Hikrobot Co., Ltd.

SC2000X Series Vision Sensor

Quick Start Guide

HIKROBOT

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

Available Model

This manual is applicable to the SC2000X Series Vision Sensor.

Contact Information

Hangzhou Hikrobot Co., Ltd.
E-mail: global.support@hikrobotics.com
Website: ***https://en.hikrobotics.com/***

Contents

Chapter 1 Safety Instruction

The safety instructions are intended to ensure that the user can use the device correctly to avoid danger or property loss. Read and follow these safety instructions before installing, operating and maintaining the device.

1.1 Safety Claim

- To ensure personal and device safety, when installing, operating, and maintaining the device, follow the signs on the device and all safety instructions described in the manual.
- The note, caution and danger items in the manual do not represent all the safety instructions that should be observed, but only serve as a supplement to all the safety instructions.
- The device should be used in an environment that meets the design specifications, otherwise it may cause malfunctions, and malfunctions or component damage caused by non-compliance with relevant regulations are not within the scope of the device's quality assurance.
- Our company will not bear any legal responsibility for personal safety accidents and property losses caused by abnormal operation of the device.

1.2 Safety Instruction

⚠Caution

- Do not install the device if it is found that the device and accessories are damaged, rusted, water ingress, model mismatch, missing parts, etc., when unpacking.
- Avoid storage and transportation in places such as water splashing and rain, direct sunlight, strong electric fields, strong magnetic fields, and strong vibrations.
- Avoid dropping, smashing or vigorously vibrating the device and its components.
- It is forbidden to install the indoor device in an environment where it may be exposed to water or other liquids. If the device is damp, it may cause fire and electric shock hazard.
- Place the device in a place out of direct sunlight and ventilation, away from heat sources such as heaters and radiators.
- In the use of the device, you must be in strict compliance with the electrical safety regulations of the nation and region.
- Use the power adapter provided by the official manufacturer. The power adapter must meet the Limited Power Source (LPS) requirements. For specific requirements, please refer to the device's technical specifications.
- It is strictly forbidden to wire, maintain, and disassemble the device is powered on. Otherwise, there is a danger of electric shock.
- Make sure that the device is installed in good condition, the wiring is firm, and the power supply meets the requirements before powering on the device.

- For a device with a power switch, please use the switch to power on and off. It is strictly forbidden to plug and unplug the power cord.
- Looking directly at the device may cause harm to the eyes. Protective measures like wearing protective glasses should be taken in the process of installation, maintenance and debugging.
- If the device emits smoke, odor or noise, please turn off the power and unplug the power cord immediately, and contact the dealer or service center in time.
- It is strictly forbidden to touch any terminal of the device when operating it. Otherwise there is a danger of electric shock.
- It is strictly forbidden for non-professional technicians to detect signals during device operation, otherwise it may cause personal injury or device damage.
- It is strictly forbidden to maintain the device that is powered on, otherwise there is a danger of electric shock.
- Avoid aiming the image sensor at strong light in direct mode or reflection mode, such as laser beams, otherwise the image sensor will be damaged.
- Keep clean of the device's image acquisition window. It is recommended to use cleaning water (not the alcohol-based corrosive solutions) to wipe off the dust. When the device is not in use, please add a dust cover to protect the image acquisition window.
- If the device does not work properly, please contact your dealer or the nearest service center. Never attempt to disassemble the device yourself. We shall not assume any responsibility for problems caused by unauthorized repair or maintenance.
- Please dispose of the device in strict accordance with the relevant national or regional regulations and standards to avoid environmental pollution and property damage.

Note

- Check whether the device's package is in good condition, whether there is damage, intrusion, moisture, deformation, etc. before unpacking.
- Check the surface of the device and accessories for damage, rust, bumps, etc. when unpacking.
- Check whether the quantity and information of the device and accessories are complete after unpacking.
- Store and transport the device according to the storage and transport conditions of the device, and the storage temperature and humidity should meet the requirements.
- It is strictly prohibited to transport the device in combination with items that may affect or damage the device.
- Please read the manual and safety instructions carefully before installing the device.
- Quality requirements for installation and maintenance personnel:
  - Qualification certificate or working experience in weak current system installation and maintenance, and relevant working experience and qualifications. Besides, the personnel must possess the following knowledge and operation skills.
  - The basic knowledge and operation skills of low voltage wiring and low voltage electronic circuit connection.
  - The ability to comprehend the contents of this manual.
- Do not contact the device with strong acids, alkalis, oils, greases or organic solutions such as thinners.

- Do not expose the device directly to flashlights, high-frequency switch lighting devices, or to sunlight, which may affect the performance.
- Do not impose pressure on the cable end of the device, such as forced bending, pulling, etc.

1.3 Electromagnetic Interference Prevention

- Make sure that the shielding layer of cables is intact and 360° connected to the metal connector when using shielded cables.
- Do not route the device together with other equipment (especially servo motors, high-power devices, etc.), and control the distance between cables to more than 10 cm. Make sure to shield the cables if unavoidable.
- The control cable of the device and the power cable of the industrial light source must be wired separately to avoid bundled wiring.
- The power cable, data cable, signal cable, etc. of the device must be wired separately. Make sure to ground them if the wiring groove is used to separate the wiring and the wiring groove is metal.
- During the wiring process, evaluate the wiring space reasonably, and do not pull the cables hard, so as not to damage the electrical performance of the cables.
- If the device is powered on and off frequently, it is necessary to strengthen the voltage isolation, and consider adding a DC/DC isolation power supply module between the device and the adapter.
- Use the power adapter to supply power to the device separately. If centralized power supply is necessary, make sure to use a DC filter to filter the power supply of the device separately before use.
- The unused cables of the device must be insulated.
- When installing the device, if you cannot ensure that the device itself and all equipment connected to the device are well grounded, you should isolate the device with an insulating bracket.
- To avoid the accumulation of static electricity, ensure that other equipment (such as machines, internal components, etc.) and metal brackets on site are properly grounded.
- During the installation and use of the device, high voltage leakage must be avoided.
- Use a figure-eight bundle method if the device cable is too long.
- When connecting the device and metal accessories, they must be connected firmly to maintain good conductivity.
- Use a shielded network cable to connect to the device. If you use a self-made network cable, make sure that the shielding shell at the aviation head is well connected to the aluminum foil or metal braid of the shielding cable.

Chapter 2 Overview

2.1 Introduction

The vision sensor mentioned in this manual integrates functions of image acquisition, image processing and result output, and is used in machine vision inspection. The device uses image sensors and optical elements to obtain the image of the measured object, realizes the functions of counting, existence, measurement and recognition via the built-in algorithms, and can output the detection results through a variety of communication methods. With the client software, the device can quickly build the project and finish related configurations, and it is easy to use, widely used in the industrial field.

2.2 Key Features

- Adopts embedded hardware platform to realize high-speed image processing.
- Adopts built-in positioning and measurement algorithms to for counting, existence, measurement detection, and recognition.
- Provides multiple IO interfaces for input and output signals.
- Provides multiple indicators for displaying device status.
- Adopts light source to ensure uniform brightness in the illuminated area.
- Supports multiple communication protocols, including RS-232, TCP, UDP, FTP, PROFINET, Modbus, Ethernet/IP, etc.

Note

- The specific functions may differ by device models.
- Refer to the device's datasheet for specific parameters.

Chapter 3 Appearance

Note

Appearance here is for reference only. Refer to the device's specification for detailed dimension information.

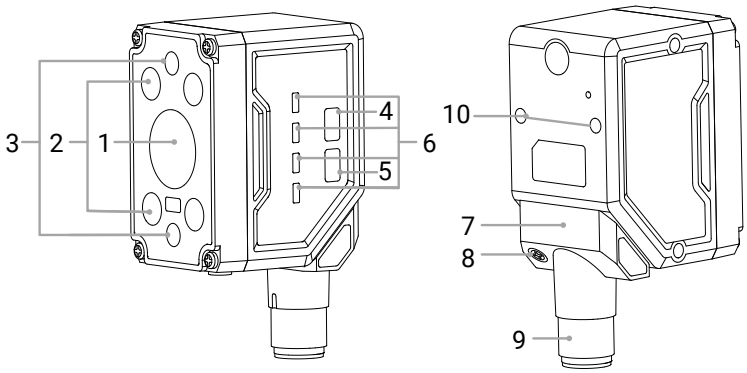


Figure 3-1 Appearance

Table 3-1 Component Description

No.	Name	Description
1	Image Sensor	It is used to acquire images.
2	Light Source	It refers to 4 white LED lamp beads providing light during image acquisition. **Note** The default color of LED lights is white. Red, blue, IR, UV, and two-color (red/blue) lights are optional.
3	Aiming System	There are two green LED lights used to show the field of view.
4	Trigger Button	● When the device is in continuous acquisition mode, press the button and the device switches to trigger mode. ● When the device is in trigger mode, press the button and the device triggers once.
5	Smart Tune Button	● Hold the button for 3 seconds, the device is in smart tune mode. ● Press the button 2 times consecutively during smart tune process, and the device parameters will be configured automatically. ● Press the button 3 times consecutively during smart tune process, and a specified template will be created automatically.

No.	Name	Description
		Note The default color of LED lights is white. Red, blue, IR, UV, and two-color (red/blue) lights are optional. ● Hold the button for 3 seconds, and the smart tune mode will be closed.
6	Indicator	It refers to 4 indicators for observing the device's status. Refer to section ***Indicator*** for details.
7	Right Angle Rotation Structure	It is used to rotate the device's cables.
8	Screw	It is used to fix the rotation structure.
9	Power and I/O Connector	It refers to 17-pin M12 connector for providing power, data communication, I/O, and serial port signal. Refer to section ***17-Pin M12 Connector*** for details.
10	Screw Hole	It is used to fix the device, and you should use M3 screws. **Note** The side screw holes and rear screw holes are the same.

Chapter 4 Connector and Indicator

4.1 17-Pin M12 Connector

The device has a 17-pin M12 connector to provide power, I/O, and serial port signal. Read the following content to get pin definitions of this connector.

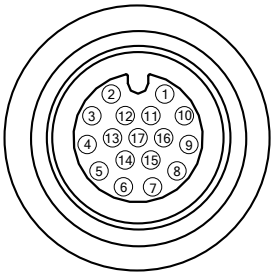


Figure 4-1 17-Pin M12 Connector

Table 4-1 Pin Definition of Cable

No.	Signal	Description	Cable Color	Supplied Cable	I/O Signal
1	POWER_IN	Direct current power supply positive	Red	Pin 8 of 8-pin terminal	--
2	OUT_COM	Output signal ground	Brown	Pin 6 of 8-pin terminal	--
4	RS232_TX	RS-232 serial port output	Red/Blue	DB9 female serial port	--
5	RS232_RX	RS-232 serial port input	Gray/Pink	DB9 female serial port	--
6	RX-	Fast Ethernet signal RX-	White/Orange	RJ45 network interface	--
7	TX+	Fast Ethernet signal TX+	Green	RJ45 network interface	--
8	GPIO2	Opto-isolated output	Blue/White	Pin 4 of 8-pin terminal	Line 2
9	IN_COM	Input signal ground	Blue	Pin 3 of 8-pin terminal	--
10	GPIO3	Opto-isolated output	Brown/White	Pin 5 of 8-pin terminal	Line 3

No.	Signal	Description	Cable Color		Supplied Cable	I/O Signal
11	GND	Direct current power supply negative		Black	Pin 7 of 8-pin terminal	--
14	RX+	Fast Ethernet signal RX+		Orange	RJ45 network interface	--
15	TX-	Fast Ethernet signal TX-		White/Green	RJ45 network interface	--
16	GPIO0	Opto-isolated input		Gray	Pin 1 of 8-pin terminal	Line 0
17	GPIO1	Opto-isolated input		White	Pin 2 of 8-pin terminal	Line 1

Note

- You should refer to the tables above and the label attached to the supplied power and I/O cable to wire the device.
- The open line of 8-pin terminal of cable with network interface is reserved. Do not use the open line for wiring.
- The cable colors mentioned above are applicable to the cables of 17-pin M12 to 8-pin terminal, RJ45, and DB9 serial port sold by our company. If other cables are used, please refer to the actual one.

4.2 Indicator

You can observe the device's indictor to check whether the device operates normally or not.

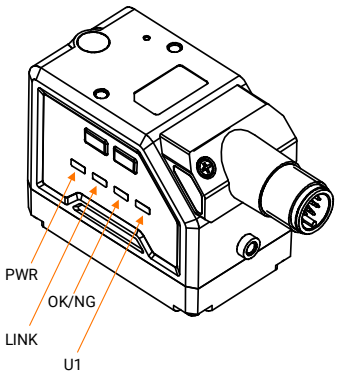


Figure 4-2 Device Indicator

Table 4-2 Indicator Description

Device Status	Description
PWR (Power Indicator)	Solid Green: Power supply is normal.
	Flashing Red: The indicator flashes once when the device is powered on.
	Unlit: Device is powered off.
LINK (Network Indicator)	Flashing Green: Network connection is normal, and the flashing speed is related to data transmission speed.
	Unlit: Network is disconnected.
OK/NG (Result Indicator)	Flashing Green: Solution execution is successful.
	Flashing Red: Solution execution failed.
	Unlit: The indicator is unlit by default.
U1 (User-Defined Indicator)	The indicator is reserved.

Chapter 5 Installation

5.1 Installation Preparation

You need to prepare following accessories before installation. The included accessories are in the device's package, and you can purchase optional accessories according to actual demands.

Table 5-1 Included Accessories

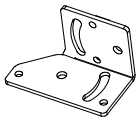
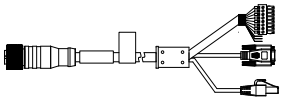
No.	Name	Image	Quantity	Description
1	Installation Bracket		1	It is used to fix the device.

Table 5-2 Optional Accessories

No.	Name	Image	Quantity	Description
1	Cable		1	The cable of 17-pin M12 to 8-pin terminal, RJ45, and DB9 serial port should be purchased separately.
2	Power Adapter		1	(Required) You should select a suitable power adapter or switch power supply according to the device power supply and consumption in the specification.
3	Lens Cap		1	The lens cap can be replaced with other lens cap according to actual demands, such as half-polarized and fully-polarized lens cap.
4	Light Board		1	The light board can be replaced with red, blue, IR, UV, or two-color (red/blue) light board according to actual demands.

5.2 Install Device

Before You Start

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

Steps

1. Select a suitable installation location according to the device's field of view.

Note

Refer to the device's specifications for detection range.

2. Adjust the device's right angle rotation structure according to the installation location.

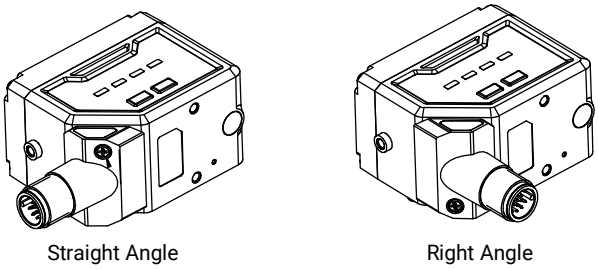


Figure 5-1 Adjust Right Angle Rotation Structure

Note

Refer to the device's specifications for the dimension of the right angle rotation structure.

3. Use M3 screws to fix the installation bracket to the device, as shown below.

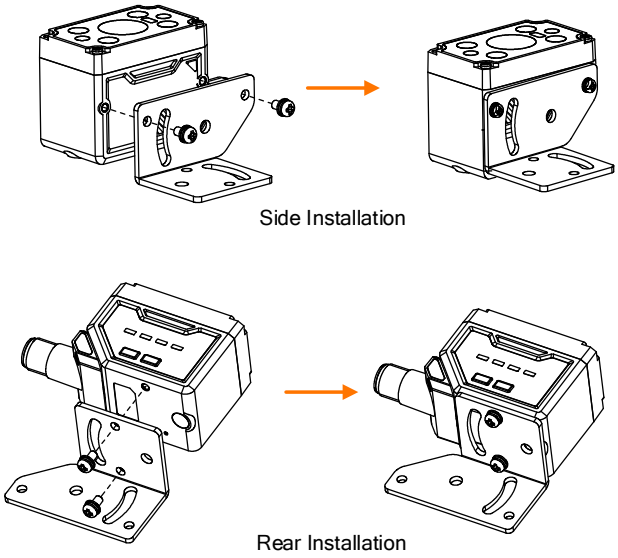


Figure 5-2 Fix Installation Bracket

4. Install the device to the installation location.

5.3 Wire Device

After installing the device, you should use the power and I/O cable and power adapter to wire and power the device.

Before You Start

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

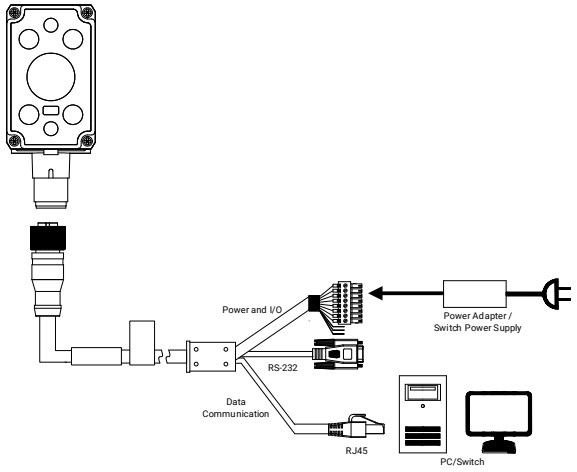


Figure 5-3 Device Connection

Steps

1. Use the supplied 17-pin M12 connector cable to connect to the device.

Note

The connector has screw thread, and it is recommended to tighten the connector before using the device to reduce looseness due to the vibration on-site.

2. Insert the RJ45 connector to the network interface of PC or switch.
3. Select a suitable power adapter to connect to the 8-pin terminal of the supplied power and I/O cable for power supply.

Note

- Power supply can be achieved via the 8-pin terminal connecting to power adapter or switch power supply.
- Refer to section ***17-Pin M12 Connector*** for specific cable color of open lines.

Chapter 6 I/O Electrical Feature and Wiring

This section introduces the I/O electrical features and wiring methods of the device. The device has 2 opto-isolated input signals (Line 0/1) and 2 opto-isolated output signals (Line 2/3).

6.1 Input Signal

The internal circuit, electrical feature, and logic level of opto-isolated input signal are as follows.

Note

- Make sure that the input voltage is from 4 VDC to 24 VDC.
- The breakdown voltage is 30 VDC. Keep voltage stable.

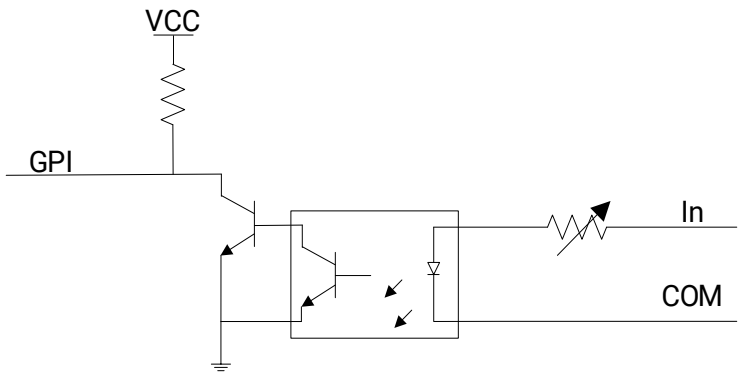


Figure 6-1 Internal Circuit of Input Signal

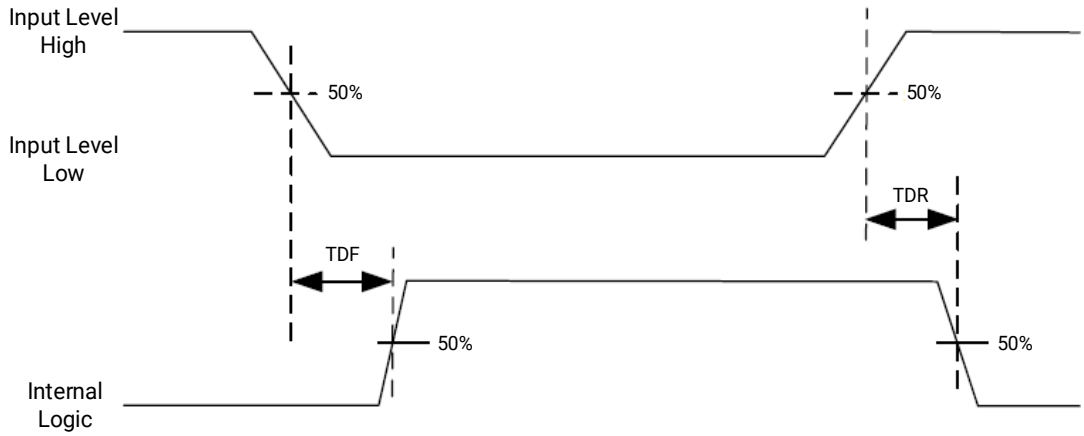


Figure 6-2 Input Logic Level

Table 6-1 Input Electrical Feature

Parameter Name	Value
Input Turn-On Level	4 V ≤ Vth ≤ 24 V
Input Turn-Off Level	0 V ≤ Vth ≤ 2 V
Input Falling Delay (TDF)	≤ 81.6 μs
Input Rising Delay (TDR)	≤ 7 μs
Current Limit	≤ 0.025 A
Frequency	≤ 5 Khz (5 V)

6.2 Output Signal

The internal circuit and electrical feature of the opto-isolated output signal are as follows.

Note

- Make sure that the output voltage is from 5 VDC to 24 VDC.
- The maximum output current is 50 mA.
- Do not directly connect with inductive load (e.g. DC motor, etc.) when outputting.

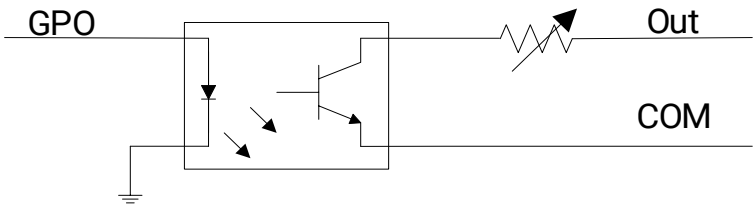


Figure 6-3 Internal Circuit of Output Signal

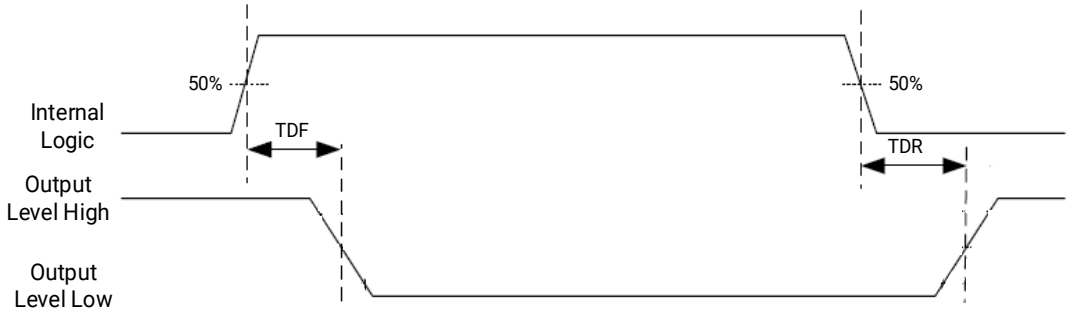


Figure 6-4 Output Logic Level

Note

If the external voltage and resistance change, the corresponding current of output signal and output logic level low may differ.

Table 6-2 Output Electrical Feature

Parameter Name	Value
Output Level High	5 V ≤ Vth ≤ 24 V
Output Level Low	≤ 2.7 V
Output Falling Delay (TDF)	≤ 6.3 μs
Output Rising Delay (TDR)	≤ 68 μs
Current Limit	≤ 0.025 A
Frequency	≤ 5 Khz (5 V)

6.3 I/O Wiring

The device can receive input signals from external devices and output signals to external devices. This section introduces how to wire the device's I/O.

Note

- The wiring methods of PNP device and NPN device are the same. When using the device, please pay attention to polarity of the different external devices in the wiring figures below.
- PWR and GND refer to the device's power supply. Make sure the isolation between power supply of the device and power supply / GND of external device.
- The device figures below are for reference only, and the actual one you got should prevail.

Input/output signal wiring may differ by the type of the external device.

Input Wiring

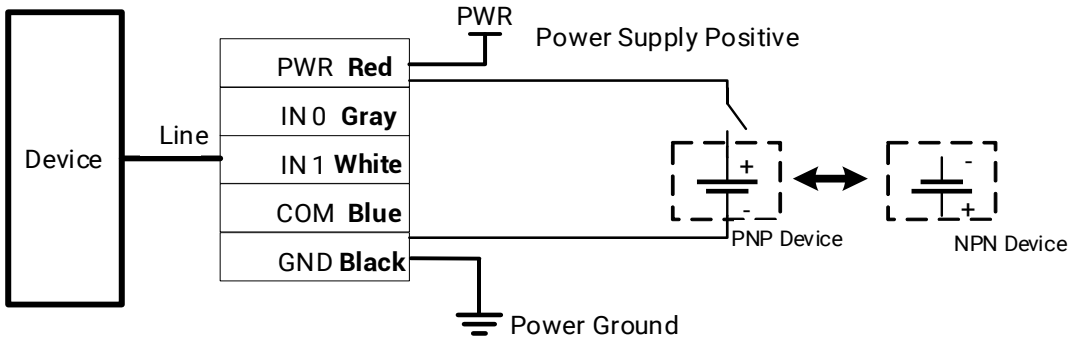


Figure 6-5 Input Wiring

Output Wiring

When the device is connected to the external device (PNP/NPN device) for outputting, a pull-up/pull-down resistor is required. It is recommended to use a 1 KΩ resistor.

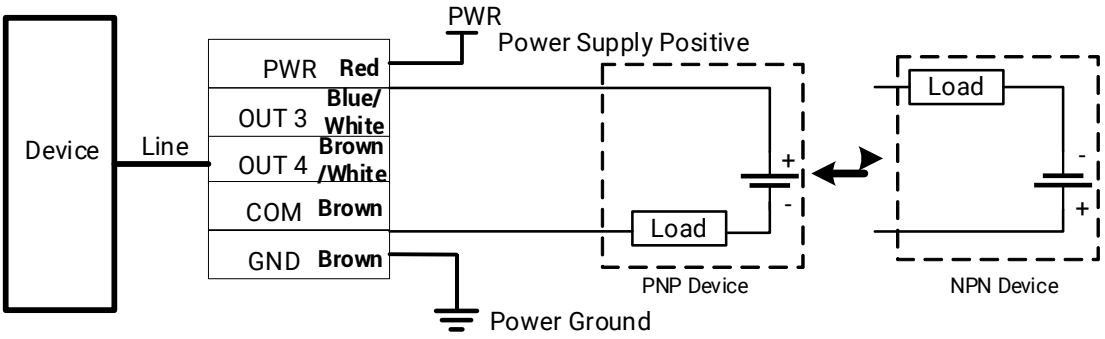


Figure 6-6 Output Wiring

When the device is connected to inductive load (relay or buzzer) for outputting, a flyback diode should be connected in parallel. It is recommended to use a diode with a reverse voltage exceeding 60 V and a current above 1 A based on field requirements. Refer to the wiring diagram below for details.

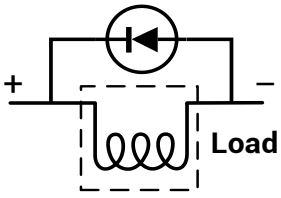


Figure 6-7 Flyback Diode Wiring

6.4 RS-232 Serial Port

The device supports outputting data via RS-232 serial port, and you can set serial port communication via the client software. Refer to section *Serial Port* in the user manual of the SCMVS client software for details.

The supplied cable has a DB9 female serial port. Refer to the figure and table below for pin definitions.

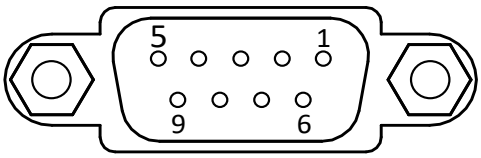


Figure 6-8 DB9 Female Serial Port

Table 6-3 Pin Definitions

Pin No.	Name	Description
2	TX	Transmits data.
3	RX	Receives data.
5	GND	Signal ground.

Chapter 7 Device Operation

You can execute device debugging and parameter settings via the client software. This section introduces how to install the client software, connect the device to the client software, fast configuration, etc.

7.1 Preparations

Before debugging the device, you need to set the PC's network, install the client software and log in to the device.

7.1.1 Set PC Network

To ensure stable image transmission and normal communication between the PC and the device via client software, you need to set the PC network before using the client software.

Steps

Note

For different Windows versions, the specific setting path and interface may differ. Please refer to the actual condition.

1. Go to PC network settings page: **Start** → **Control Panel** → **Network and Internet** → **Network and Sharing Center** → **Change adapter settings**.
2. Select NIC and set the IP obtainment mode.

- Select **Obtain an IP address automatically** to get an IP address of the PC automatically.
- Or select **Use the following IP address** to set an IP address for the PC manually.

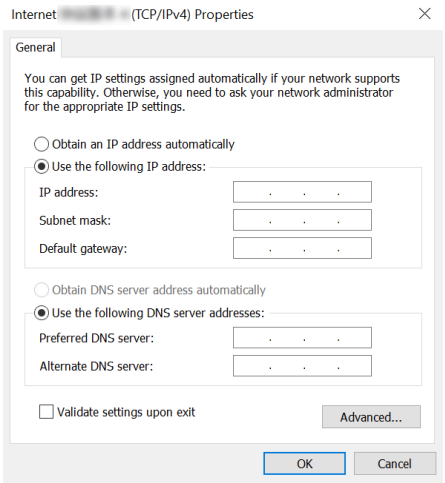


Figure 7-1 Set PC Network

Note

It is recommended to use the static IP address to reduce time for searching the device.

3. Set NIC property.
   1) Go to NIC settings page: **Control Panel** → **Hardware and Sound** → **Device Manager** → **Network Adapter**.
   2) Select corresponding network interface card, and click **Advanced**.
   3) Set **Speed and Duplex** as **Auto-Negotiation** or **100 Mbps**.

7.1.2 Install Client Software

SCMVS is a client software for device configuration and remote operations.

Steps

Note

- The client software is compatible with 32/64-bit Windows 7/10, 64-bit Windows 11, and 32/64-bit Linux operating systems. Here we take Windows as an example.
- You can get the client software installation package from ***https://en.hikrobotics.com/***. It is recommended to use the client software with version of V3.2.1 and later.
- The graphic user interface may differ by different versions of client software you use.

1. Double click the installation package to start installing the client software.
2. Select the language.
3. Read and check **Terms of the License Agreement**.

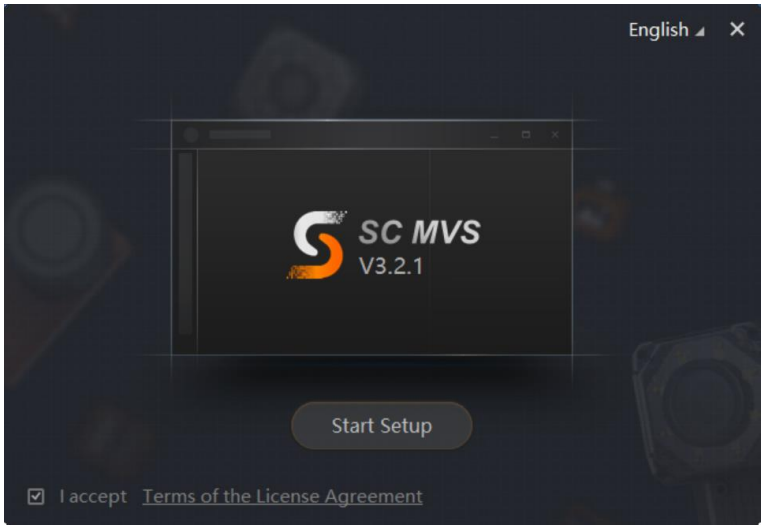


Figure 7-2 Installation Window

4. Click **Start Setup**.
5. Select installation directory and click **Next**.

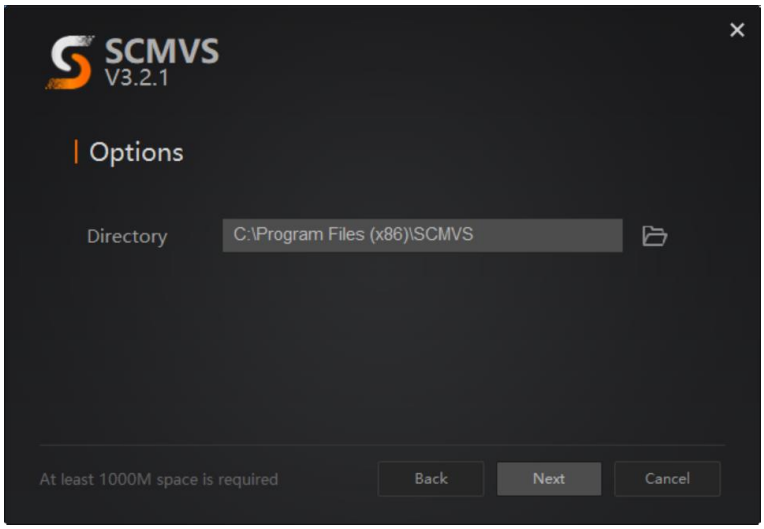


Figure 7-3 Click Next

6. Finish the installation according to the interface prompts.

7.1.3 Set Device Network

You can set and operate the device in the client software only when the device is in the same network segment with the PC where the client software is installed.

Steps

1. Double click the client software to run it.
2. Click in the device list to find the device, or click to add the device remotely.
3. Right click the device to be connected.
4. Click **Edit IP Address**.
5. Set the IP address of the device in the same network segment with the PC.

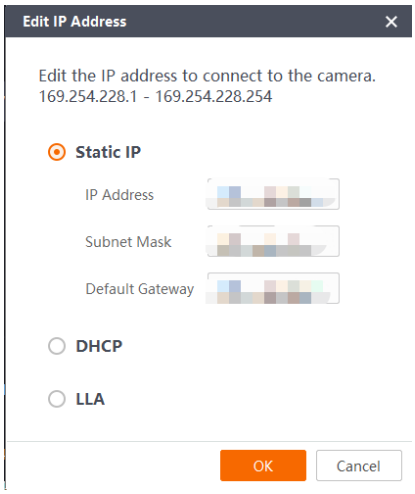


Figure 7-4 Edit IP Address

6. Click **OK**.

7.1.4 Log In

Note

- Make sure that your device IP address is in the same network segment with the PC where you installed the client software before connecting the device to it.
- The default login password is Abc1234, and it is highly recommended to change the password for the first time use.
- Follow the guidance to find the password if you forget it.
- Refer to the user manual of the SCMVS client software for detailed operation.

Steps

1. Click the device in the device list.
2. Enter password.
3. Click  to log in.

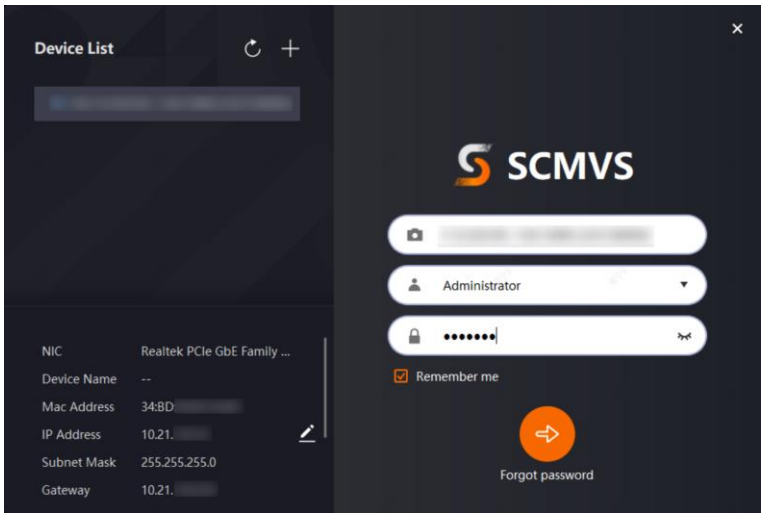


Figure 7-5 Login Window

4. (Optional) Check **Remember me** to remember the password if necessary.

Note

If you forget password, click **Forgot Password** in the login interface to view the device's serial No., and mail it to the technical support personnel or call them to get the corresponding resetting file. After that, import the resetting file and reset the password as the default one.

7.2 Client Layout and Operation Flow

7.2.1 Main Window Introduction

After logging into the client software, you can see the main window as shown below.

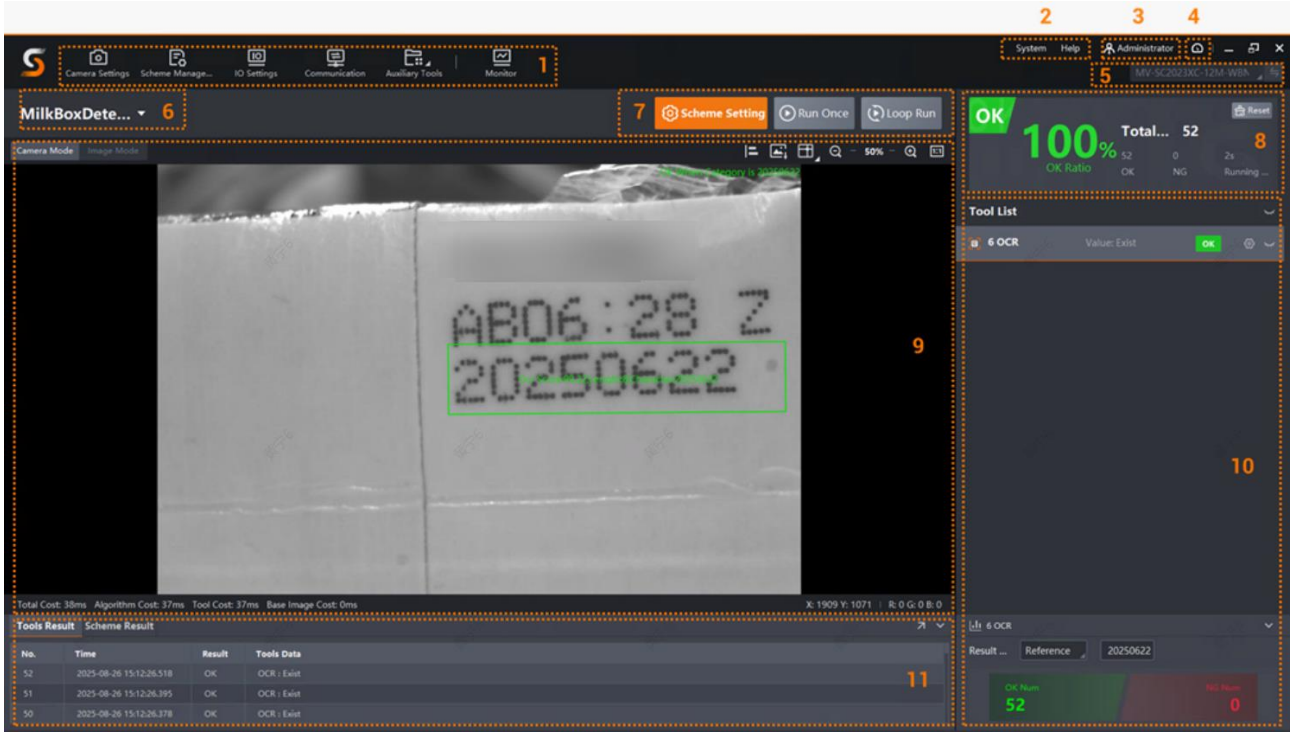


Figure 7-6 Main Window

Note

- The specific interfaces of the client software may differ by its versions.
- The client software loads and runs previous projects after logging in. If there is no project, the client software will create and run a new project.

Table 7-1 Main Window Description

No.	Name	Description
1	Menu Bar	The menu bar includes project, communication, camera settings, operation management, and camera monitoring.
2	System & Help	You can switch languages, set system parameters, view the user manual, log, and client version information here.
3	User Role	You can view, switch, and mange roles. The roles include administrator, technical support, maintenance personnel, and

No.	Name	Description
		operator. Different roles have different permissions. The role management is only available for the administrator.
4	Resource Information	You can view the usage of memory, intelligent memory, and CPU. ● Memory usage: It refers to the percentage of total memory being used by the system. ● Intelligent memory usage: It refers to the percentage of total memory being used by the algorithm. ● CPU usage: It refers to the percentage of time that the processor spends executing tasks.
5	Camera List	You can view the current camera model, or switch to other cameras. Up to 9 cameras can be connected.
6	Project name	You can view the current project, and click the project to switch to or add a new project.
7	Project Management	You can run (once/loop), stop, or edit projects here.
8	Project Status Display Area	This area displays operation status of current projects in real time, including OK ratio, number of OK/NG objects, and running duration.
9	Live View Window	This area displays images and results under camera mode and image mode in real time. Under image mode, you can import images into the device.
10	Tool Display Area	This area displays operation results of vision tools loaded in projects in real time. You can edit the specific vision tool.
11	Result Area	This area displays operation results of projects or tools.

7.2.2 Operation Flow

Note

- Refer to the user manual of the SCMVS client software for detailed parameter settings and operations.
- Click on the upper right corner of the client software, and click **User Manual** to open.

You can follow the overall operation flow below to create or edit projects via the client

software.

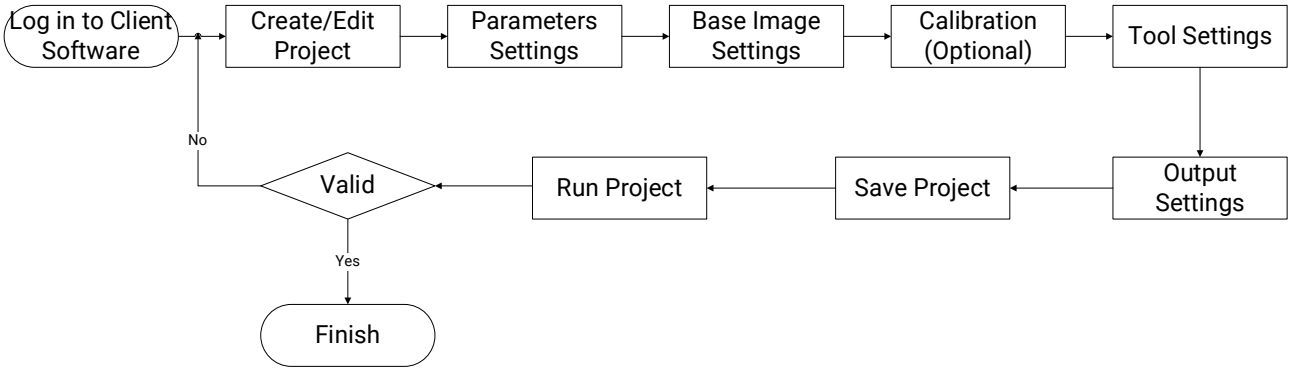


Figure 7-7 Operation Flow

Chapter 8 FAQ (Frequently Asked Question)

8.1 Why there is no device listed after I run the client software?

Table 8-1 Question 1

Possible Cause	Solution
The device is powered off.	Check the device's power connection (the indicator is solid green if the device works normally) to make sure the device is powered up normally.
Network exception.	Check the network connection (the indicator on the right is solid green and that on the left is flashing yellow if the network is normal) to make sure the device can be connected to the network normally, and make sure that the PC and the device are in the same network segment.

8.2 Why the image is very dark?

Table 8-2 Question 2

Possible Cause	Solution
All black during live view. It may be caused by insufficient brightness of light source.	Use more light sources, or change to a brighter one.
Too dark during live view. It may be caused by too small value of exposure and gain.	Increase exposure and gain appropriately.

8.3 Why the image's frame rate is very low in the live view?

Table 8-3 Question 3

Possible Cause	Solution
Network circuitry speed is not 100 Mbit/s.	Check if the network transit speed is 100 Mbit/s or above.

8.4 Why there is no image in the live view?

Table 8-4 Question 4

Possible Cause	Solution
Enabled trigger mode, but there is no trigger signal.	Send the trigger signal to the device.

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Hikrobot Co., Ltd.

Tel: 400-989-7998

Website: https://en.hikrobotics.com/

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