SM2 Series SE
Smart Camera User Manual

V2.4.10. 2024

Preface

Preface

Purpose

This Manual is a basic description of SM2 series Smart Cameras, which mainly includes the product description, quick installation guide and Simple introduction of SDK(SM-Datum). This manual may be updated due to product upgrades or other reasons. If you need, please contact the sales engineer for the latest version of this manual.

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Disclaimer

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

Latest Manual Version

For the latest version of this manual, see the Download Center on our web site at: http://www.visiondatum.com/en/service/005001007.html

Technical Support

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

Warranty

To ensure that your warranty remains in force, adhere to the following guidelines:

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.

CHAPTER 1   PRODUCT DESCRIPTION

Product Introduction

With built-in positioning and measurement algorithms, the SM2 series vision sensor can detect an object's existence, count patterns, spots, etc. It can be monitored and operated via the SM-Datum client. It can output results via RS-232 and Ethernet, and cooperate with other processes via IO. The vision sensor supports multiple result output methods and customized result text output. It is easy to use and widely used in industrial fields.

LEO series industrial cameras compatible with GigE、10GigE、USB3.0、Cameralink and CoaXPress data bus standards, support GenICam、USB3 Vision® and GigE Vision®, Smoothly connect with third-party software, like HALCON and Vision Pro, not need for secondary development. LEO series cameras with excellent cost performance and very suitable for various inspections measurement and high-speed imaging applications. This series cameras won customers high praise because its outstanding performance in cellphone and tablet PC screen inspection, LED automatic packaging, defect inspection, and electronic components manufacturing, wafer positioning and other applications.

With this variety of sensors and interfaces, combined with the extensive features offered, LEO series cameras are fit for a wide range of vision applications.

Product Features

■ Adopts Built-in hardware platform for high-speed image processing

■ Built-in high-precision positioning, measurement, calibration, logic, defect detection, OCR and code reading algorithms

■ Output results via RS-232 and Ethernet, and cooperate with other processes via I/O

■ Optional multi-color light source、Optional multi-focal length lens, multi-focal length lens optional

■ Support Serial, TCP, UDP, FTP, Modbus and other communication modes

＊ The camera functions may differ by camera models,please refer to actual functions

Status LED Description

Status LED	Description
PWR Indicator	It is a power indicator. The indicator is red during the device's poweron process. After the device is powered on, the indicator is green.
LNK Indicator	It is a network status indicator. The indicator is flashing green when the network transmission is normal. Otherwise, it is unlit.
STS Indicator	It is a status indicator. The indicator is green when the device operate normally. When errors occur during the device starts or operates, it is red.

Mechanical Dimensions

The dimensions is in millimeters:

The cameras are interfaced to an external circuity via 17-pin connectors located on the housing and contain power, I/O, Ethernet, and serial signals. The interface is threaded. Tightening the interface during use can reduce the loosening of the interface caused by on-site vibration. There are three indicators on the side of the device that show the device status. There are M2/M3 screw holes on the side and bottom of the device for fixing the device.

Camera Housing and Base Mounting Hole Size(mm):
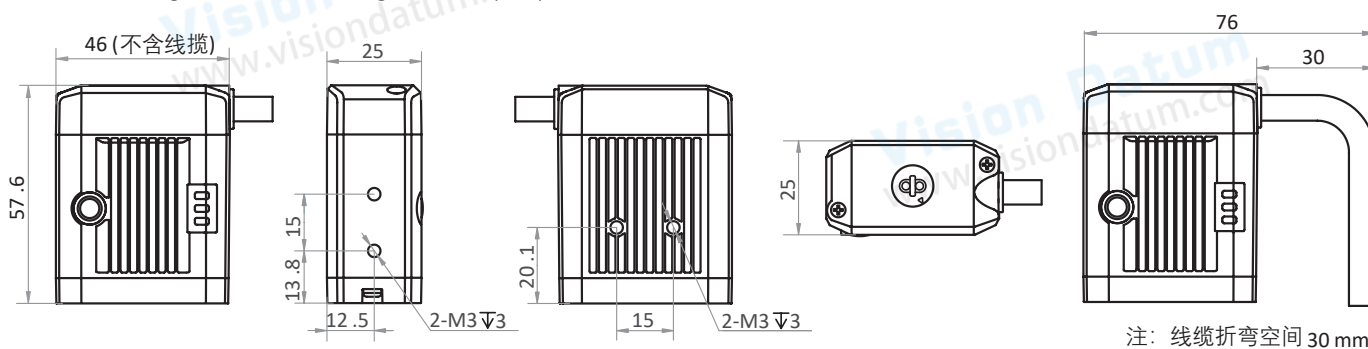
Fig. 1-1: 46 × 57.6 × 25 mm Mechanical Dimensions (in mm) of the Smart Cameras with M12-Monut housing (The installation uses M3 screws).
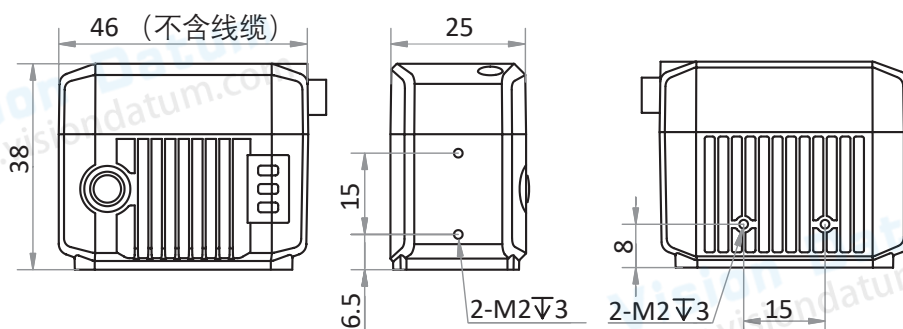
Fig. 1-2: 46 × 38 × 25 mm Mechanical Dimensions (in mm) of the Smart Cameras with M10-Monut housing (The installation uses M2 screws).

2

CHAPTER 2

POWER AND
I/O INTERFACE DEFINITION

I/O Connection Definition and Assignments

Different models of smart camera power supply and I/O interface correspond to different pin signal definitions.
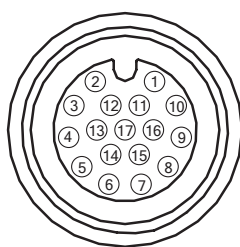
Table 2-1:
Numbering and assignments for 17-pin Power、I/O and serial ports

■ Equipment shown in Fig. 1-1

| Color		Pin	Signal	Signal Source	Designation	Cable
Red		1	POWER_IN	-	Direct current power supply positive	8-pin terminal
Brown		2	-	-	-	8-pin terminal
Purple	White	3	-	-	-	-
Green		4	RS-232 TX	-	RS-232 serial port output	DB9 female serial port
Green	White	5	RS-232 RX	-	RS-232 serial port input	DB9 female serial port
Yellow		6	MDI0+	-	Fast Ethernet signal MDI0+	RJ45 Ethernet connector
Orange	White	7	MDI1-	-	Fast Ethernet signal MDI1-	RJ45 Ethernet connector
Blue	White	8	GPIO2	Line 2+	Bi-directional I/O, and it is output by default.	8-pin terminal
Blue		9	-	-	-	8-pin terminal
Brown	White	10	GPIO3	Line 3+	Bi-directional I/O, and it is output by default.	8-pin terminal
Black		11	GND	Line 0/1/2/3-	Direct current power supply negative	8-pin terminal
Pink		12	-	-	-	-
Purple		13	-	-	-	-
Yellow	White	14	MDI0-	-	Fast Ethernet signal MDI0-	RJ45 Ethernet connector
Orange		15	MDI1+	-	Fast Ethernet signal MDI1+	RJ45 Ethernet connector
Gray		16	GPIO0	Line 0+	Bi-directional I/O, and it is the trigger by default.	8-pin terminal
White		17	GPIO1	Line 1+	Bi-directional I/O, and it is used to switch solutions by default.	8-pin terminal

I/O Connection Definition and Assignments

■ Equipment shown in Fig. 1-2

Color		Pin	Signal	Signal Source	Designation	Cable
Red		1	POWER_IN	-	Direct current power supply positive	8-pin terminal
Brown		2	GND	Line 0/1/2/3-	Direct current power supply negative	8-pin terminal
Purple	White	3	-	-	-	-
Green		4	RS-232 TX	-	RS-232 serial port output	DB9 female serial port
Green	White	5	RS-232 RX	-	RS-232 serial port input	DB9 female serial port
Yellow		6	MDI0+	-	Fast Ethernet signal MDI0+	RJ45 Ethernet connector
Orange	White	7	MDI1-	-	Fast Ethernet signal MDI1-	RJ45 Ethernet connector
Blue	White	8	GPIO2	Line 2+	Non-isolated Input	8-pin terminal
Blue		9	GND	Line 0/1/2/3-	Direct current power supply negative	8-pin terminal
Brown	White	10	GPIO3	Line 3+	Non-isolated output	8-pin terminal
Black		11	GND	-	Direct current power supply negative	8-pin terminal
Pink		12	-	-	-	-
Purple		13	-	-	-	-
Yellow	White	14	MDI0-	-	Fast Ethernet signal MDI0-	RJ45 Ethernet connector
Orange		15	MDI1+	-	Fast Ethernet signal MDI1+	RJ45 Ethernet connector
Gray		16	GPIO0	Line 0+	Can be configured as input or output; input by default	8-pin terminal
White		17	GPIO1	Line 1+	Can be configured as input or output; input by default	8-pin terminal

17-pin M12 Cable with Fast Ethernet Interface

Order Model: VT-M1217P2RJ45-3M(SM2)
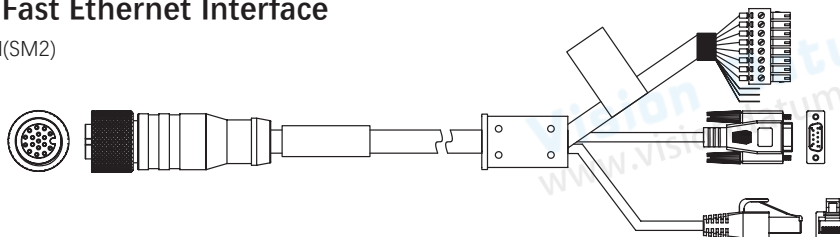
＊ The network transmission part of the 17-pin cable corresponding to 6th, 7th, 14th, and 15th pins has been made into an RJ45 interface, and there is no need to wire it yourself.

＊ The DB9 serial port connector corresponds to 4th and 5th pins of the device's 17-pin interface.

You cannot use the 12V power plug open line and DB9 female serial port connector at the same time. Otherwise, damaging to power supply may occur.

＊ The 8-pin connector corresponds to other pins of the device's 17-pin interface. You can wire according to the actual demands.

＊ The open line corresponds to 3rd, 12th, and 13th pins of the device's 17-pin interface.

> ℹ The open lines of the supplied 17-pin cable cannot be wired with the Fig.1-1 device.
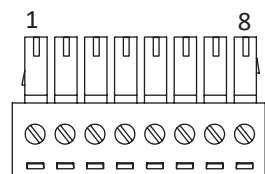
Color		Pin	Signal	Description
Brown		1	DO_5	-
Blue		2	DO_4	-
Brown	White	3	DO_3	Non-isolated Output
Blue	White	4	DI_2	Non-isolated Input
White		5	DI_1	It can be configured as input or output, and is input by default.
Gray		6	DI_0	It can be configured as input or output, and is input by default.
Black		7	GND	DC Power Supply Negative
Red		8	POWER_IN	DC Power Supply Positive

You cannot use DB9 female serial port and VCC to power the device at the same time.
Otherwise, damaging to power supply may occur.

The wire color of this user manual is the color of Vision Datum. If you use other manufacturers' cable color definitions may be different, random connection may cause the camera to burn out, please connect according to the I/O port type and pin definition or contact our technical staff for advise.

IO Box

You can use IO box to connect NPN/PNP devices to access to pull-up and pull-down resistors.
- Industrial code reader: You should use the Vision Datum cable to connect the code reader to the top terminal of the IO box.
- External devices: You should connect external devices to the bottom terminal of the IO box.
- Pull-up and pull-down resistors: if the DIP switch is switched to DOWN, pull-down resistor is connected. If the DIP switch is switched to UP, pull-up resistor is connected.

Connect to Device's Cable
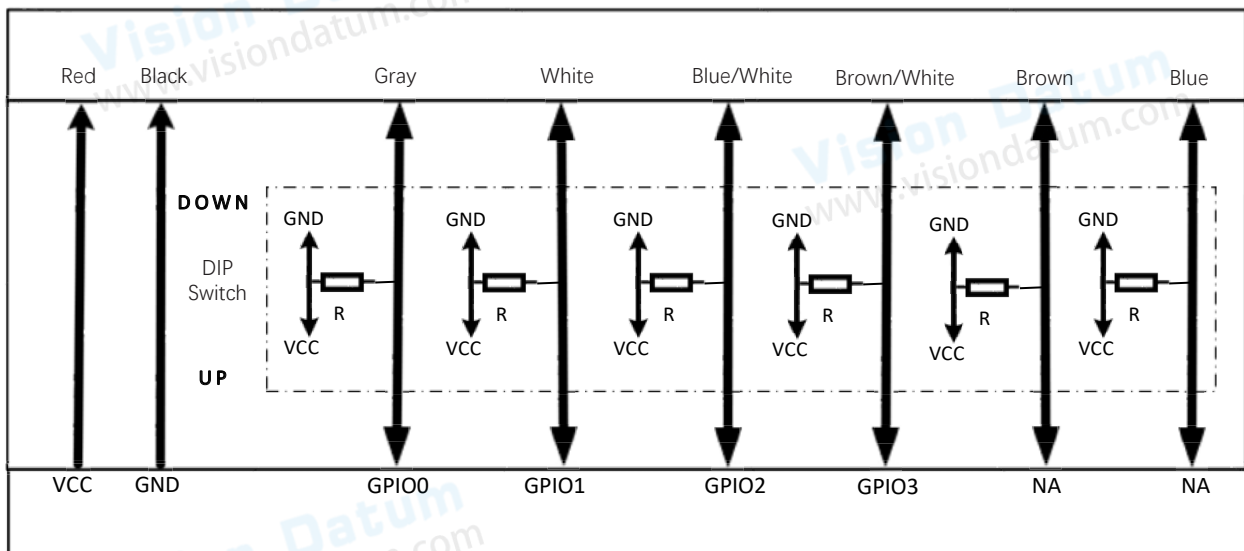
Connect to External Device

	● Whether the IO box is included in the package may differ by device models. Please refer to the actual one.
i	● When the pull-up resistor is used to wire with IO box, the voltage of IO box should be the same as that of the device.

3

CHAPTER 3 **INSTALLATION AND SETUP**

You should perform the software installation procedure first and the hardware installation procedure second.

Software Installation

■ SM-Datum Installation

If you use a firewall on your computer, disable the firewall for the network adapter to which your camera is connected.

Close the Firewall

In order to ensure the camera software keep running and image transmission stability, please close the firewall before using the software.

System Requirements

LEO Camera Software Suite for Windows requirements that one of the following operating systems is installed on your computer:

■ Windows 7 (32 bit or 64 bit)

■ Windows 10 (32 bit or 64 bit)

Installation Steps

1.You can download the SM-Datum software（Smart Cameras SDK For Windows）from：

http://www.visiondatum.com/service/005001008.html

2.Double click SM-Datum installation package to install the client.

3.Follow the instructions on the screen. The installer will guide you through the installation process.

Hardware Installation

■ Camera Installation

The installation procedures assume that you will be making a peer-to-peer connection between your camera and a computer.

Make sure that the following items are available before starting the installation:

- ■ SM2 Series Smart camera
- ■ Applicable switch or network card
- ■ The computer with a GigE network adapter installed
- ■ The computer must be equipped with appropriate operating system
- ■ Standard Ethernet cable (CA5 or above).

Steps:

- ■ Use M2/M3 screws to fix the device to the installation position.
- ■ Use the supplied 17-pin cable to wire the device to a suitable power adapter or switch power supply.
- ■ Use the network cable to connect the device via the 17-pin cable's RJ45 connector to a switch or a network interface card.

Network Settings

Before using the camera, you need to configure IP is in the same network segment with the computer. You can modify it in"Local Connection" to ensure network communication is normal.

Local Network Configuration :

● Click "Control Panel"> "Network and Internet"> "Network and Sharing Center"> "Change Adapter Configuration. "Then select corresponding network card to configure it automatically obtain IP address or manually assign it as same network segment address with the camera. Shown as below:

● Select NIC and set the IP obtainment mode.

1) Select Obtain an IP address automatically to get an IP address of the PC automatically.

2) Or select Use the following IP address to set an IP address for the PC manually.

● 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 Link Speed.

3) Set Speed and Duplex as Auto-Negotiation or 100 Mbps.
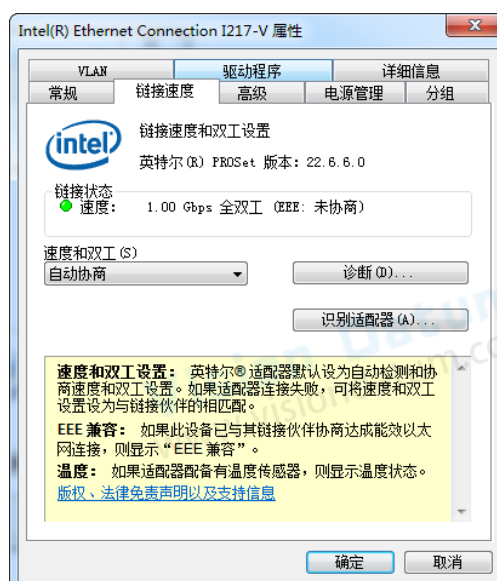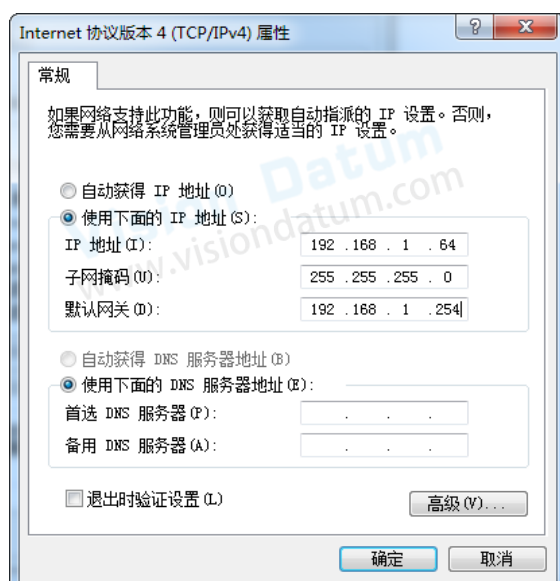
Software Operation

■ SM-Datum Operation

1、Double-click the SM-Datum shortcut on the desktop to open up the client software.

2、The Software refreshes the camera list automatically.To add a remote camera, click ⊕ type in the IP address.
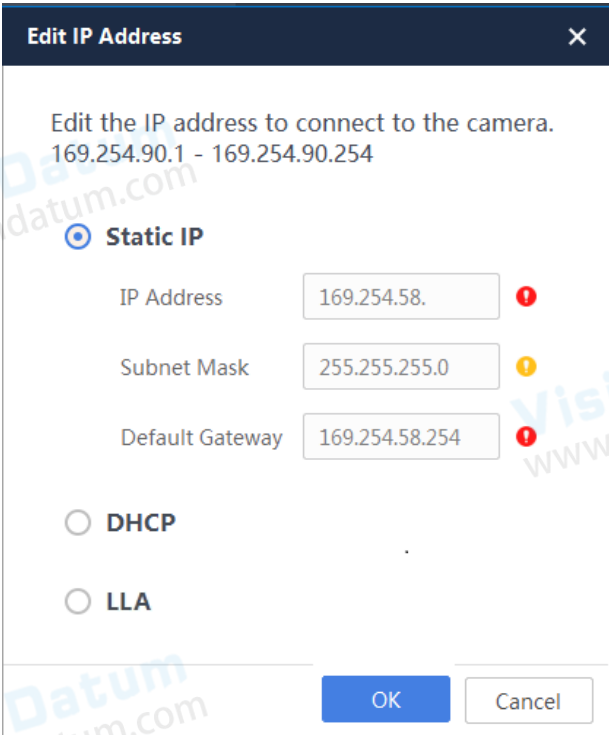
| ℹ | Make sure the connection between the remote camera and the PC is established when adding remote cameras. |

3、Make sure that the device to be connected is available 📷 and selected.

| ℹ | You cannot log in if the device is occupied or unreachable. It must be restored to the available state before logging in. |

● 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.

● The camera's IP address is not reachable on the LAN ⚠📷 . Click Edit IP Address or click ✏ before you can log into the camera.

Edit IP Address   ✕

Edit the IP address to connect to the camera.
169.254.90.1 - 169.254.90.254

⦿ **Static IP**

IP Address   169.254.58.   ❗

Subnet Mask   255.255.255.0   ⚠

Default Gateway   169.254.58.254   ❗
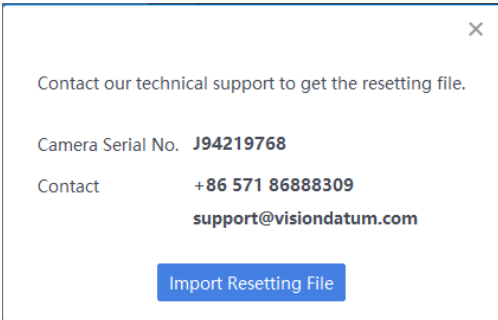
◯ **DHCP**

◯ **LLA**

OK   Cancel

4. Enter the device password on the right and click ⇨ to log in.

| ℹ | ● The camera password will be restored to Abc1234. We highly recommend you change the password after login to ensure the security of your device.
● If you forgot the password of a camera, you can click Forgot password to show the password reset window. 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.After getting the password reset file, click Import Resetting File.Click Open to load the key file and reset the password. |

✕

Contact our technical support to get the resetting file.

Camera Serial No. J94219768

Contact   +86 571 86888309

               support@visiondatum.com

Import Resetting File

Device Operation

After login, the software main interface as below.
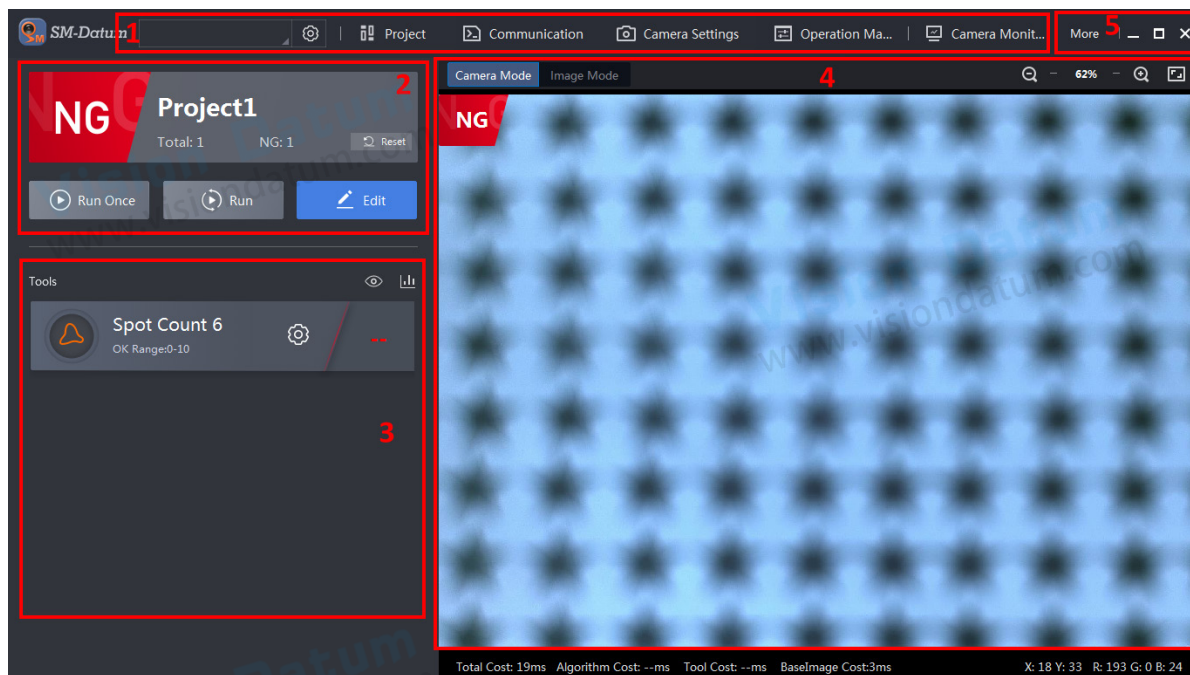
See the description of each area in the table below.

No.	Name	Description
①	Menu Bar	Related settings can be made for program management, I/O settings, communication settings, camera settings,operation management and 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	More	Check user manual, and check software version. Minimize, maximize, and exit the Software.

The device needs to perform related operations through the client. The overall operation process is shown in the following figure.
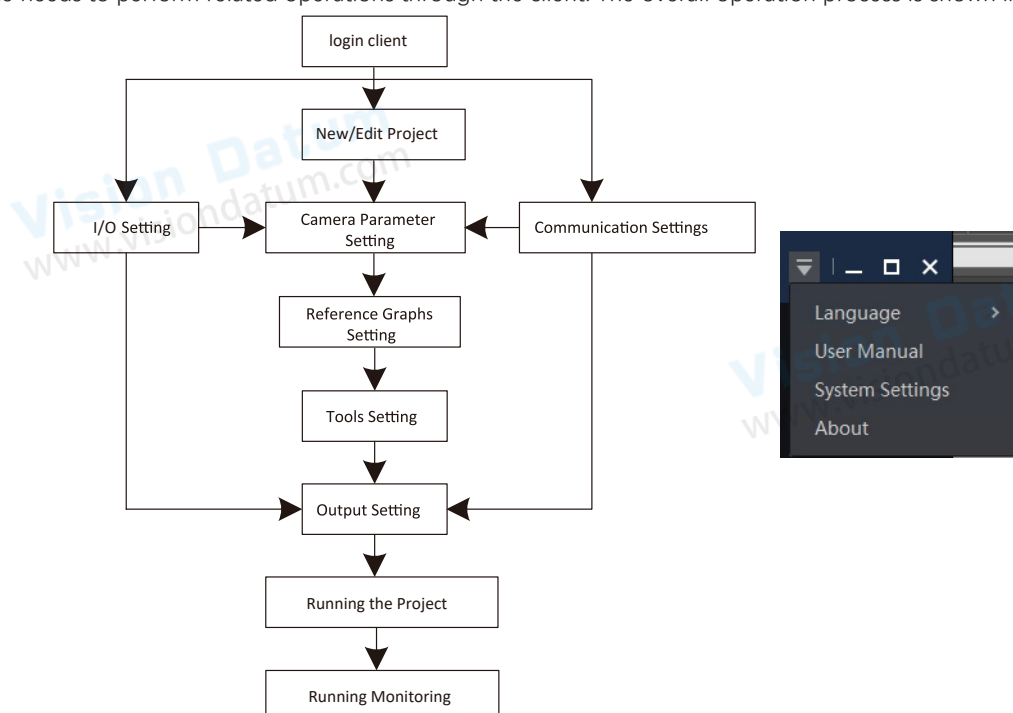
For details, please refer to the client user manual. Click "More" in the upper right corner of the client and select "User Manual" to open the client user manual.

I/O ELECTRICAL FEATURE AND WIRING

I/O Electrical Feature

08/12/15mm Focal Length Devices：Fig1-1

This section introduces the electrical feature and wirings of the device's I/O and serial port. The device has two configurable bi-directional I/Os (Line 0/1), one input signal (Line 2), one output signal (Line 3), and one RS-232.
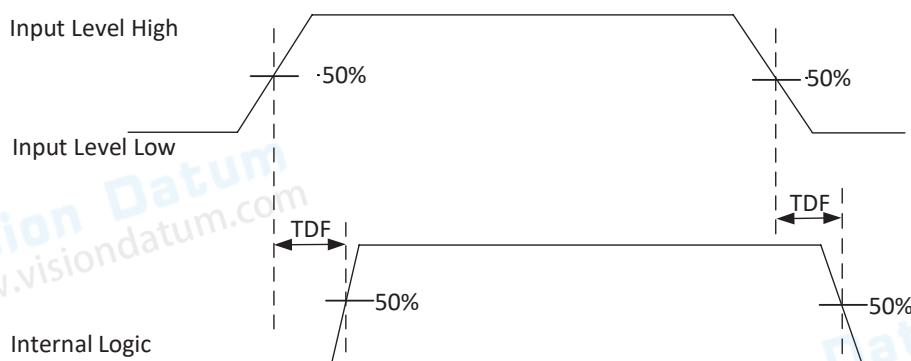
> ℹ️ By default, the I/O type of Line 0 is trigger, and the I/O type of Line 1/2 is used to switch project.

■ Input Signal

The device has one input signal (Line 2) and two configurable bi-directional I/Os (Line 0/1) that can be configured to input signal, and their internal circuit is shown below.
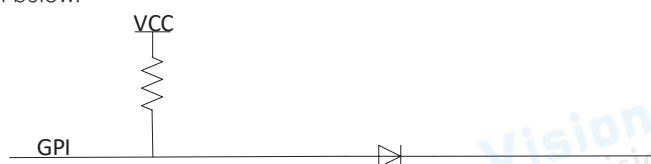
The maximum input current for the input signal is 1 mA.

Input Electrical Feature：

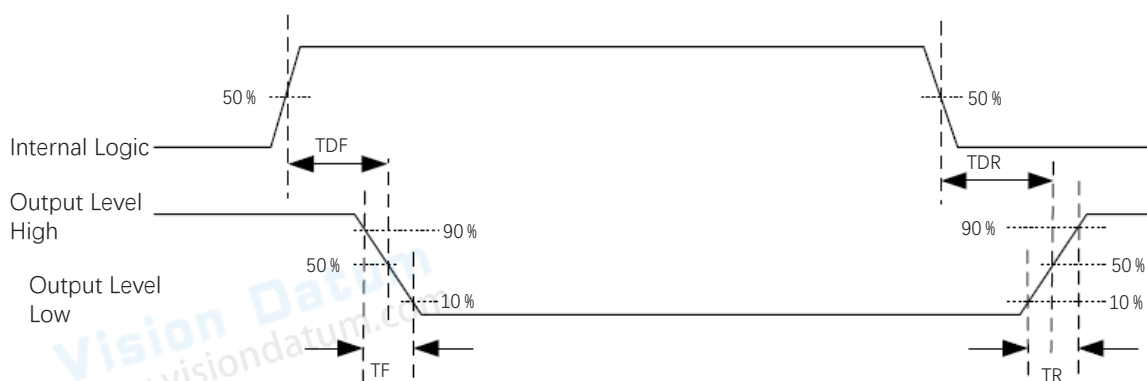| Parameter Name	Parameter Symbol	Value
Input Logic Level Low	VL	1 V
Input Logic Level High	VH	2 V
Input Rising Delay	TDR	1 μs
Input Falling Delay	TDF	200 ns

I/O Electrical Feature

08/12/15mm Focal Length Devices：Fig1-1

■ Output Signal

The device has one output signal (Line 3) and two configurable bi-directional I/Os (Line 0/1) that can be configured to output signal, and their internal circuit is shown below.
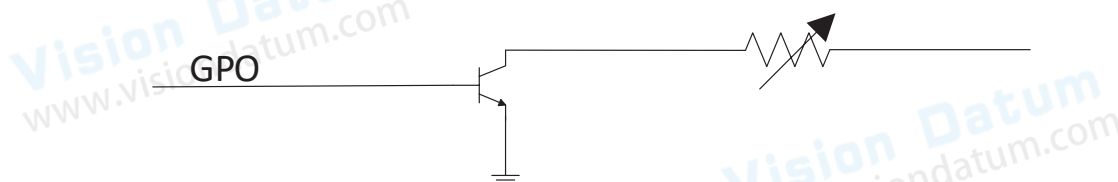
The max. output current is 25 mA.

When the external voltage is 12 VDC and pull-up resistor is 1 KΩ, output electric feature is shown below.

Parameter Name	Parameter Symbol	Value
Output Logic Level Low	VL	500 mV
Output Logic Level High	VH	12 VDC (external pull-up resistor)
Output Falling Delay	TDF	330 ns
Output Rising Delay	TDR	4.4 μs
Output Falling Time	TF	116 ns
Output Rising Time	TR	3.8 μs

Relation between different external voltages and output logic level low is shown below.

External Voltage	VL
3.3 V	180 mV
5 V	260 mV
12 V	500 mV
24 V	900 mV

I/O Electrical Feature

06mm Focal Length Devices：Fig1-2

This section introduces the electrical feature and wirings of the device's I/O and serial port.

The device has four configurable bi-directional I/O (Line 0/1/2/3) and one RS-232. The I/O type can be configured as trigger, switch solution or output.

> ● Only one I/O signal can be configured as trigger.
> ● By default, the I/O type of Line 0 is trigger, and the I/O type of Line 1 is used to switch project.
> ● Line 2 is non-isolated input signal, and Line 3 is non-isolated output signal.

The internal circuit of non-isolated input signal is shown below.
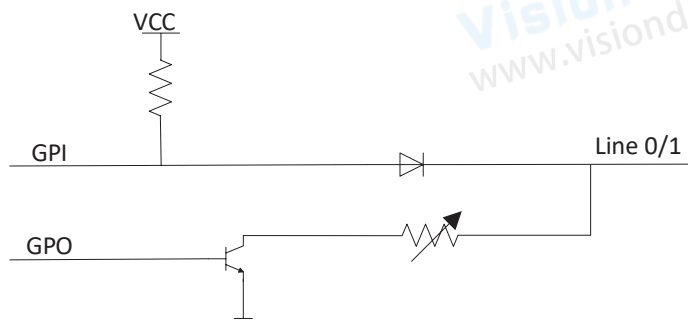
■ Non-Isolated Input Signal

The input logic level and input electrical feature are shown below.
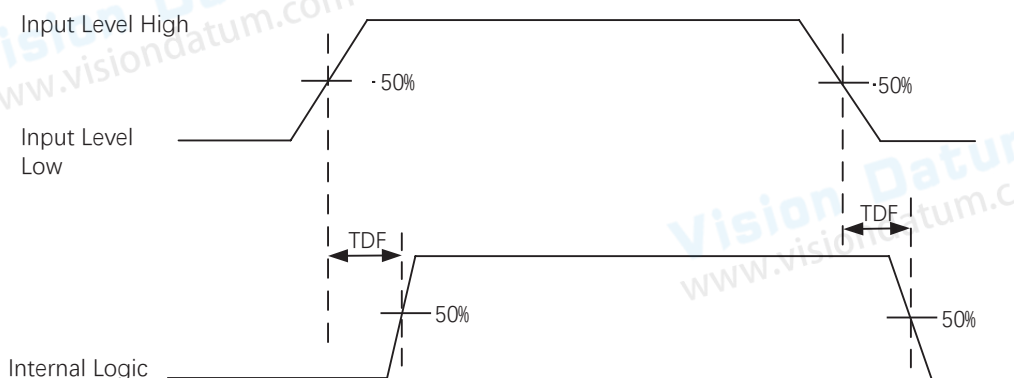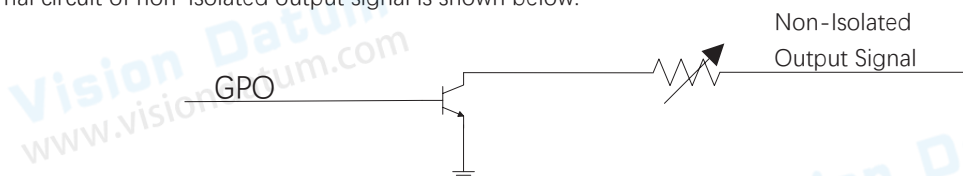

Input Electrical Feature

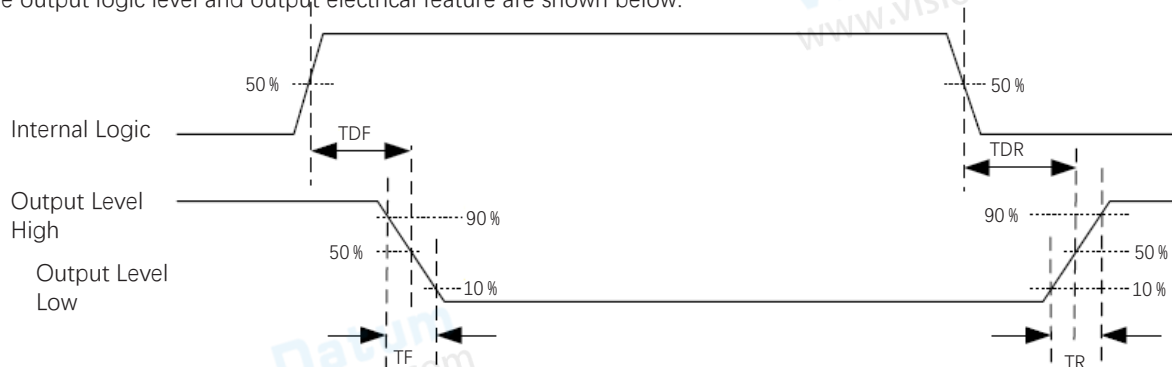| Parameter Name	Parameter Symbol	Value
Input Logic Level Low	VL	1 V
Input Logic Level High	VH	2 V
Input Rising Delay	TDR	1 µs
Input Falling Delay	TDF	200 ns

I/O Electrical Feature

06mm Focal Length Devices：Fig1-2

■ Non-Isolated Output Signal

The internal circuit of non-isolated output signal is shown below.

The output logic level and output electrical feature are shown below.

When the external voltage is 12 VDC and pull-up resistor is 1 KΩ, output electric feature is shown below.

Parameter Name	Parameter Symbol	Value
Output Logic Level Low	VL	550 mV
Output Logic Level High	VH	12 VDC (external pull-up resistor)
Output Falling Delay	TDF	330 ns
Output Rising Delay	TDR	4.4 μs
Output Falling Time	TF	116 ns
Output Rising Time	TR	3.8 μs

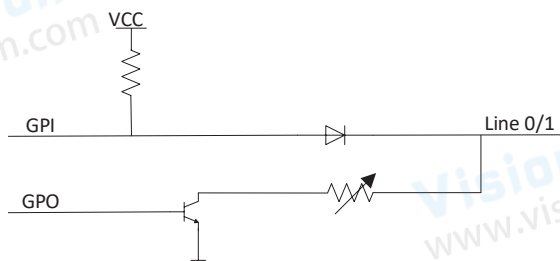Relation between different external voltages and output logic level low is shown below.

External Voltage	VL
3.3 V	180 mV
5 V	260 mV
12 V	500 mV
24 V	900 mV

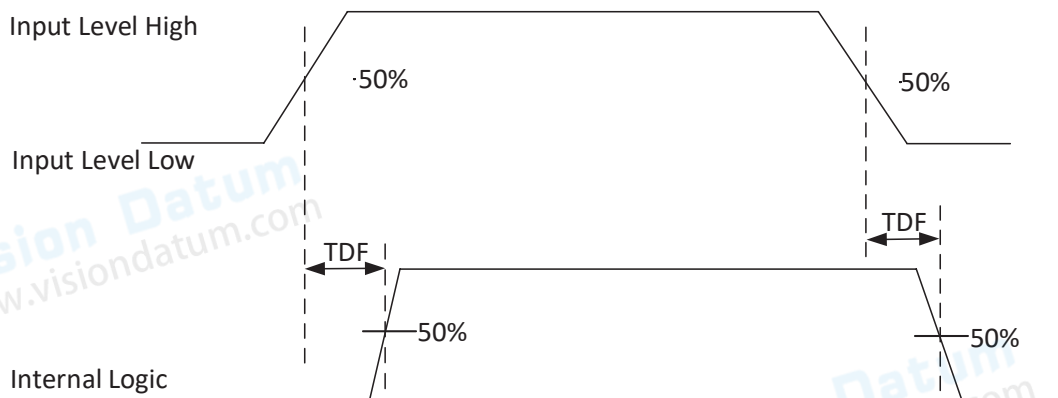# I/O Electrical Feature

06mm Focal Length Devices：Fig1-2

■ Bi-Directional Signal

The device has two bi-directional I/O (Line 0/1) and you can set them as input signal or output signal according to demands.

Configure as Input Signal

If the bi-directional I/O is configured as input signal, and its logic level and electrical feature are shown below.

Relation between different external voltages and output logic level low is shown below.

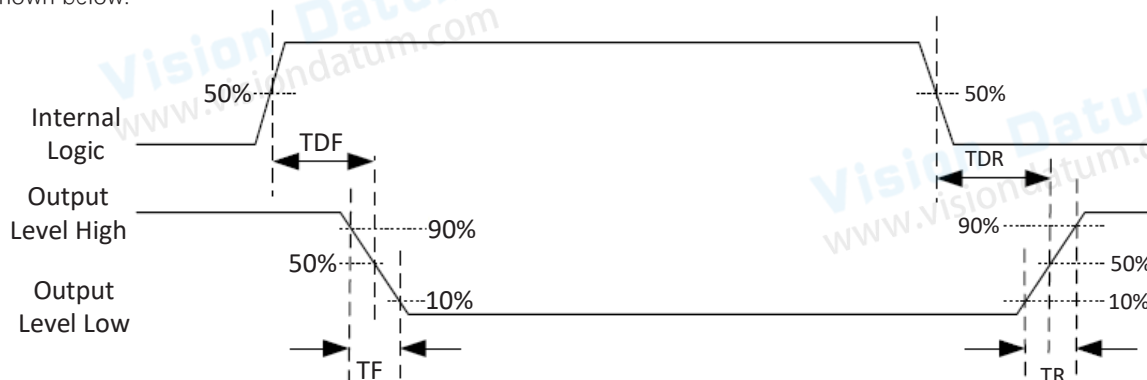| Parameter Name	Parameter Symbol	Value
Output Logic Level Low	VL	1 VDC
Output Logic Level High	VH	2 VDC
Output Rising Delay	TDR	1 µs
Output Falling Delay	TDF	200 ns

I/O Electrical Feature

06mm Focal Length Devices：Fig1-2

Configure as Output Signal

If the bi-directional I/O is configured as output signal, its output signal polarity is NPN, and its logic level and electrical feature are shown below.

When the external voltage is 12 VDC and pull-up resistor is 1 KΩ, output electric feature is shown below.

Parameter Name	Parameter Symbol	Value
Output Logic Level Low	VL	500 mV
Output Logic Level High	VH	12 VDC (external pull-up resistor)
Output Rising Time	TR	3.8 µs
Output Falling Time	TF	116 ns
Output Rising Delay	TDR	4.4 µs
Output Falling Delay	TDF	330 ns

Relation between different external voltages and output logic level low is shown below.

External Voltage	Output Logic Level Low (VL)
3.3 V	180 mV
5 V	260 mV
12 V	500 mV
24 V	900 mV

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.

> ⓘ
> ● The input and output signals mentioned in this section are the bi-directional I/O signal whose I/O type is configured as trigger and output correspondingly.
> ● The pull-up and pull-down resistors in wiring figures below need to wire with correct open lines.
> ● The voltage of VCC should be equal to or less than that of PWR. Otherwise, the device's output signal may have exception.
> ● The device figures below are for reference only, and the actual one you got should prevail.

■ Input Wiring
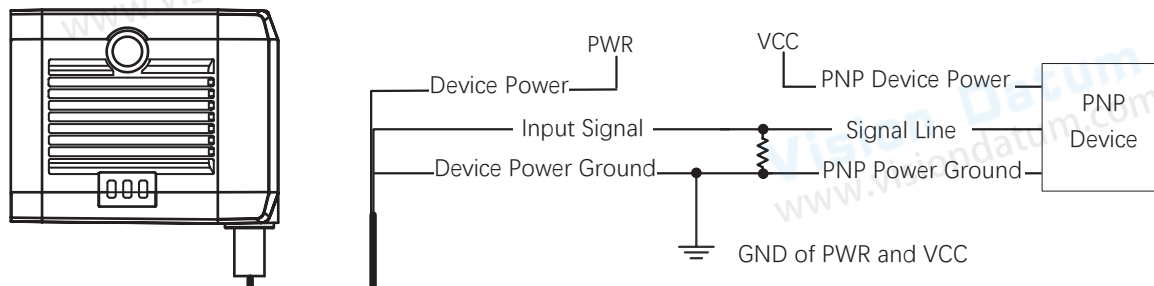
Input signal wiring may differ by external device types.

● PNP Device

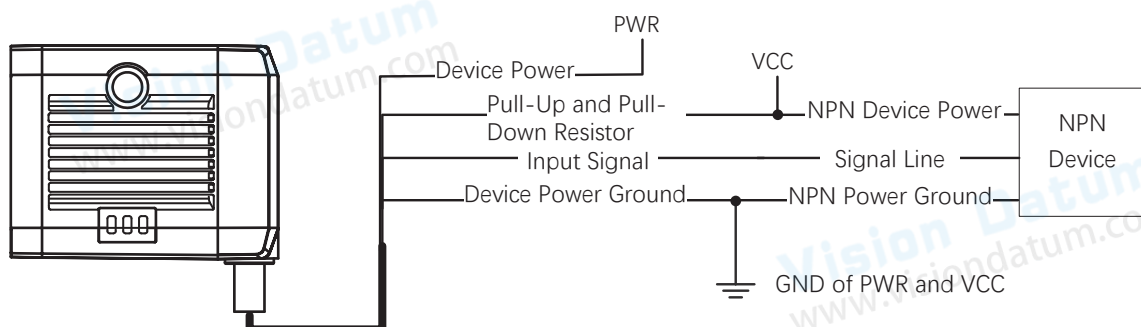_ If you use the pull-down resistor of the supplied 17-pin cable, the wiring is shown below.
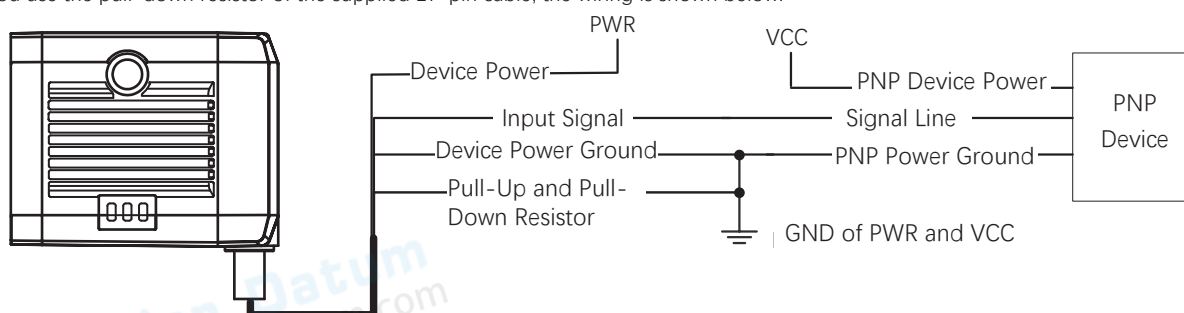
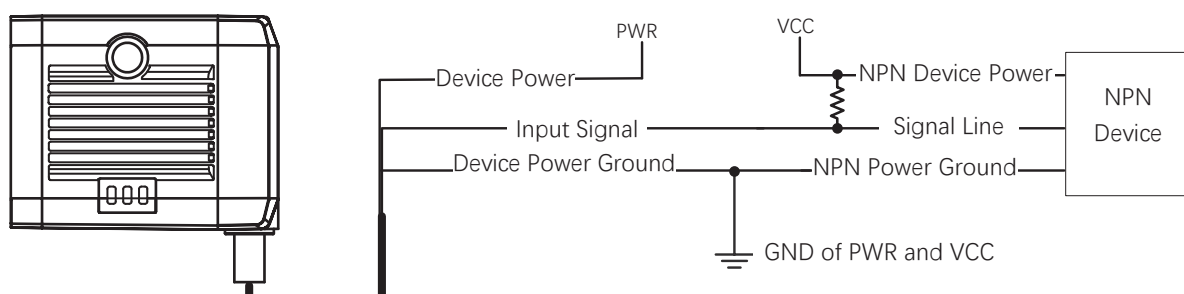_ If you use external pull-down resistor, it is recommended to use 1 KΩ pull-down resistor.

● NPN Device

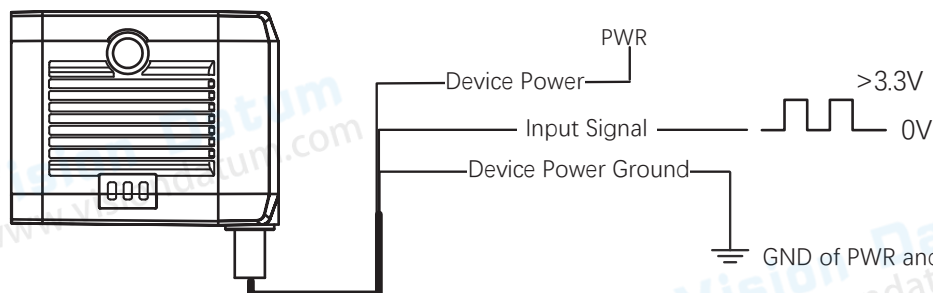_ If the VCC of NPN device is 12 VDC or 24 VDC, and the pull-up resistor of the supplied 17-pin cable is used.

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

I/O Wiring

● Switch
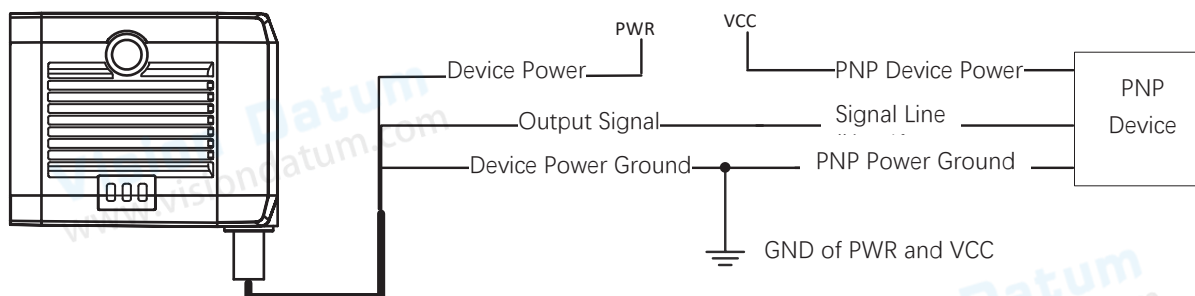
Device Power — PWR

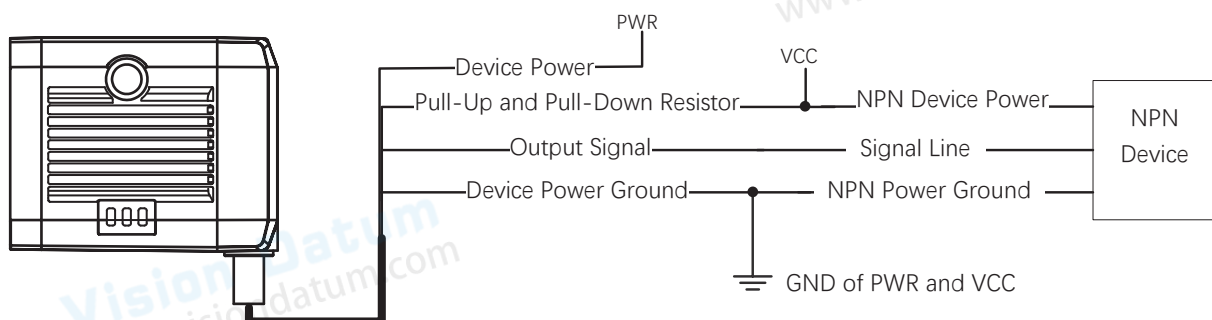Input Signal — >3.3V ⊓⊔ 0V

Device Power Ground

⏚ GND of PWR and VCC

■ Output Wiring

Output signal wiring may differ by external device types.

● PNP Device

Device Power — PWR

PNP Device Power — VCC — PNP Device

Output Signal — Signal Line

Device Power Ground — PNP Power Ground

⏚ GND of PWR and VCC

● NPN Device

_ If the VCC of NPN device is 12 VDC or 24 VDC, and the pull-up resistor of the supplied 17-pin cable is used.

Device Power — PWR

Pull-Up and Pull-Down Resistor — VCC — NPN Device Power — NPN Device

Output Signal — Signal Line

Device Power Ground — NPN Power Ground

⏚ GND of PWR and VCC

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

Device Power — PWR

NPN Device Power — VCC — NPN Device

Output Signal — Signal Line

Device Power Ground — NPN Power Ground

⏚ GND of PWR and VCC

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 the user manual of the SM-Datum client software for details. The 17-pin cable has open lines of RS-232 serial port, which are 4th and 5th pin of the 17-pin interface.

■ RS-232 Serial Port Introduction

The supplied 17-pin cable has a RS-232 serial port. Refer to the figure and table below for pin definitions.

● The definition of the 9-pin male 232 serial port connector is as follows.
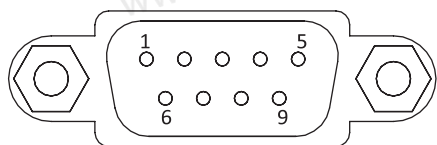
Pin	Symbol	Description
2	RX	Receive Data
3	TX	Send Data
5	GND	Signal Ground

■ RS-232 Serial Wiring

The wiring of the unit's RS-232 interface to other external devices with RS-232 serial ports is shown below.
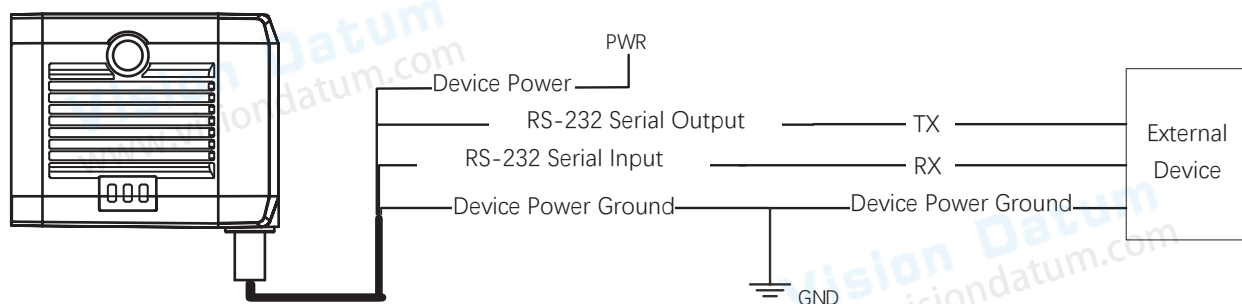
CHAPTER 5   FAQ

Trouble Shooting

Trouble:

■ No device found when running the client

Possible Reason1:   The device is not powered on

Solution1:   Check whether the power connection of the device is normal (observe whether the top PWR light is solid green), and ensure that the device is powered on normally.

Possible Reason2:   The network connection is abnormal

Solution2:   Check whether the network connection is normal (Observe whether the top LNK light is flashing green, and the ACT light is solid yellow), make sure that the network cable of the device is connected normally, and the PC network port and the device are in the same network segment.

■ Live view is black/dark

Possible Reason1:   The brightness of the light source is not enough

Solution1:   Appropriately increase the brightness of the light source or replace it with a brighter light source.

Possible Reason2:   The exposure and gain are adjusted too low

Solution2:   Appropriately increase exposure and gain.

■ Image freezes / low frame rate / tearing during preview

Possible Reason: The network line speed is not 1000Mbps

Solution: Check if the network transmission speed is 1000Mbps and above.

■ No image when previewing

Possible Reason: Enable trigger mode, but no trigger signal

Solution: Trigger the device or turn off the trigger mode.

6

CHAPTER 6   TECHNICAL SUPPORT

Technical Support

If you need advice about your camera or if you need assistance troubleshooting a problem with your camera, it's highly recommended to describe your issue in details and contact us via E-mail at support@visiondatum.com

It would be helpful if you can fill-in the following table and send to us before you contact our technical support team.

Camera Model:		Camera's SN:	
Describe the issue in as much detail as possible:			
If known, what's the cause of the issue?			
How often did/does the issue occur?			
How severe is the issue?			
Parameter set	Please connect the camera directly to PC and make note of the parameter when the issue occurred.		

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