

Hikrobot Co., Ltd.

Binocular Structured Light Stereo Camera

User Manual

HIKROBOT

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

Symbol	Description
 Danger	Indicates a hazardous situation which, if not avoided, will or could 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 Binocular Structured Light Stereo Camera.

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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.
- The supplied bracket in the package is only applicable for this device, and using with other equipment may cause instability and injury.
- This is a Class A device. In the living environment, this device may cause radio interference. In this case, the user may be required to take practical measures against the interference.
- In the use of the device, you must be in strict compliance with the electrical safety regulations of the nation and region.
- Do not connect multiple devices to the same power adapter. Exceeding the adapter load

may cause a fire due to excessive heat generation.

- Use the power adapter provided by the official manufacturer. The power adapter must meet the Limited Power Source (LPS) requirements. For the specific power consumption of the device, please refer to the device's specifications.
- Do not cover the device's plug or outlet for disconnecting power supply.
- It is strictly forbidden to wire, maintain, and disassemble the device that is powered on. Otherwise there is a danger of electric shock and a damage to device.
- 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.
- 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 is powered on, otherwise there is a danger of electric shock.
- In order to ensure the stability of the depth data, avoid enabling the depth data measurement function of the device immediately after the installation. It is recommended to start the measurement at least one hour after the electric current is taken on the device to ensure the uniform heat diffusion of the internal device.
- 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.
- Please keep the image acquisition window clean. It is recommended to wipe it with a clean cloth that is moistened with alcohol (75% or less). When the product is not in use, dust protection is required. Damage caused by improper maintenance will not be liable for warranty.
- 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.
- 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.
- Please read the manual and safety instructions carefully before installing the device.
- Please install the device strictly according to the installation method in this manual.
- Do not contact the device with strong acids, alkalis, oils, greases or organic solutions such as thinners.
- To prevent injury, the device must be securely fastened to the installation structure.
- Do not expose the device directly to flashlights, high-frequency switch lighting devices, or to sunlight, which may affect the performance.

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.

1.4 Laser Precaution

The device complies with IEC 60825-1:2014 and EN 60825-1:2014+A11:2021.

Caution

- Do not look directly at the laser beam, and if necessary, adjust the direction of direct eye gaze or close your eyes for protection.
- Do not use optical instruments (such as telescopes, magnifier) to observe the laser beam.
- Do not place optical instruments (such as mirrors) within the irradiation range of the laser beam.
- Avoid shining the laser on highly reflective materials. If it is unavoidable, the angle of the reflective material should be adjusted to prevent damage caused by laser reflection.
- Turn off the laser when the device is not in use.
- Please use this device correctly and safely in accordance with the contents of this manual and the local standards and laws and regulations. Otherwise the operator may be exposed to the risk of injury, electric shock, or radiation from the laser.

The laser-related parameters are shown below.

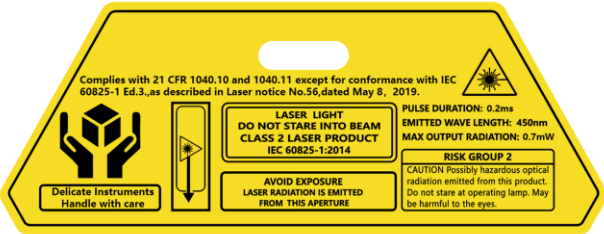
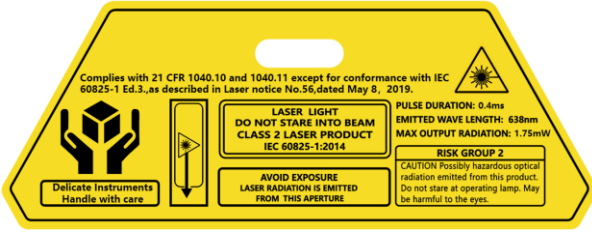
Table 1-1 Laser Parameters

Device Model	Laser Type	Laser Safety Class	Wavelength	Beam Divergence Angle
MV-RS-Base-S MV-RS-Ultra-S	Single-line, blue	Class 2	450 ± 5 nm	Vertical: 0.96 rad
MV-RS-Base-L MV-RS-Ultra-L	Single-line, red	Class 2	638 ± 5 nm	Vertical: 0.91 rad
MV-RS-Pro-XL MV-RS-Ultra-XL	Single-line, red	Class 2	638 ± 5 nm	Vertical: 0.91 rad
MV-RS-Base-S-T	Single-line, blue	Class 2	450 ± 5 nm	Vertical: 0.73 rad
MV-RS-Base-M	Single-line, blue	Class 2	450 ± 5 nm	Vertical: 0.75 rad
MV-RS-Ultra-M	Single-line, red	Class 2	638 ± 5 nm	Vertical: 0.91 rad

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The laser labels are shown below.

Table 1-2 Laser Labels

Device Model	Laser Label
MV-RS-Base-S MV-RS-Ultra-S	
MV-RS-Pro-XL MV-RS-Ultra-XL MV-RS-Ultra-L MV-RS-Base-L	

Chapter 2 Overview

2.1 Introduction

The binocular structured light stereo camera adopts binocular structured light imaging technology to obtain the RGB-D image with sub-millimeter measurement accuracy. The device has a customized optical system and a built-in algorithm of high-precision 3D image processing, applicable to scenarios of workpiece loading and unloading, bin picking, or alignment assembly.

2.2 Key Features

- Customized optical system provides high-quality image and a more detailed point cloud.
- Supports multi-core parallel processing with high precision and high image acquisition rate.
- Supports alignment between depth images and RGB images and has a built-in supplementary light, convenient for secondary development.
- Adopts light-weight design and small size with high stability for flexible installation and use.

Note

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

2.3 Terminology

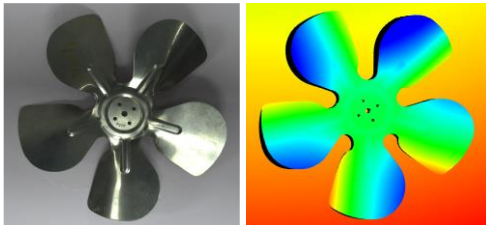
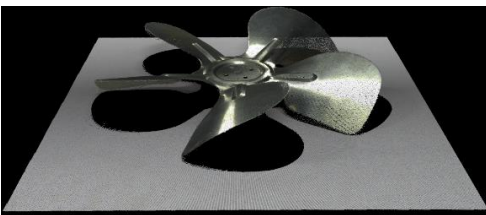
The terminologies in this user manual are shown in the table below.

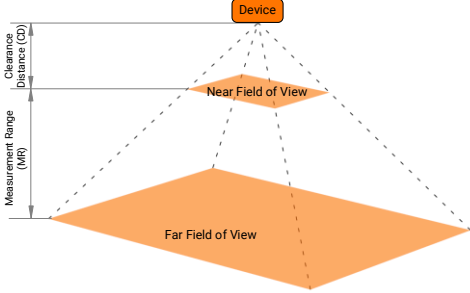
Note

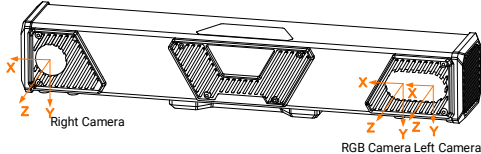
- The images below are for reference only.
 - The location of the mono image sensor or color image sensor may differ by device models.
-

Table 2-1 Terminologies

Terminology	Definition	Image
Galvanometer	It is a high-speed rotating mirror driven by motors, capable of rapid movement along the X-axis and Y-axis. By precisely controlling	--

	the motor's rotation angle, it accurately guides the laser line across the target surface, achieving full coverage of the entire working area.  Note The galvanometer on our company's galvanometer laser 3D camera is designed to move in the X-axis direction.	
Micromirror Array	The micromirror array is a semiconductor chip composed of millions of aluminum micromirrors, each representing a single pixel. The tilt angle of each micromirror can be independently controlled by electrical signals to rapidly adjust the direction of incident light.	--
Depth Image	The depth map is a grayscale image with distance information, which samples the surface of a target object along the X-axis and Y-axis and shows object information in gray or color in Z-axis. Taking the workpiece in the right figure as an example, the left side is a color image, and the right side displays a pseudocolor-rendered depth image. Different colors in the image represent the distance of each point from the camera.	
Point Cloud	The point cloud is a 3D image represented as a set of discrete points in 3D space. Each point contains its spatial coordinates (X/Y/Z). Taking the workpiece in the right figure as an example, the point cloud can reconstruct a 3D model of the object.	

IR Image	The IR image (infrared image) is generated by capturing the infrared radiation emitted from a target object via an IR camera. It obtains depth information in 3D reconstruction and enhances the robustness of image processing.	--
RGBD Alignment	Align pixel spatial positions of depth image and color image to generate an RGB-D image with the same resolution as the color image. After alignment, the depth value corresponding to each color pixel can be used for 3D coordinate calculation, achieving correspondence between color data and 3D information.	RGB Image (Original)  Depth Image (Point Cloud Rendering Effect Based on Height)    RGB-D Image (Point Cloud Rendering Effect Based on RGB)
Measurement Range (MR)	It refers to the valid range for device measurement.  Note If the object is out of the measurement range, no valid data will be obtained.	
Clearance Distance (CD)	It refers to the shortest distance between the device and the object in the measurement range.  Note If the distance between the device and the object is less than the clearance distance, no valid data will be obtained.	
Near Field of View	It refer to the viewable area close to the device.	
Far Field of View	It refer to the viewable area far from the device.	

X-Axis/Y-Axis/Z-Axis	They are coordinate axis on the three-dimensional coordinates. The origin of the coordinate system is the center of the lens.	
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2.4 Operating Principle

The binocular structured light stereo camera consists of structured light module, two 2D mono cameras, and one 2D color camera. The workflow is shown in the figure below.

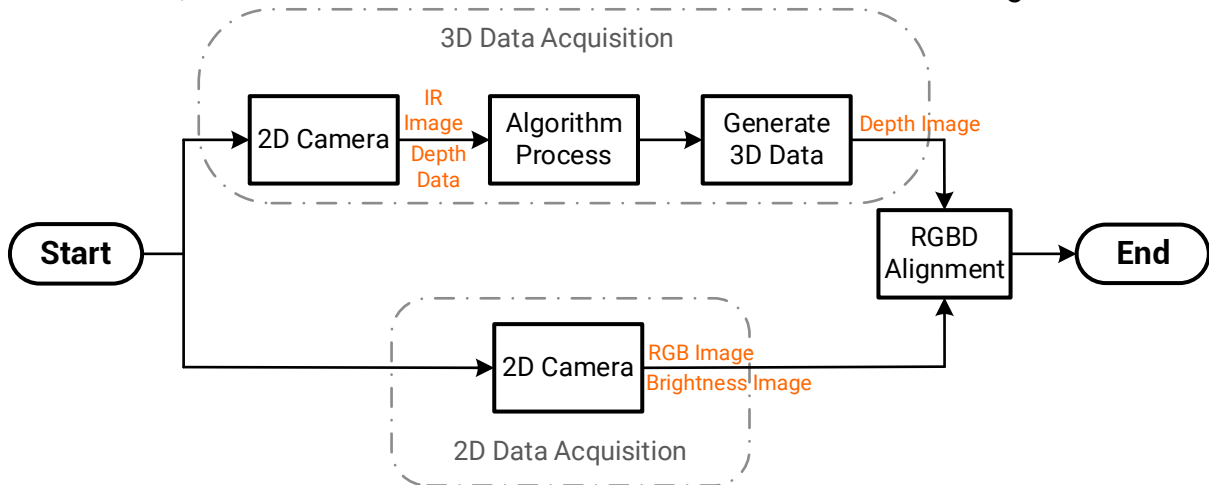


Figure 2-1 Workflow

Note

The binocular structured light stereo cameras here refer to two types: galvanometer laser 3D cameras and projected structured light 3D cameras. For galvanometer laser 3D camera, its structured light module includes laser and galvanometer, and for projected structured light 3D camera, the structured light module includes LED and micromirror array.

3D Data Acquisition

1. The structured light module projects stripe structured light on the surface of the object. Due to the height and shape of the object, the stripe patterns become distorted.
2. The two 2D mono cameras capture the distorted stripe patterns, calculate the depth data of the object surface through internal processing, and output an IR image.
3. The depth data is processed by internal algorithm to generate a depth image and point cloud.

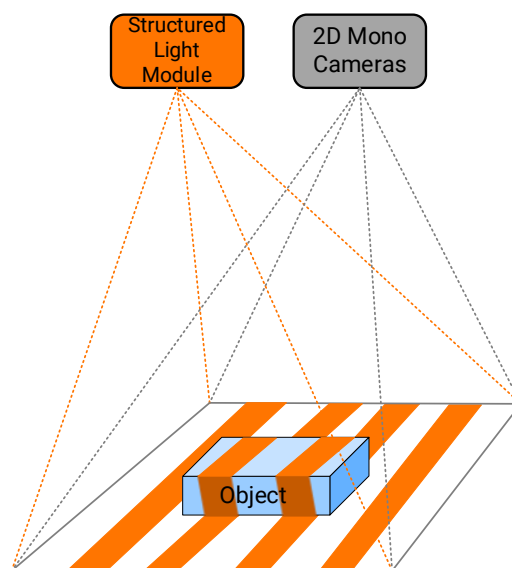


Figure 2-2 3D Data Acquisition

2D Data Acquisition

The 2D color camera and 2D mono camera capture a 2D image of the object when the galvanometer module does not project structured light, output an RGB image and intensity image, and acquire the surface color and texture information of the object.

RGBD Alignment

The pixel alignment output of RGB image and depth image can be achieved via the client software, which fuses 3D structural information with visual features such as object surface colors and textures, showing a rich and complete scene.

Chapter 3 Device Hardware

3.1 Appearance

Refer to the figures below for device appearance and the table below for component description.

Note

- For specific appearance and dimension, please refer to the device's datasheet for details.
- The appearance is subject to change, and the actual device you purchased shall prevail.

Table 3-1 Device Model and Appearance Type

Device Appearance Type	Device Model
Type I Device	MV-RS-Base-L MV-RS-Pro-XL
Type II Device	MV-RS-Base-S MV-RS-Base-S-T MV-RS-Base-M
Type III Device	MV-RS-Ultra-S MV-RS-Ultra-M
Type IV Device	MV-RS-Ultra-L MV-RS-Ultra-XL
Type V Device	MV-RC-Base-XS

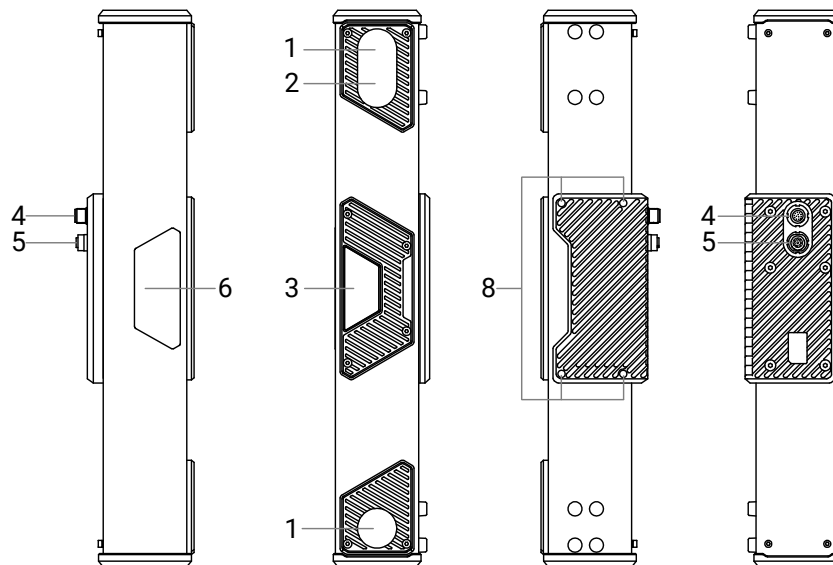


Figure 3-1 Appearance (Type I Device)

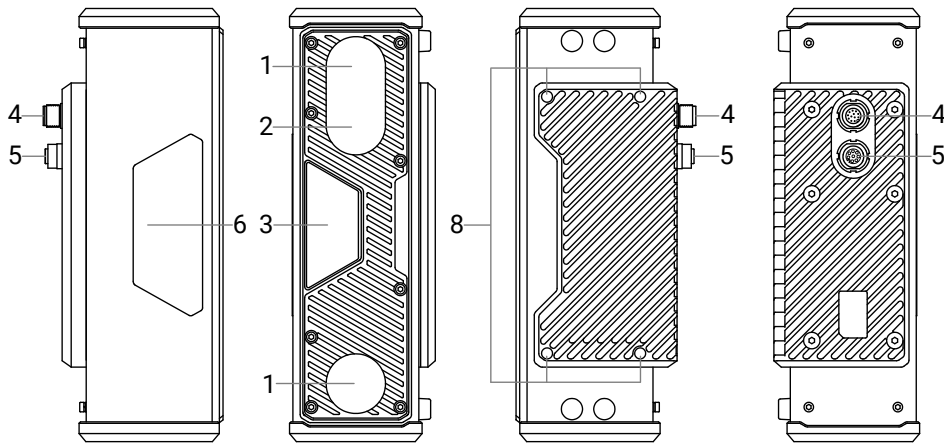


Figure 3-2 Appearance (Type II Device)

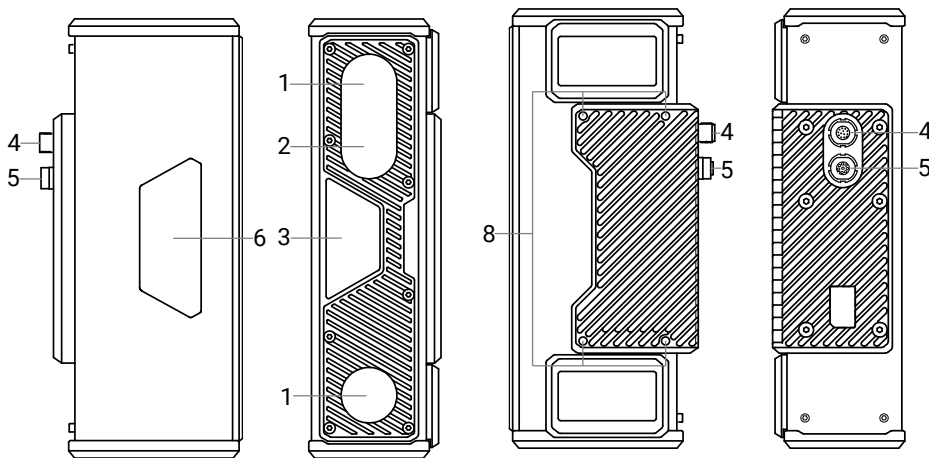


Figure 3-3 Appearance (Type III Device)

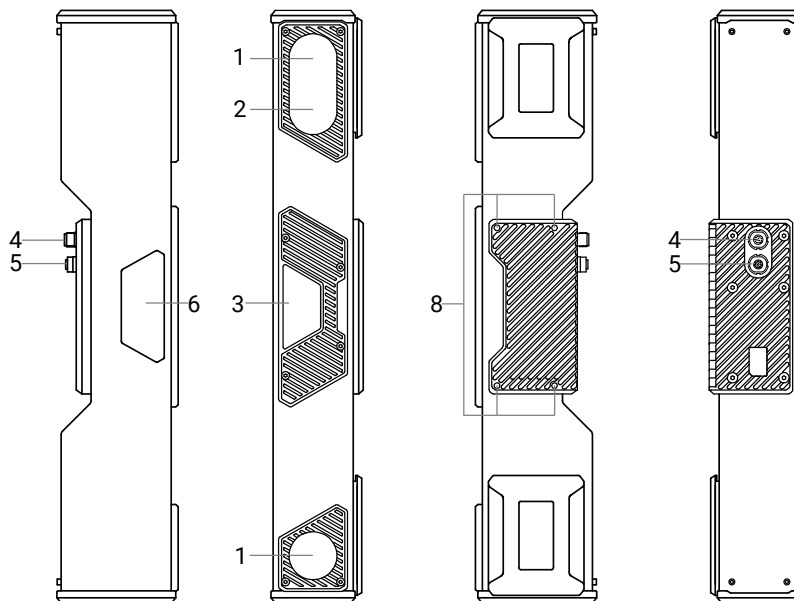


Figure 3-4 Appearance (Type IV Device)

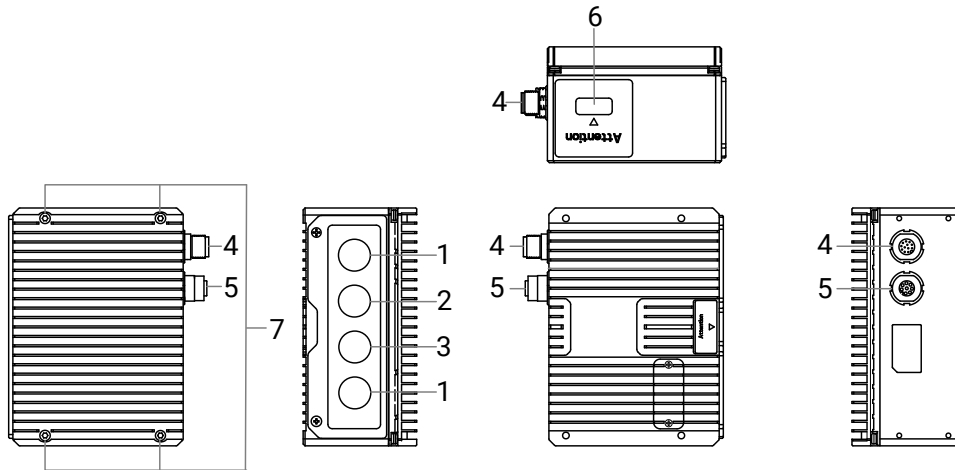


Figure 3-5 Appearance (Type V Device)

Table 3-2 Component Description

No.	Name	Description
1	Mono Image Sensor	It gets images of the measured object for calculating depth information.
2	Color Image Sensor	It gets RGB images of the measured object.
3	Structured Light Module	- For galvanometer laser 3D camera, the laser emits a laser line to the galvanometer mirror, and the galvanometer deflects to make the laser line scan the surface of the measured object. - For projected structured light 3D camera, it reflects LED light via rapid flipping of micromirror array, and projects encoded patterns onto the object surface for scanning.
4	Power and I/O Connector	It refers to the 12-pin M12 connector and provides power and I/O. The connector is designed with threads. Before connection, you should tighten it. Refer to section Power and I/O Connector for details.
5	Gigabit Ethernet Interface	It is a gigabit Ethernet interface for transmitting data. The interface is designed with threads to tighten connection between the device and network cable.
6	LED Indicator	It displays the device's operation status. Refer to section Indicator for details.
7	Installation Hole	Some devices have two $\phi 5$ installation holes on the bottom of the device for auxiliary installation.

8	Threaded Hole	There are screw holes on the bottom/side of the device, used to fix the device to the bracket, and then mount to other structures.
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3.2 Power and I/O Connector

The device has a 12-pin M12 connector that provides power and I/O. Refer to the figure and table below to get pin definitions.

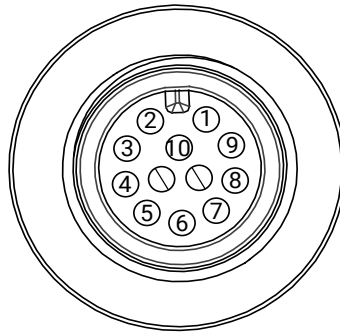


Figure 3-6 12-Pin M12 Connector

Table 3-3 Pin Definitions

Pin No.	Signal	I/O Signal Source	Description
1	POWER_IN	--	Power supply
2	GND	--	Power supply ground
3	I_OUT1	Line 1+	I/O isolated output 1
4	I_OUT4	Line 4+	I/O isolated output 4
5	I_OUT7	Line 7+	I/O isolated output 7
6	OUT_COM	Line 1/4/7-	Output signal ground
7	I_IN0	Line 0+	I/O isolated input 0
8	I_IN3	Line 3+	I/O isolated input 3
9	I_IN6	Line 6+	I/O isolated input 6
10	IN_COM	Line 0/3/6-	Input signal ground

Note

- Refer to the table above and the label attached to the supplied power and I/O cable to wire the device.
- Besides the 10 pins mentioned above, the remaining 2 pins are generally recommended to be grounded.

3.3 Indicator

The device's indicator is used to indicate the operation status of the device.



Note

- The indicator status may differ by device models, and the actual device you purchased shall prevail.
 - When the indicator is lit up, flashing rapidly, flashing slowly, or flashing very slowly, its unlit interval is 5 sec, 0.2 sec, 1 sec, and 2 sec respectively.
-

Table 3-4 Indicator Description

No.	Indicator Color	Status	Device Status
1	Blue	Rapid Flashing	The device is streaming in an internal triggering mode.
2	Blue	Slow Flashing	The device is streaming in an external triggering mode.
3	Blue	Solid	• The device operates normally. • The device's firmware is updated.
4	Red and Blue	Slow Flashing Alternately	The device's firmware is updating.
5	Red and Blue	Rapid Flashing Alternately	The device executes the command of Find Me.
6	Red	Very Slow Flashing	• The device's IP conflicts. • The device's network is not connected.
7	Red	Solid	• Loading uboot failed. • Updating firmware fails. • A fatal exception occurs. • Other errors occur.
8	Orange	Solid	Undervoltage fault is detected.

Chapter 4 Device Installation

4.1 Installation Preparation

You need to prepare following accessories before installation.

Table 4-1 Accessories

No.	Name	Quantity	Description
1	Power and I/O cable	1	It refers to the cable with 12-pin M12 connector and open end. You need to purchase separately.
2	Network Cable	1	It refers to the M12 to RJ45 network cable. You need to purchase separately.
3	Power Supply	1	It refers to the DC switch power supply. Refer to the values of power supply and power consumption in the datasheet. You need to purchase separately.
4	Bracket	1	It refers to the supplied bracket for fixing the device. Refer to section Install Device for installation details.
5	Screws	Several	They are the supplied M6T bolts for fixing the bracket.

Caution

- Before any installation or maintenance work, please disconnect the power supply from the utility, and ensure that it will not be reconnected inadvertently.
- Do not install the power supply in places with high moisture or near the water.
- Do not install the power supply in places with high ambient temperature or near fire source.
- Please install the exposed high-voltage terminals on the power supply in a closed chassis or cabinet to prevent accidental contact.
- Keep enough insulation distance between mounting screws and internal components of power supply.
- Fans and ventilation holes must be kept free from any obstructions. Also a 10 cm to 15 cm clearance should be kept when the adjacent device is a heat source. Make sure ambient temperature around the device should be within the range of the temperature described in the datasheet.
- The power supply must be grounded as required.
- Output current and output power must not exceed the rated values on specifications.
- Non-standard mounting or operating under high ambient temperature may increase the

internal component temperature and will decrease the output power.

- All failure should be examined by a qualified technician. Do not remove the case of the power supply by yourself.
 - Do not touch the power terminal for 5 minutes after the power is turned off, that may cause electric shock.
 - It is recommended to power the camera independently, which means that each electrical device should be equipped with a dedicated switching power supply and not share a power source with other electrical devices.
 - Select power modules with EMC certification (CCC or CE), and deploy them close to the camera. Make sure that the cable length from the power output to the camera is less than 3 meters.
 - A power filter should be installed at the input terminal of the power module.
-

4.2 Install 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.
- Prepare the tools, such as wrench and screwdriver, for the device installation.
- Make sure that the device is fixed with the bracket.

Steps

1. (Optional) Fix the device to the bracket.

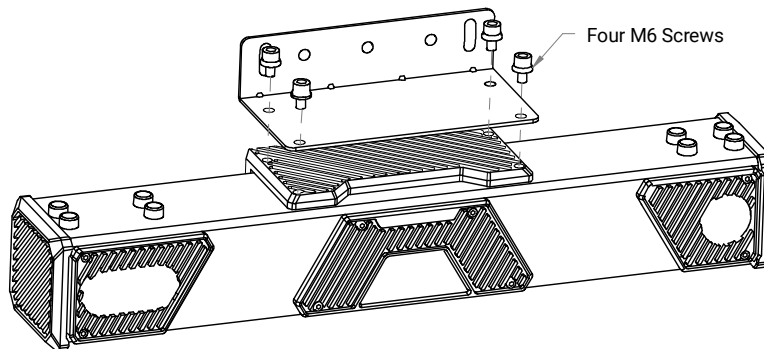


Figure 4-1 Bracket Fixing

2. Fix the bracket to the installation structure.

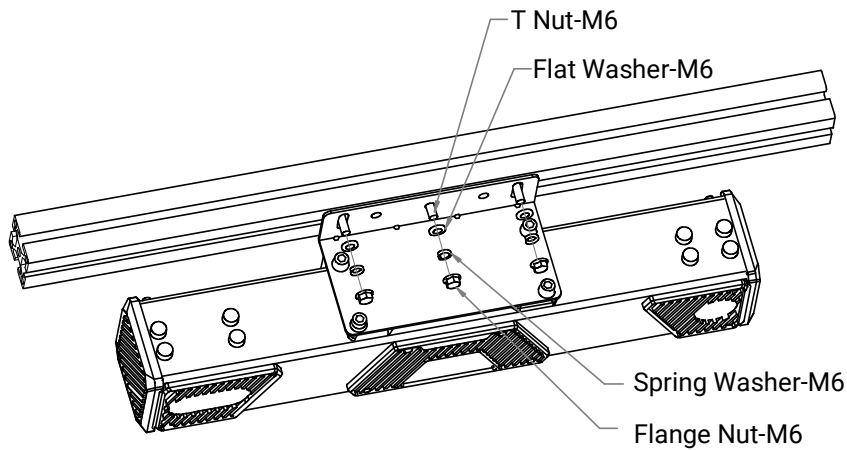


Figure 4-2 Fix to Installation Structure

Note

You can fix the bracket to the top or bottom of the installation structure. If the size of the installation structure is too large, it is recommended to fix the bracket to the bottom of the installation structure.

3. Use the network cable to connect the device to a switch or NIC.
4. Use the power and I/O cable to connect the device to a suitable switch power supply.
Refer to section [Power and I/O Connector](#) for details.



Figure 4-3 Power and I/O Connector

Chapter 5 Device Connection

5.1 Install Client Software

HiViewer (hereinafter referred to as the "client software") is a software application developed specifically for the device. The client software supports live view, parameter configuration, data saving, firmware upgrade and other functions, and you can choose among various rendering modes for viewing live images, such as RGB image, IR image, depth image, and point cloud image.

Steps



Note

- The client software is compatible with 32/64-bit Windows 7/10, and 64-bit Windows 11.
 - You can download the client software from en.hikrobotics.com.
 - 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 on the upper-left corner.

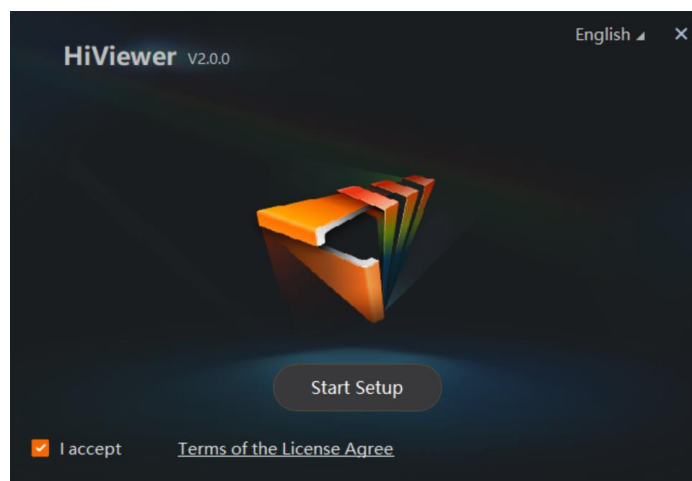


Figure 5-1 Installation Window

3. Check **I accept** and click **Start Setup**.
4. Select installation directory and driver, and click **Next**.

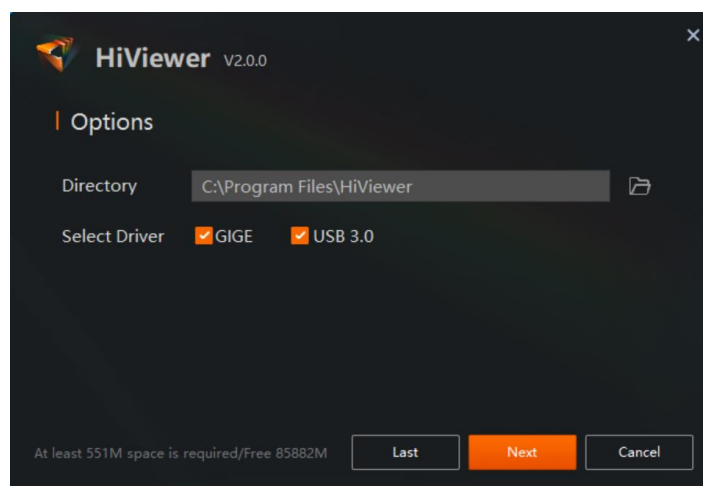


Figure 5-2 Select Directory and Driver

5. Finish the installation according to the interface prompts.

5.2 Set PC Environment

To ensure stable client running and data transmission, you are recommended to set PC environment.

5.2.1 Turn off Firewall

Steps

Note

For different Windows versions, the path name or interface may differ. Please refer to the actual condition.

1. Go to Windows Firewall.
 - Windows 7 system: Click **Start** → **Control Panel** → **Windows Firewall**.
 - Windows 10 system: Click **Start** → **Control Panel** → **System and Security** → **Windows Defender Firewall**.
 - Windows 11 system: Click **Start** → **Settings** → **Privacy & security** → **Windows Security** → **Firewall & network protection**.
2. For Windows 7 and 10 system, click **Turn Windows Defender Firewall on or off** on the left. For Windows 11, select the network and turn off in **Microsoft Defender Firewall**.
3. Select **Turn off Windows Defender Firewall (not recommended)**.

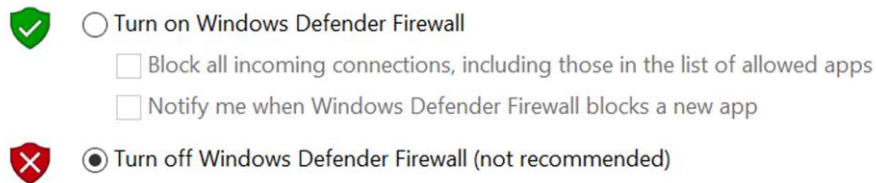


Figure 5-3 Windows Defender Firewall

4. Click **OK**.

5.2.2 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 path name or 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.
 - Select **Use the following IP address** to set an IP address for the PC manually.

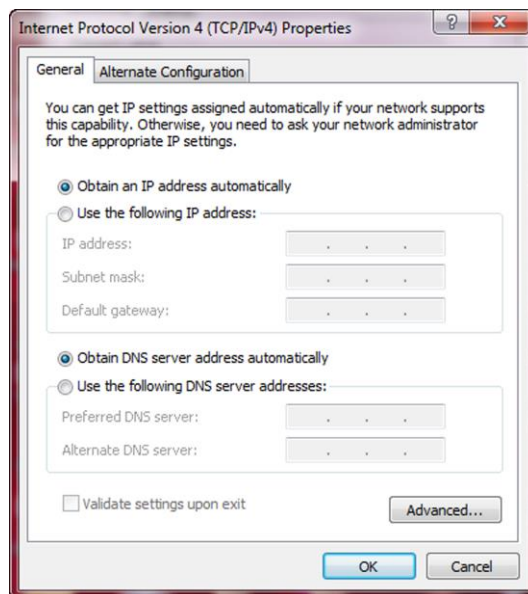


Figure 5-4 Set PC Network

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 **Receive Buffers** to its max. value.

5.3 Connect Device to Client Software

Follow the steps below to connect your device to HiViewer client software.

Steps

1. Double-click HiViewer client software.
2. On the main window, click  on the right side of the **Device List** to search for available devices.

Note

For the first-time connection, it might take a few minutes for the device to appear in the list. Please wait and refresh multiple times if needed.

3. Check the status of the device.

The device might appear in one of the following status:

Table 5-1 Device Status

Status	Status	Action
	Ready	Double-click the device or click  to proceed.
	In Use	The device is accessed by another software. Stop other software or process that is accessing the device.
	Unreachable	This status is for GigE Vision device, meaning the device is not on the same network segment as your IPC. You need to modify its IP address by following Step 4.

4. (Optional) Modify the camera IP address.
 - 1) In **Device Information**, click  on the side of **IP Address**.
 - 2) Select IP address configuration.

Static IP

Set the IP address, subnet mask, and default gateway.

DHCP

The camera automatically obtains an IP addresses from a DHCP server.

Note

The IP might change after reboot.

LLA

The camera assigns itself an IP in the 169.254.0.0/16 range when no DHCP server is available.

3) Click **OK**.

Note

If the modified IP address conflicts with another device's IP address in the same local subnet, a prompt will pop up to remind you that IP conflict occurs. Change the IP address in this situation.

5. Once the camera status is , click the  button or double click on a camera that displayed in  status to connect.

5.4 Update Firmware

The device supports updating the firmware via the client software.

Note

- Use the firmware package of the corresponding device model for updating.
 - Do not disconnect the device with PC during updating.
 - The device will restart automatically after updating.
-

Steps

1. Run the client software, and select the device that needs to be updated.

Note

Make sure that the device that needs to be updated is in available status.

2. Click  on the right of the **Version**.
3. Click  to select the firmware file (in DAV format), and click **Upgrade** to update the firmware.

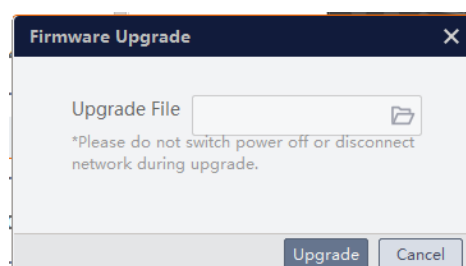


Figure 5-5 Update Firmware

5.5 Device Debugging

After connecting the camera, you will enter HiViewer's main interface, as shown in the figure below.

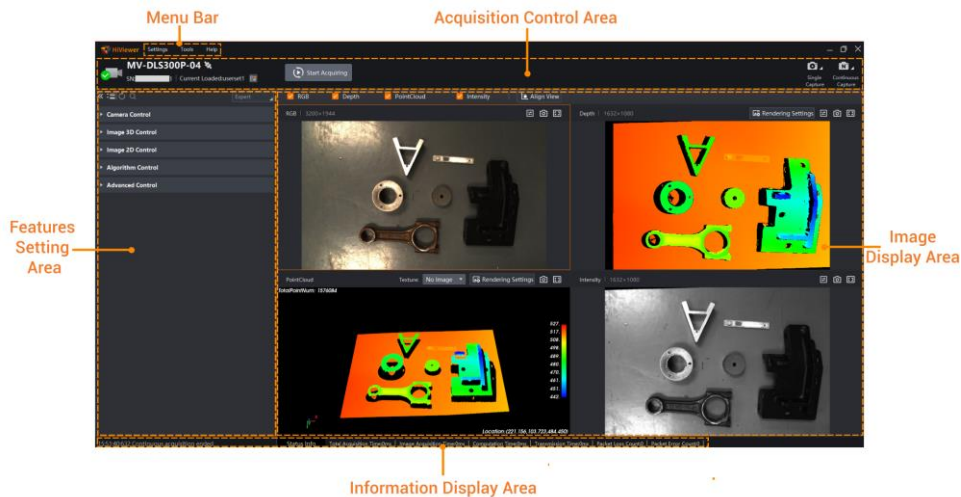


Figure 5-6 Main Window

Note

For specific main window of the client software, refer to the actual one you got.

The following table shows the description of each area of the main window.

Table 5-2 Main Window Introduction

No.	Area Name	Description
1	Menu Bar	Includes three modules: Settings , Tools , and Help .
2	Acquisition Control Area	Disconnect the camera, manage user sets, capture and save images.
3	Features Setting Area	Configure camera parameters and switch the user level. Note The functions introduced in this manual is under Expert mode.
4	Image Display Area	Display image data captured by the camera and allow for related configuration.
5	Information Display Area	Allow switching between Status Info and Monitor Info .

The overall workflow of debugging device is shown below.

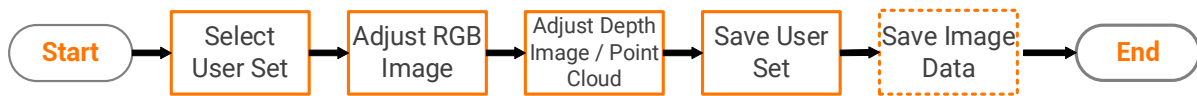


Figure 5-7 Overall Workflow

Note

Refer to the user manual of the client software for detailed operations.



Figure 5-8 Client Software User Manual

5.5.1 Select User Set

Before device debugging, you should select a user set first.

Steps

1. In Acquisition Control Area, click  to access User Set Management window.
2. (Optional) Click  to add a new user set.
3. Select a user set and click **Load**.
4. Go back to the main window of the client software.

5.5.2 Adjust RGB Image

You can adjust RGB image to get a clear image with appropriate exposure.

Steps

1. Click  to start acquisition.
 2. Go to **Camera Control** → **Image Type Enable**, and enable **2D Rgb**. You can view RGB image in real time.
 3. Go to **Image 2D Control** → **RGB Control** and set the parameters such as color exposure mode, color gain, and color Gamma to improve the quality of RGB image.
- Make sure color images have appropriate brightness for clear visibility of surface features.



Figure 5-9 Set RGB Image

- When the image is too dark, you can increase the values of exposure and gain. If the exposure is set to the maximum value allowed by the current frame rate, and the image requires more brightness, it is recommended to increase the gain first. As the exposure increases, the actual acquisition frame rate of the device decreases, which affects the efficiency of image acquisition.
 - When the image is too bright, you can reduce the gain first, and then decrease the exposure if necessary.
4. (Optional) When the same scene in a color image changes in light and dark at different times, you can select **DynamicMode** as **Color Exposure Mode**, and the device will automatically adjust the exposure according to the configured brightness.

Note

- The **Color Exposure Mode** can be set only when the acquisition is stopped.
 - If you need to adjust intensity image, refer to the methods of adjusting RGB image.
-

5.5.3 Adjust Depth Image / Point Cloud

You can adjust depth image and point cloud to get a clear and complete data.

Before You Start

Make sure the acquisition is stopped.

Steps

1. Go to **Camera Control**, and set **Working Mode** as **Depth**.
2. Enable **3D Depth** in **Image Type Enable**. You can view depth image and point cloud in real time.
3. If the data of depth image and point cloud is incomplete, you can go to **Image 3D Control** to set related parameters in **Capture 3D Control** and **Calculate 3D Control**.

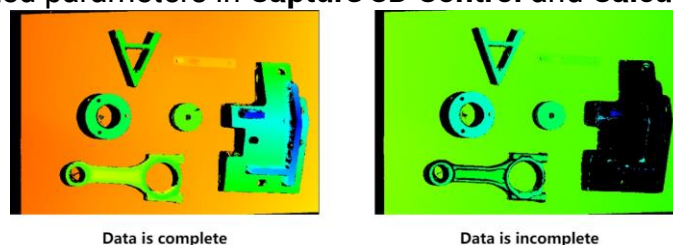


Figure 5-10 Set Depth Image / Point Cloud

5.5.4 Save User Set

After debugging the device parameters and images, you need to save the changes to prevent the device from restoring the default parameters after a power failure and restart.

Steps

1. Click  to access User Set Management window.
2. Select a user set for saving the parameters.
3. Click **Save**.

Note

When you reconnect this device next time, the user set will be loaded automatically.

5.5.5 Save Image Data

Click  or  in the upper-right corner respectively to save a single image or enable continuous image saving.

You can use  to set the saving path, naming rules, and file types for the images.

Chapter 6 I/O Electrical Features and Wiring

The device has three opto-isolated input signals (Line 0/3/6) and three opto-isolated output signals (Line 1/4/7).

6.1 Input Signal

The device's Line 0/3/6 are opto-isolated input signals, and their internal circuit is as follows.

Note

- The input voltage ranges from 5 VDC to 30 VDC.
- The breakdown voltage is 36 VDC. Keep voltage stable.

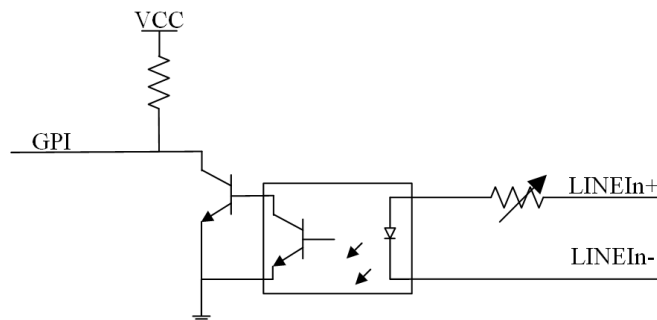


Figure 6-1 Internal Circuit of Input Signal

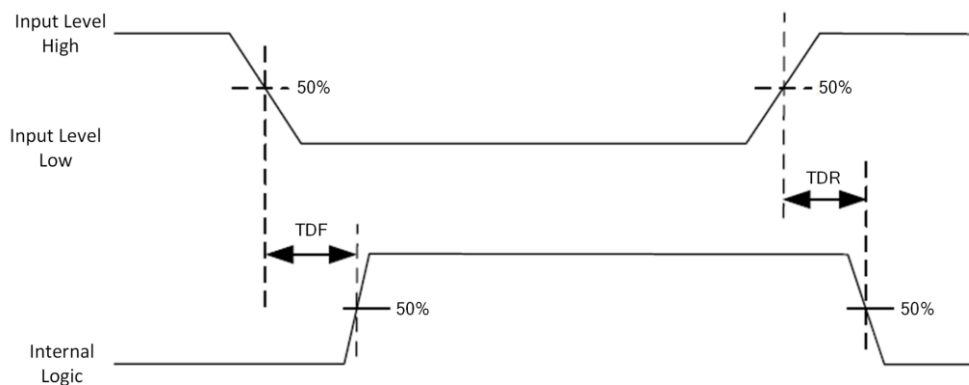


Figure 6-2 Input Logic Level

Table 6-1 Input Electrical Feature

Parameter Name	Parameter Symbol	Value
Input Logic Level Low	VL	1.5 VDC

Parameter Name	Parameter Symbol	Value
Input Logic Level High	VH	2 VDC
Input Falling Delay	TDF	81.6 μ s
Input Rising Delay	TDR	7 μ s

6.2 Output Signal

The device's Line 1/4/7 are opto-isolated output signals, and their internal circuit is as follows.

Note

- The output voltage ranges from 5 VDC to 30 VDC.
- The maximum output current is 25 mA.
- Do not directly connect with inductive load (e.g. DC motor, etc.) when outputting.

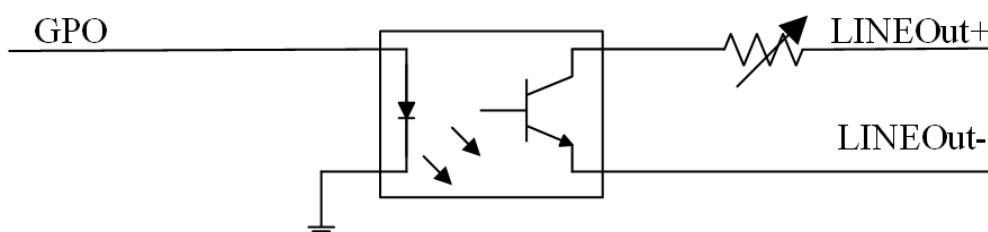


Figure 6-3 Internal Circuit of Output Signal

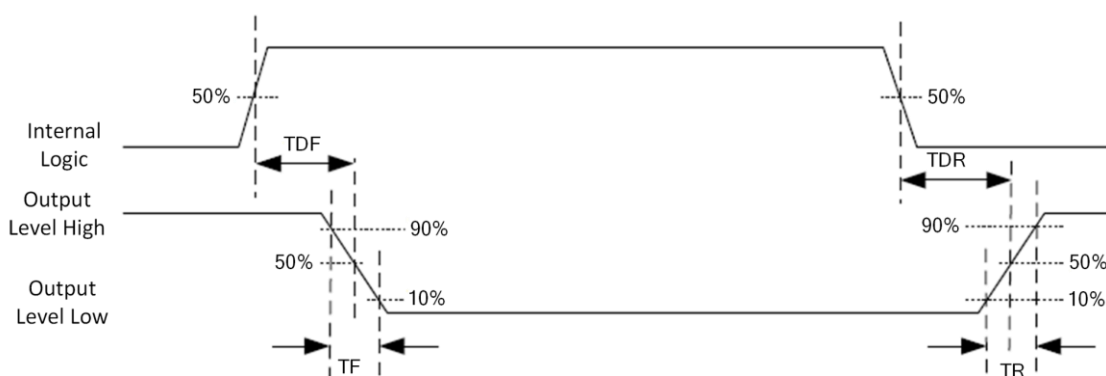


Figure 6-4 Output Logic Level

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	Parameter Symbol	Value
Output Logic Level Low	VL	730 mV
Output Logic Level High	VH	3.2 VDC
Output Falling Delay	TDF	6.3 μ s
Output Rising Delay	TDR	68 μ s
Output Falling Time	TF	3 μ s
Output Rising Time	TR	60 μ s

6.3 Input Signal Wiring

The device can receive external input signal via its I/O interface.

Note

Input signal wiring may differ with different types of external devices.

PNP Device

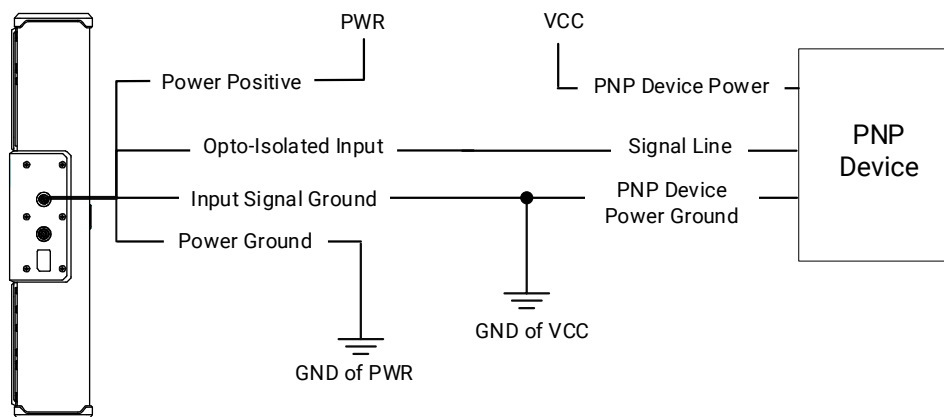


Figure 6-5 Input Signal Connecting to PNP Device

NPN Device

If the VCC of NPN device is 12 VDC or 24 VDC, it is recommended to use a 4.7 K Ω pull-up resistor.

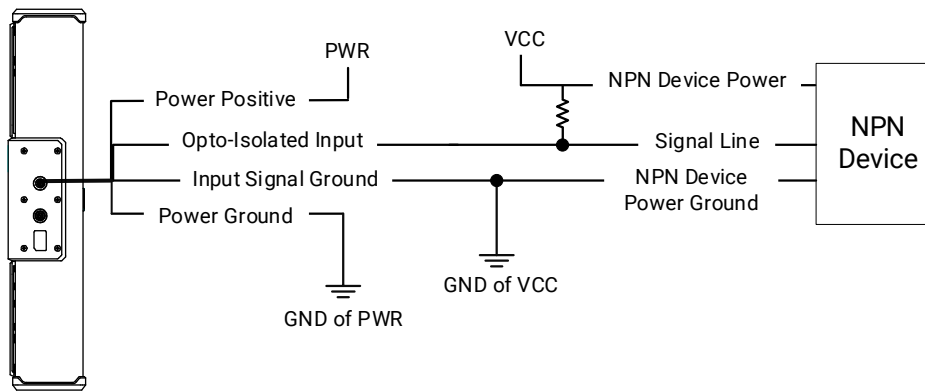


Figure 6-6 Input Signal Connecting to NPN Device

6.4 Output Signal Wiring

The device can output signal to external device via I/O interface.

Note

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

PNP Device

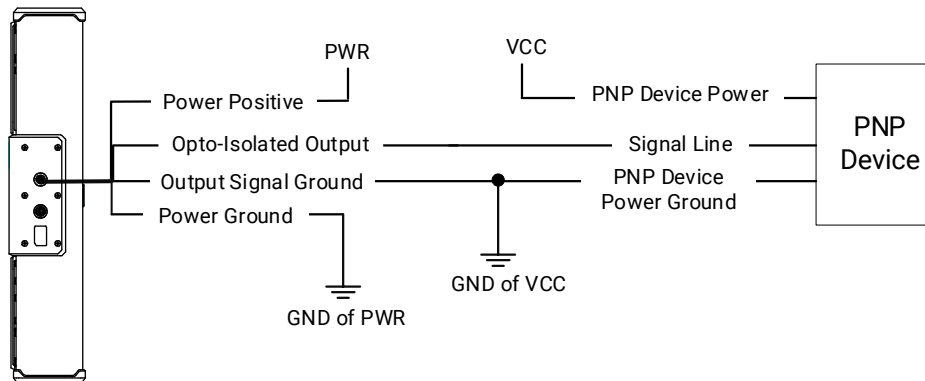


Figure 6-7 Output Signal Connecting to PNP Device

NPN Device

If the VCC of NPN device is 12 VDC or 24 VDC, it is recommended to use a 4.7 K Ω pull-up resistor.

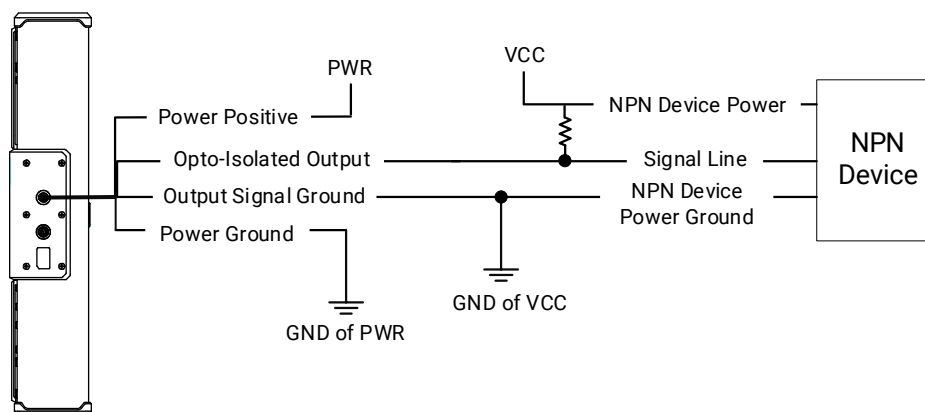


Figure 6-8 Output Signal Connecting to NPN Device

Chapter 7 Device Application

Combined with RobotPilot, the binocular structured light stereo camera can be used for the positioning and recognition of the reflective objects, achieving object picking.



Figure 7-1 Application Scenario

The whole process of object picking is shown below, and you can refer to RobotPilot User Manual for details.

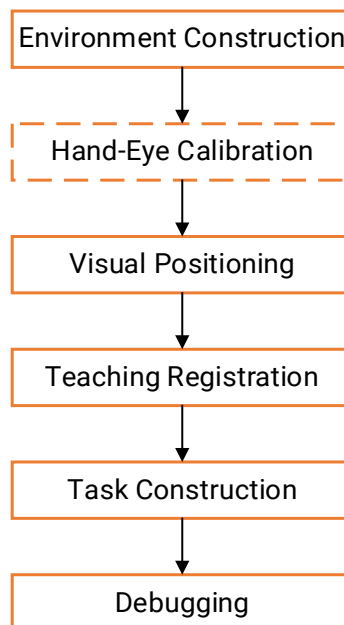
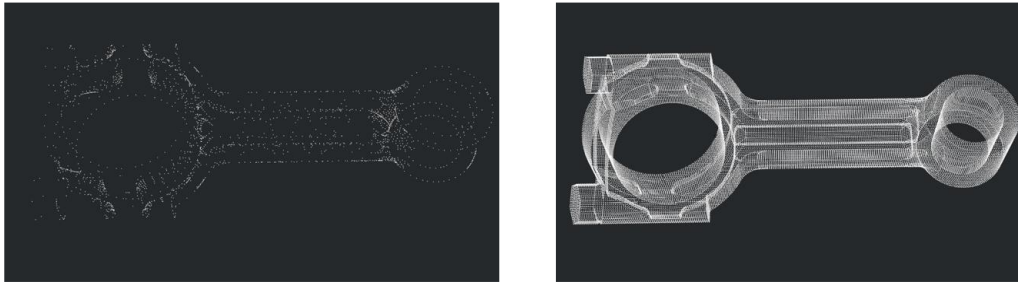


Figure 7-2 Object Picking Process

Chapter 8 Depth Image / Point Cloud Optimization

The quality of depth image or point cloud imaging is influenced by factors such as exposure settings, lighting conditions, object material, and reflectivity of the surrounding environment. If the effect of depth image or point cloud imaging is poor, for example, the point cloud appears sparse or incomplete, you can refer to the following optimization measures.



Sparse and Incomplete

Dense and Complete

Figure 8-1 Point Cloud Effect

8.1 Adjust Exposure/Gain

The quality of depth image or point cloud is highly dependent on the compatibility between exposure settings and the detection scene, especially in scenes involving black objects, reflective interference, or poor lighting. Therefore, make sure that the device is configured with appropriate exposure settings during image acquisition.

Steps

1. Change the working mode to **Depth**, and start image acquisition.
2. Adjust gain. You can configure different gain values, save the corresponding point cloud data, and select an appropriate value.

Note

The exposure settings not only influence the image quality, but also affect the time required for depth image acquisition. In scenarios with time limit, it is recommended to adjust the gain, and then change exposure parameters.

3. If the effect of depth image is still poor, you can adjust exposure manually. Configure different exposure values, save the corresponding point cloud data, and select an appropriate value.
4. If there are many ROIs, and single exposure parameter settings cannot enhance the effect of depth image / point cloud across all ROIs, you can set multiple exposure parameters.

 Note

The multiple exposure settings may increase the image acquisition time.

8.2 Optimize Effect

This section introduces methods for optimizing effect of depth image or point cloud 3D reconstruction based on two scenes (highly-reflective object surface and inner surface reflection in material box).

8.2.1 Scene of Highly-Reflective Object Surface

Issue

When scanning highly-reflective metal objects, the position of the reflector significantly affects the quality of 3D reconstruction due to the high reflectivity. If the reflector is aligned with or deviates too far from the device's FoV, point cloud data on the workpiece surface may be missing.

Method

You can enable **Complete Scene Flag** to solve this issue. This function uses binocular-monocular fusion algorithm based on binocular structured light stereo camera to enhance the quality of 3D reconstruction.

Table 8-1 Complete Scene Flag Workflow

No.	Workflow	Description
1	Binocular Data Acquisition	Acquire reflected light information on the object's surface from two different perspectives.
2	Data Fusion	Fuse data of the two perspectives, and compensate for the limitations of monocular via binocular disparity information.
3	Point Cloud Completion	Generate a complete point cloud from fused data, reducing reconstruction missing.

Before You Start

Make sure that the device firmware meets the requirements in the table below.

Table 8-2 Firmware Requirements

Device Model	Minimum Firmware Version
MV-RS-Base-S	Build20250304

Device Model	Minimum Firmware Version
MV-RS-Base-L MV-RS-Pro-XL	
MV-RS-Ultra-S MV-RS-Ultra-L MV-RS-Ultra-XL	Build20250226
MV-RC-Base-XS	All supported

The **Complete Scene Flag** function also has some limitations.

Table 8-3 Limitations of Complete Scene Flag

Limitation	Description
Accuracy Reducing	The compensated point cloud areas are reconstructed independently by a single camera, resulting in lower accuracy compared to normally-reconstructable areas.
Noise Point Adding	This function may add some noise points, affecting quality of point cloud.

Therefore, it is recommended to use noise point optimization and point cloud filtering functions in the client software or SDK when you enable **Complete Scene Flag** function. These functions can remove noise points during the compensation and improve the quality of point cloud.

8.2.2 Scene of Inner Surface Reflection in Material Box

Issue

When scanning workpieces that are placed in material boxes with highly-reflective inner surfaces (e.g., mirror surface or polished metal surface), reflections from the inner surfaces may cause partial missing of 3D point cloud data, especially the area near the edge of the box. The following issues may occur.

- Point cloud discontinuity: Discontinuous areas (breakpoint or edge breakage) appear on the workpiece surface.
- Ring-shaped spot artifact: Ring-shaped or spot areas (typically near the side of the material box) appear on the workpiece surface.
- Positioning accuracy reduction: The position of point cloud in contact areas between the workpiece and material box deviates from the actual geometric structure.
- Point cloud completeness loss: Point cloud data in partial areas on the workpiece surface are missing, particularly in highly-reflective areas.

Method

You can set **AntiReflection** as the code pattern inner mode to solve this issue.

Before You Start

Make sure that the device firmware meets the requirements in the table below.

Table 8-4 Firmware Requirements

Device Model	Minimum Firmware Version
MV-RS-Base-S MV-RS-Base-L MV-RS-Pro-XL	Build20250304
MV-RS-Ultra-S MV-RS-Ultra-L MV-RS-Ultra-XL	Build20250226
MV-RC-Base-XS	All supported

After the **AntiReflection** is set, the additional scans result in increased processing time. The specific increase depends on the complexity of the scene. If the detection scenario has strict time requirements, please carefully evaluate the impact of the increased time consumption.

Chapter 9 FAQ (Frequently Asked Question)

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

Table 9-1 Question 1

Possible Cause	Solution
The device is powered off.	Check the device power connection to make sure that the device is powered up normally.
Network exception occurs.	Check the network connection to make sure that the device can be connected to the network normally. PC and the device are in the same network segment.
Undervoltage fault is detected, and the orange light is ON.	Check if the power supply meets the requirements in datasheet.

9.2 Why the image is very dark?

Table 9-2 Question 2

Possible Cause	Solution
The values of exposure and gain are too small.	Increase the values of exposure and gain properly.
No trigger signal exists when the trigger mode is enabled.	Disable trigger mode or input trigger signal when trigger mode is enabled.

9.3 Why the image quality is very poor during the live view?

Table 9-3 Question 3

Possible Cause	Solution
The network may not be 1 Gbps.	Check if the network transmission speed is 1 Gbps or not.
Packet loss occurs.	Go to Settings → Resend Packet in the menu bar of the client software, enable Resend Packet , and increase Max .

Possible Cause	Solution
	Packet Resending Percent and Timeout Period properly.

9.4 Why is the image capture process taking too long?

Table 9-4 Question 4

Issue Description	Solution
The Acquisition Frame Rate Control Enable is enabled, and the frame rate is too low.	Disable Acquisition Frame Rate Control Enable , or increase the frame rate.
The exposure mode is MultipleMode .	Set SingleMode as the exposure mode.
The exposure time is too large.	Appropriately reduce the exposure time and increase the gain to maintain the image brightness.
The code pattern inner mode is AntiReflection or HighPrecision .	Under Developer management mode, go to All Features → Scan Control → Sensor Control , and set Fast as the code pattern inner mode.

Chapter 10 Revision History

Table 10-1 Revision History

Version	Revision Date	Revision Details
V3.0.0	Jun. 17,2026	• Edit Section Laser Precaution. • Edit Chapter Device Connection, and update to client software V2.0.
V2.0.0	Sep. 15, 2025	• Edit Section Introduction. • Add Section Terminology. • Add Section Operating Principle. • Edit Section Appearance. • Edit Section Install Device. • Edit Section Switch Rendering Mode. • Add Section Set RGB JPEG. • Edit Section Set Laser. • Add Section Set SDK Align. • Edit Section Set SSL Parameters. • Edit Section Set Normal Filter. • Add Section Set Extension. • Edit Section Set Range Filter. • Add Section Depth Image / Point Cloud Optimization. • Edit Section FAQ.
V1.0.0	Mar. 3, 2025	Original version.



HIKROBOT

SHAPE OUR FUTURE INTELLIGENTLY

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