent by the trigger source.

● Continuous Running Interval: Available when you select Off as the trigger mode. It refers to the time interval between each trigger.

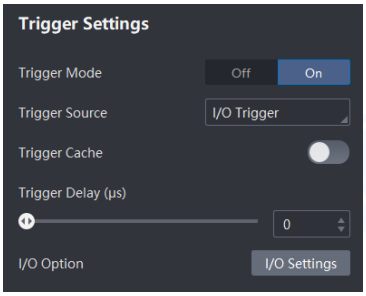
● Trigger Source: You can select Trigger IO, Button, Software, or Communication.

○ Button: Press the button among the indicators on the top of the camera to trigger an acquisition.

○ Software Trigger: The Software sends a command of acquisition to the camera.

○ Communication Trigger: Send specific strings by a communication tool (except FTP tool) to the camera to trigger an acquisition. If you select this as the trigger source, you need to add related communication tool to the project.

○ I/O Trigger: The camera acquires an image when receiving the IO signal of which the IO type is set as Trigger. You can click IO Setting under the Trigger Source to open the IO Settings window to set the I/O related parameters. See IO Settings for details.



● Software Trigger: Available when you select Software as the trigger mode. You can click Execute to command the camera to acquire images.

● Trigger Cache: If you do not enable this, when the camera is dealing with the triggering signal of acquisition, the newly-sent signals will not be received by the camera; if you enable this, 3 newly-sent triggering signals will be saved when the camera is dealing with the triggering signal of acquisition, and the camera will deal with the newly-sent triggering signals after dealing with the last signal.

● Trigger Delay (μs): The delayed duration before the camera deals with the received triggering signal.

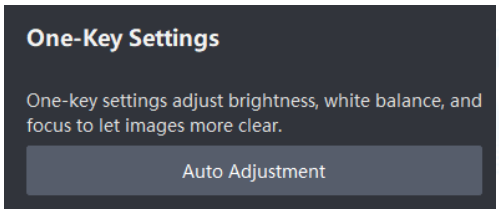
● Filter Time (μs): Available when the Trigger Source is Button. If the duration for pressing the triggering button is shorter than the Filter Time duration, the trigger will fail. This function helps to avoid fault triggers resulted by mistake press on the button.

● Communication String: Available when the Trigger Source is Communication. When the communication tool sends the same communication string to the camera as the string you enter here, the camera will be triggered to acquire an image.

One Key Settings

SM2-DL series camera supports one-key settings, while SM2-SE series camera does not support one-key settings.
Click Auto Adjustment to adjust the brightness, white balance, focus, and other parameters automatically. The camera will adjust to the optimum settings according to the actual environment.

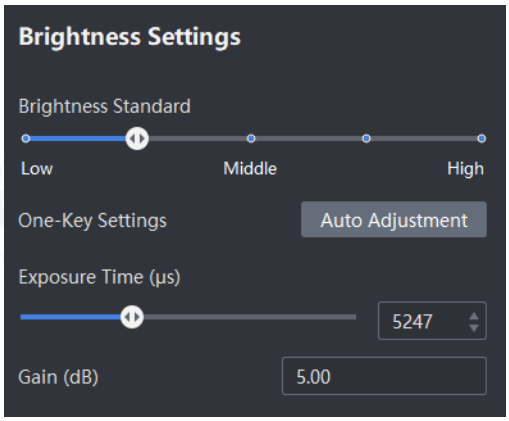
	● Auto adjustment might take a while. You cannot operate the Software during auto adjustment. ● Only colored camera has the white balance feature.



Brightness Settings

Set the brightness of pictures acquired by the camera. You can adjust the image brightness manually or let the Software adjust image brightness automatically.

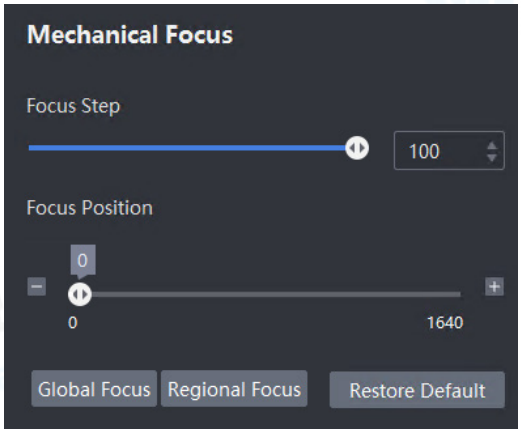
- Set the Brightness Manually: Adjust the Exposure Time and Gain manually to change the image brightness.
- Auto Adjustment: After setting the Brightness Standard, click Auto Adjustment to let the Software adjust the image brightness automatically.



Mechanical Focus

You can adjust the focal length of the camera.

- Focus Step: Set the stepping value of focal length adjustment.
- Focus Position: Adjust the focus position of the camera.
- Global Focus: Click Global Focus to let the camera find the optimum focal length.
- Regional Focus: Click Regional Focus and then draw an ROI on the right. The Software will focus in the ROI.
- Restore Default: Click Restore Default to restore the focal length to its default value.
- For users of SM3-SE series camera, you need to focus manually on the camera.



Light Source Adjustment

With this function, you can select the used light source on the camera.

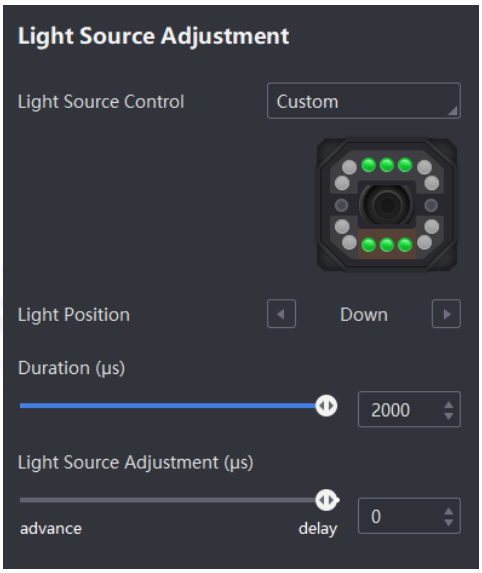
● For SM2-SE series camera:
Click the aiming light or light source to enable them. the four sources together. When enabling the light sources, the four light sources will be enabled at a time.

● Duration: The duration for which the light source flashes.
Make the light source light in advance or later than the configured time by adjusting Light Source Adjustment.

● For other series of cameras:
Select a light source control mode in the Light Source Control field.

Custom: In this mode, you can select the light source to be enabled according to your needs and set related parameters. All: All the light sources will be enabled, and you can set the related parameters for all light sources at a time. None: No light source will be enabled and you do not need to set related parameters.

If you select Custom as the Light Source Control mode, select the light sources on the light source image to enable them.



	● If you select Custom as the Light Source Control mode, you need to select light sources and set parameters for them. ● If you select All as the Light Source Control mode, the parameters can be set uniformly.

Other Parameters

Set parameters including frame rate, Gamma, image size, mirror image, greyscale image output, etc.

● Frame Rate: Set the frame rate of real-time acquisition. The maximum frame rate is the maximum frame rate of the camera itself.

● Gamma: Gamma is a non-linear mechanism of mapping. When the value is between 0.5 and 1, the dark area of the image will become more bright; if the value is between 1 and 4, the dark area of the image will become less bright.

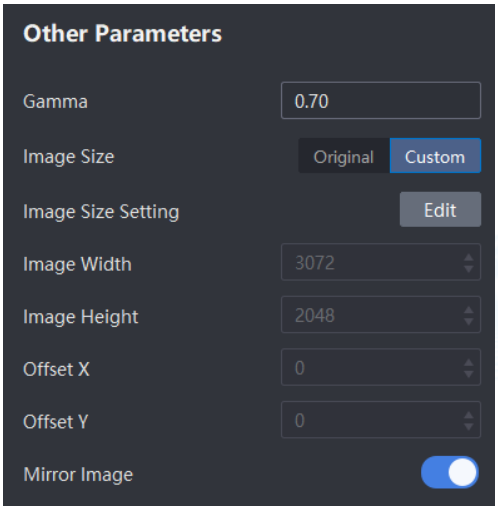
● Image Size Setting: Draw ROI of image resolution. If you select Original, the whole image will be displayed with the resolution. If you select Custom, you can click Edit and adjust the image size on the Live View window and click Finish. Or you can edit the value in Image Width and Image Height to adjust the image size.

	The setting of this parameter requires device support.

● Mirror Image: After enabling this, the image will be displayed like the right side of the original image appears on the left and the left side appears on the right.

	The setting of this parameter requires device support.

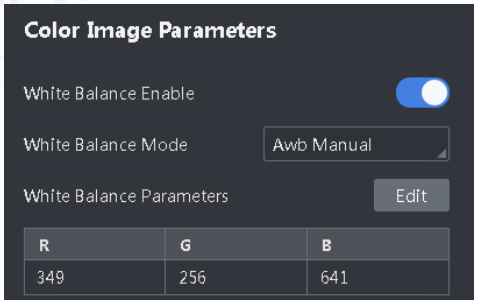
- Greyscale Image Output: The parameter for colored cameras. If you enable this, images will be output in Mono 8 format.



If you have enabled Greyscale Image Output for a colored camera, the Color Image Parameters will be hidden, and the tools for area of certain color and color contrast will be unavailable.

Color Image Parameters

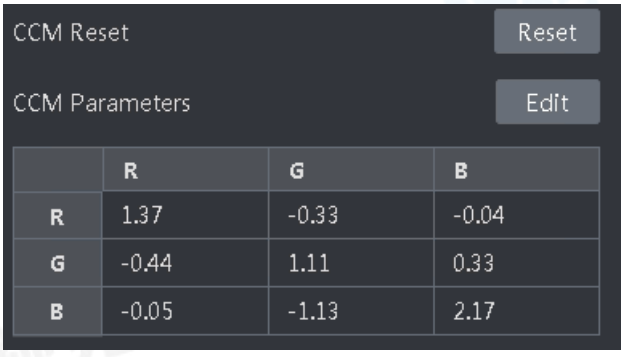
Color Image Parameters are parameters for colored cameras exclusively, including white balance and CCM. It is available only when the Greyscale Image Output is disabled.
White Balance: It corrects colors in different lighting condition. It keeps white area white all the time by adjusting R, G, and B value of the image. The supposed proportion of R, G, and B is 1:1:1. you can configure white balance manually or automatically.



Awb Once: After enabling the White Balance Enable, the White Balance Mode is in automatic mode. In this situation, the camera adjusts the R, G, and B value according to the real-time image color automatically.

Awb Manual: Click Edit beside the White Balance Mode. Edit the R, G, and B value and click Edit to finish.
After processed by white balance, the image may be darker than before, and some color may vary from the standard value. In this situation, you can correct the image color by CCM to make the color more bright.

- CCM Reset: Click Reset and the camera will adjust the CCM values automatically.
- Edit CCM Parameters: Click Edit to edit the values in the following table. Click Edit again to finish.

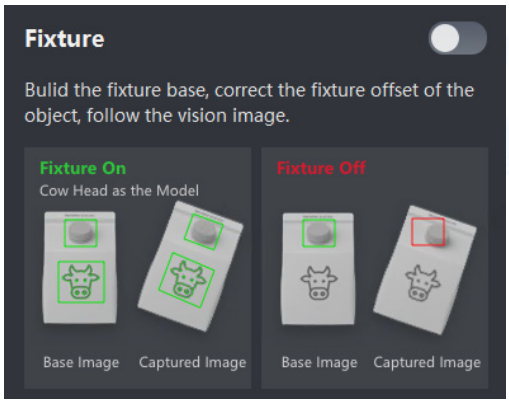


Configure Base Image

After setting parameters for the camera, you need to set a base image for the camera for position fixture. It is a required step for position fixture and tool test. Position fixture helps locating objects when the object positions or angles change. So that the detection area will change according to the base image to avoid acquisition failure caused by the change of object position or angle. The results of enabling and disabling Fixture are shown as the following. It is recommended that you enable this function.

Before You Start

Make sure you have set parameters for the camera.



Steps

1.Get a base image via the window on the right. You can get a base image by 3 ways.

- Current Image: Click Current Image to get the image displayed on the right as the base image.
- Historical Image: Click Historical Image to select an image stored in the camera as the base image. You can search wanted images by setting the filtering conditions.

	○ The SM2 SE series devices cannot store images in the camera, and thus they do not support importing historical images from the camera. ○ For the image search during importing historical image(s), see Acquired Image Management for details.

- Import: Click Import to upload an image in the PC to the Software as the base image.

	Only images in JPG, BMP, and PNG format are supported.

2. Switch on on the right of Fixture to enable Fixture.

3. Click Edit on the right of Template Area and select □ or ⬡ , and then draw on the live view window.

	After drawing an area, you can click → Select similar patterns to manually set the match point. Click Reset to restore to default if needed. Refer to How to draw an ROI? for ROI drawing details.

4.Click Edit to finish drawing the template.

5.Optional: If you need to shield an area in the template area, perform the same operation in the last step after clicking Edit on the right of the Template Shield Area.

6.Select the configuring mode for Template Sensitivity.

- Auto: Set the sensitivity by setting the degree. The higher the sensitivity, the better the fixture quality. Noises may be recognized as the template if the sensitivity is too high, so it is recommended that you set the sensitivity according to your actual need.
- Manual: Set the sensitivity by setting the Coarse Granularity and the Greyscale Threshold.

7.Optional: Configure the Extend Parameter.

Parameter Name	Description
Search Area	The search area of fixture.
Shielded Area	The fixture will not be performed in the shielded area.
Match Polarity	Polarity refers to the color transition from the template area to the background. ● When the polarity of the analyzed areas edge is different from that of the template area, set the Match Polarity as Ignored to make sure the target can be found. ● If it is not necessary to find the target, you can set the Match Polarity as Considered for a quick search.
Angle Range	If the analyzed object is turned and the turned angle is smaller than the value you set, the object can be recognized, otherwise it cannot be recognized.
Min. Score	The minimum similarity between the template area and the analyzed area in the image. Only when the similarity is higher than the Min. Score, the target can be recognized. The Min. Score ranges from 0 to 1, and 1 indicates that the analyzed area in the image is completely the same with the template area.
Samples	Sample codes of various programming languages.
Algorithm Timeout (ms)	The algorithm timeout. When the actual time consumed by algorithms exceeded the configured value, the output result is NG. If the value is set to 0, the algorithm detection time is not limited.

8. Click Test Run beside Fixture to test the fixture effect.

i	Click to end the test.

Configure Tools

Add tools for the project according to your actual need.

Before You Start

Make sure you have set parameters for the camera and have set the base image.

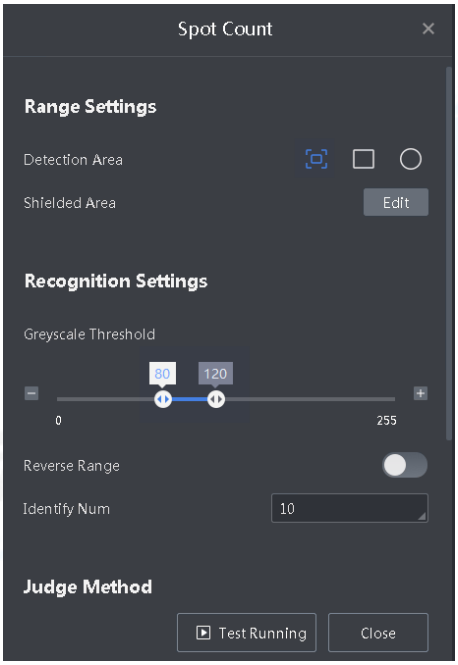
Steps

i	The camera may supports multiple types of tools. The supported tool types of different camera models vary. See the camera datasheets for details about supported tool types.

1. Click + on the top left to open the window for adding tools.

2. Select a category on the left and double-click a tool to enter the configuration page of the tool. Here we take Spot Count tool as an example.

i	You can click Image Feature Selector to select the tools according to tool features. But some tools may not show.



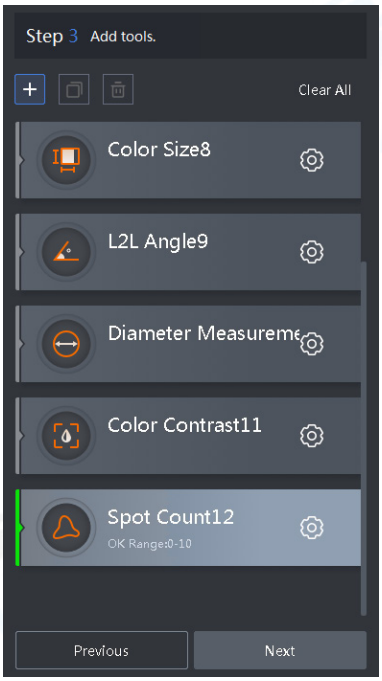
3. On the base image displayed on the right, configure the related parameters according to your actual need.

	● For different tools, the parameters vary. See Tool Introduction for details about different tools. ● Generally, it is not necessary to set the Extend Parameters unless you cannot get your wanted analyzing result.

4.Optional: Click Test Running to test.

5.Click Close to quit the page for setting parameters and go to the Tool Configuration page.

	Green indicates that the analyzing result is OK, while red indicates that the analyzing result is NG. You can click ⚙ to edit a tool.



6. Optional: Select a tool and click ⚙ to duplicate the tool and the duplicated tool will be displayed at the bottom of the tool list.
7. Optional: Select a tool and click ⚙ to remove the tool.
8. Optional: Click Clear All to remove all the tools in the list.
9. Optional: Click the name of a tool to edit its settings.

Output Settings

You can configure the parameters for the results of project running, image saving, result output, and I/O settings

	● Make sure you have set parameters and base image for the camera, and have selected tools for the project. ● The SM2 SE series devices cannot store images in the camera.

Project Results

You can set the rules for outputting the results of a project running.

1. You can select the project results.

All Tool OK

The results output by all the tools are OK.

Any Tool OK

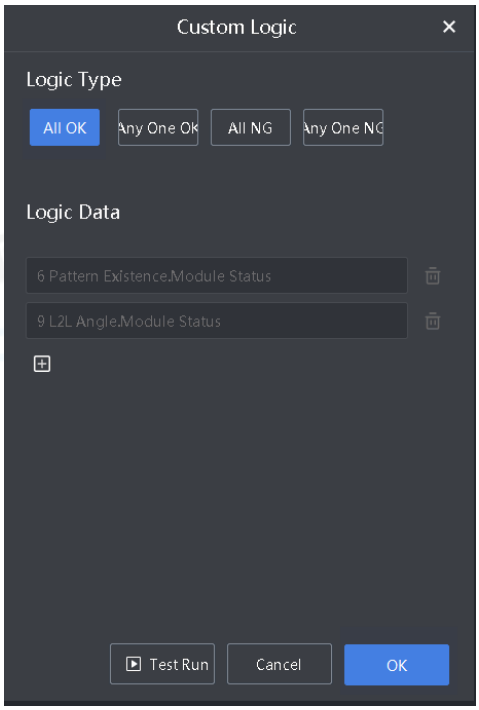
The result output by any tool is OK.

Custom

Customize the logic of result output.

If you select Custom as the Project Results, you need to click Edit below to customize the running logic.

2. On the Custom Logic page, you are required to configure the Logic Type and Logic Data.When the logic data meets the standard of the logic type, the result will be OK, or the result will be NG.



Logic Type

You can select All OK, Any One OK, All NG, or Any One NG.

Logic Data

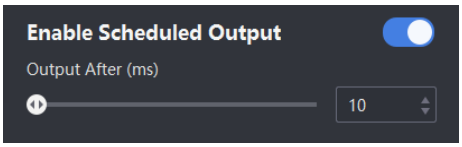
Click to subscribe the status of each module as the logic data of the project.

3. Click Test Run to test the data, and the result will be displayed on the lower left of this panel and the image on the right.

	The Test Run button functions the same as that in the I/O part.

Scheduled Output

You can enable the scheduled output and configure the output schedule of partial results.



Make sure you have switched on the device's trigger mode. You can configure the output time (Output After) as needed after enabling the scheduled output.
When the device receives a trigger signal, it will take the signal generation time as the start point and output corresponding results after the configured time period.

- If the project running is completed within the configured time period, the communication module will output the result string (such as OK or NG), and the I/O module will execute the action corresponding to the result.
- If the project running is not completed within the configured time period, the communication module will output NG, and the I/O module will execute the action corresponding to the NG condition.

Save Image

With this function, you can save images in the camera.

i	This function should be supported by the cameras.

After enabling Save Image, click Edit to configure the related parameters.

Image Saving

The rule for saving images.

Output Condition

Subscribe to the information such as module status of different tools as the reference for saving images.

Image Saving Strategy

You can select Not Save Image, Save Image (OK), Save Image (NG), and Save All.

Saving Format

The format of saved images, supporting BMP and JPG.

Storage Method

The rule for saving newly received images when there is no more space on the camera for saving images. You can select Stop Saving Image or Overwrite. Stop Saving Image indicates newly received images will not be saved, while Overwrite indicates the oldest images in the camera will be overwritten by the newly received images.

Image Naming Rule

The rule for naming the saved images.

Frame No.

If you enable this, the frame No. of the image will be contained in the image name.

Result

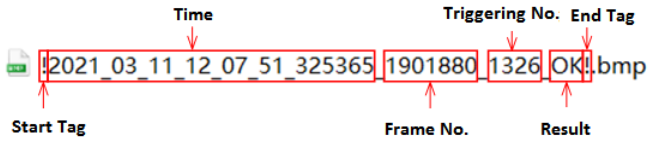
If you enable this, the running result of the Output Condition will be contained in the image name.

Start Tag and End Tag

The start character and the end character in the name of the saved images. You can customize it. Only letters, digits, and characters including !, @, #, ^, &, (,), -, _, =, +, ., ,, ;, ` are allowed.

Delimiter

The separator between each option. You can customize it. Only letters, digits, and characters including !, @, #, ^, &, (,), -, _, =, +, ., ,, ;, ` are allowed.

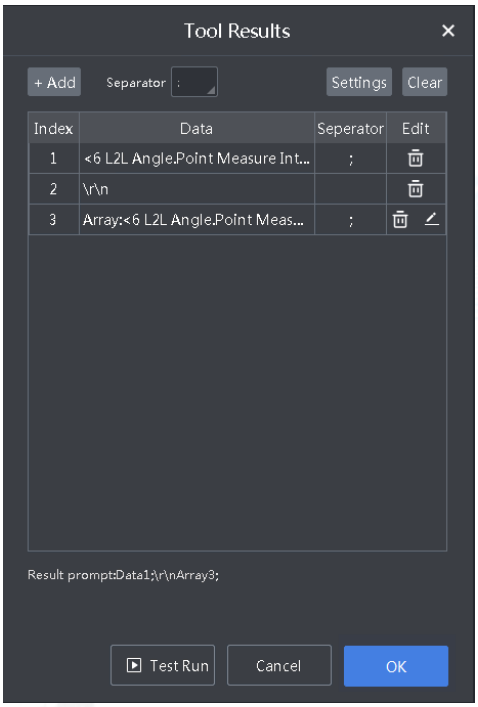


i	By default, the time and triggering time will be contained in the image name.

Tool Results

With this function, the Software can output a result after processing the data of each module and strings.

1. After enabling Tool Results, click Edit to add data.



2. Click Add to add data, symbol, or array as the output data.

Data

Subscribe to related data of different modules of the project as the output result.

Symbol

Add symbols to the output data.

Array

Combine multiple pieces of data as the output result.

Length Regularity

Set the length and regularity of the output data. The digits before the decimal point indicates the length of the output data, and the digits after the decimal point indicates the regularity of the output data (i.e., how many decimal places the data should be accurate to).

	● If the length of the output data is smaller than the set length, the vacant digital places will be zero. For example, the length regularity is 4, and the actual result data is 1, the output data will be 0001. ● Length and regularity range of integer data: [0-10]. ● Length and regularity range of float data: [0-10][.][0-10].

Separator

A separator separates different data. When the added data is a symbol, there will be no delimiter following it. You can select a comma or a semicolon as a delimiter, or customize it.

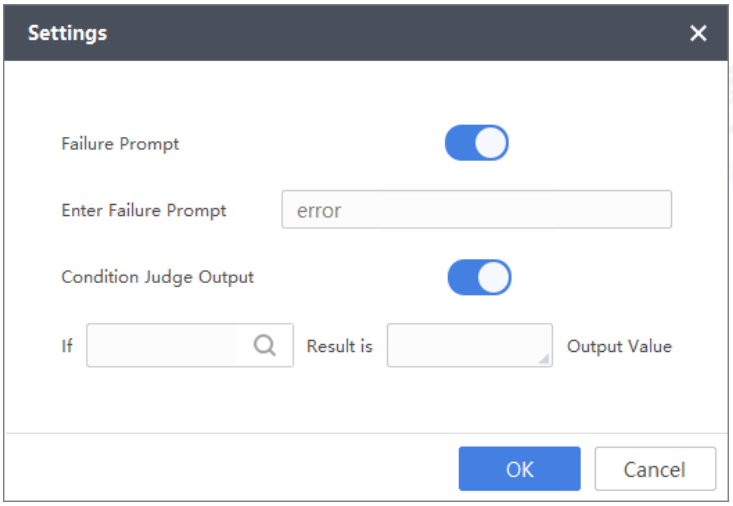
	Data outputs only one piece of data, while Array outputs a group of data in order.

3. After adding data, you can perform the following operations.

- Select a piece of data and click to delete it. You can click to edit an array.
- Click Clear on the top right to delete the configured data.

The output content will be displayed in Result prompt on the lower left.

- Click Settings to configure the failure prompt, and set the condition for outputting the results you configured.



Failure Prompt

A window will pop up when a failure occurs.

Enter Failure Prompt

The information given in the pop-up window.

Condition Judge Output

When enabled, select a specific module and its corresponding status (OK or NG). The results will only be outputted when the condition configured here is met. When disabled, all configured results will be outputted.

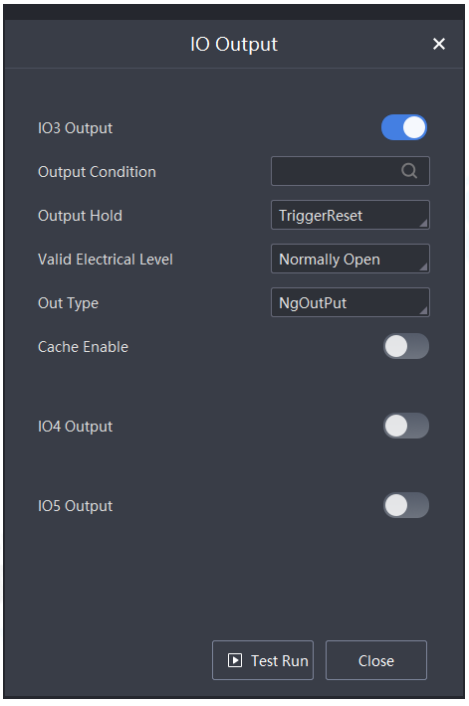
4. Click Test Run to test the data, and the result will be displayed on the lower left of this panel and the image on the right.

I/O

If the result is qualified, the camera can send signals to connected devices.

1. After enabling I/O, click Edit to set related parameters.

On the IO Output panel, the IO signals whose IO types are set as Output will be loaded and displayed. You can enable an IO signal according to your need and set the related parameters.



Output Condition

You can subscribe to the module status of different tools as the reference for IO output.

Output Hold

You can set the IO signals and keep the electrical level status.

Disable

Control the IO signals output by configuring Duration and Delayed Duration.

TriggerReset

When the device receives a trigger signal, it sets the output signal to a low electrical level, and then sets the output signal to the corresponding electrical level according to the subscribed module result and Out Type. The electrical status keeps to the next trigger signal.

Duration Time

The duration of outputting signals.

Delayed Time

The camera outputs signals after the Delayed Duration.

Valid Electrical Level

You can select Normally Closed or Normally Open as the valid electrical level. Normally Closed is used for low electrical levels, while Normally Open is used for high electrical levels.

Out Type

The condition for outputting IO signals. If you select ExposureOutPut, the camera outputs signals when it starts exposure, instead of being controlled by the Output Condition you set before. If you select NgOutPut or OkOutPut, the camera outputs signals when the subscribed condition is triggered.

	The ExposureOutPut is not supported by the SM2 SE series cameras.

Cache Enable

If you enable this, when the camera receives a new signal when outputting signals, the newly received signal will be saved temporarily and the camera will output them after finishing the last output.

	This parameter varies according to different series cameras. ● It is not supported by the SM2 SE series cameras. ● For SM2 DL series cameras, up to 3 signals can be saved.

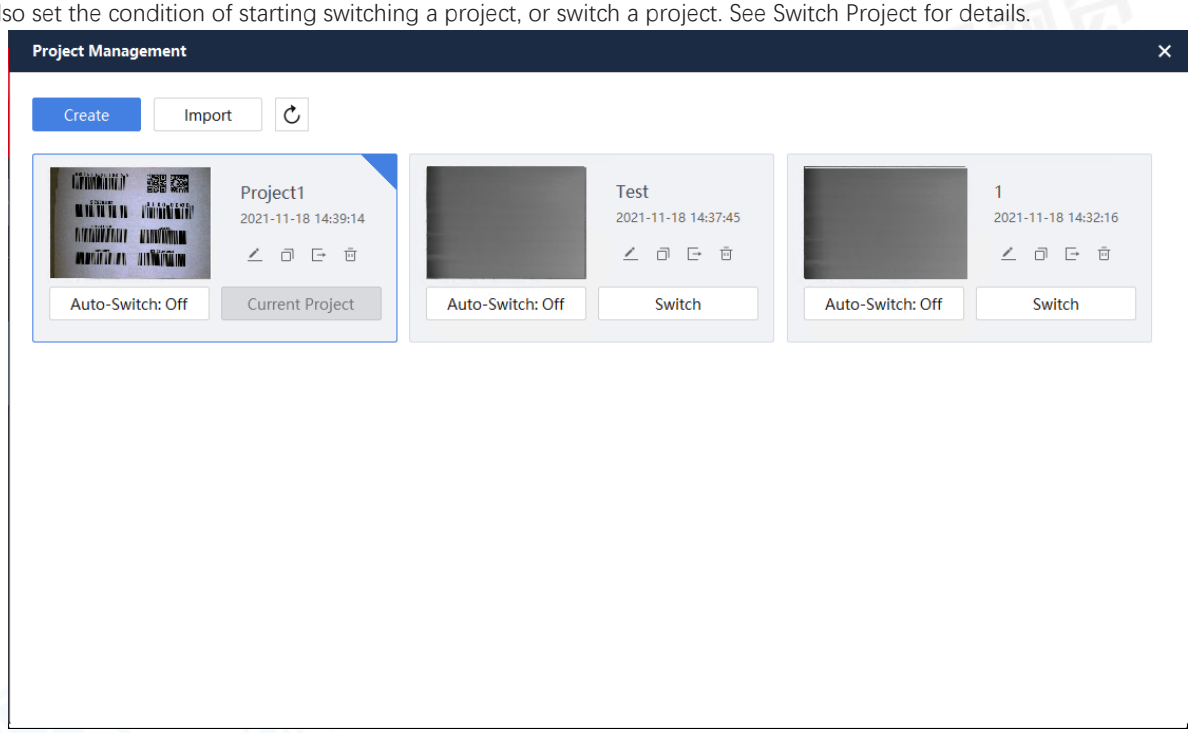
2. Click Test Run to test the data, and the result will be displayed on the image on the right.

Run Project

After logging in to the Software or loading a project, you can manage the project and set its running mode on the following page. In the upper-left area, you can manage the project, see Menu Bar for more details; in the lower-left area, you can see the tools added to the project, see Tool List for more details; in the right area, you can select the display mode as "Camera Mode" or "Image Mode", and view the detection result, see Live View Panel for more details.

Project Management

On the top of the Software, click Project to open the Project Management window to view all the projects of the camera and manage the projects.
The name, saving time, and the base image of the project will be displayed.
You can create, import, refresh, export, copy, or delete a project. See Project Settings for details.
You can also set the condition of starting switching a project, or switch a project. See Switch Project for details.



Project Settings

You can create, import, export, edit, copy, and delete projects.

- Create a Project: Click Project → Create to enter the Edit Project page.
- Import a Project: Click Project → Import and select the to-be-imported project file and click Open.

	○ Only the project of the same camera model can be imported. ○ It is also recommended that the firmware version of the project's camera is the same with the current camera, or the importing may fail.

- Refresh Project(s): Click .
- Edit a Project: Click of a project to enter the Edit page.

	If the edited project is not the running one, a prompt will pop up asking whether to switch the project and start editing. Click OK to switch the project and start editing.

- Copy a Project: Click , edit the project name and click OK. By default, the project name is "the current project name_Copy".
- Export a Project: Click , select the saving directory and click Save.
- Delete a Project: Click → OK.

	You cannot delete a running project.

Switch Project

If you have set multiple projects for one camera, you can switch among them.
You can switch projects manually or enable Auto-Switch to switch projects automatically.

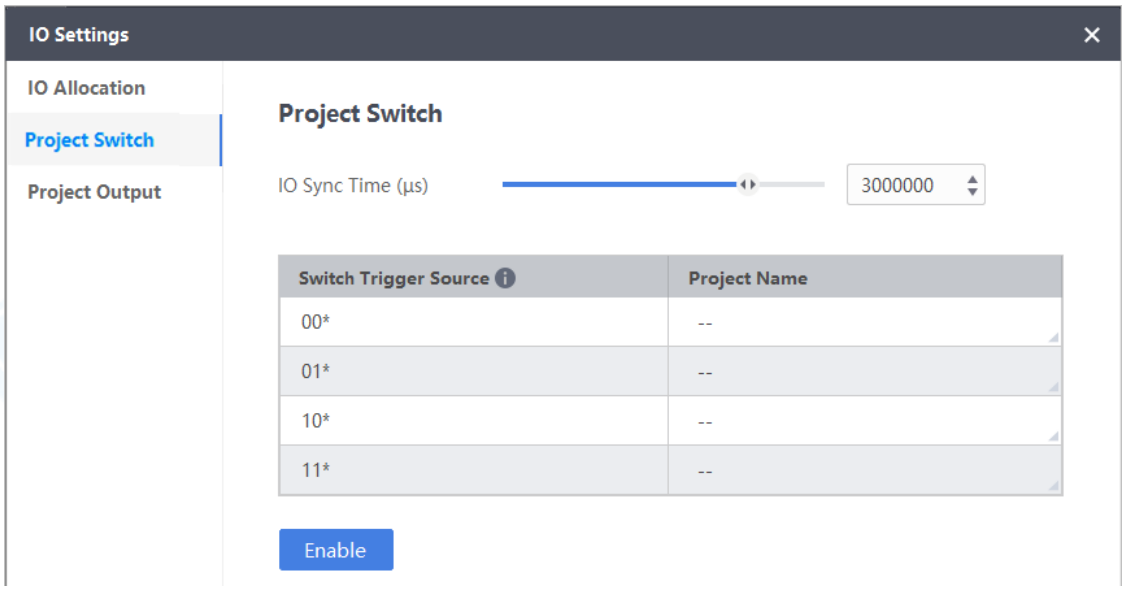
- Manual Switch: Click Switch in a project area to load this project.

> ○ A prompt window will pop up to remind you to save the project currently used before switching.
>
> ○ If a project is being used currently, the Switch button is changed into Current Project, and the project cannot be switched.

- Auto-Switch: Click the button beside Switch to set auto-switch. You can select from Off, TriggerIO, and TriggerCommunication.
  - ○ Off: Auto-Switch is disabled. The button is displayed as "Auto-Switch: Off".
  - ○ TriggerIO: Switching project automatically by triggering the signal source via I/O. You need to set the I/O trigger source.
  - ○ TriggerCommunication: Switching project automatically via the string sent by the communication tool. You need to set the communication string and the return string.

TiggerIO

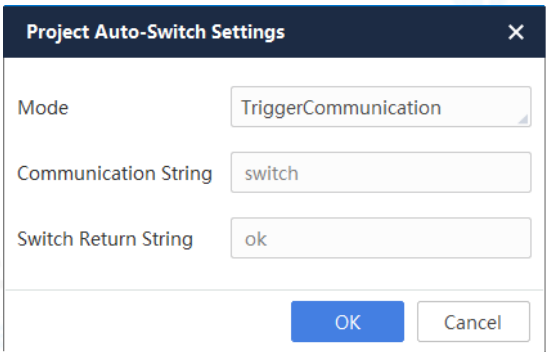
If the auto-switching mode of a project is set to TriggerIO, the project will be automatically set to the running project when the received signal meets the requirements of the configured switch trigger source and is received within the IO synchronization time range. To enable TriggerIO, you need to configure the IO synchronization time, switch trigger source, and project name. For details, see Project Switch Settings.



TriggerCommunication

If the auto-switching mode for a project is set to TriggerCommunication, the project will be automatically set to the running project when the communication protocol of the project sends a message "Communication String + Spacebar + Project Name".

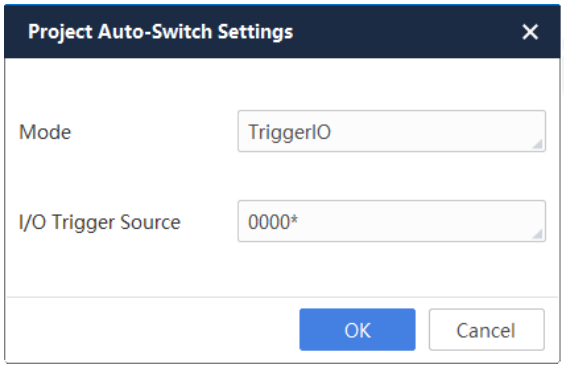
> ● Communication String: The string sent to the device via a communication protocol. The default value is "switch".
>
> ● Switch Return String: The value returned by the device after a successful project switch. The default value is "ok".



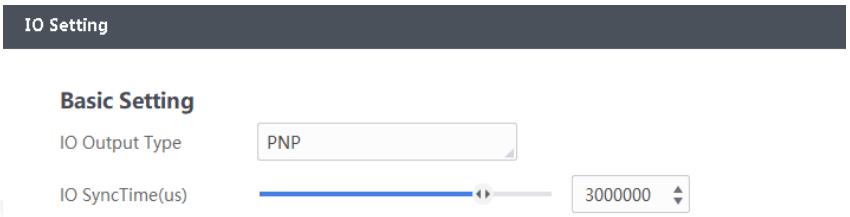
> All communication protocols except for FTP can send messages to switch the project. Modbus cannot receive the switch return string after a successful project switch.

TriggerIO

When the auto-switch mode of a project is set to TriggerIO, this projects will be set to Current Project if the received signal meets the requirement of the configured I/O trigger source and is received within the line back time.
The I/O trigger source consists of five digits, and each digit is either 0 or 1. The digits, from the first to the last, correspond to the I/O signal's Line4, Line3, Line2, Line1, and Line0. If the I/O type of the I/O signal is set to SolutionSwitch and the trigger type is set to Level High, the corresponding digit is 1; if the I/O type is set to SolutionSwitch and the I/O trigger mode is set to Level Low, the corresponding digit is 0; if the I/O type it set to Trigger or Output, the corresponding digit is 0.



Moreover, you need to set the Line Back Time in I/0 Settings. If several I/O signals are set to Level High when switching a project, the interval between the first and the last signal received should be within the configured line back time.

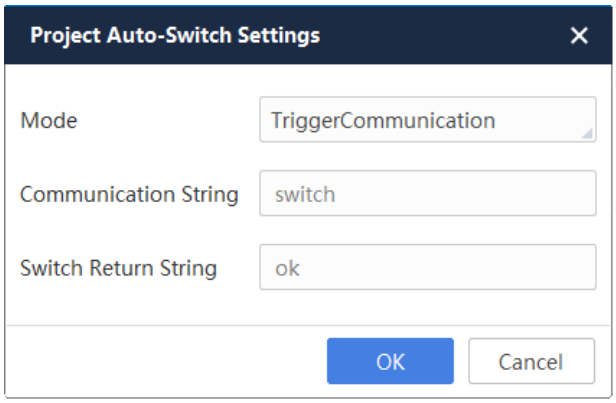


If the I/O trigger source of a project is set to 10110 and the line back time is set to 3 seconds, it is necessary to ensure that the I/O type of Line1, Line2, and Line4 is set to SolutionSwitch, and the these three signals should be sent to the camera within 3 seconds so that the project cannot be switched automatically.

Trigger Communication

If the auto-switch mode of one project is set to "TriggerCommunication", and the communication tool used in this project sends the required string and project name to the camera, this project will be set to "Current Project".

- Communication String: The content of the string sent by the communication tool, which is set to "Switch" by default.
- Switch Return String: The content of the string sent to the communication tool by the camera after switching the project, which is set to "OK" by default.



	Except the FTP tool, all of the other communication tools can send command to switch projects to cameras, while the Modbus tool cannot receive the switch return string after switching projects.

Communication Settings

Click Communication on the menu bar to check and set up the communication tools of the current project.
Supported communication protocols: Modbus, FTP, UDP Server, TCP Client, TCP Server, Serial Port, Melsec, and Keyence KV.

Select Communication Mode

You can set the communication methods of the current project in Communication Settings.

Steps

1. Click Communication on the menu bar.
2. Click ⊞ to add a new communication method.

ⓘ	You can add multiple communication methods in a project.

3. Select a method in the list to set the parameters. See details in Configure Communication Parameters.
4. Switch on ⊙ to enable the communication method.
5. Set related parameters.

ⓘ	● Parameters vary for different communication methods. ● Before configuring FTP parameters, configure the FTP server.

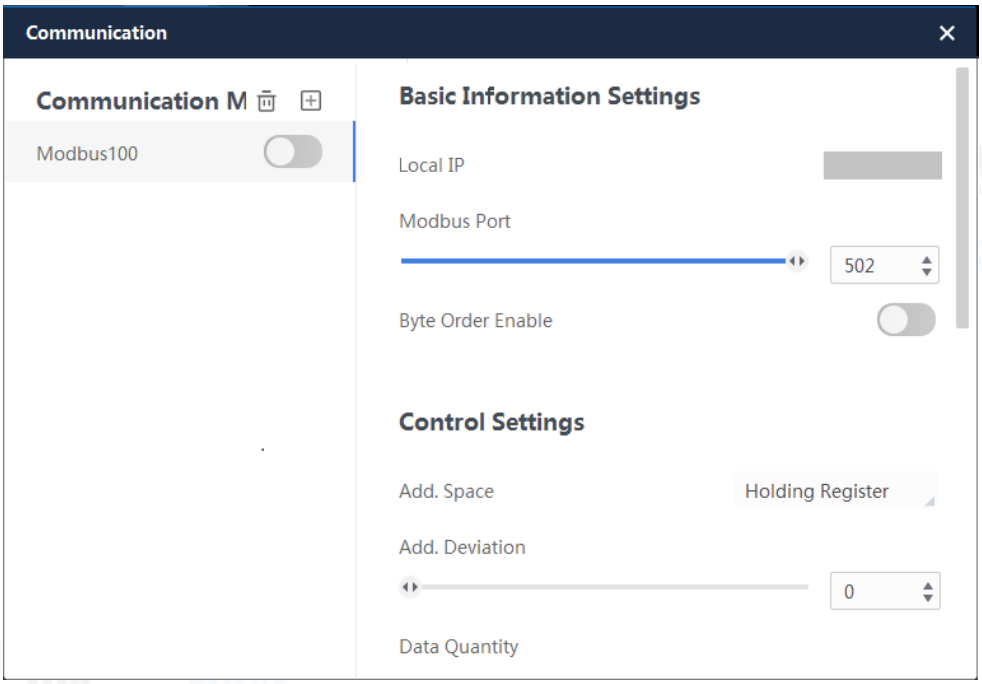
6. Optional: Select a method and click 🗑 to delete the method.

Configure Communication Parameters

The camera supports the communication tools of Modbus, FTP, UDP Server, TCP Client, TCP Server, Serial Port, Melsec, and Keyence KV. Parameters vary among different tools.

Modbus

Modbus is an application layer protocol that provides communication between clients and servers connected to different types of buses or network devices. Modbus is a request and response protocol, and its services are specified by function codes.
Modbus is a passive station in the camera, and the system port number is 502.

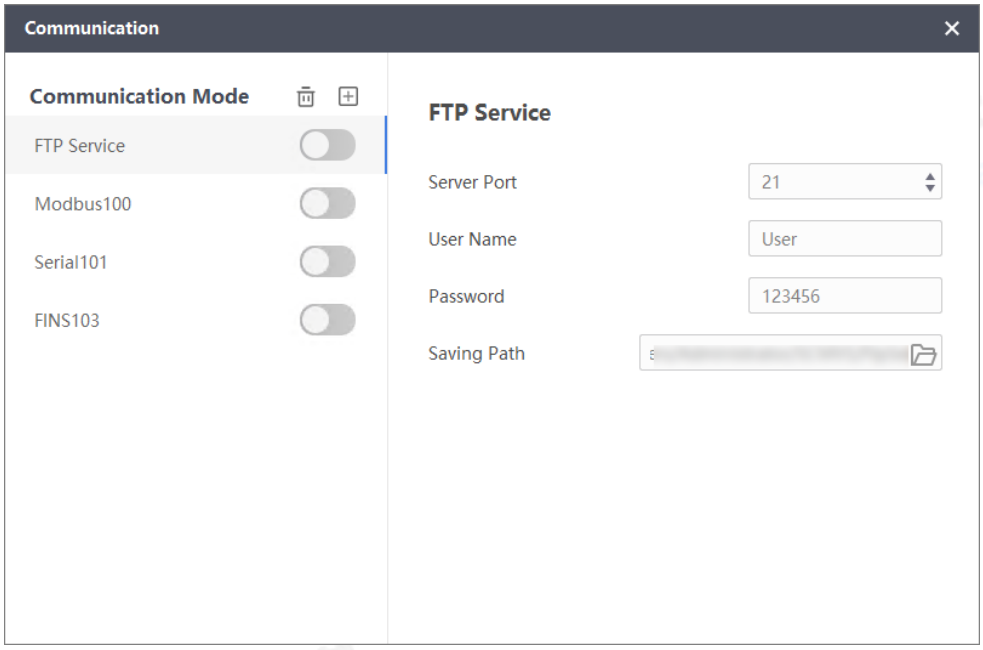


FTP

FTP communication can store the qualified images on FTP in the format of JPG.

FTP Service Configuration

Before setting FTP parameters, configure the parameters for FTP service and enable FTP Service.



Sever Port

Configure the port number of FTP service, which should be the same as that communicates with FTP.

User Name

Configure the user name to log in to the FTP service.

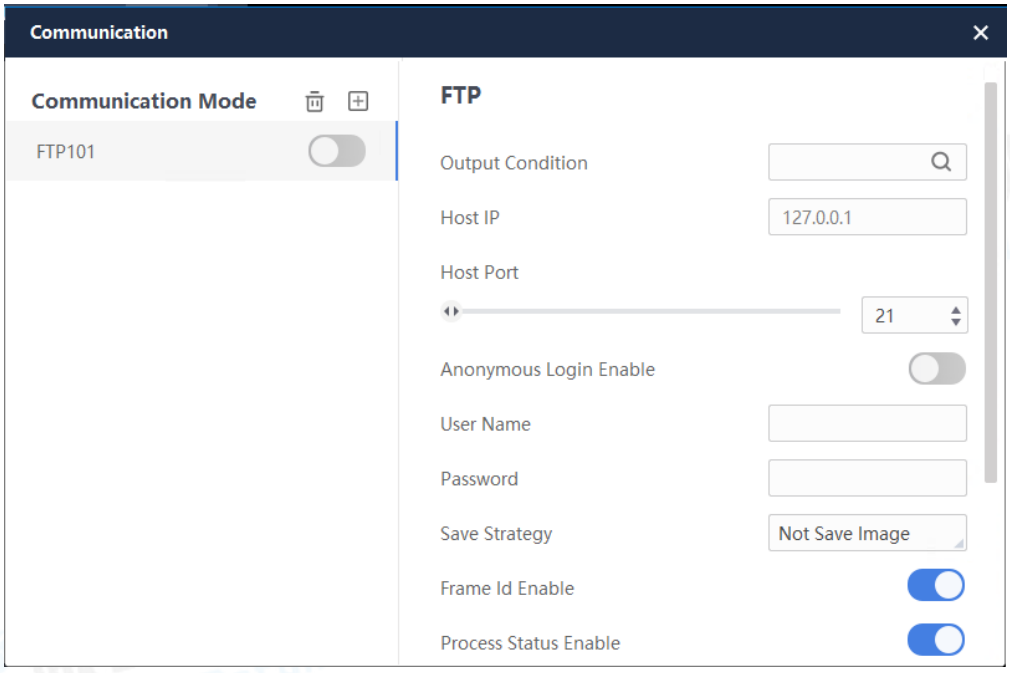
Password

Configure the password to log in to the FTP service.

Saving Path

Set the saving path for the data of FTP service in the local PC.

Set FTP Parameters



Output Condition

Condition for saving images on FTP. Click to subscribe information on modules such as camera image, base image, tools, and communication.

Host IP
IP address of the FTP server. 127.0.0.1 represents that the current PC is used as the FTP server.

Host Port
Port number of the FTP server.

Anonymous Login Enable
Switch on if the FTP server does not require a user name and password to log in.

> When anonymous login is enabled, the user name is shown as anonymous and the password is empty. Entering user name or password is invalid.

User Name & Password
If anonymous login is disabled, specify the user name and password to log into the FTP server.

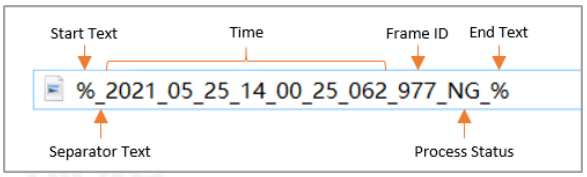
Save Strategy
Set the condition for saving images.

Frame ID Enable
Switch on to include frame ID in the image name.

Process Status Enable
Switch on to include running status in the image name.

Start End Text
Set the start and end text of the image name.

Separator Text
Set the separator text between different items in the image name.



Directory Type

Not Create
All the images will be stored in the default file folder in the server.

Create
New file folders will be created for storing each day's images.

Max file Num
the maximum number of images allowed for a single file folder.

Dir Increment Enable
if you do not enable this, new images will not be stored when the number of stored images reaches the upper limit of allowed images. If you do not enable this, a new file folder will be created for storing new images when the number of stored images reaches the upper limit of allowed images.

FTP Link Check
Click Execute to test the connection with the FTP server with the settings above.

UDP Server

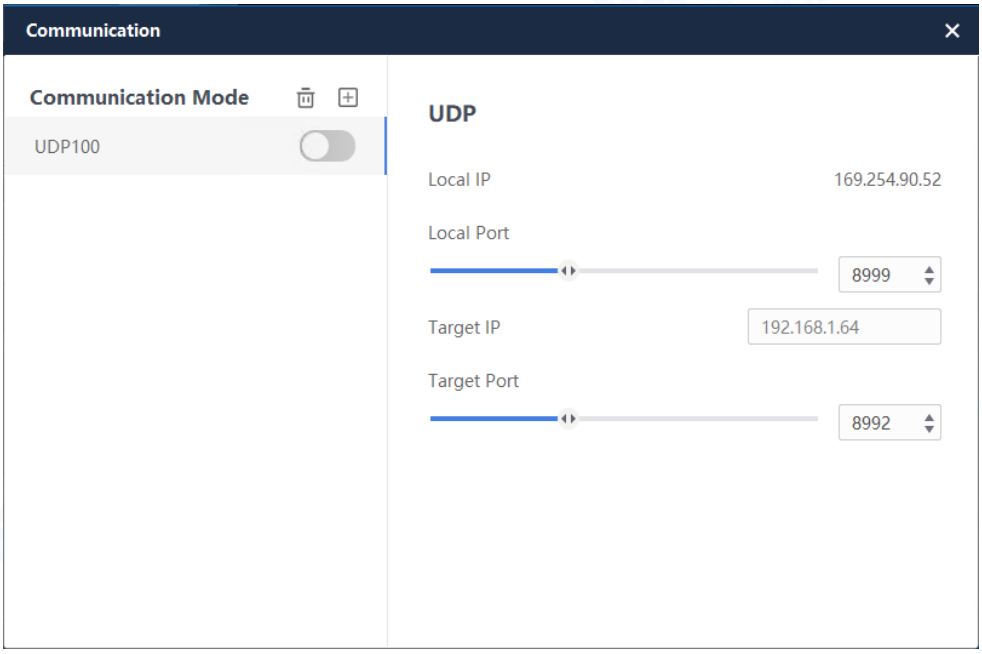
The camera can communicate with the UDP tool.
You need to specify the parameters according to the setting of the UDP tool.

Local IP
IP address of the camera. The IP address of the client of the UDP tool should be same with the address.

Local Port
The port number of the client of the UDP tool.

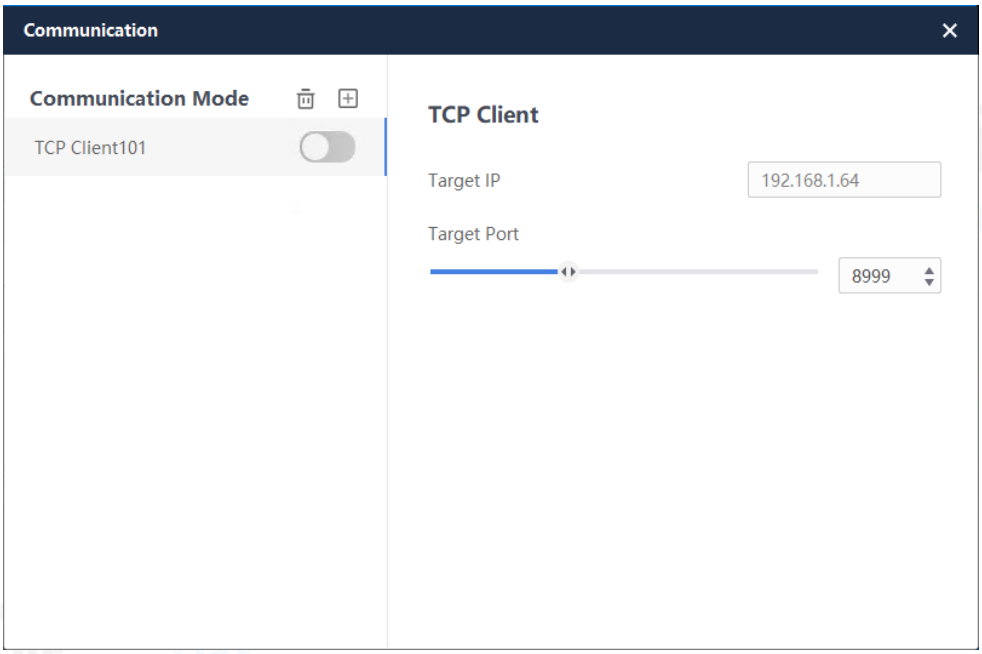
Target IP
The IP address of the server of the UDP tool.

Target Port
The port number of the server of the UDP tool.



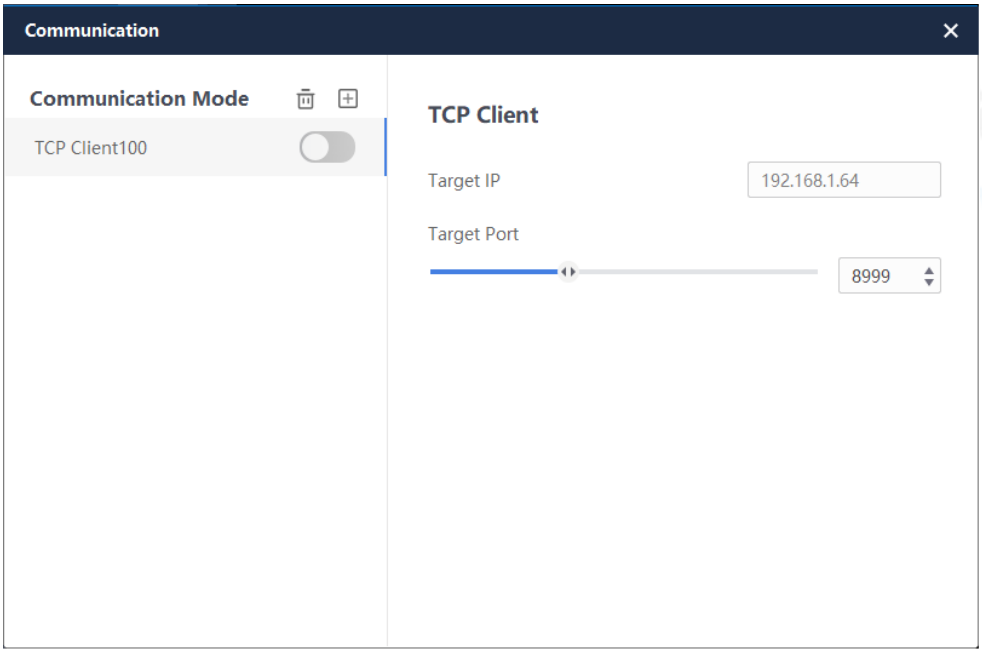
TCP Client

The camera can be used as the TCP client and communicate with a specific TCP server. Specify the IP and port number of the TCP server.



TCP Server

The camera can be used as the TCP server and communicate with a specific TCP client. Set the local port number and then enter the IP address and port number on the TCP client.



Serial Port

The camera can communicate with another device through the RS-232 serial ports.

> Make sure the camera is connected to the device with RS-232 serial port via a 17-pin cable. Refer to the quick start guide of the camera for instructions on connecting serial ports.

You need to set the following parameters.

Serial Port Mode

Only RS-232 is supported.

Baud Rate

Specify the rate according to actual condition. Make sure the baud rate is the same between the two ends of the communication.

Data Bit

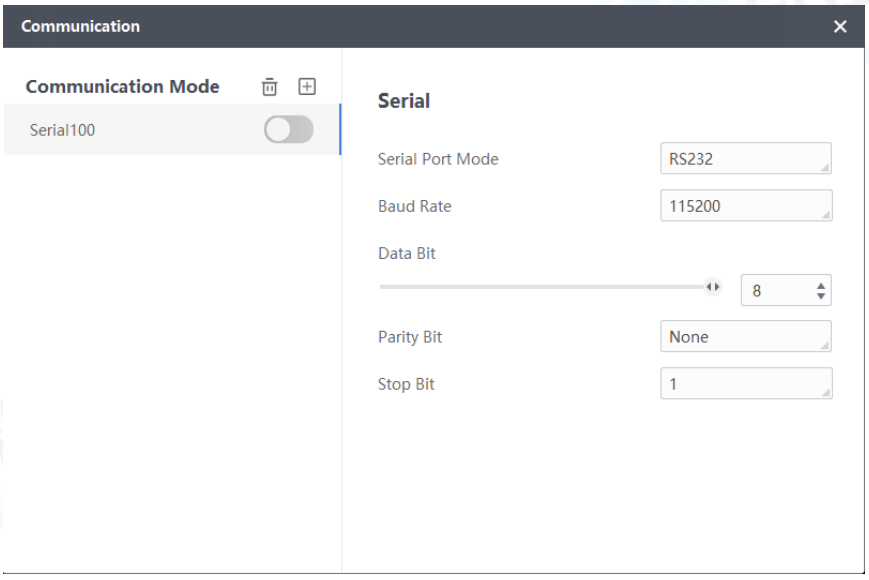
The default value is 8 and cannot be changed.

Parity Bit

Select from None, Odd, and Even.

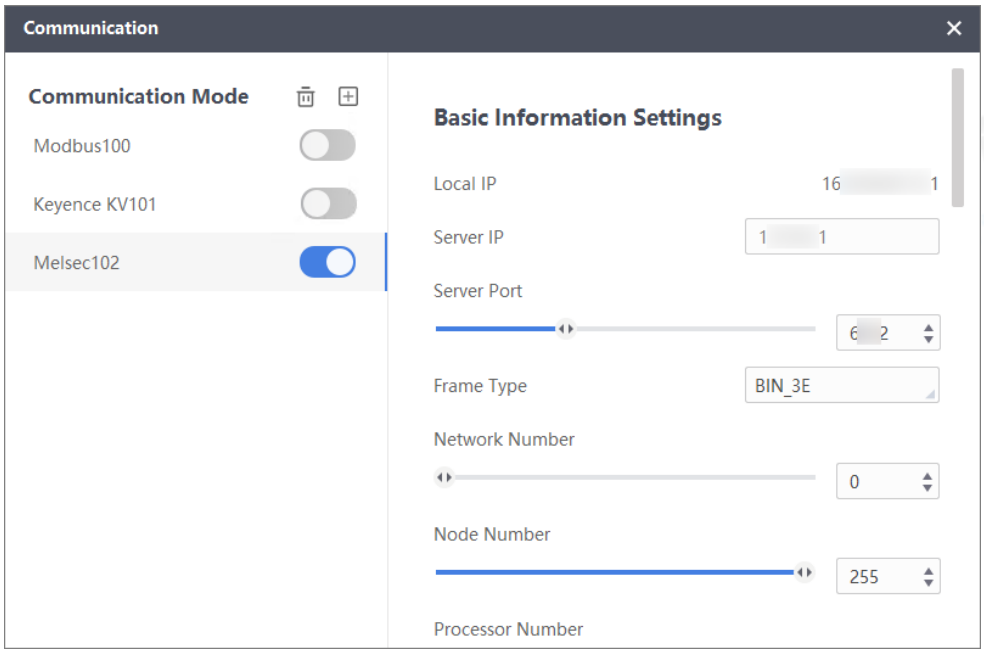
Stop Bit

Select from 1 and 2.



MELSEC

The camera can read/write the soft elements of the PLC via the MELSEC protocol.



Parameter description:

Basic Information Settings

Server IP

IP address of the MELSEC PLC.

Server Port

Port No. of the MELSEC PLC.

Frame Type

The device can use ASCII and binary data in communication via MELSEC protocol, so its frame type includes BIN_1E, BIN_3E, BIN_4E, ASCII_1E, ASCII_3E, and ASCII_4E.

- When the device accesses the PLC of MELSEC Q series, select 1E, 3E, or 4E as the frame type.
- When the device accesses the PLC of MELSEC FX3U series, select 1E as the frame type.

Network Number

The network number of the target station.

Node Number

The number of the target nodes.

Byte Order Enable

If it is enabled, the data will be stored in byte order.

Poll Interval

Polling frequency. The client will send requests to the server and the server will receive requests at the set time interval.

Timeout

The time that the device waiting for the response returned from the PLC.

Control Settings / Status Settings / Result Area Settings / Instruction Area Settings

The parameter of different modules are shown below.

Add Space

Type of the soft element. By default, it is D, which presents the data register.

Add Deviation

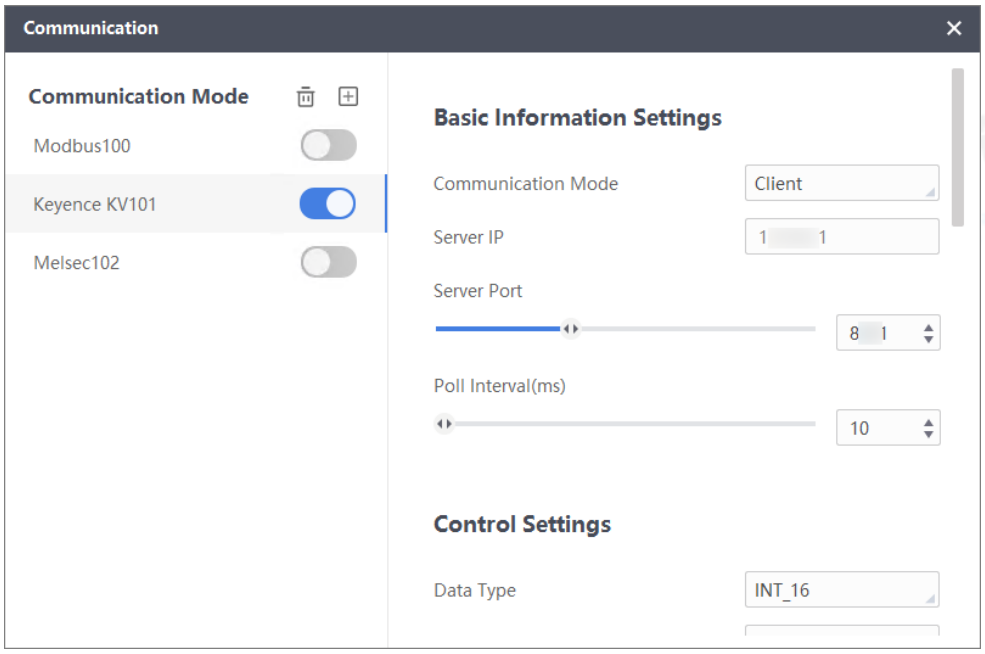
Offset value of the data.

Data Size

Max. number of data stored in the soft element.

Keyence KV

The camera can communicate with the PLC via the Keyence KV protocol.



Parameter description:

Basic Information Settings

Communication Mode

- Client: The camera can be used as the server to communicate with the Keyence KV client.
- Server: The camera can be used as the client to communicate with the Keyence KV server.

Client/Server IP

- For Client communication mode, enter the IP address of the Keyence KV client.
- For Server communication mode, enter the IP address of the Keyence KV server.

Poll Interval

Polling frequency. Theclient will send requests to the server and the server will receive requests at the set time interval.

Control Settings / Status Settings / Result Area Settings / Instruction Area Settings

The parameter of different modules are shown below.

Data Type

Type of the data transmited between the device and the Keyence KC client/server.

Soft Element Type

Type of the soft element. By default, it is D, which presents the data register.

Soft Element Address

The address of soft element in the corresponding modules (control, status, result, and instruction).

Soft Element Size

Max. number of data stored in the soft element.

Camera Monitoring

Click Camera Monitoring on the Software main interface to enter the Run Monitoring interface.
There are two parts of Run Monitoring: monitoring interface and camera management.

Manage Cameras

Click Camera Management on the top right to open the Camera Management window.

Camera List

The Camera List supports viewing camera status and the basic information about the cameras, logging into/out cameras, and changing IP address, and sticking a camera to the top. See Camera List and Log Into Camera for details.

Window Division Settings

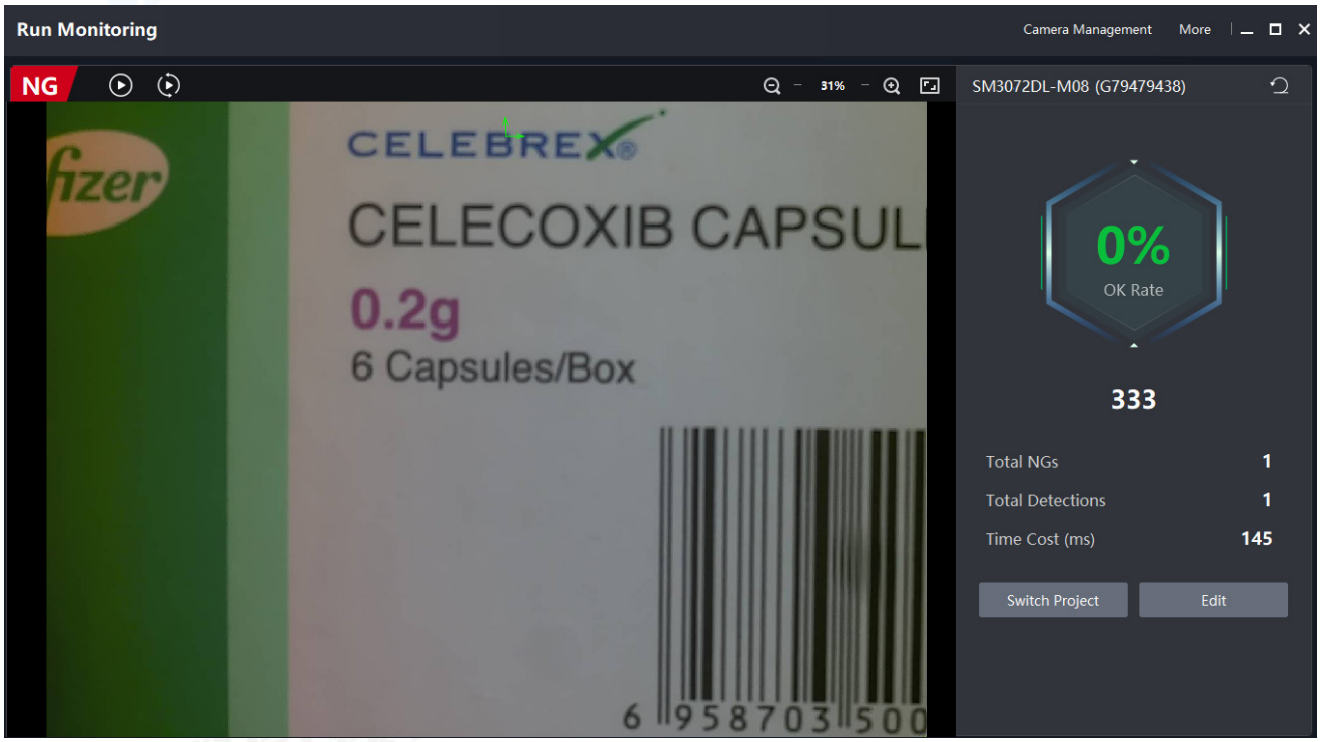
The Camera Management supports setting the division of the monitoring window and selecting cameras to display images on specified windows.
Click the icons above the window to select a division mode. No more than 9 cameras can be monitored at the same time.
After logging into a camera, drag the camera to a window to link the camera to the window. Click Stop Monitoring to unlink the camera from the window.
If you switch the division mode, the monitoring will stop automatically and the linkage will expire.

Default Settings

In this area, you can configure default settings of Camera Monitoring, including displaying the camera monitoring page by default after launching the Client, maximizing the monitoring page by default, reconnecting the camera after it goes offline, and setting the time period (sec) after which the auto connecting will stop.

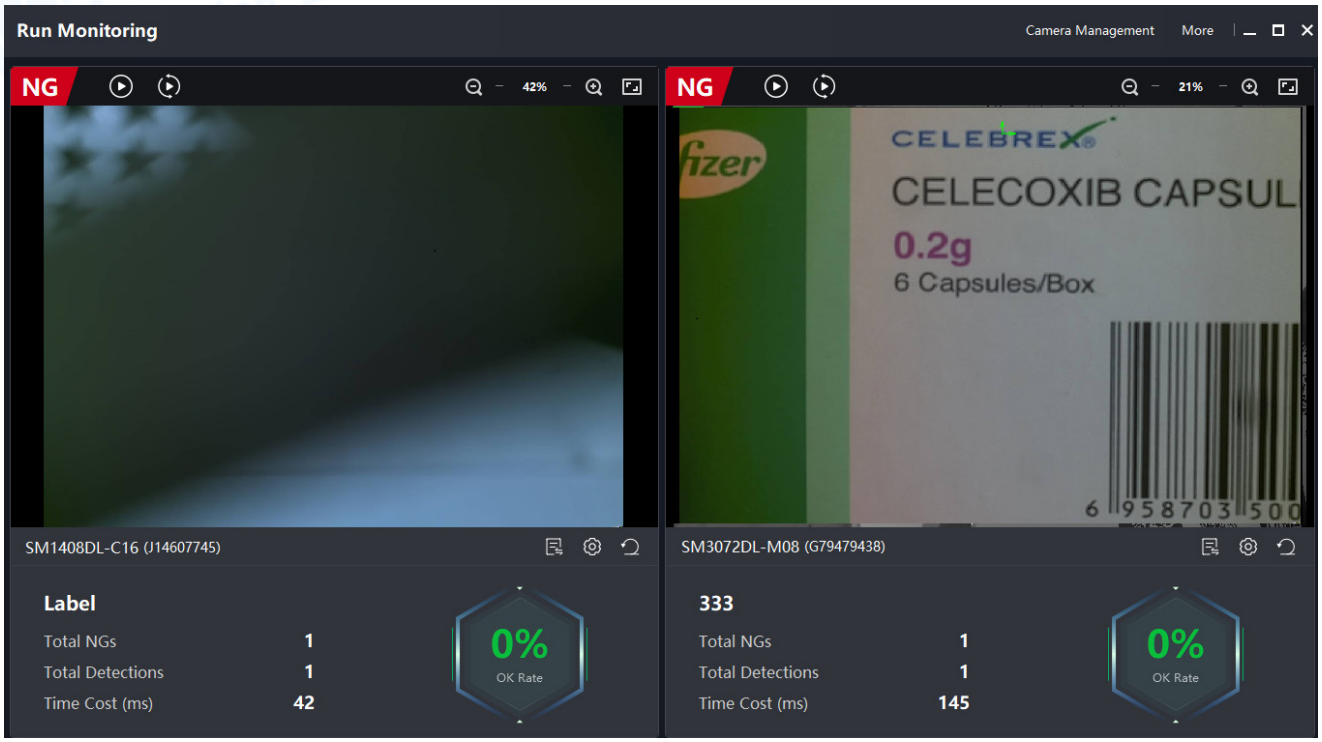
Monitoring Interface

Run Monitoring is to view the status of a single or multiple cameras, you can make some simple operations.
When there is no camera on the monitoring interface, you can click Camera Management to add and link cameras.
When there are linked cameras on the monitoring interface, you can view their real-time status and operate them.
The monitoring interface of the single-screen layout mode is shown below.



Monitoring Interface

The monitoring interface of the 1x2-screen layout mode is shown below.



	The functions and operations of different layout modes are basically the same. The project execution result (OK or NG) is displayed on the upper-left corner. Meanwhile, the linked camera information, including the project name, OK rate, total NGs, total detections, and time cost is displayed.

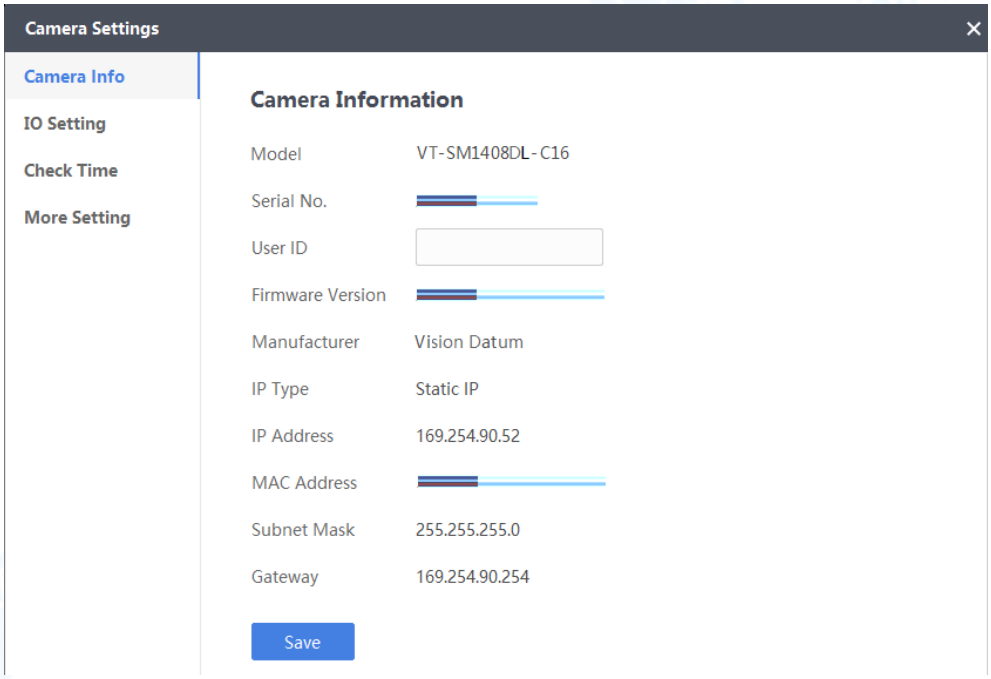
	In 3x3 screen mode, only total detections and total NGs will be displayed. On Run Monitoring interface, you can make some operations as follows: ● : Execute current project once. ● : Execute current project continuously, and click to stop the execution. ● / : Zoom in or out the image, the ratio will be displayed. ● / : Display the image in the original ratio or self-adaptive ratio. ● /Switch Project: Open the device's projects management window to switch the project. ● /Edit: Switch to the main interface to edit the project parameters of current device. ● : Reset the displayed detection data, including the OK rate, total NGs, total detections, and time cost.

Camera Settings

Click Camera Settings and you can view the camera information, set I/O parameters, perform time synchronization, and other operations.

Camera Information Settings

You can view the camera's basic information and edit User ID.
The information includes model, IP Type, serial No., IP address, user ID, subnet mask, Mac address, gateway, firmware version, and manufacturer. You can edit the user ID. Enter the User ID and click Save.

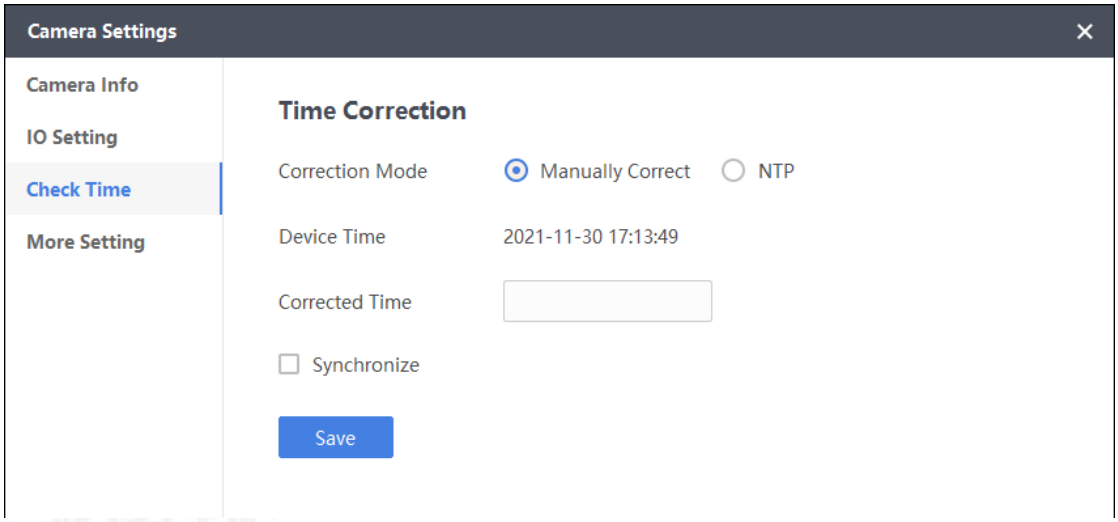


Check Time

You can correct the camera's time manually or by NTP timing.

Manually Correct

If you select the correction mode to Manually Correct, the page will be displayed as follows.



Device Time

The current time of the camera.

Corrected Time

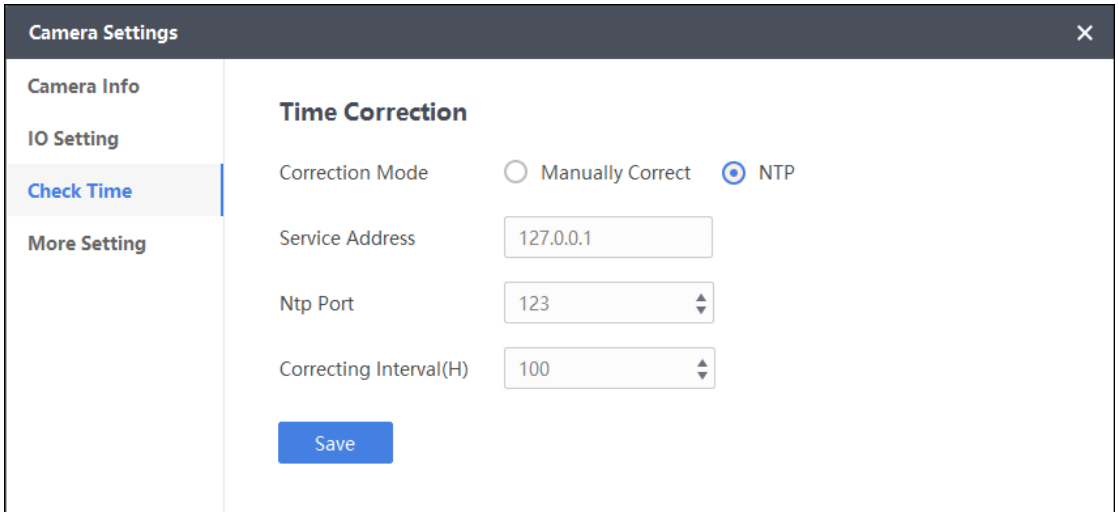
Click to correct the camera time.

Check Time

Synchronize

After checking this, the PC time will be set as camera time. Click OK to synchronize the time.

NTP

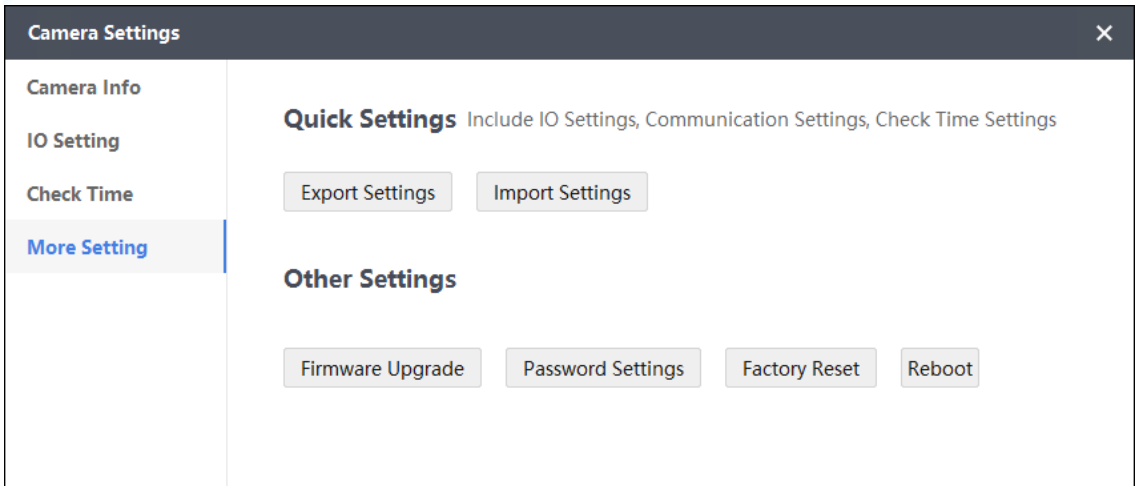


Enter the service address and NTP Port, and then set a correcting interval. Click OK. The camera's time will be synchronized with the NTP server according to the interval you set.

i	If the service address is 127.0.0.1, the NTP server is the current PC where the Software runs.

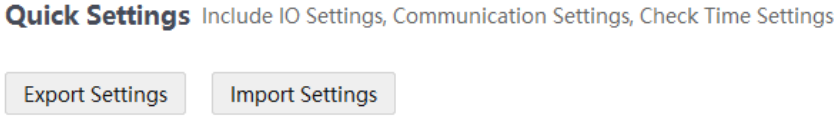
More Settings

In More Settings, you can import/export settings, upgrade the firmware, set the password, restore to factory defaults, and reboot cameras.



Quick Settings

Quick Settings support importing and exporting parameters configured in I/O Settings and Communication and time correcting parameters in tar.gz format.



- Click Export Settings to export the settings of the current camera to the PC.
- Click Import Settings to import the settings saved in the PC to the current camera to configure the parameters quickly.

i	Only the settings of cameras of the same series can be imported.

Other Settings

In Other Settings, you can upgrade camera firmware, change password, restore to factory settings, and reboot your camera.

Firmware Upgrade

Supports upgrading the firmware of your camera.

Before You Start

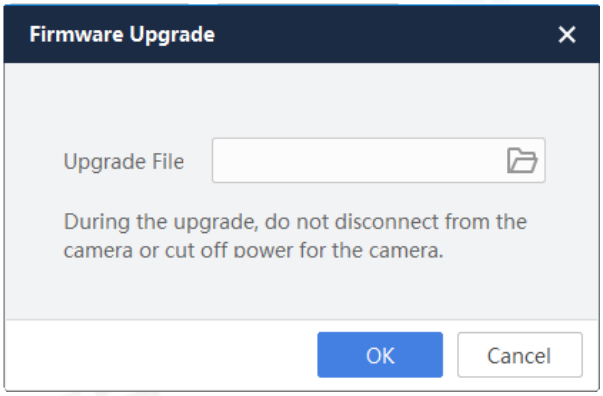
Make sure you have got the firmware for this model of camera from technical support.

> If you upgrade with firmware of a different model, it will lead to upgrade failure.

Steps

1.Unzip the firmware to format in dav.

2.Click Firmware Upgrade, and a window as shown below will pop up.



> If the firmware is already in the process of being upgraded, it will automatically stop.

3. Click to open the dav file and click Open.

4. Click OK to start to upgrade. The upgrade process will be displayed as below.

> During the upgrade, do not disconnect from the camera or cut off power for the camera. The device will reboot after upgrade, and you can reconnect the camera.

Password Settings

Supports resetting the camera password.

Steps

> The default password is Abc1234, and it is highly recommended that you change your password when you first log in.

1.Click Password Settings.

2.Enter your current password in the Old Password field.

> Click to reveal the password. When your typed text gets momentarily displayed as real instead of black dots, you can check if there is any mistake.

3. Enter your new password in the New Password field.

> Your password must contain: 6 to 15 characters; at least 2 of the following: uppercase, lower case, numeric, or special characters excluding (,), =, and ^.

4.Enter your password again in the Confirm Password field.

5.Click OK.

> You need to log in again using your new password after resetting your password.

More Settings

Factory Reset

Supports restoring camera settings to factory default settings.

	The I/O, IP Address, Time, NTP Correction, User Name, and Password of the camera cannot be restored.

Click Factory Reset, and then enter your password in the pop-up window, and finally click OK.

	You need to reconnect the camera after factory reset.

Reboot

Click Reboot and then OK to reboot your camera.
You will then be redirected to the login page, and you can reconnect the camera after it is enumerated.

Export License

The Software supports exporting the license of a camera to the PC.
Click Camera Settings → More Settings → Other Settings → Export License, and then select a saving path to download the camera license to the PC.

IO Settings

You can allocate IO signals,and configure project switch settings and project output settings.

IO Allocation

The Software supports setting IO types, trigger types, output types, and filter time.

IO

All IO lines are supported by the camera.

IO Type

Select Trigger, SolutionSwitch, or Output.
The IO settings vary with different device models.

- SM2-SE 06 Focal Length Cameras: It has 4 I/O lines of both inputs and outputs, which can be set to Trigger, SolutionSwitch, or Output. The IO types of Line 0/1 or Line2/3 are associated, meaning their settings are synchronized. For example,if you set Line0 to SolutionSwitch or Output, Line1 will be SolutionSwitch or Output; if you set Line0 to Trigger, Line1 will be SolutionSwitch.
- SM2-SE 08/12/15mm Focal Length Cameras: It has 4 I/O lines: 1 input, 1 output, 2 bidirectional configurable inputs/outputs. Line 0/1 can be set to both input and output, and their IO type can be set to Trigger, SolutionSwitch, or Output. Line2 can be set to input, andLine3 can be set to output.
- SM2-1408DL and SM2-2368DL Cameras: It has the following 8 IO lines: 2 inputs, 3 outputs, and 3 bidirectional configurable inputs/outputs. Line 0/1 can be set to Trigger or SolutionSwitch; Line 2/3/4 can be set to Trigger, SolutionSwitch, or Output; Line 5/6/7 can be set to Output.
- SM2-1216DL, SM2-2048DL, and SM2-2432DL Cameras: totally 6 IOs, including 3 inputs and 3 outputs. Line 0/1/2 can be set to Trigger or SolutionSwitch, while Line 3/4/5 can be set to Output.

i	The available LUT types vary with different camera models.

Trigger Type

When the IO type is Trigger, set this parameter.

Output Type

Polarity of output signals.

i	SM2-SE 06 Focal Length Cameras only supports NPN, and SM2-2048DL-M/C08 only supports PNP.

Filter Time

When the IO type is Trigger or SolutionSwitch, set this parameter. If the trigger signal duration is shorter than the filter time, the trigger signal will not be responded to.

Project Switch Settings

If you create multiple projects and set the auto-switch mode of a project to TriggerIO, this project will be selected as the running project when the signal meets the requirements of the switch trigger source and is received within the configured IO synchronization time.

Before You Start

Select TriggerIO as the mode of project auto-switch settings.

Steps

1.Select a switch trigger source.

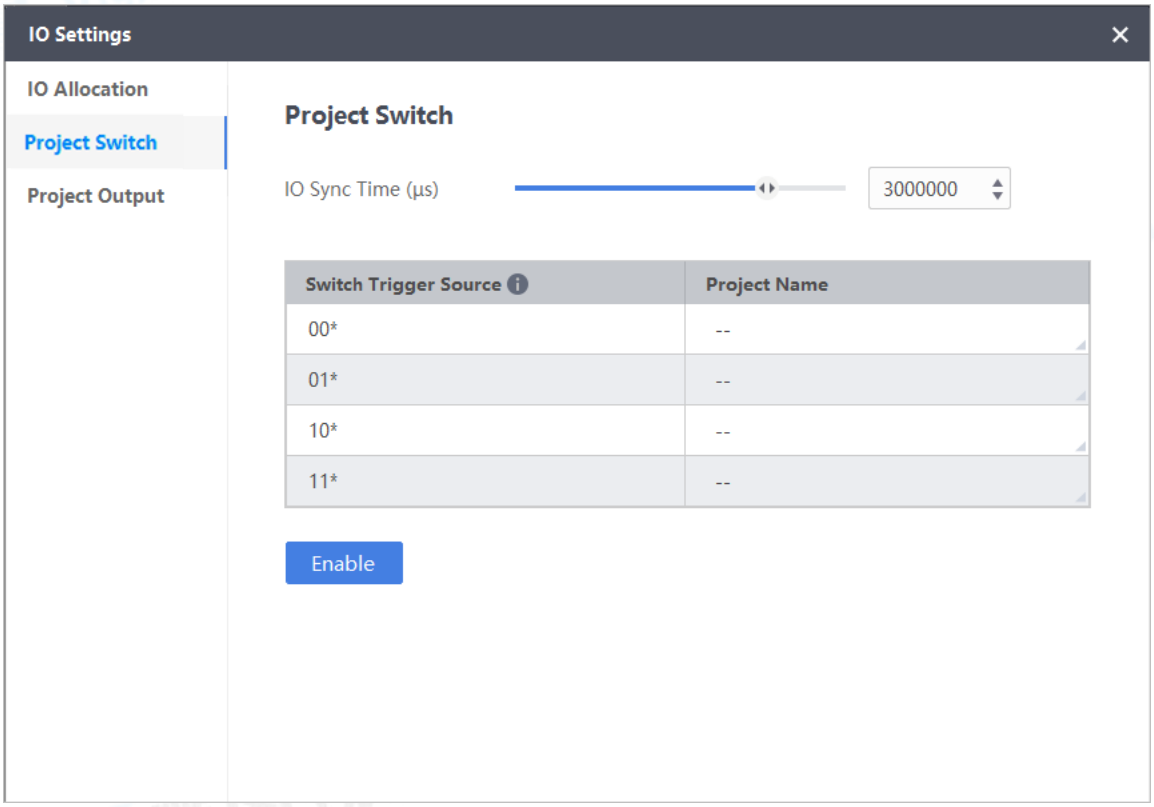
- The switch trigger source name is represented by a sequence of numbers or characters (from right to left) that correspond to the line numbers of the device.
- The number of characters consisting the switch trigger source name is the same with the line number of IO signals. Each number or character can be either 0, 1, or *.

i	○ If the IO type is SolutionSwitch and the trigger type is set to LevelHigh, the number is 1. ○ If the IO type is SolutionSwitch and the trigger type is set to LevelLow, the number is 0. ○ If the IO type is Trigger or Output, the number is *.

Project Switch Settings

2.On the right column, select a project.

3.Set IO Sync Time.



Example

If an SM2-DL series camera's project trigger source is *101* and the IO sync time is 3, we can get the conclusion that the IO type of Line0 is Trigger, the IO type of Line4 is Output, and the IO types of Line1 to Line3 are all set to SolutionSwitch. To automatically switch to this project, the signal LevelHigh of Line1 to Line3 should be sent to the camera within 3 seconds.

Project Output Settings

You can view all devices' IO outputs and configure the relevant parameters to ensure that the devices output signals as required.

Output Condition

Subscribe to module statuses of different tools to determine the type of IO output.

Output Hold

The location of IO output signals and the electronic level.

Disable

Set the duration time and delay time to control IO output signals.

TriggerReset

When the device receives a trigger signal, the IO output signal is set to levellow. Then, based on the subscribed module results and the set output type, the IO output signal is set to the corresponding electronic level. The level persists until the next trigger signal is received.

ReverseReset

If the module status subscribed by device output is opposite to the configured output type,the IO output signal is set to levellow until a model status matching the output type is received.

i	Output Hold should be supported by the device.

Duration Time

The duration of the output signal remaining at a specific electronic level.

Delay Time

The device outputs signals after the configured delay time ends.

Valid Electrical Level

Normally Close means valid levelhigh, while Normally Open means valid levellow.

Out Type

When the device meets the option you select, the IO signals will be output.

i	SM2-SE series cameras do not support EposureOutPut.

Cache Enable

If enabled,the subsequent output signal will be cached while the previous signal is still being output. Once the previous output ends, the cached signal will be automatically output. No more than 3 signals can be cached.

i	This parameter varies with different series of devices. ● SM2-SE, SM2-1216DL, SM2-2048DL and SM2-2432DL series do not support this parameter. ● SM2-1408DL and SM2-2368DL series cache no more than 3 output signals.

Operation Management

In Operation Management, you can search, view, and operate camera logs, software logs, acquired images, and imported images.

Camera Log Management

Supports searching and exporting the camera logs.
The SM2-SE series devices cannot store logs in the camera, and thus they do not support camera logs management.

Steps

1.Click Operation Management → Camera Logs.

2.Filter the log type by Info, Warning, Error, and All.

3.Optional: Click Extend to customize the period. For detailed information, refer to Check Time. The default period is the 24 hours prior to the current system time.

i	If you Pick up the period, all logs will be displayed.

4. Click Search and you can search logs.

5. Optional: Click Export to save the searched logs as files in JSON format to your PC.

Software Logs Management

You can search for software logs and export them to your PC.
As the steps to manage software logs are highly similar to those to manage camera logs, you can see Camera Log Management for more details.
The log types that can be selected are as follows: track, debug, information, alarm, and error.

Acquired Image Management

You can search for, export, and delete the pictures stored in camera projects.

The SM2-SE series cameras cannot store images in the camera, and thus they do not support acquired image management.

Steps

1.On the menu bar, click Operation Management → Acquired Images.

2.Select the image state type from All, OK, and NG. The image state type corresponds to the Output Condition (OK, NG) in the Save Image settings of an project.

3.Select the image format from ALL, BMO, and JPG.

4.Optional: Enter key words of the image name in the Name field.

5.Optional: Click Extend to set a period during which the images are acquired, see Check Time for how to set the time period. The default time period for a search is the 24 hours before the current time of the PC.

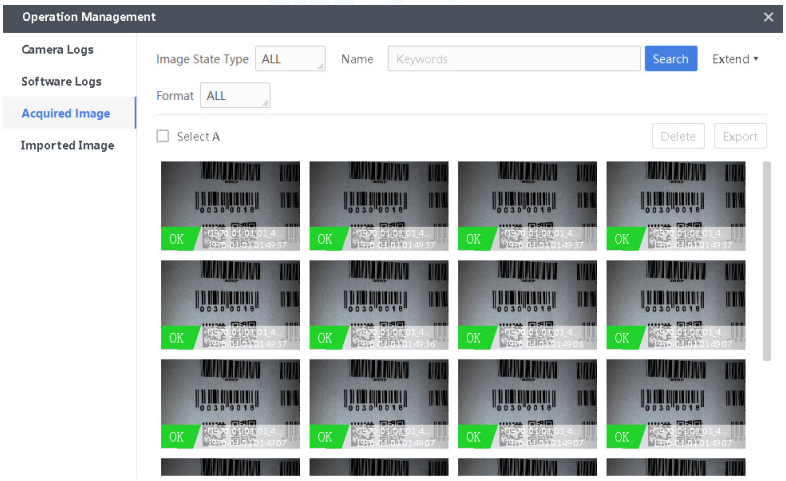
i	If you click Pick up, the software will search the images acquired in all periods.

6. Click Search.

7.Double-click an image to zoom it in.

8.Optional: Check one or multiple images, and click Delete to delete the image(s).

9.Optional: Check one or multiple images, and click Export to export the image(s) to your PC.



Imported Image Management

You can search for, export, and deleted the pictures imported to cameras from your PC.

> The pictures are imported into cameras via the image-mode preview window, see Live View Panel for more details.

As the steps to manage imported images are highly similar to those to manage acquired images, you can see Acquired Image Management for more details.
The imported images can be in BMP, JPG, or PNG format.

Export Data

Save the following data of the running project to your local device: project name, total project running times, OK times, NG times, module ID, module name, OK condition, and running results.
Select the File Saving Path, and then enable the Export Data to save the data to the PC in CSV format.

Tool Introduction

Various types of tools can be added to cameras to perform visual detection.

Tools Supported by SM2-SE Series Cameras

Category	Tool	VT-SM2-SE-Mono	VT-SM2-SE-Color
Counting Tools	Spot Count	√	√
	Pattern Count	√	√
Existence	Spot Existence	√	√
	Pattern Existence	√	√
Measurement	Brightness Average Value	√	√
	Contrast Measurement	√	√
	Color Size		√
Recognition	Color Recognition		√

Tools Supported by SM2-DL Series Cameras

Category	Tool	VT-SM2-DL-Mono	VT-SM2-DL-Color
Counting Tools	Spot Count	√	√
	Edge Count	√	√
	Pattern Count	√	√
Defect Detection Tool	Exception Detection	√	√
Existence	Circle Existence	√	√
	Line Existence	√	√
	Spot Existence	√	√
	Edge Existence	√	√
	Pattern Existence	√	√
Location	Match Calibration	√	√
	Match Locate	√	√
	Fixture	√	
Logic	If Module	√	√
	Condition Judge	√	√
	Logic Judge	√	√
	Combination Judge	√	√
	Character Comparison	√	√
	Calculator	√	√
Measurement	Color Size		√
	L2L Angle	√	√
	Diameter Measurement	√	√
	Brightness Average Value	√	√
	Contrast Measurement	√	√
	Width Measurement	√	√
	P2L Measurement	√	√
	Greyscale Size	√	√
	Line Angle	√	√
Recognition	OCR	√	√
	Color Contrast		√
	Code Recognition	√	√

Measuring Tool

Measuring tools analyzes images via measurement.

Color Size

The Color Size tool calculates the area size with qualified colors in the detection area.

Before You Start

- Make sure that the connected camera is the color camera and the Greyscale Image Output function is disabled.
- Make sure that you have configured the camera parameters and base image, and added the Color Size tool.
- This function is available only when the Greyscale Image Output function of color device is disabled. Only color camera supports this tool.
- If you enable the Greyscale Image Output function for a color camera, the color size tool can still be configured but the output result will be NG.

Steps

1. Set the Detection Area as needed. It it set to analyze the whole base image by default.

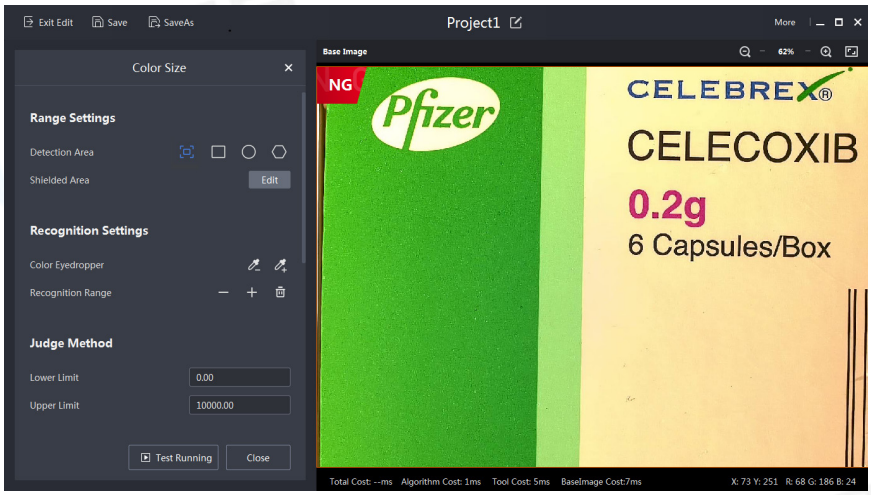
Click ▭ or ○ or ⬡ to draw on the base image; click ⛶ to set the whole base image as the detection area.

ⓘ	Refer to How to draw an ROI? for ROI drawing details.

2.Optional: If you need to shield areas in the detection area, click Edit on the right of Shield Area, and then click ⬡ to draw polygons on the base image.

3.Optional: You can enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.
Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4.Set recognition-related parameters.



Color Eyedropper

Set the color value range to be recognized or not need to be recognized. Click ✎+ and move the cursor on the base image to select the area to be recognized. The pixels with the same color value will turn to green. You can click ✎− and select an area that does not need to be recognized.

Recognition Range

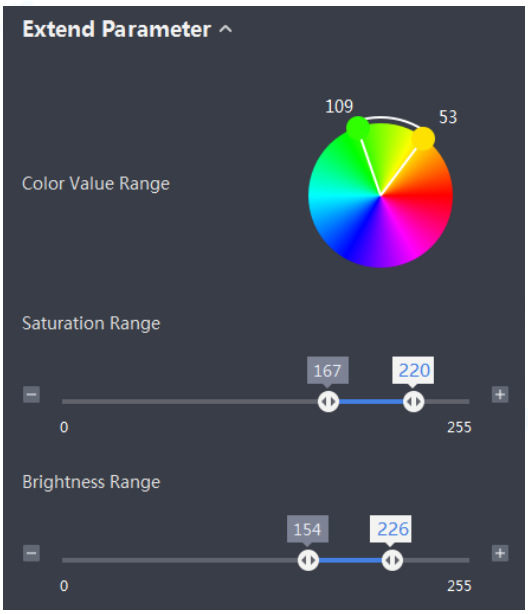
Click + / − and move the cursor on the area defined by the color dropper to enlarge or narrow down the to-be-recognized area.

ⓘ	Click 🗑 to clear the recognition range you set.

5. In Judge Method, set Upper Limit and Lower Limit. If the detection result is within the configured range, the result is OK. Otherwise, the result is NG.

ⓘ	The Judge Method parameters vary according to the camera type. For some cameras, the Judge Method parameter is the similarity range, which is from 0% to 200%. If the value cannot satisfy your need, you can switch 200% to 900%. The maximum similarity range is 900%. If the actual value is higher than 900%, the camera will respond based on 900%.

6. Optional: Set extra parameters in Extend Parameter if the result is not what you have expected.



7. Click Test Running to test the detection according to settings.

	Click Stop Running to stop the test.

L2L Angle

Find straight lines in two ROIs and calculate the angle between the two straight lines. You can configure range settings, recognition settings, judge method, and extend parameter for the tool.

● Range Settings: You can set area-related parameters.

○ Detection Area: Click and click on a position on the two lines respectively.

	Click beside the Detection Area to display the tutorial video on the top left of the live view image.

○ Shielded Area: The shielded area will not be analyzed by the tool. Click Edit → and draw the shielded area on the base image in the live view image.

○ Independent Fixture: When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

	Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

● In Recognition Settings, you can set recognition-related parameters.
Line 1/2 Sensitivity Adjustment: Adjust the sensitivity when measuring line 1 and line 2. When adjusting the parameter, the result will be displayed on the map located on the top right. Red indicates the sensitivity range.

● In Judge Method, set the Upper Limit and the Lower Limit. If the detection result is within the range you set, the tool will output OK, otherwise the tool will output NG.

	For some cameras, the Similarity Range will be displayed here. When the similarity between the detected angle and that of the base image is within the range, the result will be OK, or the result will be NG. By default, the similarity range is from 0% to 200%. If the value cannot satisfy your need, you can switch 200% to 900%. The maximum similarity range is 900%. If the actual value is higher than 900%, the camera will respond based on 900%.

● In Extend Parameter, you can set extra parameters for line1 and line 2 if the result is not what you have expected.

○ Straightness Accuracy: the minimum ratio of the number of points used to make up lines to the total number of points. When a line's line rate is higher than the configured rate, it will be recognized as a line, otherwise it will not. The more points selected, the more accurate the line will be.

○ Edge Polarity: It represents the excessive change of color.

›Black to White: The tool recognizes edges from area with higher grey scale to the area with lower grey scale.

›White to Black: The tool recognizes edges from the area with lower grey scale to the area with higher grey scale.

›All: The tool recognizes edges from area with higher grey scale to area with lower grey scale and from area with lower grey scale to area with higher grey scale.

○ Edge Type: You can select "The Best", "The First", "The Last", and "Manual".

›The Best: The tool will find the most suitable points to make up lines.

›The First: The tool will find the points nearest to the start point to make up lines.

›The Last: The tool will find the point nearest to the end points to make up lines.

›Manual: Based on the green lines in the greyscale layout map, you can manually select points to make up lines.

	If the edge type is set to "Manual", the edge polarity is set to "All" automatically and it cannot be changed.

After setting the above parameters, you can go to Output → Tool Results to set which data to transmit to the communication tool by the tool.
The data can be transmitted are as follows: module status, point measure intersection point angle, point measure intersection point angle X, point measure intersection point angle Y, point measure distance, point measure line 1 start point X, point measure line 1 start point Y, point measure line 1 end point X, point measure line 1 end point Y, point measure line 1 angle, point measure line 2 start point X, point measure line 2 start point Y, point measure line 2 end point X, point measure line 2 end point Y, point measure line 2 angle, result similarity, detection area center X, detection area center Y, detection area width, detection area height, detection area angle, result quantity, and base value.

Diameter Measurement

In the detection area range, measure the diameter of the circle.
You can configure range settings, recognition settings, judge method, and extend parameter for the tool.

● Range Settings: You can set area-related parameters.

○ Detection Area: Click and click the base image to draw a circle on the base image.

	Click beside the Detection Area to display the tutorial video on the top left of the live view image.

○ Shielded Area: The shielded area will not be analyzed by the tool. Click Edit → and draw the shielded area on the base image in the live view image.

○ Independent Fixture: When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

	Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

● In Recognition Settings, you can set recognition-related parameters. Sensitivity Adjustment: Adjust the sensitivity when measuring the circle. When adjusting the parameter, the result will be displayed on the map located on the top right. Red indicates the sensitivity range.

● In Judge Method, set the Upper Limit and the Lower Limit. If the detection result is within the range you set, the tool will output OK, otherwise the tool will output NG.

	For some cameras, the Similarity Range will be displayed here. When the similarity between the detected angle and that of the base image is within the range, the result will be OK, or the result will be NG. By default, the similarity range is from 0% to 200%. If the value cannot satisfy your need, you can switch 200% to 900%. The maximum similarity range is 900%. If the actual value is higher than 900%, the camera will respond based on 900%.

● In Extend Parameter, you can set extra parameters for line1 and line 2 if the result is not what you have expected.

○ Circle Rate: The minimum ratio of the number of points used to make up circles to the total number of points. When a circle's circle rate is higher than the configured rate, it will be recognized as a circle, otherwise it will not. The more points selected, the more accurate the circle will be.

○ Edge Polarity: It represents the excessive change of color.

›Black to White: The tool recognizes edges from area with higher grey scale to the area with lower grey scale.

›White to Black: The tool recognizes edges from the area with lower grey scale to the area with higher grey scale.

›All: The tool recognizes edges from area with higher grey scale to area with lower grey scale and from area with lower grey scale to area with higher grey scale.

○ Edge Type: You can select "The Best", "The Biggest", "The Smallest", or "Manual".

›The Best: The tool will find the most suitable points to make up lines.

›The Biggest: The tool will find the points that are the most distant from the center to make up circles.

›The Smallest: The tool will find the points nearest to the center to make up circles.

›Manual: Based on the green lines in the greyscale layout map, you can manually select points to make up circles.

	If the edge type is set to "Manual", the edge polarity is set to "All" automatically and it cannot be changed.

After setting the above parameters, you can go to Output → Tool Results to set which data to transmit to the communication tool by the tool.
The data can be transmitted are as follows: module status, detection area center X, detection area center Y, detection area width, detection area height, detection area angle, circle diameter, circle center X, circle center Y, circle radius, result quantity, and base value.

Brightness Analysis

The Brightness Average Value tool can measure the brightness of an ROI and then calculate the mean value.

Before You Start

Make sure that you have configured the camera parameters and base image, and added the Brightness Average Value tool.

Steps

1.Set the Detection Area as needed. It it set to analyze the whole base image by default.Click ▭ or ◯ or ⬡ to draw on the base image, the position and size of the area can be adjusted manually; click ⛶ to set the whole base image as the detection area.

ⓘ	Refer to How to draw an ROI? for ROI drawing details.

2.Optional: If you need to shield areas in the detection area, click Edit on the right of Shielded Area, and then click ⬡ o draw polygons on the base image.

3.Optional: You can enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.
Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4.In Judge Method, set Upper Limit and Lower Limit. If the detection result is within the configured range, the result is OK. Otherwise, the result is NG.

ⓘ	The Judge Method parameters vary according to the camera type. For some cameras, the Judge Method parameter is the similarity range, which is from 0% to 200%. If the value cannot satisfy your need, you can switch 200% to 900%. The maximum similarity range is 900%. If the actual value is higher than 900%, the camera will respond based on 900%.

5. Click ▶ Test Running to test the detection according to settings.

ⓘ	Click ⏻ Stop Running to stop the test.

Contrast Measurement

The Contrast Measurement tool can measure the contrast of the detection area.

Before You Start

Make sure that you have configured the camera parameters and base image, and added the Contrast Measurement tool.

Contrast is a relative value, representing the ratio of brightest to the darkest of the detection area.

Steps

1.Set the Detection Area as needed. It it set to analyze the whole base image by default.

Click ▭ or ◯ or ⬡ to draw on the base image; click ⛶ to set the whole base image as the detection area.

ⓘ	Refer to How to draw an ROI? for ROI drawing details.

2.Optional: If you need to shield areas in the detection area, click Edit on the right of Shielded Area, and then click ⬡ o draw polygons on the base image.

3.Optional: You can enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.
Make sure you have enabled Fixture when configuring the base image. Refer to
Configure Base Image for details.

4.In Judge Method, set Upper Limit and Lower Limit. If the detection result is within the configured range, the result is OK. Otherwise, the result is NG.

ⓘ	The Judge Method parameters vary according to the camera type. For some cameras, the Judge Method parameter is the similarity range, which is from 0% to 200%. If the value cannot satisfy your need, you can switch 200% to 900%. The maximum similarity range is 900%. If the actual value is higher than 900%, the camera will respond based on 900%.

5. Click ▶ Test Running to test the detection according to settings.

ⓘ	Click ⏻ Stop Running to stop the test.

Width Measurement

The Width Measurement tool can detect two edges in the detection area and measure the perpendicular distance between the two edges.

The parameters of the tool are divided into four categories: range settings, recognition settings, judge method, and extend parameter.

- Range settings determine the detection area:

  Detection Area

  Click and click on the two endpoints on the base image to measure the distance between the two edges.

  > Click to show animated instructions on drawing ROI.

  Shielded Area

  Specify the shielded area within the detection area. The shielded area will not be analyzed. Click Edit and then click to draw a polygon on then base image.

  Independent Fixture

  When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

  > Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

- Recognition settings determine the pattern recognition conditions:

  Sensitivity Adjustment

  Adjust the sensitivity of edge detection. The grayscale graph in the upper-right corner shows the current effect, and the red area is the sensitivity range.

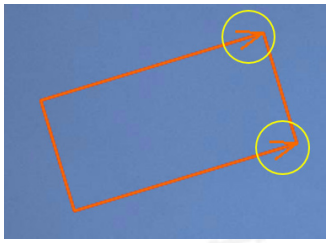
- In Judge Method, set the Upper Limit and the Lower Limit. If the detection result is within the range you set, the tool will output OK, otherwise the tool will output NG.

> For some cameras, the Similarity Range will be displayed here. When the similarity between the detected angle and that of the base image is within the range, the result will be OK, or the result will be NG. By default, the similarity range is from 0% to 200%. If the value cannot satisfy your need, you can switch 200% to 900%. The maximum similarity range is 900%. If the actual value is higher than 900%, the camera will respond based on 900%.

- If the parameter settings above cannot achieve the expected outcome, you can adjust the Extend Parameter.

  Polarity

  Color transition direction. Edge polarity is related to the arrow's direction of the ROI.

  Black To White

  Only detect the edge formed by low grayscale to high grayscale.

  White To Black

  Only detect the edge formed by high grayscale to low grayscale.

  All

  Detect any type of edge.

  Width Extraction

  The Widest

  Only detect the edge pair with the longest distance.

  The Narrowest

  Only detect the edge pair with the shortest distance.

  Manual

  Drag the green line in the grayscale graph in the upper-right corner to select the set of edge points and fit the edge pair.

  > If you select Manual, the polarity will be set to All and cannot be changed.

After setting the above parameters, you can go to Output → Tool Results to set which data to transmit to the communication tool. The output data items include: module status, detection area center X/Y, detection area width/height/angle, line start point X/Y, line end point X/Y, result similarity, line 0 start point X/Y, line 0 end point X/Y, line 0 angle, line 1 start point X/Y, line 1 end point X/Y, line 1 angle, pixel edge spacing, and base value.

P2L Measurement

The P2L Measurement tool can detect edges and lines, and then measure the perpendicular distance between a point (on a line/edge) and a line/edge.

Before You Start

Make sure that you have configured the camera parameters and base image, and added the P2L Measurement tool.

Steps

1. Click and click on the base image to determine the point and then click twice to draw on the line so as to measure the distance between the point and the line.

	Click to show animated instructions on drawing ROI.

2. Optional: If you need to shield areas in the detection area, click Edit on the right of Shielded Area, and then click o draw polygons on the base image.

	Refer toHow to draw an ROI? for ROI drawing details.

3.Optional: You can enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.
Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4.Set the pattern recognition conditions in Recognition Settings.

Line Sensitivity Adjustment

Adjust the sensitivity of line detection. The grayscale graph in the upper-right corner shows the current effect, and the red area is the sensitivity range.

Point Sensitivity Adjustment

Adjust the sensitivity of point detection. The grayscale graph in the upper-right corner shows the current effect, and the red area is the sensitivity range.

5. In Judge Method, set the Upper Limit and the Lower Limit. If the detection result is within the configured range, the result is OK. Otherwise, the result is NG.

	The Judge Method parameters vary according to the camera type. For some cameras, theJudge Method parameter is the similarity range, which is from 0% to 200%. If the value cannot satisfy your need, you can switch 200% to 900%. The maximum similarity range is 900%. If the actual value is higher than 900%, the camera will respond based on 900%.

6.Set extra parameters in Extend Parameter if the result is not what you have expected.

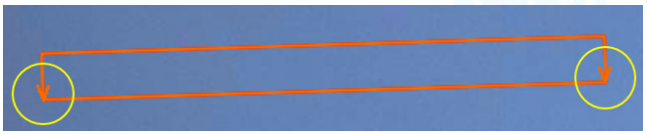
- Line Parameters:

Line Rate

You can set the minimum value of the ratio of the fitting points to the total number of points. When the straightness of the detected line exceeds this value, it is judged as a straight line. Otherwise, it is not judged as a straight line.

Edge Polarity

Color transition direction. Edge polarity is related to the arrow's direction of the ROI.



Black To White

Only detect the edge formed by low grayscale to high grayscale.

White To Black

Only detect the edge formed by high grayscale to low grayscale.

All

Detect any type of edge.

Edge Type

The Best

Only detect edge points with the largest gradient threshold and fit them into a line.

The First

Only detect edge points that are the nearest to the detection start point and fit them into a line.

The Last

Only detect edge points that are the nearest to the detection end point and fit them into a line.

Manual

Drag the green line in the grayscale graph in the upper-right corner to select the set of edge points and fit them into a line.

- Point Parameters:

Edge Polarity

Refer to the descriptions in Line Parameters.

7. Click Test Running to test the detection according to settings.

	Click Stop Running to stop the test.

Greyscale Size

The Greyscale Size tool can measure the area of pixels with greyscale value that is within the range you set.

Before You Start

Make sure that you have configured the camera parameters and base image, and added the Greyscale Size tool.

Steps

1. Set the Detection Area as needed. It it set to analyze the whole base image by default.

Click ▭ or ◯ or ⬡ to draw on the base image, the position and size of the area can be adjusted manually; click ⛶ to set the whole base image as the detection area.

ⓘ	Refer to How to draw an ROI? for ROI drawing details.

2.Optional: If you need to shield areas in the detection area, click Edit on the right of Shielded Area, and then click ⬡ o draw polygons on the base image.

3.Optional: You can enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.
Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4.Set the pattern recognition conditions in Recognition Settings.

Greyscale Threshold

Set the valid greyscale value range. Qualified area will be marked in green.

Reverse Range

When enabled, the unqualified area will be marked in green. It is used to measure the area that is not within the valid greyscale range.

5. In Judge Method, set the Upper Limit and the Lower Limit. If the detection result is within the configured range, the result is OK. Otherwise, the result is NG.

ⓘ	The Judge Method parameters vary according to the camera type. For some cameras, the Judge Method parameter is the similarity range, which is from 0% to 200%. If the value cannot satisfy your need, you can switch 200% to 900%. The maximum similarity range is 900%. If the actual value is higher than 900%, the camera will respond based on 900%.

6. Optional: Set extra parameters in Extend Parameter if the result is not what you have expected.

Area Range

Set the recognition area size. Unit: pixel.

7. Click ▶ Test Running to test the detection according to settings.

ⓘ	Click ⏻ Stop Running to stop the test.

Line Angle

The Line Angle tool can measure the angle between a line and the X-axis.
The parameters of the tool are divided into four categories: range settings, recognition settings, judge method, and extend parameter.

- Range settings determine the detection area:

Detection Area

Click and click on two points on a line on the base image to get the starting point coordinates and intersection angle.

> ○ Click to show animated instructions on drawing ROI.
>
> ○ Click on the top of the base image window to view notes about the coordinates image.

Shielded Area

Specify the shielded area within the detection area. The shielded area will not be analyzed. Click Edit and then click to draw a polygon on the base image.

Independent Fixture

When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

> Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

- Recognition settings determine the pattern recognition conditions:

Sensitivity

Adjust the sensitivity of edge detection. The grayscale graph in the upper-right corner shows the current effect, and the red area is the sensitivity range.

- In Judge Method, set the Upper Limit and the Lower Limit. If the detection result is within the range you set, the tool will output OK, otherwise the tool will output NG.

> For some cameras, the Similarity Range will be displayed here. When the similarity between the detected angle and that of the base image is within the range, the result will be OK, or the result will be NG.By default, the similarity range is from 0% to 200%. If the value cannot satisfy your need, you can switch 200% to 900%. The maximum similarity range is 900%. If the actual value is higher than 900%, the camera will respond based on 900%.

- If the parameter settings above cannot achieve the expected outcome, you can adjust the Extend Parameter for the line.

Line Rate

You can set the minimum value of the ratio of the fitting points to the total number of points. When the straightness of the detected line exceeds this value, it is judged as a straight line. Otherwise, it is not judged as a straight line.

Edge Polarity

Color transition direction. Edge polarity is related to the arrow's direction of the ROI.

Black To White

Only detect the edge formed by low grayscale to high grayscale.

White To Black

Only detect the edge formed by high grayscale to low grayscale.

All

Detect any type of edge.

Edge Type

The Best

Only detect edge points with the largest gradient threshold and fit them into a line.

The First

Only detect edge points that are the nearest to the detection start point and fit them into a line.

The Last

Only detect edge points that are the nearest to the detection end point and fit them into a line.

Manual

Drag the green line in the grayscale graph in the upper-right corner to select the set of edge points and fit them into a line.

> If you select Manual, the polarity will be set to All and cannot be changed.
> After setting the above parameters, you can go to Output → Tool Results to set which data to transmit to the communication tool.
> The output data items include: module status, line start point X/Y, line end point X/Y, detection area center X/Y, detection area width/height/angle, result similarity, and base value.

Edge Width Measurement

The Edge Width Measurement tool measures the distance between two edges in an ROI.

Before You Start

Make sure that you have configured the camera parameters and base image, and have added the Edge Width Measurement tool.

Steps

1. Click and then draw a detection area on the image.

	After drawing the detection area, a histogram will show on the top right of the image displaying the greyscale difference between adjacent pixels.

2. Click Edit to draw a shielded area in the detection area.

	See About ROI for details about drawing an ROI.

3. Optional: You can enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4.Select a sensitivity for the tool.

5.Configure the Judge Method, including judge basis, range low, and range high.

6.Set the Extend Parameters.

Parameter	Description
Brightness Mode	The reference for identifying an object.
Find Measure Mode	The method of measurement.

Width

The width of the object.

Distance

The distance between two objects.

7. Click Test Running to test the tool.

Existence Tool

The existence tools are as follows: the circle-existence tool, line-existence tool, spot-existence tool, edge-existence tool, pattern-existence tool, and profile-existence tool.

Circle Existence

The circle-existence tool can find multiple points in a detection area and fit them into circles. It can also detect existing circles in the area.

The parameter settings for the circle-existence tool include range settings, recognition settings, judge method settings, and extend parameter settings.

● Range Settings: You can set area-related parameters.

○ Detection Area: Click , hover the cursor on the circle, and the click the mouse to display the recognized circle and its center coordinate.

	Click beside Detection Area, and the animated tutorial will pop up in the upper-left corner of the live view panel.

○ Shielded Area: The shielded area will not be analyzed by the tool. Click Edit → and draw the shielded area on the base image in the live view image.

○ Independent Fixture: When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

	›This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ›Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

● In Recognition Settings, you can set recognition-related parameters.

○ Sensitivity: the sensitivity of circle detection. When setting this parameter, the greyscale layout map in the upper-right corner of the live view panel will display the effect, and the red area represents the sensitivity range.

● In Judge Method, you can set parameters related to result judgment by selecting "Exist OK" or "Not Exist OK". For Not Exist OK, if there are no circles that meets the configured parameter requirements, the result will be "OK".

● In Extend Parameter, you can set extra parameters if the result is not what you have expected.

○ Circle Rate: The minimum ratio of the number of points used to make up circles to the total number of points. When a circle's circle rate is higher than the configured rate, it will be recognized as a circle, otherwise it will not. The more points selected, the more accurate the circle will be.

○ Edge Polarity: It represents the excessive change of color.

›Black to White: The tool recognizes edges from area with higher grey scale to the area with lower grey scale.

›White to Black: The tool recognizes edges from the area with lower grey scale to the area with higher grey scale.

›All: The tool recognizes edges from area with higher grey scale to area with lower grey scale and from area with lower grey scale to area with higher grey scale.

○ Edge Type: You can select "The Best", "The Biggest", "The Smallest", or "Manual".

›The Best: The tool will find the most suitable points to make up lines.

›The Biggest: The tool will find the points that are the most distant from the center to make up circles.

›The Smallest: The tool will find the points nearest to the center to make up circles.

›Manual: Based on the green lines in the greyscale layout map, you can manually select points to make up circles.

	If the edge type is set to "Manual", the edge polarity is set to "All" automatically and it cannot be changed.

After setting the above parameters, you can go to Output → Tool Results to set which data to transmit to the communication tool by the circle-existence tool.

The data can be transmitted are as follows: module status, circle center X, circle center Y, circle radius, detection area center X, detection area center Y, detection area width, detection area height, and detection area angle.

Line Existence

The line-existence tool can find points with specific features to fit them into straight lines. The parameter settings for the line-existence tool include range settings, recognition settings, judge method settings, and extend parameter settings.

● Range Settings: You can set area-related parameters.

○ Detection Area: Click , and then click two different positions on the base image to draw a detection area.

	›On the top left of the live view window, click next to Base Image to view descriptions of the coordinate axes. ›Click beside Detection Area, and the animated tutorial will pop up in the upper-left corner of the preview window.

○ Shielded Area: The shielded area will not be analyzed by the tool. Click Edit → and draw the shielded area on the base image in the live view image.

○ Independent Fixture: When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

	›This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ›Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

● In Recognition Settings, you can set recognition-related parameters.

○ Line Sensitivity Adjustment: Here you can adjust the sensitivity of line detection. When adjusting this parameter, the greyscale layout map in the upper-right corner of the preview window will display the effect of adjustment, and the red area represents the sensitivity range.

● In Judge Method, you can set parameters related to result judgment by selecting "Exist OK" or "Not Exist OK". For Not Exist OK, if there are no circles that meets the configured parameter requirements, the result will be "OK".

● In Extend Parameter, you can set extra parameters if the result is not what you have expected.

○ Line Rate: the minimum ratio of the number of points used to make up lines to the total number of points. When a line's line rate is higher than the configured rate, it will be recognized as a line, otherwise it will not. The more points selected, the more accurate the line will be.

○ Edge Polarity: It represents the excessive change of color, and defines the direction to look for the edges in a detection area. Here the edge is the line between two areas with different greyscales.

›Black to White: The tool recognizes edges from area with higher grey scale to the area with lower grey scale.

›White to Black: The tool recognizes edges from the area with lower grey scale to the area with higher grey scale.

›All: The tool recognizes edges from area with higher grey scale to area with lower grey scale and from area with lower grey scale to area with higher grey scale.

○ Edge Type: You can select "The Best", "The Biggest", "The Smallest", or "Manual".

›The Best: The tool will find the most suitable points to make up lines.

›The First: The tool will find the points nearest to the start point to make up lines.

›The Last: The tool will find the point nearest to the end points to make up lines.

›Manual: Based on the green lines in the greyscale layout map, you can manually select points to make up lines.

	If the edge type is set to "Manual", the edge polarity is set to "All" automatically and it cannot be changed.

After setting the above parameters, you can go to Output → Tool Results to set which data to transmit to the communication tool by the circle-existence tool.

The data can be transmitted are as follows: module status, line start point X, line start point Y, line end point X, line end point Y, line angle, detection area center X, detection area center Y, detection area width, detection area height, detection area angle.

Spot Existence

Spot Existence tool is used for analyzing whether there are areas with qualified greyscale in the analyzed area.

Before You Start

Make sure that you have configured the camera parameters and base image, and added the Spot Count tool.

Steps

1. Set the Detection Area as needed. It it set to analyze the whole base image by default.

Click ▭ or ◯ or ⬡ to draw on the base image, the position and size of the area can be adjusted manually; click ⛶ to set the whole base image as the detection area.

ⓘ	Refer to How to draw an ROI? for ROI drawing details.

2.Optional: If you need to shield areas in the detection area, click Edit on the right of Shield Area, and then click ⬡ to draw polygons on the base image.

3.Optional: Enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration.

ⓘ	● This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ● Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4. Set recognition-related parameters in Recognition Settings.

Greyscale Threshold

Set the greyscale range for detection area. The area with greyscale in the range will be recognized.

Reverse Range

The area with greyscale not in the range will be recognized.

5. Set the result judgment parameters in Judge Method.

Exist OK

The result is OK if the area, which meets the configured requirement is detected.

Reverse Range

The result is OK if the area, which meets the configured requirement is not detected.

6. Optional: Set extra parameters in Extend Parameter if the result is not what you have expected.

Area Range

Set the area of recognized area. The unit is pixel.

7. Click ▶ Test Running to test the detection according to settings.

ⓘ	Click ⏻ Stop Running to stop the test.

Edge Existence

The tool will detect edges with qualified sensitivity in the detection area.
You can configure range settings, recognition settings, judge method, and extend parameter for the tool.

● Range Settings: You can set area-related parameters.

○ Detection Area: Click and click two positions on the detected edge.

	›On the top left of the live view window, click next to Base Image to view descriptions of the coordinate axes. ›Click beside Detection Area, and the animated tutorial will pop up in the upper-left corner of the preview window.

○ Shielded Area: The shielded area will not be analyzed by the tool. Click Edit → and draw the shielded area on the base image in the live view image.

○ Independent Fixture: When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

	›This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ›Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

● In Recognition Settings, you can set recognition-related parameters.

○ Sensitivity Adjustment: Adjust the sensitivity of the tool. When adjusting, a greyscale map will be displayed on the top right of the live view image showing the adjusting result, while the red area showing the sensitivity range.

● In Judge Method, you can set the parameters related to result judgment by selecting Exist OK or Not Exist OK.

● In Extend Parameter, you can set extra parameters if the result is not what you have expected.

○ Edge Polarity: It represents the excessive change of color, defines the direction to look for the edges in a detection area. Here the edge is the line between two areas with different greyscales.

›Black to White: The tool recognizes edges from the area with higher greyscale to the area with lower greyscale.

›White to Black: The tool recognizes edges from the area with lower greyscale to the area with higher greyscale.

›All: The tool recognizes edges from the area with higher greyscale to the area with lower greyscale and from the area with lower greyscale to the area with higher greyscale.

After setting the above parameters, you can go to Output → Tool Results to set which data to transmit to the communication tool by the tool.
The data can be transmitted are as follows: module status, detection area center X, detection area center Y, detection area width, detection area height, detection area angle, edge point X, edge point Y, edge point quantity, line start point X, line start point Y, line end point X, line end point Y, line angle.

Pattern Existence

With pattern existence tool, the Software can tell you whether the specific pattern exists in the detection area.
You can configure range settings, recognition settings, judge method, and extend parameter for the tool.

● Range Settings: You can set area-related parameters.

○ Detection Area: The area analyzed by the tool on the image. By default, the tool analyzes the whole image. Click ☐ to draw the detection area on the base image on the right, you can change its position and size manually. Click ⛶ to set the whole base image as the detection area.

○ Shielded Area: The shielded area will not be analyzed by the tool. Click Edit → ⬡ to draw the shielded area on the base image on the right.

○ Independent Fixture: When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

ⓘ	›This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ›Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

● In Search Settings, you can set search-related parameters.

○ Template Area: The same with the template area in the step of configuring base image.

ⓘ	After drawing an area, you can click ⛶ → Select similar patterns to manually set the match point. Click Reset to restore to default if needed.

○ Shielded Area: The same with the shielded area in the step of configuring base image.

○ Template Sensitivity:

›Auto: Set the sensitivity by setting the degree. The higher the sensitivity, the better the fixture quality.

›Manual: Set the sensitivity by setting the Coarse Granularity and the Greyscale Threshold.

● In Judge Method, you can set the parameters related to result judgment by selecting Exist OK or Not Exist OK.

● In Extend Parameter, you can set extra parameters if the result is not what you have expected.

○ Min. Score: The minimum similarity between the template area and the analyzed area in the image. Only when the similarity is higher than the Min. Score, the target can be recognized. The Min. Score ranges from 0 to 1, and 1 indicates that the analyzed area in the image is completely the same with the template area.

○ Match Polarity: When the polarity of the analyzed area's edge is different from that of the template area, set the Match Polarity as Ignored to make sure the target can be found. If it is not necessary to find the target, you can set the Match Polarity as Considered for a quick search.

○ Angle Range: If the analyzed object is turned and the turned angle is smaller than the value you set, the object can be recognized, otherwise it cannot be recognized.

Contour Existence

You can use this tool to verify the presence of a contour through contour matching.

Before You Start

Make sure that you have configured the camera parameters and the base image, and added the Contour Existence tool.

Steps

1. Set the Detection Area as needed. It is set to analyze the whole base image by default.

Click ▢ or ◯ to draw on the base image, the position and size of the area can be adjusted manually.

	● By default, the whole base image is set to the detection area. ● Refer to How to draw an ROI? for ROI drawing details.

2.Optional: If you need to shield areas in the detection area, click Edit on the right of Shield Area, and then click ⬡ to draw polygons on the base image.

3.Optional: If you need to adjust the target offset, enable Independent Fixture. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration.

	● This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ● Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4. Select the scale mode, threshold mode, and chain mode.

	By default, Auto is selected as the scale mode. For the manual mode, configure the following parameters.

Velocity Scale

The higher this value, the higher the characteristic scale, and the less the picked points from the contour. But the feature matching will be faster.

Characteristic Scale

The fineness of picking points from the contour.

	This value should be lower than the velocity scale. The lower the value, the finer the point-picking.

Threshold Mode

Used for setting the greyscale threshold of contour edges. The area with greyscale within the threshold will be detected.

	The higher this value, the less qualified number of contour edges, and the points on edges may be filtered out.

Chain Mode

During control detections, only the chain length of a contour is higher than the minimum chain, can it be identified as a valid contour.

5. Set the result judgment parameters in Judge Method.

Exist OK

If the area that meets the configured requirement is detected, the result is OK.

Reverse Range

If the area that meets the configured requirement is not detected, the result is OK.

6. Optional: Set extra parameters in Extend Parameter if the result is not what you have expected.

Minimum Score

The threshold of similarity between the feature template and the detected target. A higher score indicates a greater similarity. When the similarity score reaches or exceeds the threshold, the target can be found.

Match Polarity

The color change from detected target to its background. When the target's polarity is different from that of the feature template, select Ignored to make sure the target can be found. Otherwise, select Considered to shorten the finding time.

Angle Range

If the target's angle changes and the change is within this range, the target can still be recognized; or it cannot be recognized.

Algorithm Timeout

The maximum duration for running the algorithm.

● If the algorithm is still working when the working time reaches the value you set, the detection will stop and the Software will output NG.

● If you set this parameter to 0, there will be no limitation for the algorithm's working duration.

7. Click ▶ Test Running to test the detection according to settings.

	Click ⏻ Stop Running to stop the test.

Counting Tools

Counting tools are as follows:the spot-counting tool, edge-counting tool, pattern-counting tool, profile-counting tool, and color-counting tool.

Spot Count

The spot-counting tool uses the Blob method to recognize and count multiple spots whose greyscales are within the configured greyscale range.

	● Blob analysis refers to the process of detecting, locating, and analyzing an target object by measuring its greyscale value. It can output the information about some of the object's features, such as existence, number, location, shape, direction, and the topological relationship among Blobs. ● Make sure that you have configured the camera parameters and base image, and added the Spot Count tool.

1. Set the Detection Area as needed. It it set to analyze the whole base image by default.

Click □ or ○ or ⬡ to draw on the base image, the position and size of the area can be adjusted manually; click ⊡ to set the whole base image as the detection area.

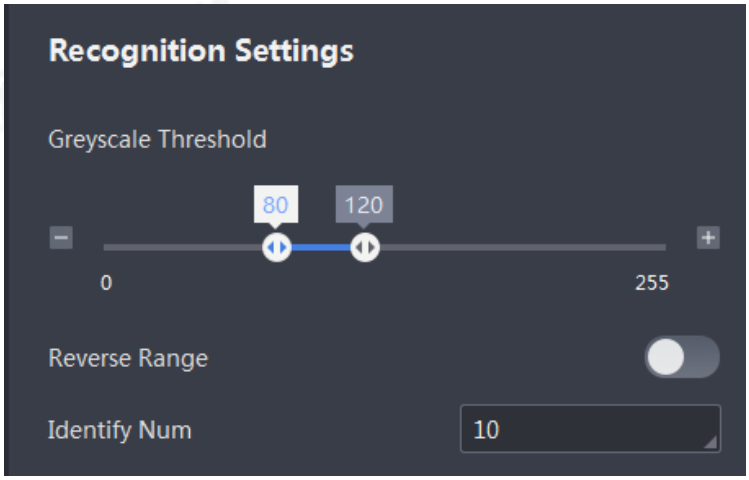
	Refer to How to draw an ROI? for ROI drawing details.

2.Optional: If you need to shield areas in the detection area, click Edit on the right of Shield Area, and then click ⬡ to draw polygons on the base image.

3.Optional: Enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration.

	● This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ● Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4. Set recognition-related parameters in Recognition Settings.



Greyscale Threshold

Here you can set the greyscale range for the detection area, so that the areas whose greyscale is within the greyscale range will be recognized.

Reverse Range

Once enabled, the greyscale value outside the configured greyscale range will be the valid range, so that the camera will recognize the areas whose greyscales are outside the configured greyscale range.

Identify Num

Here you can set the number of areas (whose greyscale is within the configured greyscale range) to be recognized.

	If the number of qualified areas exceeds the configured number, the camera will select the areas to output based on there sizes.

5.Set the result judgment parameters in Judge Method.

● Quantity Range: If the actual number of recognized areas is within the configured quantity range, the result will be OK, otherwise it will be NG.

6.Optional: Set extra parameters if the result is not what you have expected in Extend Parameter.

● Area Range: Defines the size of the detection area (unit: pixel).

7. Click ▶ Test Running to test the detection according to settings.

	Click ⏻ Stop Running to stop the test.

Edge Count

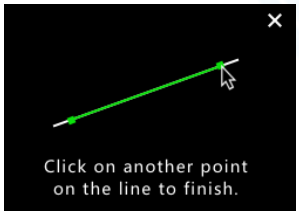
The edge-counting tool can recognize and count edges based on the configured edge-counting sensitivity.
The parameter settings for the edge-counting tool include range settings, recognition settings, judge method settings, and extend parameter settings.

- In Range Settings, you can set area-related parameters.

  Detection Area

  Click , and then click two different positions on the base image to draw a detection area.

	›On the top left of the live view window, click next to Base Image to view descriptions of the coordinate axes. ›Click beside Detection Area, and the animated tutorial will pop up in the upper-left corner of the preview window.

  Shielded Area

  Here you can shield some areas for them not to be analyzed. Click Edit, and then click to draw polygons on the base image.

  Independent Fixture

  When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

	Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

- In Recognition Settings, you can set recognition-related parameters.

  Sensitivity

  Here you can set the sensitivity of edge counting.

  Identify Num

  Here you can set the maximum number of qualified edges to be recognized based on the configured sensitivity.

- In Judge Method, you can set parameters related to result judgment.

  Quantity Range

  If the actual number of recognized edges is within the configured quantity range, the result will be OK, otherwise it will be NG.

- In Extend Parameter, you can set extra parameters if the result is not what you have expected.

  Edge Polarity

  It represents the excessive change of color, defines the direction to look for the edges in a detection area. Here the edge is the line between two areas with different greyscales.

  Black to White

  The tool recognizes edges from the area with higher greyscale to the area with lower greyscale.

  White to Black

  The tool recognizes edges from the area with lower greyscale to the area with higher greyscale.

  All

  The tool recognizes edges from the area with higher greyscale to the area with lower greyscale and from the area with lower greyscale to the area with higher greyscale.

After setting the above parameters, you can go to Output → Tool Results to set which data to transmit to the communication tool by the edge-counting tool.
The data can be transmitted are as follows: module status, detection area center X, detection area center Y, detection area width, detection area height, detection area angle, edge point X, edge point Y, line start point X, line start point Y, line end point X, line end point Y, and line angle.

Pattern Count

The pattern-counting tool can recognize and count patterns via the template-matching method.
The parameter settings for the pattern-counting tool include range settings, recognition settings, judge method settings, and extend parameter settings.

Range Settings

You can set area-related parameters.

Detection Area

Here you can set the area that the tool analyzes. It it set to analyze the base image by default. Click to draw boxes on the base image, the position and size of the boxes can be adjusted manually. Click to set the whole base image as the detection area.

Shielded Area

Here you can shield some areas for them not to be analyzed. Click Edit, and then click to draw polygons on the base image.

Independent Fixture

When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

	Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

Search Settings

You can set search-related parameters.

Template Area

Click Edit, and then click or to draw boxes or polygons on the base image, the position and size of the graphics can be adjusted manually.

	After drawing an area, you can click → Select similar patterns to manually set the match point. Click Reset to restore to default if needed.

Template Shielded Area

Click Edit, and then click or to draw boxes or polygons on the base image, the position and size of the graphics can be adjusted manually.

Template Sensitivity

It can be set to "Manual" or "Auto".

- Manual: To manually adjust the template's sensitivity by setting Coarse Granularity and Greyscale Threshold.
- Auto: To automatically adjust the template's sensitivity according to the configured sensitivity range. The higher the sensitivity, the more features of an template area will be recognized, so the detection result will be better.

Identify Num

Here you can set the maximum number of qualified patterns to be recognized based on the configured sensitivity.

Judge Method

You can set parameters related to result judgment.

Quantity Range

If the actual number of recognized patterns is within the configured quantity range, the result will be OK, otherwise it will be NG.

Extend Parameter

You can set extra parameters if the result is not what you have expected.

Min Score

The degree of the similarity between the template and the target object, i.e., the similarity threshold. Only if the actual similarity is higher than the configured similarity threshold can the object be recognized. The similarity range is between 0 and 1, and 1 indicates completely match.

Polarity

Polarity represents the excessive change of color from the object to the background, it can be considered or ignored during recognition. If the polarity of an object's edges is different from that of the template, to ensure that the object is recognized, you need to set the polarity to Ignored, otherwise you can set it to Considered to accelerate the search.

Angle Range

If the object's angle changes but is still within the configured angle range, it can still be recognized, otherwise it cannot be recognized.

Overlap Rate

The maximum overlap rate allowed when detecting multiple objects of which two objects overlap with each other. The higher the overlap rate, the larger the area of two objects is allowed to be overlapped.

After setting the above parameters, you can go to Output → Tool Results to set which data to transmit to the communication tool by the pattern-counting tool.
The data can be transmitted are as follows: module status, the number of matches, match box X, match box Y, match box width, match box height, match box angle, and score.

Contour Count

You can use this tool to determine the presence of contours through contour matching and to count the number of contours.

Before You Start

Make sure that you have configured the camera parameters and the base image, and added the Contour Existence tool.

Steps

1. Set the Detection Area as needed. It is set to analyze the whole base image by default.

Click ☐ or ◯ to draw on the base image, the position and size of the area can be adjusted manually.

	● By default, the whole base image is set to the detection area. ● Refer to How to draw an ROI? for ROI drawing details.

2.Optional: If you need to shield areas in the detection area, click Edit on the right of Shield Area, and then click ⬡ to draw polygons on the base image.

3.Optional: Enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration.

	● This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ● Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4. Select the scale mode, threshold mode, and chain mode.

	By default, Auto is selected as the scale mode. For the manual mode, configure the following parameters.

Velocity Scale

The higher this value, the higher the characteristic scale, and the less the picked points from the contour. But the feature matching will be faster.

Characteristic Scale

The fineness of picking points from the contour.

	You can set only integers that are not larger than the velocity scale to the characteristic scale value.When the value is set to 1,it is the finest scale. Generally, adjusting this value will result in a significant change in the number of contour points. The lower the value, the finer the point-picking.

Threshold Mode

Used for setting the greyscale threshold of contour edges. The area with greyscales within the threshold will be detected.

	The higher this value, the less qualified number of contour edges, and the points on edges may be filtered out.

Chain Mode

It is used to set the minimum chain length for the detection area.Only when the chain length exceeds the minimum chain length, the contour will be retained.

5. Set the Identify Num.

	If the number of qualified contours exceeds the value you set, you can get the best contours no more than the value.

6. Set the quantity range.

	● If the number of identified contours is within the quantity range, the detecting result will be OK, or the result will be NG. ● The maximum quantity range is subject to the Identify Num.

7. Optional: Set extra parameters in Extend Parameter if the result is not what you have expected.

Minimum Score

The threshold of similarity between the feature template and the detected target. A higher score indicates a greater similarity. When the similarity score reaches or exceeds the threshold, the target can be found.

Match Polarity

The color change from detected target to its background. When the target's polarity is different from that of the feature template, select Ignored to make sure the target can be found. Otherwise, select Considered to shorten the finding time.

Angle Range

If the detected target has angle variations (such as rotation), you can set the relative angle range. The angle can be adjusted as needed. The default range is -180° to 180° .

Overlap Rate

The maximum allowed overlap proportion of two overlapped targets when detecting multiple targets. The higher the value, the higher the allowed overlap rate.

Algorithm Timeout
The maximum duration for running the algorithm.

- If the actual algorithm processing time exceeds this value, the algorithm will stop detecting and output NG.
- If youset this parameter to 0, there will be no limitation for the algorithm's working duration.

8. Click Test Running to test the detection according to settings.

	Click Stop Running to stop the test.

Color Count

This tool is used for identifying colors and counting qualified colors.

Before You Start

- Make sure the greyscale image mode of the color camera is disabled.
- Make sure that you have configured the camera parameters and the base image, and added the Color Count tool.

Steps

1.Set the Detection Area as needed. It is set to analyze the whole base image by default.Click Edit.

Click ▭ or ⬡ to draw on the base image, the position and size of the area can be adjusted manually.

	● By default, the whole base image is set as the detection area. ● Refer to How to draw an ROI? for ROI drawing details.

2.Optional: If you need to shield areas in the detection area, click Edit on the right of Shield Area, and then click ⬡ to draw polygons on the base image.

3.Optional: Enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration.

	● This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ● Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4. Add colors to count and configure related parameters.

1) Click ＋ in the Color List to add a color to count.

	● No more than 8 colors are allowed. ● During the color counting process, make sure you have check all the colors in the list for recognition.

2)Select a color in the list, and enter a name of the color in Color Name.

3)Pick the color to count by Color Eyedropper or by changing the Color Value Range.

Color Eyedropper

- : To add colors from the base image, click this icon and pick colors from the base image. The pixels in the same color range will be selected and marked as green.
- : To avoid recognizing some colors on the base image, click this icon and pick colors on the base image.
- : To replace a color by a color from the image, click this icon and pick a color from the base image.

Color Value Range

Set the color value range, saturation range, and brightness range.

	You can configure these parameters to fine-tune the selected colors using the color eyedropper tool.

4)Optional: To select the complement of the currently set color range as the picking area, enable Color Inversion.

5)Optional: To configure both the hole filling area and the color patch area, enableUsing Global Area Parameters.

	If you disable this parameter, you should configure the hole filling area and the color patch area for each color.

Hole Filling Area

Used for editing the threshold of hole area. A hole with an area smaller than the threshold cannot be recognized.

	Holes refer to the eight-connected domains of non-target pixels that are completely surrounded by target pixels.

Color Patch Area

The color patch with area lower than the threshold you set cannot be recognized.

5.Optional: Via the Number of Detected Blobs, configure the number of detected color patches.

6.Select the Judge Basis.

AmountJudge

If the number of detected targets is in the range you set, the result will be OK, or it will be NG.

CategoryJudges

If the detected category is the same with the category you set, the result will be OK, or it will be NG.

7.Optional: Set extra parameters in Extend Parameter if the result is not what you have expected.

- Global Hole Filling Area: the detecting threshold of all colors' hole area.
- Global Color Patch Area: the detecting threshold of all color patches' area.

8. Click ▶ Test Running to test the detection according to settings.

	Click ⏻ Stop Running to stop the test.

Recognition Tool

The recognition tools include the Color Contrast tool, OCR tool, Color Recognition tool, Classification Registration tool, Code Recognition tool, and Object Detection Recognition tool.

Color Contrast

In the detection ROI range, identify color information according to color template.

	This function is available only when the Greyscale Image Output function of color device is disabled. Only color camera supports this tool. If you enable the Greyscale Image Output function for a color camera, the color contrast tool can still be configured but the output result will be NG.

You can configure range settings, recognition settings, judge method, and extend parameter for the tool.

● Range Settings: You can set area-related parameters.

Detection Area

The area analyzed by the tool on the image. By default, the tool analyzes the whole image.

Click ▭ or ◯ to draw the detection area on the base image on the right, you can change its position and size manually. Click ⛶ to set the whole base image as the detection area.

Shielded Area

The shielded area will not be analyzed by the tool. Click Edit → ⬡ and draw the shielded area on the base image in the live view image.

Independent Fixture

When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

	Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

● In Model Settings, you can set model-related parameters.

Model Area

The area that will be set as a template on the base image.

Shielded Area

The shielded area will not be analyzed as a template area by the tool. You can draw the shielded area on the base image.

● In Recognition Settings, you can set sensitivity-related parameters.

Sensitivity Adjustment

Adjust the sensitivity when recognizing the color.

● In Judge Method, you can set parameters related to result judgment.

Similarity Range

When the similarity between the detected diameter and that of the base image is within the range, the result will be OK, or the result will be NG.

● In Extend Parameter, you can set extra parameters if the result is not what you have expected.

Feature Type

The sensitivity of different feature type varies. Histogram Feature is more sensible to the image change.

Brightness Enable

If you enable this, the brightness change will be a reference of color contrast. By default, it is disabled.

Color Feature

This parameter gives you the hue, saturation, and brightness of the Histogram Feature.

After setting the above parameters, you can go to Output → Tool Results to set which data to transmit to the communication tool by the tool.
The data that can be transmitted are as follows: module status, best score, detection area center X, detection area center Y, detection area width, detection area height, detection area angle, and result similarity.

OCR

The OCR tool can recognize the text in the detection area.

Before You Start

The camera parameters and base image are configured. The OCR tool should be added.

Steps

	The parameters are subject to the camera model.

1.Optional: Enable Position Box Enable.

2.Optional: Click Import to import the position model list.

	The list name only allows upper and lower case letters, digits, and underline.

3. Draw a detection area.

	● See details in About ROI. ● The camera has no more than 8 detection areas.

4.Optional: Enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.
Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

5.Select the character filtering types.

1)Click Charter Filter.

2)Enable the function.

3)Set the number of recognize.

4)Select character types such digits and special characters.

	The supported character types are subject to the camera model.

6. Set the Judge Method. The parameters of different method vary.

Quantity Range

When you set Judge Basis to Character Quantity, you need to set the range of number of characters. If the number of the actual detected characters is within the range, the process result is OK. Otherwise, the result is NG.

Min. Score

If you select Character Score as the judge basis, you need to set this. When the character score is higher than the min. score, the tool will output OK, or the tool will output NG.

	This parameter can be referred to as the similarity range.

Character Content

When you set Judge Basis to Reference Character, you need to set the content of the string. If the specified content is recognized, the process result is OK. Otherwise, the result is NG.

7.Set more parameters.

● Select a model type according to the camera model.

	The default model named Common.bin is suitable for common cameras.

● Click Import and select a .bin file to import it to the camera.

	The list name only allows upper and lower case letters, digits, and underline.

8. Click ▶ Test Running to test the detection according to settings.

	Click ⏻ Stop Running to stop the test.

Color Recognition

The Color Recognition tool recognizes the object color based on the trained color templates. When the colors of different objects are obviously different, the tool can implement the accurate classification of objects and output the result.

Before You Start

Make sure that you have configured the camera parameters and the base image, and added the Color Recognition tool.

Steps

1. Set the Detection Area according to your actual needs. It it set to analyze the whole base image by default.

Click ▭ or ◯ to draw a rectangle or circle detection area on the base image, or click ⛶ to set the whole base image as the detection area.

2. Optional: If you need to shield areas in the detection area, click Edit on the right of Shielded Area and draw areas.

ⓘ	Refer to How to draw an ROI? for ROI drawing details.

3. Optional: You can enable or disable Independent Fixture as needed. When enabled,target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

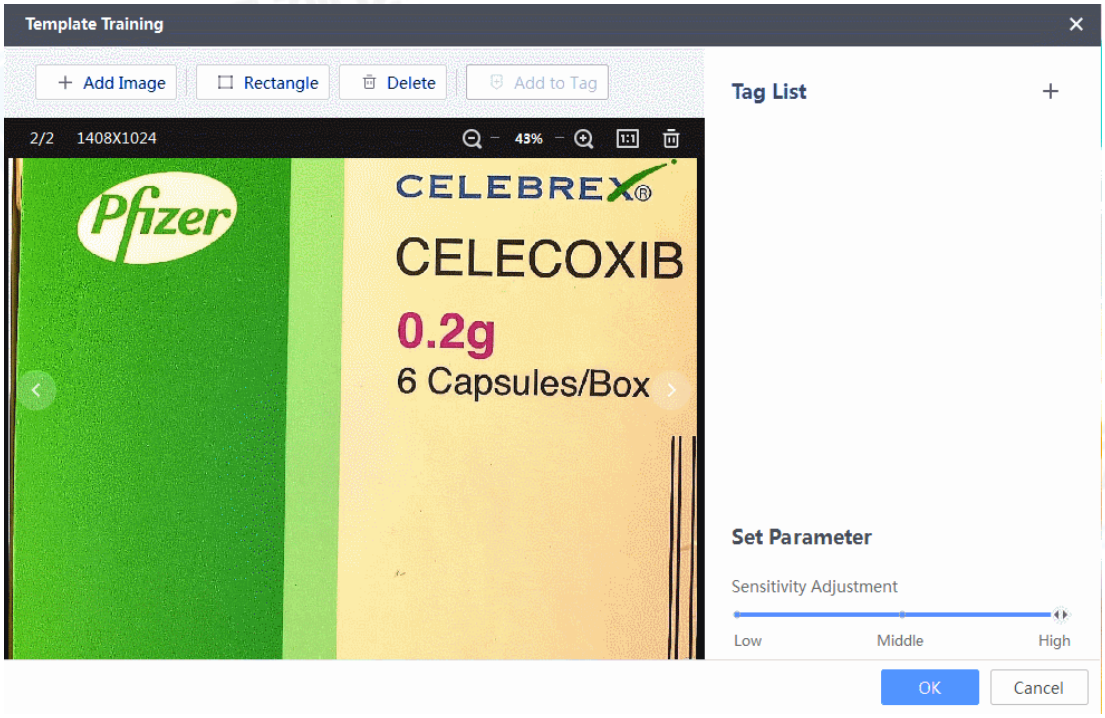
Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4.Click ✎ on the right of Template List to open the Template Training window.

1)Click + Add Image to import pictures from your PC.

ⓘ	● The pictures to be imported should be in png, jpg, or bmp format. Up to 10 pictures can be imported. ● You can also click Add Current Image to add the current image in the camera.You can click 🗑 to delete the image or click ‹ / › to switch the image.

2) Add tags to a picture, the detailed operations are shown in the GIF below.

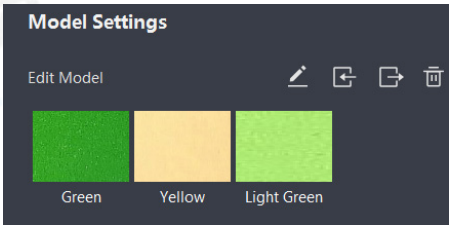


3) Set the template training parameters.

Sensitivity Adjustment

Defines the color recognition sensitivity.

4) Click OK to finish training the template. All added tags will be displayed in the **Template Training.**



5.Optional: Click ◯ to export the template file to your PC.

6.Optional: Click ☐ to import the template file to the camera from your PC.

ⓘ	The template file to be imported should be trained by the program, which is supported by the Software, and the file name can only contain characters, digits, and underlines.

7.Optional: Click ◯ to clear all templates.

8. Set the Judge Basis and relative parameters to define the result judgment rule.

Min. Score

You need to set the minimum score for the color recognition result. The result will be OK if the color recognition score reaches or exceeds the configured min score, or it will be NG.

Label

You need to set the label name. The result will be OK if the recognition result is same as the configured label name, or it will be NG.

ⓘ	The configured label name should be according to the added tags during template training.

9. Click ▶ Test Running to test the detection according to settings.

ⓘ	Click ⏻ Stop Running to stop the test.

Classification Registration

This tool is used for categorizing images after learning imported OK samples. You should train a model by following steps before the categorization.

Before You Start

- The camera parameters and base image are configured.
- Fixture should be enabled and the template area should be drawn.
- The classification registration tool should be added.

Steps

1. Draw a Detection Area. By default, the whole image is the detection area. You can click ▢ to draw a rectangle detection area.

ⓘ	See About ROI for details.

2. Optional: Enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration.

ⓘ	● This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ● Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

3. Configure parameters in Parameter Settings.

First K Classifications

The K refers to the classifications output by the tool. For example, if the user registers 5 classifications, and sets this parameter as 3, the tool will output the first 3 classifications in the end.

Minimum Similarity

When classifying images by this tool, only when images of which the Min. similarity is equal to or above the value you set, can they be displayed in the live view window.

4. Train the classification registration model.

– Click ⇦ to import a model from the PC.

1. Import the training images (up to 50).

- 📷 : import the image acquired in real time.
- 📷 : import images stored in the camera. You can set the searching conditions to search images in the camera. The Software supports importing multiple images at a time.

ⓘ	See Acquired Image Management for details about searching images stored in cameras.

- 📁 : import images from the PC. The image format should be .jpg, png, or .bmp.

ⓘ	○ You can click to clear the imported images. ○ Hover the cursor on the upper-right of the image, and click to delete the image.

2. Click ＋ and enter a classification name to add a classification.

- ✎ : rename the added classification.
- 🗑 : delete the added classification.

3. Select an image and draw a ROI on the left.

- ▢ : draw a rectangle ROI.
- ⬡ : draw a polygon ROI.
- 🧹 : clear all ROIs.
- ↖ : select a ROI.

ⓘ	Click ⛶ on the right label, and view the thumbnail of the label sample.

4. After the image labeling, view the labeling records on the lower-right.

- 🗑 : delete the selected labeling records.
- 🧹 : clear all labeling records.

5. (Opetional) Enable/disable Save Registered Images.

- If it is enabled, the imported image and trained model will be saved after the model training.
- If it is disabled, only the trained model will be saved after the model training, while the imported image will not be saved.

6. Click Train.

	Make sure at least 1 valid sample exists in each piece of classification.

7. After the classification registration, on the Registration Information area, view the total classifications, total registered targets, and total registered images.

5. In the Result Judgment area, enter the classification label as the judgment basis.

Min. Score

Set the Min. Score. The detection result will be OK if the detected image's minimum score reaches or exceeds the configured min score, or it will be NG.

Type Judge

Set the Classification Label. The detection result will be OK if the detected image's label is the same as the configured one, or it will be NG.

	The classification label should be set according to the training label and real needs.

6.On the More Parameters area, select different fundamental model file.

–Select the default system model.

–Click Import to import the model from the PC.

	● The name of the model file should only contain digits, uppercase and lowercase letters, and underscores. ● For details about training models by deep learning modules, refer to the user manual of Vision Train.

7. Click ▶ Test Running to test the detection according to settings.

	Click ⏻ Stop Running to stop the test.

Code Recognition

The Code Recognition tool can identify 1D code and 2D code in a detection area.

Before You Start

Make sure that you have configured the camera parameters and base image, and added the Code Recognition tool.

Steps

1. Set the Detection Area as needed. It it set to analyze the whole base image by default.

Click ▢ to draw an area on the base image or click ⛶ to set the whole base image as the detection area.

- For detecting multiple codes, you can draw up to 8 ROIs.
- Refer to How to draw an ROI? for ROI drawing details.

2.Optional: Enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.
Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

3.Set the types and maximum number of 1D codes and 2D codes to be identified in Recognition Settings.

1D Code Type

The types of 1D code that the tool needs to identify. Click the box on the left to select code types. Currently, the tool only supports identifying the following types of 1D code: CODE39, CODE128, CODABAR, EAN8, EAN13, UPCA, UPCE, ITF25, and CODE93.

Code Number

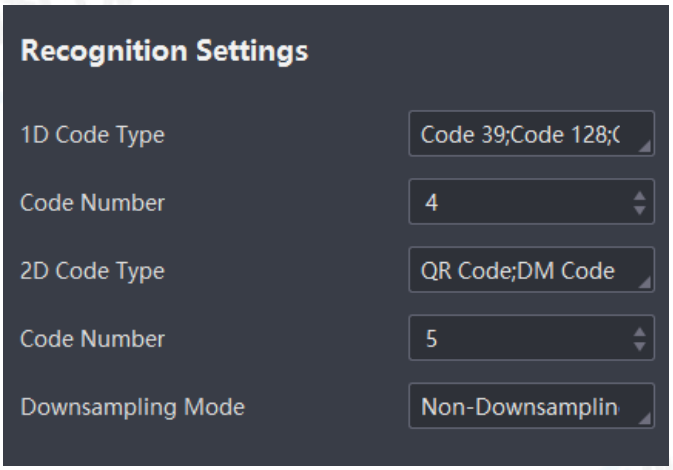
The maximum number of 1D codes to be identified.

2D Code Type

The types of 2D code that the tool needs to identify. Click the box on the left to select code types. Currently, the tool only supports identifying QR code and DM code.

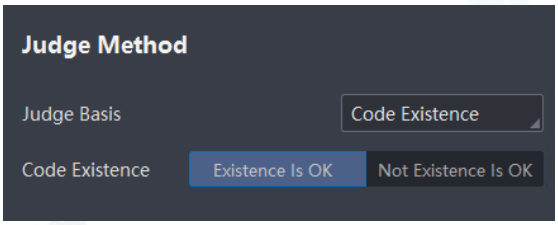
Code Number

The maximum number of 2D codes to be identified.



4.Set the criterion for identifying codes and parameters related to result judgment in Judge Method.

- If you select Code Existence as the judge basis, you can select Existence Is OK or Not Existence Is OK as the judge method.
- If you select Min. Score as the judge basis, you need to set the minimum score for the codes to be identified. The detection result will be OK if a code's minimum score reaches or exceeds the configured min score, or it will be NG.



5. Set parameters related to the display of results in Result Display.

Sort Type

The order of results displayed. You can select X Coordinate Ascending, Y Coordinate Ascending or Score Descending.

6. Optional: Set extra parameters if the result is not what you have expected, including the filtering rule, 1D code, 2D code, and timeout settings in Extend Parameters. Related parameters are shown in the table below:

Parameter Category	Parameter Name	Description
Filter Rule	Code Length	The code length that can be analyzed. The tool only identifies the codes whose lengths are within the configured range.
	Start With	When enabled, you need to enter characters in the box. The tool only outputs code information that starts with the entered characters, or the code information will be filtered out.
	End With	When enabled, you need to enter characters in the box. The tool only outputs code information that ends with the entered characters, or the code information will be filtered out.
	Include	When enabled, you need to enter characters in the box. The tool only outputs code information that contains the entered characters, or the code information will be filtered out.
	Exclude	When enabled, you need to enter characters in the box. The tool only outputs code information that does not contain the entered characters, or the code information will be filtered out.
	Digit Only	When enabled, the tool identifies the codes that consist of digits only.
	Letter Only	When enabled, the tool identifies the codes that consist of letters only.
1D Code	Polarity	The type of 1D code that can be identified. You can select Black Code On White or White Code On Black.
2D Code	Polarity	The type of 2D code that can be identified. You can select Black Code On White, White Code On Black or Arbitrarily. Arbitrarily indicates that both types of 2D code can be identified.
	QR Distortion	If the QR code is on a bottle or crumpled paper, you need to select Distortion, or you can select Non Distortion.
Timeout Settings	Algorithm timeout (ms)	The maximum time consumed by the algorithm. If the actual time consumed exceeds the configured value, the tool will stop identifying codes and output NG. You can set the value of this parameter to 0 to disable this function.

7. Click Test Running to test the detection according to settings.

Click Stop Running to stop the test.

Registered Object Detection

You can use this tool to register objects,and identify and count them based on the registered ones.

Before You Start

Make sure that you have configured the camera parameters and the base image, and added the Object Detection tool.

Steps

1. Draw a Detection Area. By default, the whole image is the detection area. You can click ☐ to draw a rectangle detection area.

ⓘ	See About ROI for details.

2. Optional: Enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration.

ⓘ	● This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ● Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

3.In Model Training, register and train the model.

– Click ⇤ to import on the right of Register Train Set to import a model to the device.

–Click Register Manually to register models manually.

1. Import up to 10 images for training.

● 📷 : import real-time captured images.

● 🖼 : import images saved in the device. You can search for wanted images by setting the search conditions.

● 📁 : import images from the PC. The image format should be JPG, BMP, or PNG.

2. In the Label List, click ＋ to add tags.

● ✎ : rename the added classification.

● 🗑 : delete the added classification.

3. Select a to-be-labeled imageand draw an ROI in the live view window.

ⓘ	Hover the cursor on a tag and click ⛶ to view the thumbnail of a tag.

4.View the labeling records on the lower right.

5.Go back to the tool configuration page, and enable Save Registered Images if needed.

ⓘ	If you enable this, the imported images will be saved in the PC together with the model file after training. Otherwise, only the model file will be saved.

6. Click Train.

ⓘ	Ensure at least 1 valid sample per category for successful model training.

7. Check the total number of labels, registered targets, registered images in the Registered Information area.

4. Set the Judge Basis.

Judge by Quantity

ConfigureQuantity Range. If the actual recognized targets is in the configured range, the result will be OK, or the result will be NG.

Min. Score

If the detection score is high than the entered score, the result will be OK, or it will be NG.

Type Judge

If the detected type is the same with the type you set, the result will be OK, or it will be NG.

5. Via Import Fundamental Detect Model File and Import Fundamental Train Model File, enable different fundamental models. By default, the Software will used the model provided by the system. You can click Import to import a fundamental model.

ⓘ	The name of the imported model file can only contain lower and uppercase letters, digits, and underscores.

6. Optional: Set extra parameters in Extend Parameter if the result is not what you have expected.

Maximum Number to Find

The maximum number of targets that can be found and output.

Minimum Score

The threshold of similarity between the feature template and the detected target. A higher score indicates a greater similarity. When the similarity score reaches or exceeds the threshold, the target can be found.

Overlap Rate

The maximum allowed overlap proportion of two overlapped targets when detecting multiple targets. The higher the value, the higher the allowed overlap rate.

Sort Type

The sequence of outputting targets.

Angle Enable

If the detected target has angle variations (such as rotation), you can set the relative angle range. The angle can be adjusted as needed. The default range is -180° to 180° .

Width/Height/Area Enable

The width/height/area range of the detected targets. The unit is pixel. If you enable this parameter, only objects within the configured range of width/height/area can be detected. By default, the width/height range is set from 1 to the maximum horizontal/vertical resolution of the device, but it can be customized.

Outside Filter Enable

If a small part of the target extends beyond the detection area, you can configure this parameter to decide whether the target is recognized. When it is disabled, the target can be recognized. When it is enabled, the target cannot be recognized.

Optimal Model Size Enable

Change this value if the value generated automatically is not precise.

7. Click Test Running to test the detection according to settings.

	Click Stop Running to stop the test.

Logic Tool

Logic tools include the If Module tool, Condition Judge tool, Logic Judge tool, Combination Judge tool, Character Comparison tool, and Calculator tool. This module mainly implements relative functions via the logical calculation.

If Module

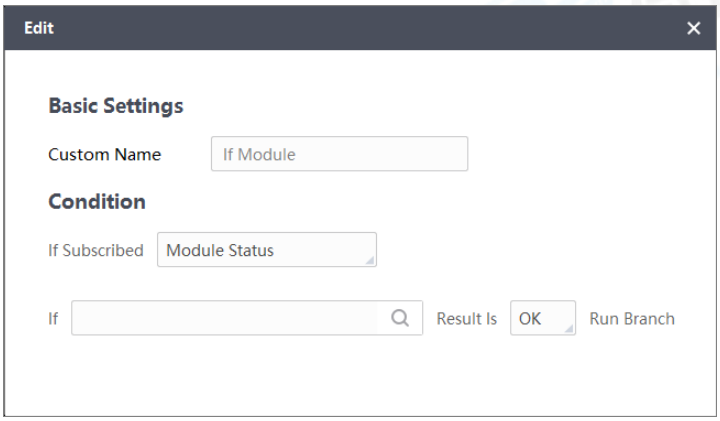
In certain conditions, the Software can run the branch tools in the If module.

Before You Start

The camera parameters and base image are configured. The If module is added.

Steps

1. Click ⚙ on the right of If Module.



2.Optional: Customize a name for this tool at the Custom Name field. By default, the tool will be named as If Module.

3.Set the Condition.

– Module Status: Click 🔍 to select a module or tool, and then select OK or NG at the Result field.

– Communication String: Click 🔍 to select a module or tool, and then enter the result.

ℹ	You can select Camera, Base Image, and tools which are not added to the branch.

4. Click ＋ on the right of If Module to add branch tools.

ℹ	● You can add all the other tools supported by the camera except If Module as branch tools. ● The configuration of branch tools are the same as those not in the If module. ● Select a branch tool and then click 🗑 to remove it from the If module.

Condition Judge

The Condition Judge tool is used for judging whether the status of the selected module is qualified and generate a tool result.

Before You Start

The camera parameters and base image are configured. The Condition Judge tool is added.

Steps

1. Click ＋ to select a condition that can be output.

ℹ	● You can select camera image, base image and the tools which have been added. ● You can select multiple conditions.

2.Set the Valid Range for each condition. If the output results are in the valid range, the tool outputs OK, or the tool outputs NG.

3.Select the Operation Type.

–All Match: if the output results of all the conditions are in the valid range, the tool outputs OK, or the tool outputs NG.

–Any Match: if the output result of any condition is in the valid range, the tool outputs OK, or the tool outputs NG.

4. Click ▶ Test Running to test the tool.

Logic Judge

The Logic Judge tool can make comprehensive judgments based on multiple visual tools and give the final detection result (OK or NG).

Before You Start

Make sure that you have configured the camera parameters and the base image, and added the Logic Judge tool.

Steps

1. Click + under the Operation Data and select a module to subscribe to its status. You can subscribe to the statuses of multiple modules.

	● You can subscribe to statuses of the camera image module, reference image module, and other added visual tools. ● You can click to delete the selected data.

2.Select the Operation Type to define the logic judgment rule.

–AND: The output is OK only when the statuses of all subscribed modules are OK, otherwise the output is NG.

–OR: The output is OK when at least one subscribed module status is OK, otherwise the output is NG.

–NOR: The output is NG when the statuses of all subscribed modules are NG, otherwise the output is OK.

–NAND: The output is NG when at least one subscribed module status is NG, otherwise the output is OK.

3. Click Test Running to test the detection according to settings, and the result will be displayed on the right of the image.

	Click Stop Running to stop the test.

Combination Judge

Combination Judge outputs specified results by judging the results output by different tools in a combination.

Before You Start

The camera parameters and base image are configured. The Combination Judge tool is added.

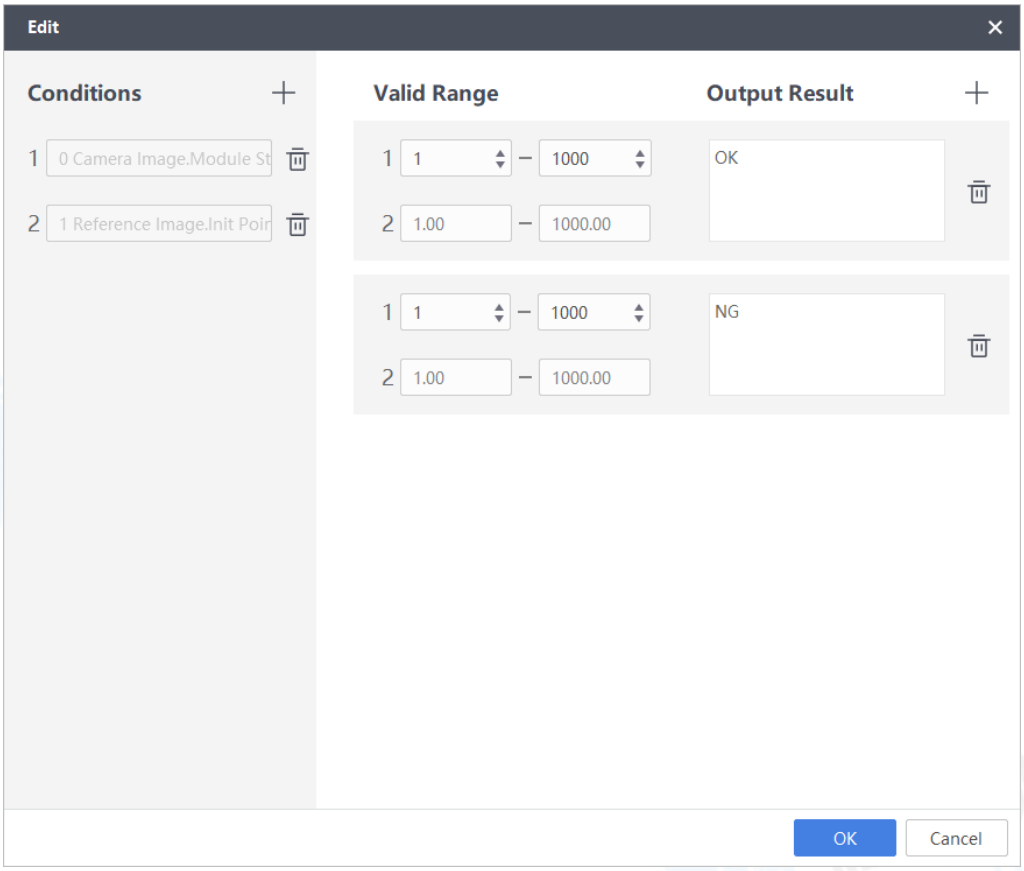
Steps

1. Click Edit to open the Edit window.
2. Click ＋ on the right of Conditions to add a condition.

ⓘ	You can select the data output by camera images, base images, and tools which have been added.

3. Click ＋ on the top right of the window to add a valid range and output result.
4. Set the valid ranges

ⓘ	If there are multiple duplicated valid ranges, the software will only execute the output results of the valid range which is set in the earliest time.



5. Set output results.

–Click ⚙ → ⊞ → Data to select the output results.

–Click ⚙ → ⊞ → Custom and enter the custom output text.

6. Click OK to save the settings. The conditions and output results will be displayed on the Combination Judge pane.
7. Click ▶ Test Running to test the image according to settings.

ⓘ	Click ⏻ Stop Running to stop the test.

String Compare

The Character Comparison tool can check whether the string of subscribed module meets the configured matching condition and output the comparison result according to the judge method.

Before You Start

Make sure that you have configured the camera parameters and the base image, and added the String Compare tool.

Steps

1.Select the Subscription Condition in Data Source to define the data source to be compared.

2.In the text box of Sub String Index String, set the string(s) you subscribe to. You can enter the No. of the string(s) you subscribe to.

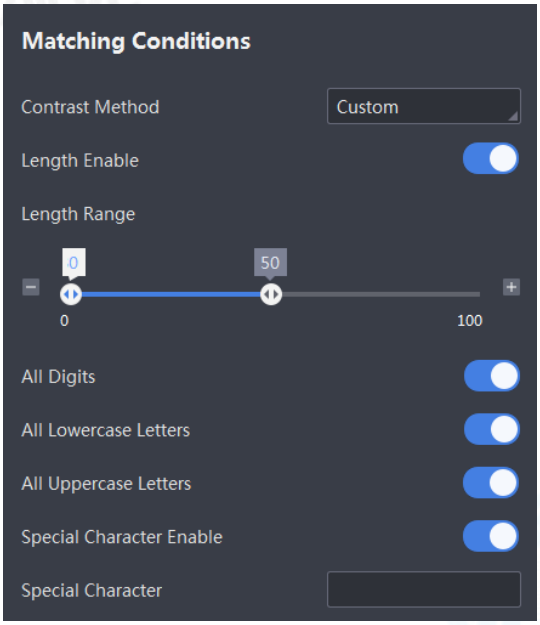
3.Set the matching conditions.

–When selecting Subscribe as the contrast method, you should set the data source to be compared in Subscription Condition.

–When selecting Custom as the contrast method, you should set relative parameters as shown in the table below:

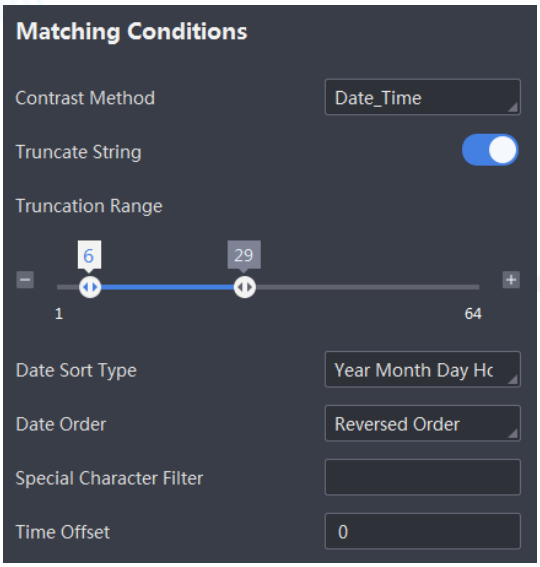
Parameter	Description
Length Enable	When it is enabled, you can set the Length Range to define the string length condition that the subscribed data source should meet.
All Digits	When it is enabled, the data source should be the combination of digits.
All Lowercase Letters	When it is enabled, the data source should be the combination of lowercase letters.
All Uppercase Letters	When it is enabled, the data source should be the combination of uppercase letters.
Special Character Enable	When it is enabled, you can enter the special characters in Special Character. The data source should contain one or more configured special characters.

- The entered special characters should be in English.
- When multiple parameters are enabled, the data source should meet multiple conditions.For example, when All Digits, All Uppercase Letters, and All Uppercase Letters are enabled, the data source should be the combination of digits, uppercase letters, and lowercase letters.



– When selecting Date_Time as the contrast method, you should set matching conditions based on the current system time of the camera. The relative parameters are shown in the table below:

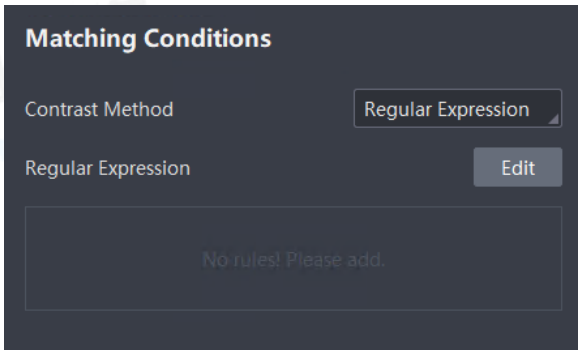
Parameter	Description
Truncate String	When it is enabled, you can set the Truncation Range to define the positions in the string of characters to be compared.
Date Sort Type	Set the date and time format, such as Year-Month-Day-Hour-Minute-Second, Year-Month-Day-Hour-Minute, Year-Month-Day-Hour.
Date Order	Set the date and time sorting type, such as normal order and reversed order.
Special Character Filter	Set the characters, which will not be compared.
Time Offset	Set the offset of data source from system time. When subscribed data - system time = time offset, the data source meets the requirement.



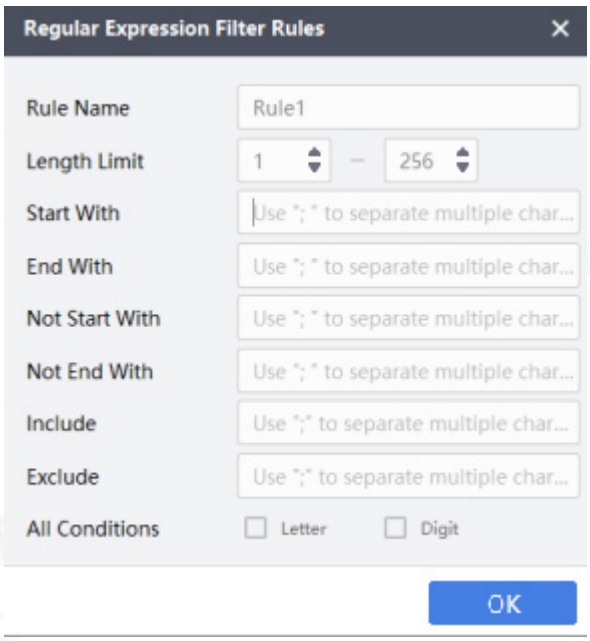
– When selecting Fixed String as the contrast method, the Software will compare the strings you subscribed to with the fixed strings. If they are the same, the Software outputs OK, otherwise NG.

i	Only letters and digits are supported.

– When selecting Regular Expression as the contrast method, you can customize, import,and export the regular expression rules. If the data you subscribed to meets the rules you set, the Software outputs OK, otherwise NG.



Click Edit → Add to open the Regular Expression Filter Rules window and set the parameters for the rules.



i	No more than 10 regular expression rules can be added.

4.Set the output result rule in Judge Method.

–Fit Is OK: The result is OK when the data source meets the matching conditions.

–Not Fit Is OK: The result is OK when the data source does not meet the matching conditions.

5. Click Test Running to test the image according to settings.

	Click Stop Running to stop the test.

Calculator

The Calculator supports customizing variable names and functions.

Before You Start

The camera parameters and base image are configured. The Calculator is added.

Steps

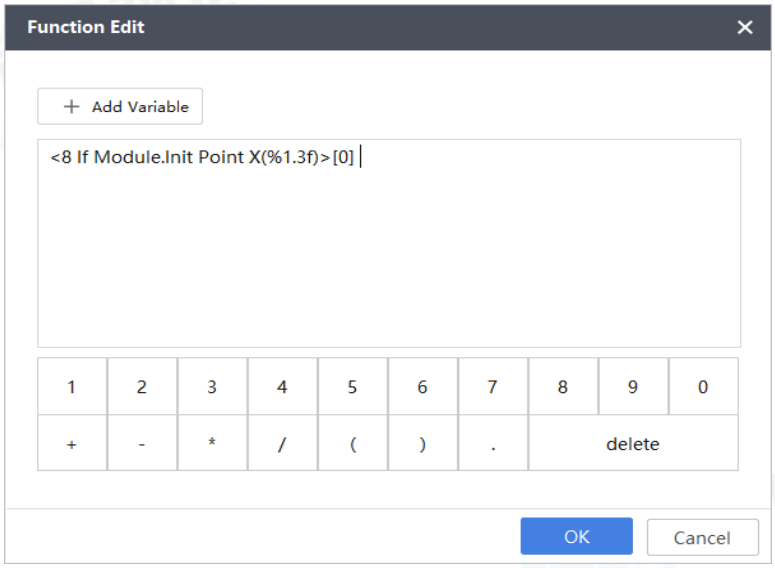
1. Click + to add a variable.

	A variable is added by default.

2.Edit the variable name.

3.Click the space behind = of a variable to edit the function.

	● Click Add Variable to add the camera image, base image, or the data output by the added tools as the variables. ● You can click the buttons below to edit the function. ● A red function is invalid; while a black function is valid.



4. Select the data type for the variable behind the function.

	If you select float, you need to set the decimal digits which range from 1 to 6.

5. Click Test Running to test the tool.

Defect Tool

Defect detection tools include the Exception Detection tool, which can detect the exceptions after training.

Exception Detection

Exception detection tool tests whether there are defects on images after learning the imported OK model. It is mainly used for scenarios where there are no NG images or the number of NG images is small.

Before You Start

The camera parameters and base image are configured. Fixture should be enabled and the template area should be drawn. The exception detection tool should be added.

Steps

1. Draw a Detection Area. By default, the whole image is the detection area. You can click ▢ to draw a rectangle detection area.

	See About ROI for details.

2. Optional: Enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration.

	● This function is enabled by default and automatically subscribes to the fixture configuration of the base image. ● Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

3.In the Model area, select a registration method.

–Click Import to import the models to the devices.

–Click Manually Register to manually register the image.

1.No more than 20 models can be imported.

● : import real-time captured images.

● : import images stored in the camera. You can set the searching conditions to search images in the camera. The Software supports importing multiple images at a time.

	See Acquired Image Management for details about searching images stored in cameras.

● : import images from the PC. The image format should be .jpg or .bmp.

2.Select OK or NG to classify the imported images.

3.Click OK to finish importing images.

4.Optional: View, delete the imported images in the list below.

● Click an image to view preview it.

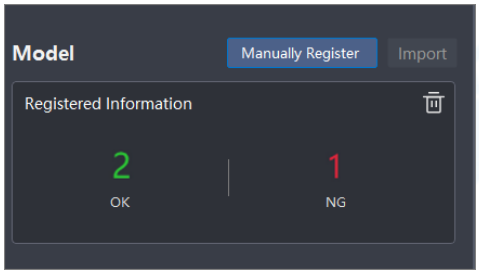
● Click on the left to clear all the imported images.

● Put the mouse cursor on the upper-right of the image, and click to delete this image.

● Select All, OK, NG in the drop-down list to filter images.

5.In the classification list, click Switch to switch the classification type of the current image.

6.Go back to the parameter configuration page and view the registered information.



4. Optional: Enable Save Imported Images.

	● If you enable this, the imported images and models will be kept after training. ● If not, only the models will be kept after training.

5. Select Size Mode. Auto is recommended.

	If you select Manual Select, you will be required to set the Size. Size indicates the size of the smallest unit to be detected. The smaller the size, the higher the sensitivity; the bigger the size, the lower the sensitivity.

6. Click the image of the imported OK or NG models to view details of the images.

7.Optional: Adjust Down Sample Rate to change the image size. By default, it's 100.

8.Click Train to start learning the imported models. The learning results will show after finishing training.

	● Make sure at least 1 valid OK model is imported. Otherwise, the training will fail. ● You can click in the upper-right corner to train again if needed.

9.Select OK or NG as the basis of judging running results.

10.Optional: Set Score Threshold. When the detected score is within this range, the detecting result will be OK, or the detecting result will be NG.

11.Click Test Running to test the configured parameters based on the real-time acquired images.

	You can stop testing if needed.

Location Tool

Location tools include the Match Calibration tool and Match Location tool. This module implements the detection via locating.

Match Calibration

This tool is used for setting the transferring relation between the camera coordinate and the world coordinate. Using multiple-point calibration, a calibration file can be generated. At least 4 points are required for the calibration.

Before You Start

The camera parameters and base image are configured. The Match Calibration tool is added.

Steps

1.Select a method for acquiring calibration points in the Get Calibration Point field.

2.Set the Translation Number, e.g. the times of translation for acquiring calibration points. Only the translation in X/Y direction is supported. The minimum value is 4. Generally, it is set as 9.

3.If the block and the image do not share the same axis, set the Rotation Number.

4.If you select Trigger Acquisition at the Get Calibration Point field, you should set the template area and configure the following parameters for a better recognition quality.

Category	Parameter	Description
Search Settings	Template Area	The area which will be analyzed. Click Edit to the right of Template Area and select □ or ⬡ , and then draw on the live view window. Note:After drawing an area, you can click → Select similar patterns to manually set the match point. Click Reset to restore to default if needed.
	Template Shielded Area	The area which will not be analyzed within the template area.
	Template Sensitivity	The sensitivity of analyzing a template. **Auto** The camera will automatically adjust the sensitivity of model fixture based on the Sensitivity you set. **Manual** Set the sensitivity by configuring the Scale and Greyscale Threshold. **Scale** The same as Downsampling Coefficient. The downsampling coefficient factor = coarse granularity/10. For example, if you set the coarse granularity as 50, the downsampling coefficient factor will be 5. The Software will pick 1 pixel from each 6 pixels at each line to generate an image. The smaller the value you set, the less time the detection costs. The bigger the value you set, the fuzzier the image profile. **Greyscale Threshold** The range of greyscale value within the detection area. The area with greyscale value in this range will be recognized.
Range Settings	Detection Area	The area to be detected during a measurement. By default, the entire image is the detection area.
	Shielded Area	The shielded area will not be detected.
Template Parameter Settings	Min. Score	The similarity between the model and the object in the image. It ranges from 0 to 100. Only if the similarity between the object and the model is equal to or higher than the value you set, the object will be detected.
	Match Polarity	The transition from the detected object to the background in the image. ○ If the object's polarity varies from the model's polarity, you should select Ignored to make sure the object is found. ○ If you do not need to make sure the object is found, you can select Considered to save the detecting time.
	Angle Range	If the angle change of the object position is within the range you set, the object can be found, or it cannot be found.
	Algorithm Timeout (ms)	The maximum duration of algorithm running. If the working duration of the algorithm exceeds the duration you set, the detection will stop and output the results of NG. If you set the value as 0, there will be no limit for the working duration of the algorithm.

5. Set the operation parameters.

Parameter	Description
Camera Mode	3 options are supported. **Upper Camera Position** The camera position does not change, and it is above the detecting object. **Lower Camera Position** The camera position does not change, and it is below the detecting object. **Dynamic Camera** The camera moves with the mechanical arm.
DOF	3 options are supported. ○ Scale, Rotation, Aspect Ratio, Tilt, Translation and Transmission. ○ Scale, Rotation, Aspect Ratio, Tilt and Translation. ○ Scale, Rotation and Translation.
Weighting Function	We recommend you to use the default values. ○ If you select Huber or Tukey as the weighting function, you need to set the weighting coefficient. ○ If you select Ransac as the weighting function, you need to set the distance threshold and sampling rate. The distance threshold refers to the distance threshold of discarding mistake points. The lower the distance threshold, the more strict the selection of points.

6. Configure the physical coordinate parameters.

Parameter	Description
Reference Point X/Y	The physical coordinates representing the origin. You can set it as (0,0).
Offset Point X/Y	The offset of each movement to X or Y direction. It can be positive or negative.
Movement Priority	The direction of movement in priority.
Communation Number	The movement times before the mechanical arm changes moving direction.
Reference Angle	The original angle before rotation.
Angle Offset	The angle of each rotation.
Calibration Origin	Generally, it should be set as 4.

7.Get calibration points. The number of calibration points is subject to the times of rotations and offsets.

- If you select Manual Input at the Get Calibration Point, click Edit below to edit the calibration points or import the data from the PC.
- If you select Trigger Acquisition at the Get Calibration Point, click ▶ Test Running ▶ Execute to get the calibration points.

	○ If you click Test Running, the camera will acquire images continuously and start calibration; if you click Execute, the camera will acquire one image and start calibration. ○ After calibration, you can click Edit to view the data, or edit the calibration points or import calibration points from the PC. ○ You can clear the current calibration points and reset them, or click Export to save the calibration points to the PC.

8. Click ▶ Test Running ▶ Execute to generate the calibration file.

9. Click Export on the right of Calibration Parameters to save the generated calibration file to the PC.

Match Location

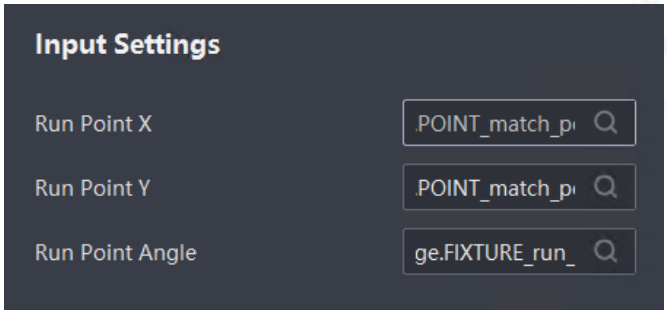
Match Locate helps get the exact position of the object in the image coordinate, and the position in the image coordinate corresponds with the position in the physical coordinate.

Before You Start

The camera parameters and base image are configured. The Match Locate tool is added.

Steps

1. Click next to Run Point X, Run Point Y, and Run Point Angle and select a parameter to subscribe to for each of them respectively.

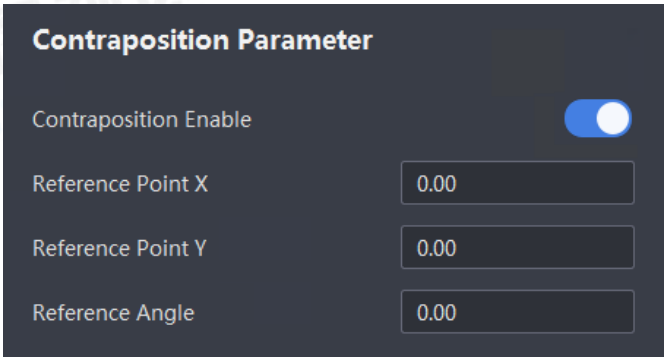


2.If you need to transform the image coordinate of the object into the physical coordinate, switchCalibration Transformation Enableto on and set the related parameters.

1)Click Import on the right of Calibration List to import the calibration file to the Software.

i	You can generate the calibration file by the Match Calibration tool. See Match Calibration.

2) If you need to calculate the offset of the physical points and reference points,switchContraposition Enableto on and set the related parameters.



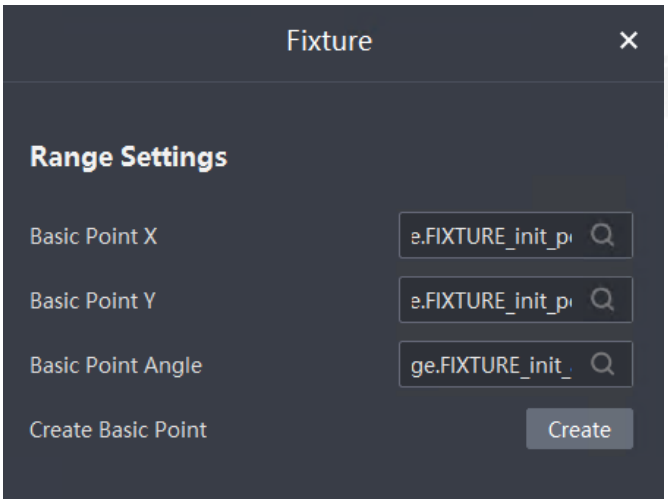
3. Click Test Running to test the tool.

Fixture

The fixture tool is used to perform position fixture based on the reference created by subscribing to the output result information (including the x-coordinate, y-coordinate, and angle) of each module.

Steps

1. Click next to Basic Point X, Basic Point Y, and Basic Point Angle and select a module output result to subscribe to for each of them respectively.



2. Click Create to output result information based on the information subscribed above.
The result information being outputted can be subscribed by other modules.
3. Click Test Running to test the tool.

Deep Learning

Deep learning tools include the DL Classification tool and DL Object Detection tool. They can implement the visual detection via deep learning algorithms.

DL Object Detection

The DL Object Detection tool is an image segmentation based on target geometric and statistical features. It combines target segmentation and recognition. Its accuracy and real-time performance are an important capability of the whole system.

Before You Start

Make sure that you have configured the camera parameters and the base image, and added the DL Object Detection tool.

Steps

1.Set the Detection Area according to your actual needs. It it set to analyze the whole base image by default.

You can click ☐ to draw a rectangle detection area.

2.Optional: If you need to shield areas in the detection area, click Edit on the right of Shielded Area and draw areas.

ⓘ	Refer to How to draw an ROI? for ROI drawing details.

3.Optional: You can enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.

Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

4.Click Import of Model List to import the trained model file.

ⓘ	● The name of model files to be imported can only contain characters, digits, and underlines. ● The model is trained by the deep learning training tool, the target platform is SM-Datum, and the training type is target detection. ● You can refer to the user manual of relative tools for detailed training operations.

5. Set the Judge Basis and relative parameters to define the result judgment rule.

Judge by Quantity

You need to set the quantity range of detected targets. The result will be OK if the number of detected targets is within the configured quantity range, or it will be NG.

Min. Score

You need to set the minimum score for the detection result. The result will be OK if the detection result score reaches or exceeds the configured min score, or it will be NG.

Judge Type

You need to set the type. The result will be OK if the detected target type is same as the configured type, or it will be NG.

ⓘ	The configured type name should be according to the added types during model training.

6. Optional: Set extra parameters if the result is not what you have expected.The parameters are shown in the table below.

Parameter Name	Description
Max. Number to Find	The maximum quantity of objects to be searched.
Min. Score	The minimum similarity between the model and the target, i.e., the similarity threshold. The higher the value, the higher the confidence. The object whose similarity reached or exceeded the configured threshold can be searched.
Max. Overlap Rate	The maximum percentage of target can be tampered.
Sort Type	The order of results displayed. ● X Coordinate Ascending: Sort the displayed results according to the X-coordinate value in ascending order. ● Y Coordinate Ascending: Sort the displayed results according to the Y-coordinate value in descending order. ● Confidence Descending: Sort the displayed results according to the target score in descending order.
Angle Enable	Defines 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 is within the configured range can be detected.
Height Enable	If it is enabled, target objects whose height is within the configured range can be detected.
Outside Filter Enable	If it is enabled, the outside filter score can be set. When a part of the target is not in the detection area, and the proportion of the part within the edge of the search target in the whole is less than the filter score, the target cannot be searched.

7. Click Test Running to test the image according to settings.

	Click Stop Running to stop the test.

DL Classification

The DL Classification tool can distinguish different types of targets according to the different features reflected in the image. It can classify the objects in the image or area of an image via deep learning algorithms, and has a wide range of applications in object recognition and sorting.

Before You Start

Make sure that you have configured the camera parameters and the base image, and added the DL Classification tool.

Steps

1.Optional: You can enable or disable Independent Fixture as needed. When enabled, target offset can be adjusted according to the parameter settings of the chosen fixture configuration. This function is enabled by default and automatically subscribes to the fixture configuration of the base image.
Make sure you have enabled Fixture when configuring the base image. Refer to Configure Base Image for details.

2.Click Import in Model List to import the model file.

	● The name of model files to be imported can only contain characters, digits, and underlines. ● The model is trained by the deep learning training tool, the target platform is SM-Datum, and the training type is image classification. ● You can refer to the user manual of relative tools for detailed training operations.

3. Set the Judge Basis and relative parameters to define the result judgment rule.

Min. Score

You need to set the minimum score for the detection result. The result will be OK if the detection result score reaches or exceeds the configured min score, or it will be NG.

Judge Type

You need to set the type name. The result will be OK if the detected target type is same as the configured type name, or it will be NG.

	The configured type name should be according to the added tags during model training.

4. Click Test Running to test the image according to settings.

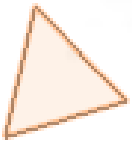
	Click Stop Running to stop the test.

About ROI

While editing a project, drawing an ROI is often required for the base image and most tools. This chapter introduces the supported ROIs and how to draw an ROI.

ROI Types

The ROI types include template area, detection area, and shielded area drawn inside the template area and detection area. For different ROI types, the supported number of ROIs and shapes vary.

ROI Type	Shape	Numbers	Example
Template Area	rectangle, polygon	Multiple	
Detection Area	rectangle, single line, dual-lines, point + line, polygon, circle	Other Tools: only one Code Recognition Tool: up to 8	
Shielded Area	Template Area: rectangle, polygon Detection Area: polygon	Multiple	

- By default, the detection area is the whole image.
- When drawing multiple ROIs, digit icons indicating the number of ROIs will be displayed in the down-right corner of the drawing area.
- Some tools do not support drawing an ROI. The supported shapes are as follows.

Category	Tool	ROI Shape
Counting Tool	Spot Count	rectangle, circle, polygon
	Edge Count	single line
	Pattern Count	rectangle
	Outline Count	rectangle, circle, polygon
	Color Count	rectangle, circle, polygon
Defect Tool	Exception Detection	rectangle
Existence Tool	Circle Existence	circle
	Line Existence	single line
	Spot Existence	rectangle, circle
	Edge Existence	single line
	Pattern Existence	rectangle
	Outline Existence	rectangle, circle
Location Tool	Match Calibration	rectangle
	Match Location	rectangle
Logic	If Module	N/A
	Condition Judge	N/A
	Logic Judge	N/A
	Combination Judge	N/A
	Character Comparison	N/A
	Calculator	N/A
Measuring Tool	Color Size	rectangle, circle
	L2L Angle	dual-lines
	Diameter Measurement	circle

ROI Types

Category	Tool	ROI Shape
Measuring Tool	Brightness Average Value	rectangle, circle
	Contrast Measurement	rectangle, circle
	Width Measurement	single line
	P2L Measurement	point + line
	Greyscale Size	rectangle, circle
	Line Angle	single line
	Edge Width Measurement	single line
Recognition Tool	OCR	rectangle
	Color Contrast	rectangle, circle
	Registration Classification	rectangle
	Code Recognition	rectangle
	Object Detection	rectangle, polygon
Deep Learning	DL Classification	N/A
	DL Object Detection	rectangle

How to draw an ROI?

For different shapes, the drawing steps vary.

ROI Shape	Icon	Drawing Steps
Single Line		1. Click  , and then click the base image to specify the start point. Then move the cursor and click another place on the base image to specify the end point. 2. Hover the cursor on  and drag to turn the ROI. Hover the cursor on  and drag to change the ROI size. 3. Select the ROI and press Delete on your keyboard or right-click the ROI and click Delete to remove the ROI from the image.
Dual-Lines		1. Click  , and then draw the first line on the base image. And then draw the second line. 2. Hover the cursor on  and drag to turn the ROI. Hover the cursor on  and drag to change the ROI size. 3. Select the ROI and press Delete on your keyboard or right-click the ROI and click Delete to remove the ROI from the image.
Point + Line		1. Click  , and then click the base image to specify the point. And then draw a line. 2. Hover the cursor on  and drag to turn the ROI. Hover the cursor on  and drag to change the ROI size. 3. Select the ROI and press Delete on your keyboard or right-click the ROI and click Delete to remove the ROI from the image.
Rectangle		1. Click  , and then click the base image and drag to draw a rectangle. 2. Hover the cursor on  and drag to turn the ROI. Hover the cursor on  and drag to change the ROI size. 3. Select the ROI and press Delete on your keyboard or right-click the ROI and click Delete to remove the ROI from the image.
Polygon		1. Click  and then click the base image to specify vertexes of the polygon. Double-click to finish the polygon. At least 3 points are required. 2. Drag the polygon to move it. Hover the cursor on the  and drag to change the ROI size. 3. Select the ROI and press Delete on your keyboard or right-click the ROI and click Delete to remove the ROI from the image.
Circle		1. Click  and then click the base image to specify a point as the circle center. The camera will generate a circle. 2. Drag the circle to move it. Hover the cursor on  and drag to change the semi-diameters of the two circles. 3. Select the ROI and press Delete on your keyboard or right-click the ROI and click Delete to remove the ROI from the image.

How to draw an ROI?

ROI Shape	Icon	Drawing Steps
Circle	◯	1. After clicking ◯ , click the base image and drag to draw a circle. The point you click will be the center of the circle. 2. Drag the circle to move it. Hover the cursor on  and drag to change the semi-diameters of the circle. 3. Select the ROI and press Delete on your keyboard or right-click the ROI and click Delete to remove the ROI from the image.

Module Results Output

The output results of the image capture module, base image module, and visual tools that can be subscribed to.
The results of different modules are shown in the table below.

Tool Category	Tool Name	Output Result Data Type
Camera	Camera Image	● module status, module status string ● raw image height, raw image width ● image height, image width ● trigger No.
Base Image	Reference Image	● module status, module status string ● reference point coordinate X, reference point coordinate Y, reference angle ● operation point coordinate X, operation point coordinate Y, operation angle ● match box center X, match box center Y, match box width, match box height, match box angle, match point X, match point Y ● score Note：Except for the module status and module status string, the other data can be output only after the position fixture.
Results Count	Project Results	● module status, module status string ● logic result, project result ● NG running times, current project name, total running times Note：Except for the solution result, the other data can be output only when the Project Results rule is set to Custom.
	Spot Count	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● speckle number ● centroid X, centroid Y ● size, circumference ● Blob rectangle point X, Blob rectangle point Y, Blob rectangle width, Blob rectangle height, Blob rectangle angle
	Edge Count	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● edge point X, edge point Y, edge point quantity ● line start point X, line start point Y, line end point X, line end point Y, line angle
	Pattern Count	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● match number ● match box X, match box Y, match box width, match box height, match box angle ● score
	Outline Count	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● match number ● match box X, match box Y, match box width, match box height, match box angle, match point X, match point Y ● score
	Color Count	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● color number ● centroid X, centroid Y ● circumference ● Blob rectangle point X, Blob rectangle point Y, Blob rectangle width,Blob rectangle height, Blob rectangle angle ● color name

Tool Category	Tool Name	Output Result Data Type
Defect	Exception Detect	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● match tag ● score ● similarity
Whether	Circle Existence	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● circle center X, circle center Y, circle radius
	Line Existence	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● line start point X, line start point Y, line end point X, line end point Y, line angle
	Spot Existence	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height,detection area angle ● centroid X, centroid Y ● size, circumference ● Blob rectangle X, Blob rectangle Y, Blob rectangle width, Blob rectangle height, Blob rectangle angle
	Edge Existence	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● edge point X, edge point Y, edge point quantity ● line start point X, line start point Y, line end point X, line end point Y, line angle
	Pattern Existence	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● match box X, match box Y, match box width, match box height, match box angle ● score
	Outline Existence	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● match box X, match box Y, match box width, match box height, match box angle, match point X, match point Y ● score
Location	Match Calib	● module status, module status string ● calibration translation error, calibration rotation error
	Match Locate	● module status, module status string ● calibration physical coordinate X, calibration physical coordinate Y, calibration physical angle ● X offset, Y offset, Theta offset ● match box center X, match box center Y, match box width, match box height, match box angle
	Fixture	● module status string ● basic point X, basic point Y, basic point angle ● run point X, run point Y, run point angle
Logic	If Module	● module status, module status string ● init point X, init point Y, init angle ● run point X, run point Y, run angle ● match box X, match box Y, match box width, match box height, match box angle
	Condition Judge	module status, module status string
	Logic Judge	module status, module status string
Location	Combination Judge	● module status, module status string ● combination output
	String Compare	● module status, module status string ● subscription value, contrast value
	Calculator	● module status, module status string ● var 0 Note： var 0 is the variable name of Calculator tool, its result depends on the configured variable quantity and name.

Tool Category	Tool Name	Output Result Data Type
Measurement	Color Size	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● total size, measurement value
	L2L Angle	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● intersection point X, intersection point Y ● distance ● line 1 start point X, line 1 start point Y, line 1 end point X, line 1 end point Y, line 1 angle ● line 2 start point X, line 2 start point Y, line 2 end point X, line 2 end point Y, line 2 angle ● measured value ● result quantity
	Diameter Measurement	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● circle diameter, circle center X, circle center Y, circle radius ● result measure value
	Brightness Analysis	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● min. value, max. value, variance, standard deviation, mean value, contrast ● result measure value
	Contrast Measurement	● module status, module status string ● detection area center X, detection area center Y,detection area width, detection area height, detection area angle ● min. value, max. value, variance, standard deviation, mean value, contrast ● result measure value
	Width Measurement	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● line start point X, line start point Y, line end point X, line end point Y ● result measure value ● line 0 start point X, line 0 start point Y, line 0 end point X, line 0 end point Y, line 0 angle ● line 1 start point X, line 1 start point Y, line 1 end point X, line 1 end point Y, line 1 angle ● pixel edge spacing
	P2L Measurement	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● perpendicular foot X, perpendicular foot Y, angle ● vertical distance, closet distance, furthest distance ● result measure value ● line start point X, line start point Y, line end point X, line end point Y ● point X, point Y ● result quantity
	Greyscale Size	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● Blob total area ● result measure value
	Line Angle	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● line start point X, line start point Y, line end point X, line end point Y, line angle ● result measure value
	Edge Width Measurement	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● line start point X, line start point Y, line end point X, line end point Y ● result measure value ● line 0 start point X, line 0 start point Y, line 0 end point X, line 0 end point Y, line 0 angle ● line 1 start point X, line 1 start point Y, line 1 end point X, line 1 end point Y, line 1 angle ● pixel edge spacing ● min. edge width, max. edge width, average edge width, edge width standard offset

Tool Category	Tool Name	Output Result Data Type
Recognition	OCR	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● position box center X, position box center Y, position box width, position box height, position box angle, position box score ● string quantity, string status, character quantity, character info., string confidence ● similarity Note: The similarity is valid when the Judg Basis is set to Score.
	Color Contrast	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● best score ● similarity
	Code Recognition	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● code status, code info., code score, code type, code number ● status ● code area center X coordinate, code area center Y coordinate, code area width, code area height, code area angle ● similarity Note: The similarity is valid when the Judge Basis is set to Code Min. Score.
	Color Recognition	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● color name ● best score ● similarity
	Registration Classify	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● category name ● score ● image Index
	Registration Object Classify	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● target box center X, target box center Y, target box width, target box height, target number, target status ● category value, category name ● confidence
Deep Learning	DL Classify	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● tag value, probability, tag name ● confidence ● similarity Note: The similarity is valid only when the Judge Basis is set to Min. Score.
	DL Object Detection	● module status, module status string ● detection area center X, detection area center Y, detection area width, detection area height, detection area angle ● target box center X, target box center Y, target box width, target box height, target box angle ● object number ● category value, category name ● confidence ● target status ● similarity Note: The similarity is valid only when the Judge Basis is set to Min. Score.

The results output varies according to different series cameras and firmware versions.

FAQ

Why the Software cannot enumerate my camera?

Question:

Why the Software cannot enumerate my camera?

Possible Cause：

1.The camera is not powered on.
2.The network connection is abnormal.

Solution：

1.Check the PWR light at the top of the camera. If the camera is powered on, the light will remain green.
2.Check the LNK light at the top of the camera. If the network connection is normal, the light is green and keeps flashing. You should also make sure that your PC's network port is in the same network segment with the camera.

Why is the image completely black or too dark when previewing?

Question:

Why is the image completely black or too dark when previewing?

Possible Cause：

1.The light is not strong enough.
2.The value of exposure, gain, and other settings is too low.

Solution：

1.Enhance the brightness or use a stronger light.
2.Increase the value of exposure and gain.

Why is the image stuck / in low frame / separated in the live view panel?

Question:

Why is the image stuck / in low frame / separated in the live view panel?

Possible Cause：

The network transmission speed is below 100Mbps.

Solution：

Make sure that the network transmission speed is 100Mbps or above.

Why is the image failed to be displayed in the preview window?

Question:

Why is the image failed to be displayed in the preview window?

Possible Cause：

The trigger mode is enabled, but no trigger signal is sent.

Solution：

Send a trigger signal to the camera or disable the trigger mode.

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