微图视觉
Vision Datum

SM2 Series DL
Smart Camera User Manual

V2.4.10. 2024

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.

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/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 and deep learning AI 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.

Mechanical Dimensions

The dimensions is in millimeters:

Single Line Output Structure

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 top of the device that show the device status.

There are M4 screw holes on the back of the device for fixing the device.

Camera Housing and Base Mounting Hole Size(mm):

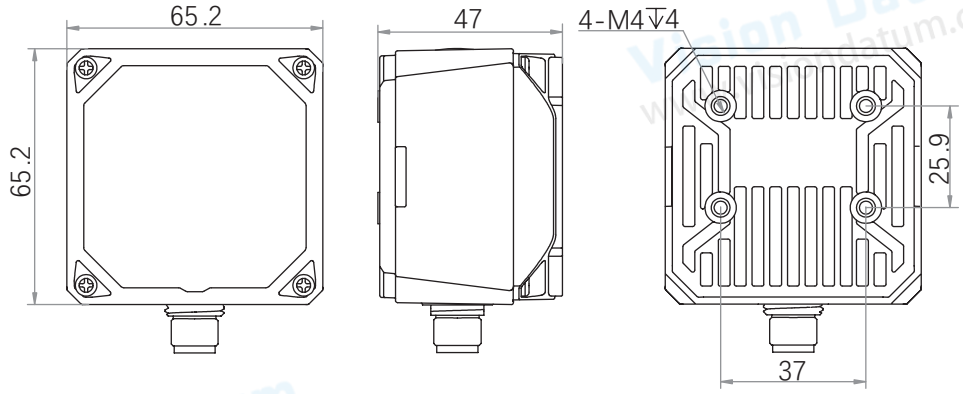

Fig. 1-1: 65.2 × 65.2 × 47 mm Mechanical Dimensions (in mm) of the Smart Cameras with M12-Monut housing (The installation uses M4 screws).

Right Angle Rotation Structure

The cameras are interfaced to an external circuity via 12-pin connectors located on the housing and contain power, I/O, 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 is an indicator light on the top of the device that show the device status. An 8-pin M12 connector can be converted to RJ45 network cable for data transmission.

There are M3 screw holes on the back of the device for fixing the device.

Camera Housing and Base Mounting Hole Size(mm):

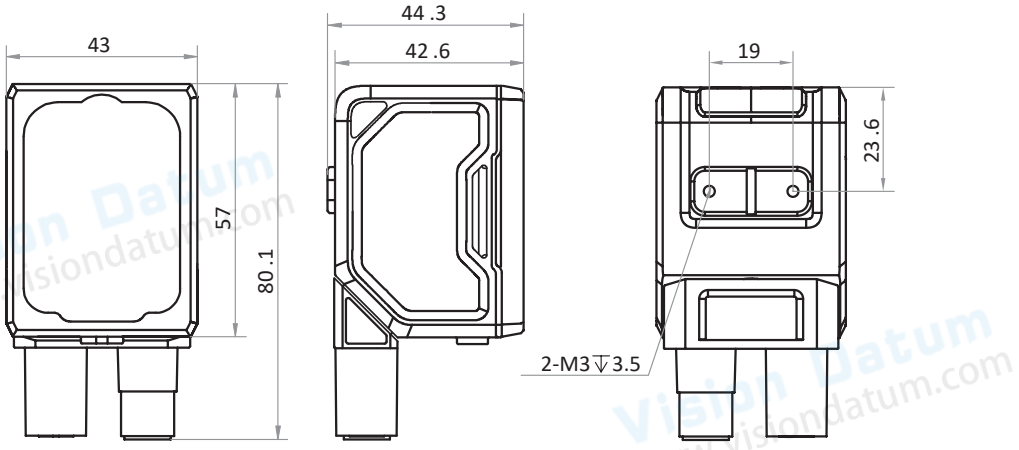

Fig. 1-2: 43 × 44.3 × 80.1 mm Mechanical Dimensions (in mm) of the Smart Cameras with M12-Monut housing (The installation uses M3 screws).

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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.

Single Line Output Structure

Table 2-1: Numbering and assignments for 17-pin power, input/output, Ethernet, and serial port signal.

Color	Pin	Signal	Signal Source	Designation
Red	1	POWER_IN	-	Direct current power supply positive
Brown	2	I/O_1	Line3 signal line	Can be configured as input or output
Purple White	3	DO_2	Line7 signal line	Opto-isolated output
Green	4	RS-232 TX	-	RS232 serial port output
Green White	5	RS-232 RX	-	RS232 serial port input
Yellow	6	MDI0+	-	Fast Ethernet signal MDI0+
Orange White	7	MDI1-	-	Fast Ethernet signal MDI1-
Blue White	8	DO_0	Line5 signal line	Opto-isolated output
Blue	9	I/O_0	Line2 signal line	Can be configured as input or output
Brown White	10	DO_1	Line6 signal line	Opto-isolated output
Black	11	GND	Signal ground	Direct current power supply negative
Pink	12	IN_COM	Line 2/3/4 input signal ground	Input signal ground
Purple	13	I/O_2	Line4 signal line	Can be configured as input or output
Yellow White	14	MDI0-	-	Fast Ethernet signal MDI0-
Orange	15	MDI1+	-	Fast Ethernet signal MDI1+
Gray	16	DI_0	Line0 signal line	Opto-isolated input
White	17	DI_1	Line1 signal line	Opto-isolated input

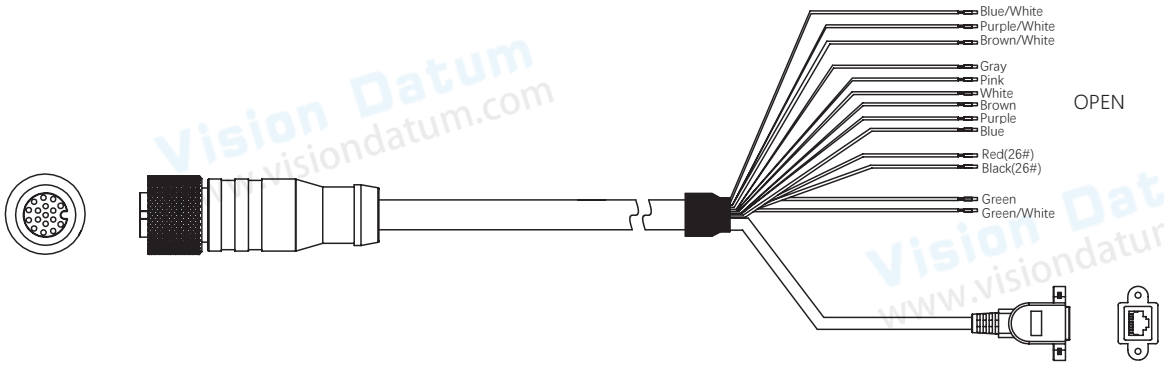
It is recommended to use the supplied 17-pin cable. The 6th, 7th, 14th, and 15th pin have been made as RJ45 connector. The lines of other pins should be wired according to the actual demands.

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.

I/O Connection Definition and Assignments

17-pin M12 Cable diagram

Order Model: VT-M1217P2RJ45-3M(SM)



* 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 open line of the device's 17-pin interface. You can wire according to the actual demands.

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.

I/O Connection Definition and Assignments

Right Angle Rotation Structure

The power supply and I/O connector of the device is a 12-pin M12 connector, which provides power supply and I/O signal input/output of the device. The corresponding pin signals are defined as follows:

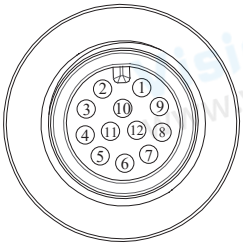
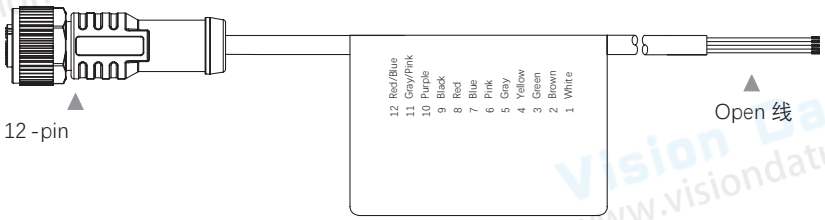


Table 2-1:
12-Pin It provides power supply, I/O, and RS-232 signals.

Color	Pin	Signal	Signal Source	Designation
White	1	DC-PWR	-	Direct current power supply positive
Brown	2	GND	-	Power supply ground
Green	3	OPTO_OUT0	Line 3 output signal line	I/O isolated output 3
Yellow	4	OPTO_OUT1	Line 4 output signal line	I/O isolated output 4
Gray	5	OPTO_OUT2	Line 5 output signal line	I/O isolated output 5
Pink	6	OUT_COM	Line 3/4/5 output signal ground	Output common port
Blue	7	OPTO_IN0	Line 0 output signal line	I/O isolated input 0
Red	8	OPTO_IN1	Line 1 output signal line	I/O isolated input 1
Black	9	OPTO_IN2	Line 2 output signal line	I/O isolated input 2
Purple	10	IN_COM	Line 0/1/2 output signal ground	Input common port
Gray Pink	11	RS-232_R	-	RS232 input
Red Blue	12	RS-232_T	-	RS232 output

12-pin M12 Cable diagram

Order Model: VT-M12TR12P-3M(SM)



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

Status LED Description

Status LED	Description
PWR Indicator	It is the power indicator. The indicator is green when the device operates normally. Otherwise, it is red.
LNK Indicator	It is network status indicator. The indicator is flashing green when the network transmission is normal. Otherwise, it is unlit.
STS Indicator	It is the status indicator. The indicator is green when the project operates normally. Otherwise, it is red.
OK/NG Indicator	It indicates the result of projects. ● The indicators are green when the project result is OK. ● The indicators are red when the project result is NG. ● The indicators are green and red when switching projects. After switching, the indicators are unlit. ● The indicators are yellow when the device restarts or error occurs.
Right Angle Rotation Structure Status LED	**Description**
-	Power Off Status
Solid Yellow	Non-Streaming Status
Solid Green	Streaming Status / Project Result OK
Solid Red	Streaming Status / Project Result NG

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.

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

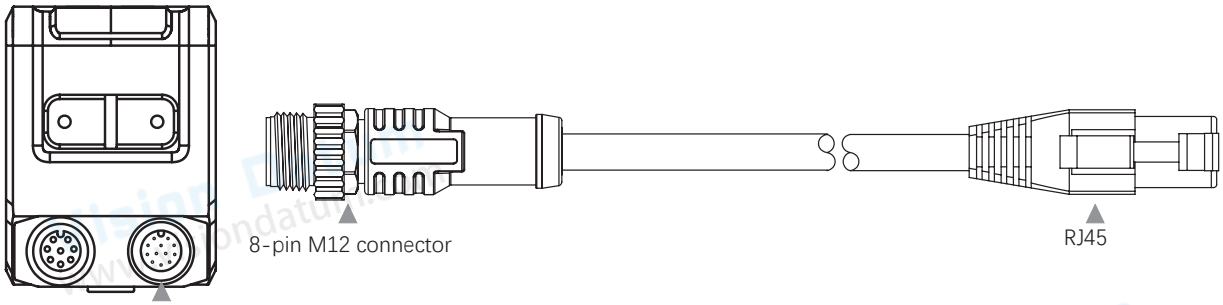
The installation procedures assume that you will be making a peer-to-peer connection between your camera and a computer.

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 M3/M4 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.
- Right Angle Rotation Structure uses an 8-pin M12 to RJ45 network cable to access the network port on the device side for image debugging or data communication, as shown in the figure below:



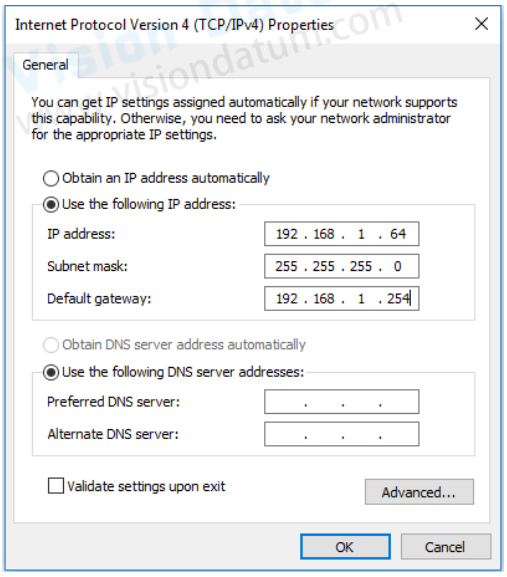
- Connect the device to a switch or NIC via network cable.

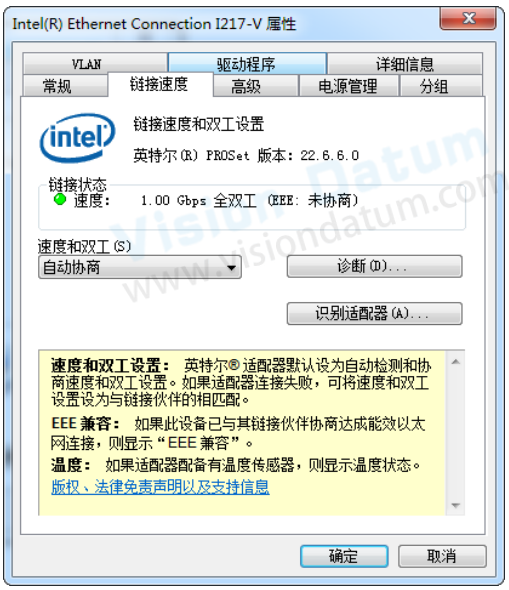
Network Settings

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:
- Open "Advanced" in the properties, set Speed and Duplex as Auto-Negotiation or 100 Mbps.Shown as below:





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.

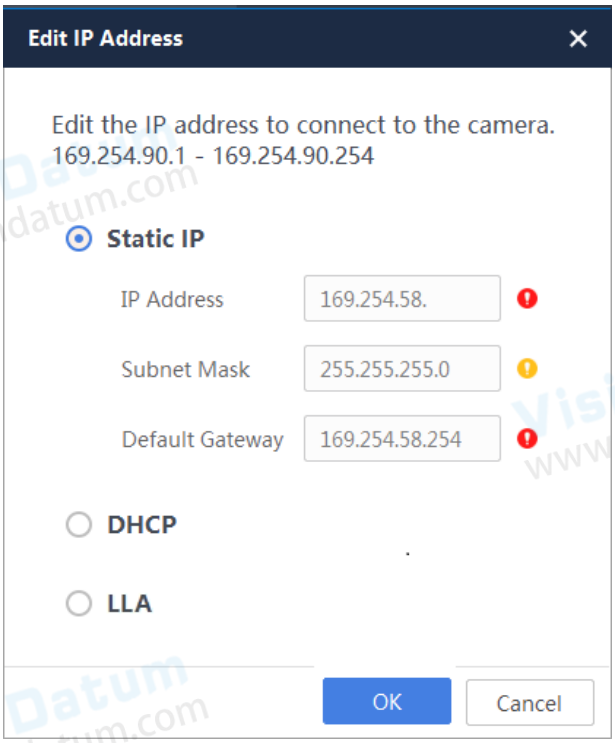
ⓘ	Make sure the connection between the remote camera and the PC is established when adding remote cameras.

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

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

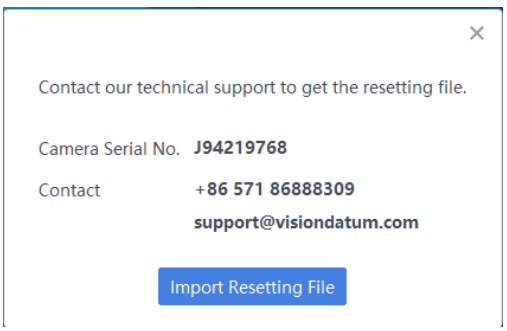
● The camera is occupied by another process . Log out the camera from the current process before you can log into the camera via the Software.

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



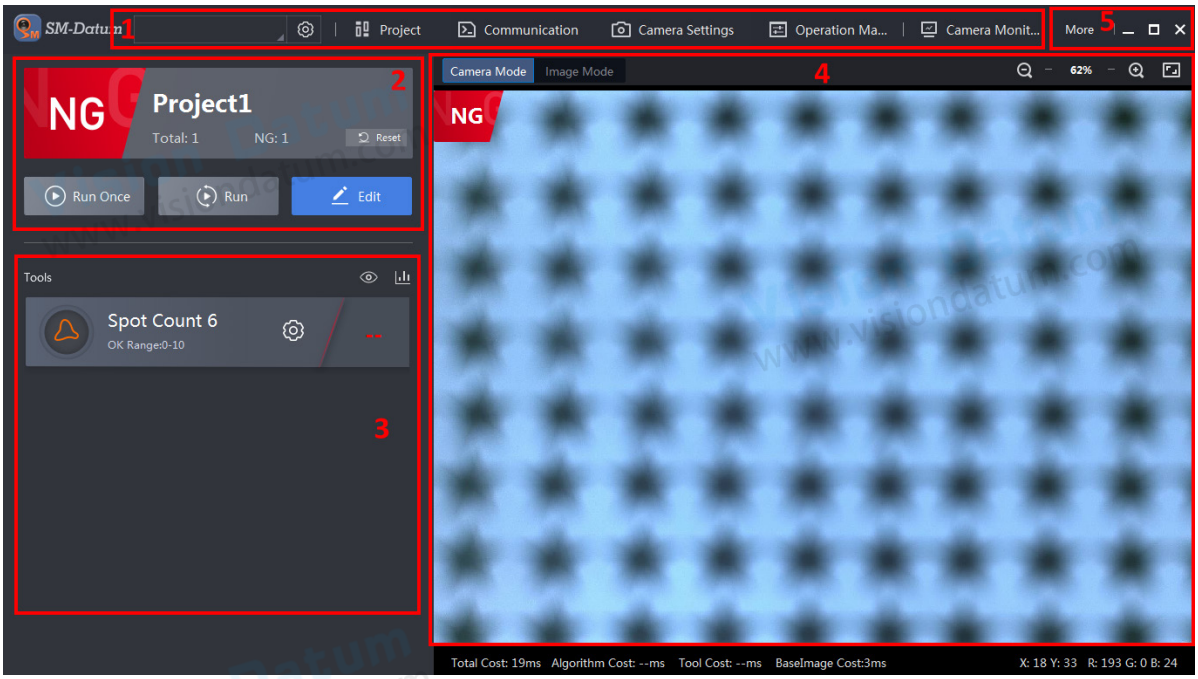
4. Enter the device password on the right and click to log in.

ⓘ	● 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.



Device Operation

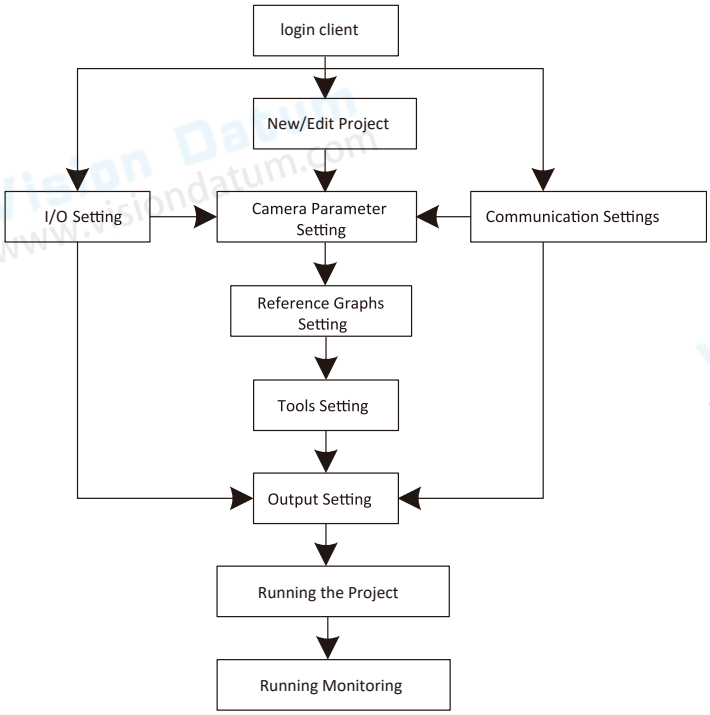
After login, the software main interface as below.

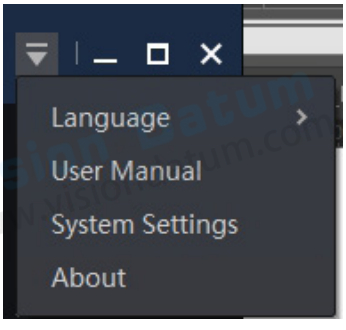


See the description of each area in the table below.

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.

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CHAPTER 4 I/O ELECTRICAL FEATURE AND WIRING

I/O Electrical Feature

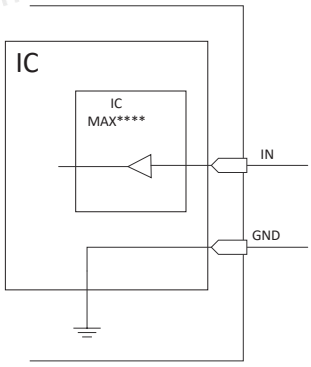
Single Line Output Structure

This section introduces the electrical feature and wirings of the device's I/O and RS-232 serial port. The device has two input signals (Line 0/1), three output signals (Line 5/6/7), and three bi-directional I/O (Line 2/3/4) signals.

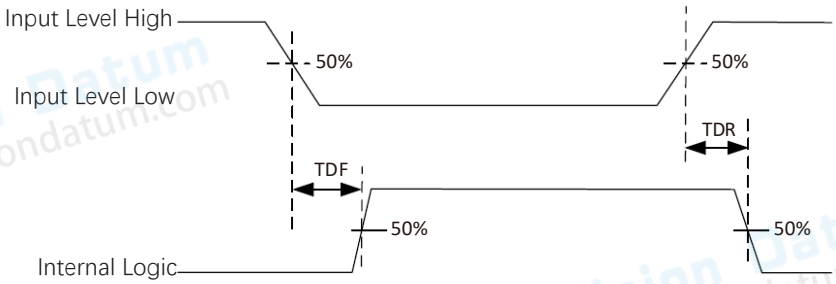
> The two input signals and three bi-directional I/O signals can also be used as signal sources to switch the device's projects. Refer to the user manual of the SM-Datum client software for details.

Input Signal

The device's Line 0/1 are input signals, and Line 2/3/4 are bi-directional I/O signals that can be set as input. The internal circuit of input signal is shown below.



The maximum input current of input signal is 25 mA.



Input Electrical Feature:

Parameter Name	Parameter Symbol	Value
Input Logic Level Low	VL	0 ~ 9 VDC(VCC=24 V) 0 ~ 5.4 VDC(VCC=12 V)
Input Logic Level High	VH	11 ~ 24 VDC(VCC=24 V) 7.56 ~ 12 VDC(VCC=12 V)
Input Rising Delay	TDR	1.3 ~ 3.5 μs
Input Falling Delay	TDF	1.3 ~ 3.5 μs

> ● VCC is the device's input voltage.
> ● The breakdown voltage is 36 VDC, and keep voltage stable.

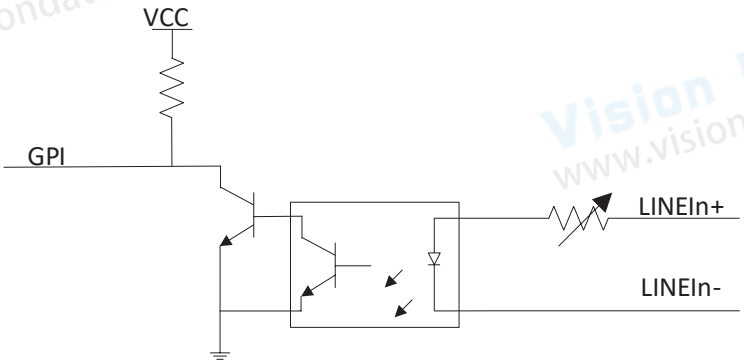
I/O Electrical Feature

Right Angle Rotation Structure

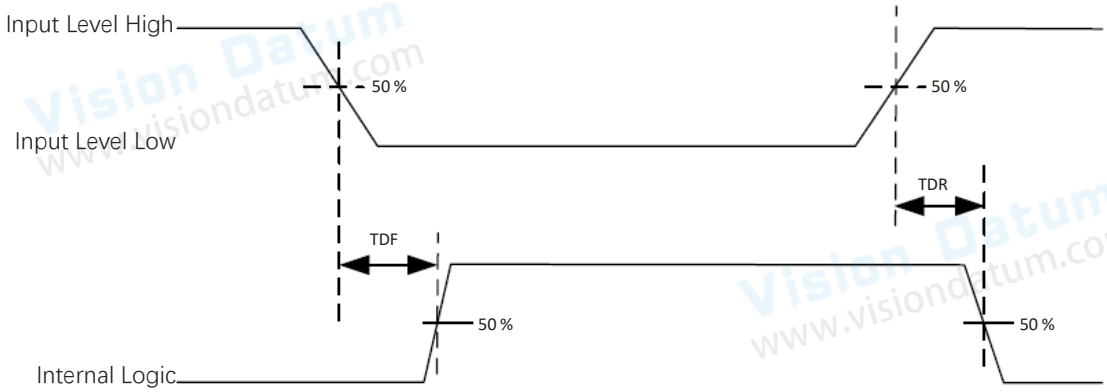
This section introduces the electrical feature and wirings of the device's I/O and RS-232 serial port. The device has three opto-isolated inputs(Line 0/1/2), three opto-isolated outputs (Line 3/4/5), and one RS-232 serial port.

Input Signal

The device's LINE 0/1/2 are opto-isolated inputs, the input voltage ranges from 5 VDC to 30 VDC, and their internal circuit is as follows.



Internal Circuit of Input Signal:



Input Electrical Feature:

Parameter Name	Parameter Symbol	Value
Input Logic Level Low	VL	1.5 V
Input Logic Level High	VH	2 V
Input Rising Delay	TDR	81.6 μs
Input Falling Delay	TDF	7 μs

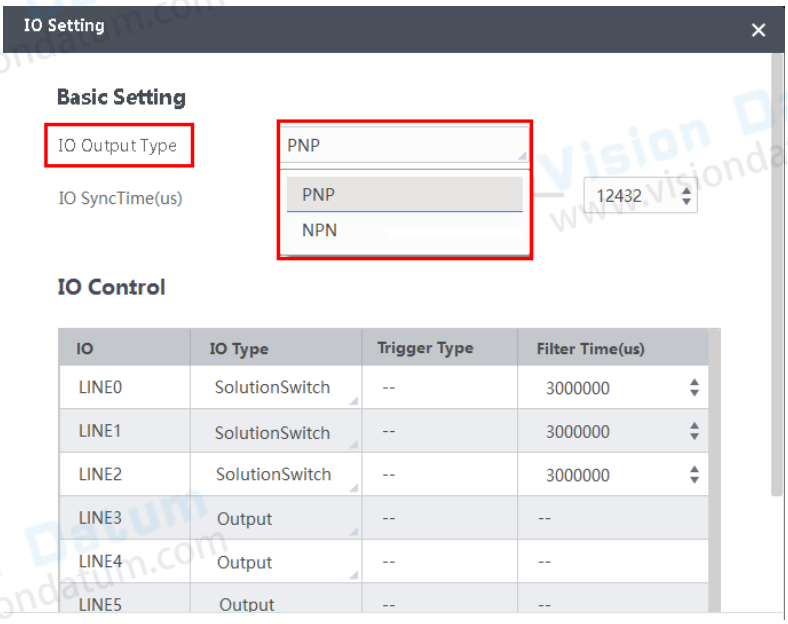
The breakdown voltage is 36 VDC, and keep voltage stable.

I/O Electrical Feature

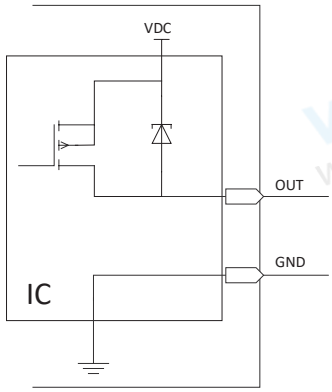
Single Line Output Structure

Output Signal

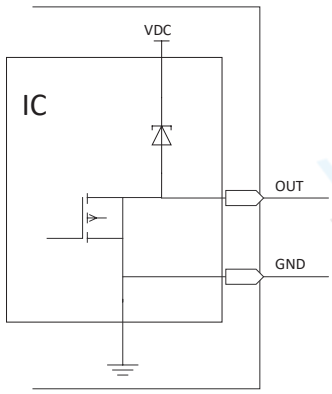
The device's Line 5/6/7 are output signals, and Line 2/3/4 are bi-directional I/O signals that can be set as output. You can go to I/O settings of the client software to set I/O output type as PNP or NPN according to actual demands, as shown below.



- If the output signal is PNP type, its internal circuit is shown below.

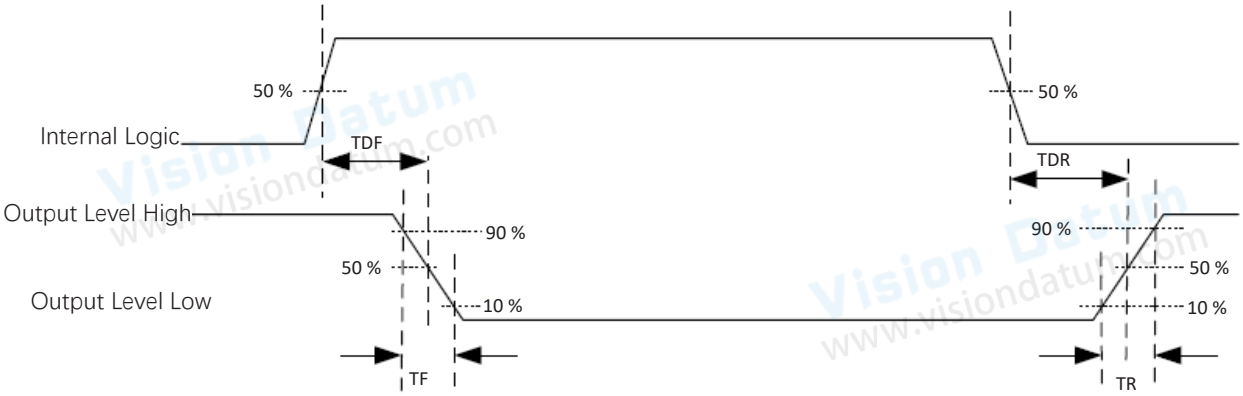


- If the output signal is NPN type, its internal circuit is shown below.



I/O Electrical Feature

The maximum output current of the output signal is 200 mA.



When the external voltage and resistance is 12 VDC and 1 KΩ respectively, the electrical feature of output signal is as follows.

Parameter Name	Parameter Symbol	Value
Output Logic Level Low	VL	212 mV
Output Logic Level High	VH	11.8 V
Output Falling Delay	TDF	0.4 μs
Output Rising Delay	TDR	0.4 μs
Output Falling Time	TF	0.4 μs
Output Rising Time	TR	0.4 μs

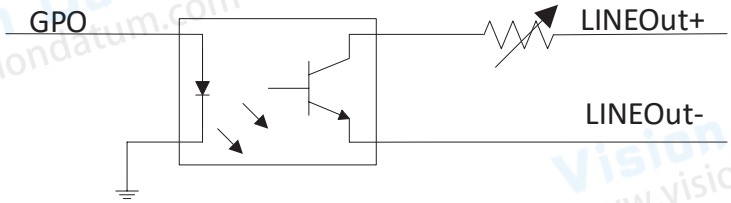
If the external voltage and resistance change, the corresponding current of output signal and output logic level low may differ.

I/O Electrical Feature

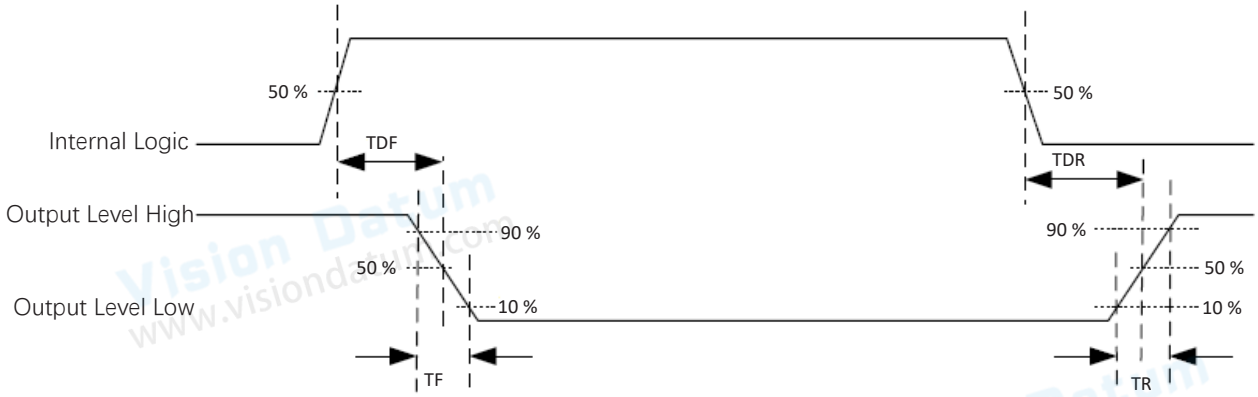
Right Angle Rotation Structure

Output Signal

The device's LINE 3/4/5 are opto-isolated outputs, the output voltage ranges from 5 VDC to 30 VDC, the maximum output current is 45 mA, and their internal circuit is as follows.



Do not directly connect with inductive load (e.g. DC motor, etc.) when outputting.



Output Electrical Feature:

Parameter Name	Parameter Symbol	Value
Output Logic Level Low	VL	730 mV
Output Logic Level High	VH	3.2 V
Output Falling Delay	TDF	6.3 μs
Output Rising Delay	TDR	68 μs
Output Falling Time	TF	3 us
Output Rising Time	TR	60 us

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

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.

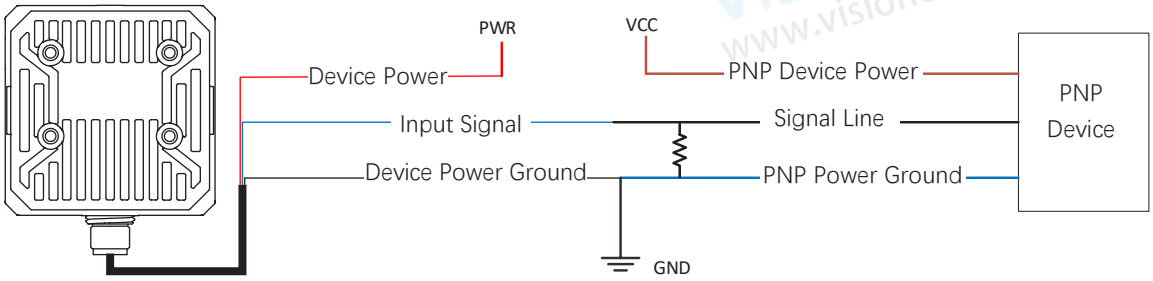
Single Line Output Structure

Input Wiring

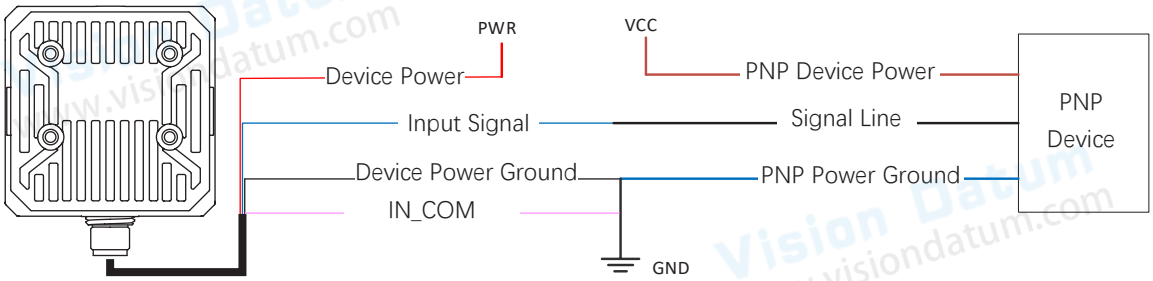
Input signal wiring may differ by external device types. Here we take Line 2 as an example to introduce I/O wiring.

- PNP Device, two types of input wiring are available

_ If you have available external resistors, you should use 1 KΩ pull-down resistor to wire the device as shown below. It is recommended to use the following type of input wiring because this type is applicable to all I/O input signals, including Line 0/1/2/3/4.

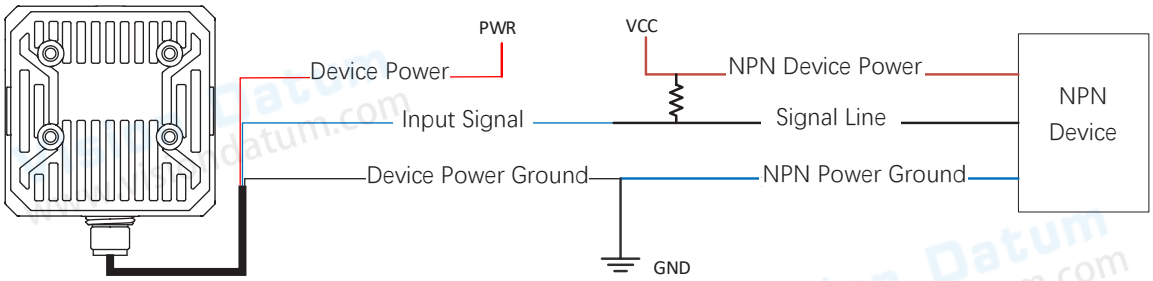


_ If you do not have available external resistors, you can wire the device as shown below. This type of input wiring is only applicable to Line 2/3/4.

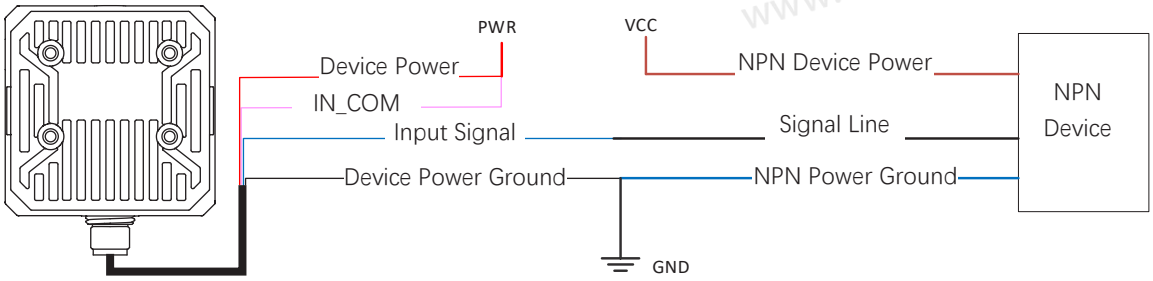


- NPN Device, two types of input wiring are available

_ If you have available external resistors, and the VCC is 12 VDC or 24 VDC, you should use 1 KΩ pull-up resistor to wire the device as shown below. It is recommended to use the following type of input wiring because this type is applicable to all I/O input signals, including Line 0/1/2/3/4.

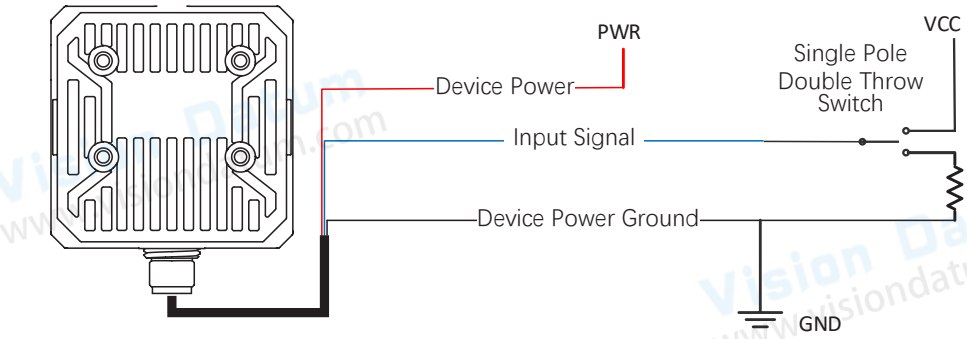


_ If you do not have available external resistors, you can wire the device as shown below.This type of input wiring is only applicable to Line 2/3/4.



I/O Wiring

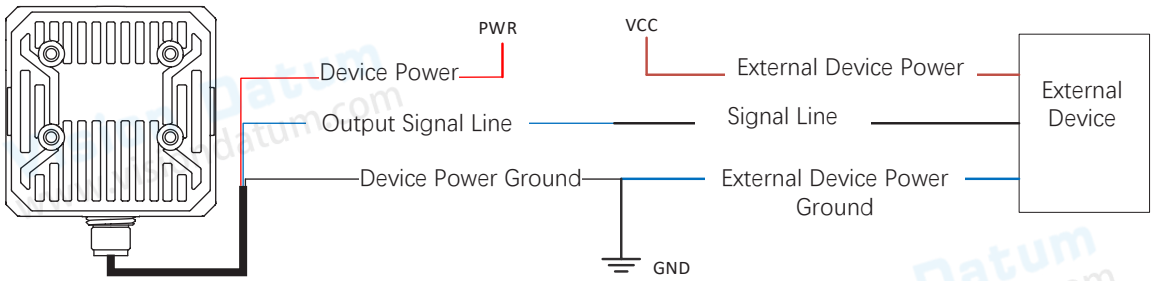
- Switch, it is recommended to use 1 KΩ pull-down resistor.



Output Wiring

You can set I/O output type as PNP or NPN via the client software.

- If the external device is PNP, you should set the device's output signal polarity as NPN.
- If the external device is NPN, you should set the device's output signal polarity as PNP.



When the device's output signal is set as NPN, the voltage of VCC should not higher than that of PWR. Otherwise, the device's output signal may have exception.

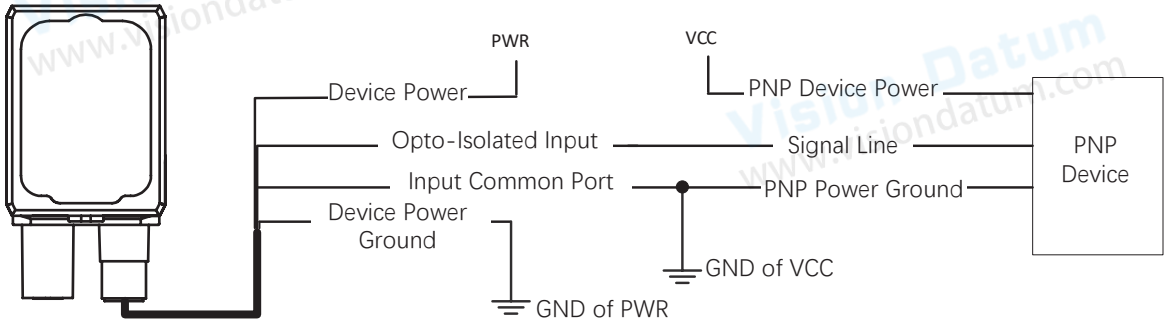
I/O Wiring

Right Angle Rotation Structure

Input Signal Wiring

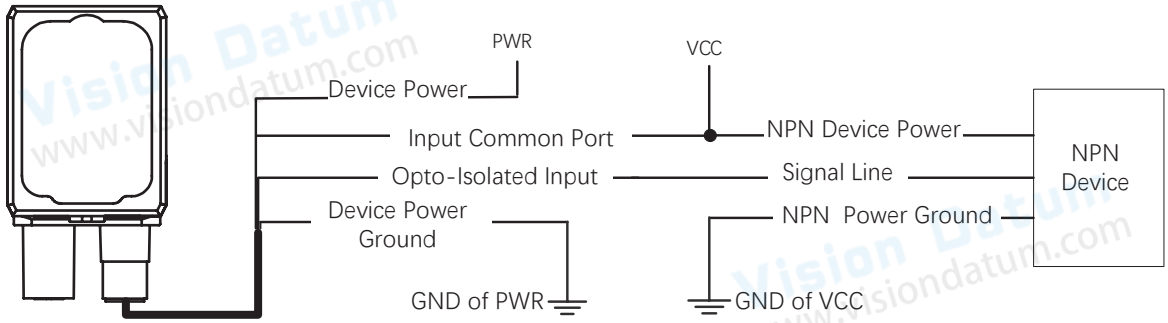
Input signal wiring may differ by external device types, here we take LINE 0 as an example to introduce input signal wiring, and take LINE 3 as an example to introduce output signal wiring.

- PNP Device

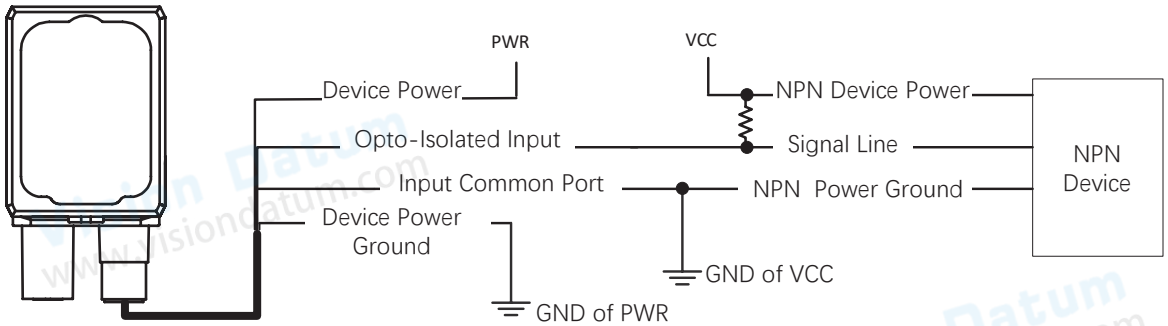


- NPN Device, two types of input wiring are available

_ If the VCC of NPN device is 12 VDC or 24 VDC and pull-up resistor is not used, and its wiring is as follows.



_ If the VCC of NPN device is 12 VDC or 24 VDC and 1 KΩ pull-up resistor is used, its wiring is as follows.

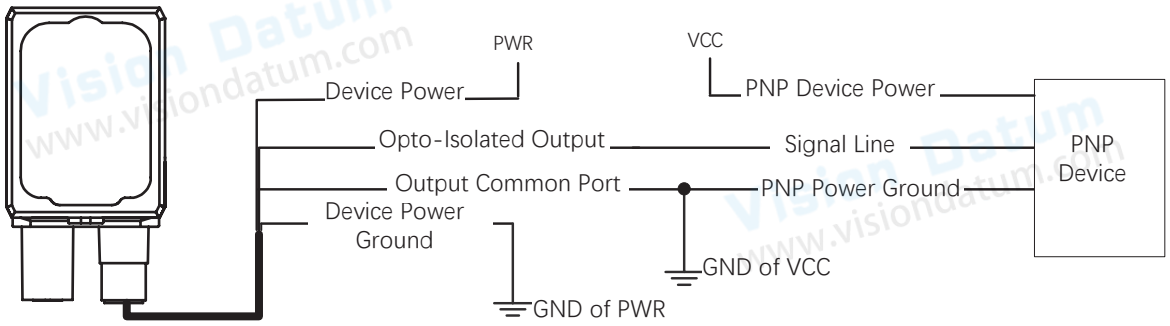


I/O Wiring

Output Signal Wiring

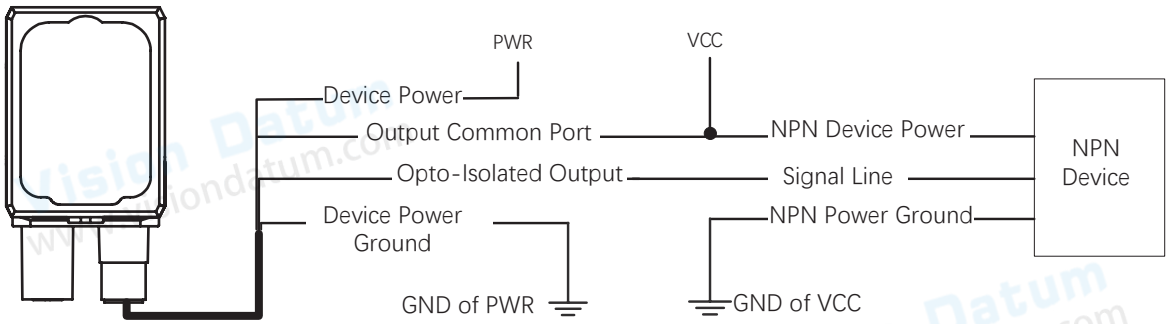
Output signal wiring may differ by external device types.

- PNP Device

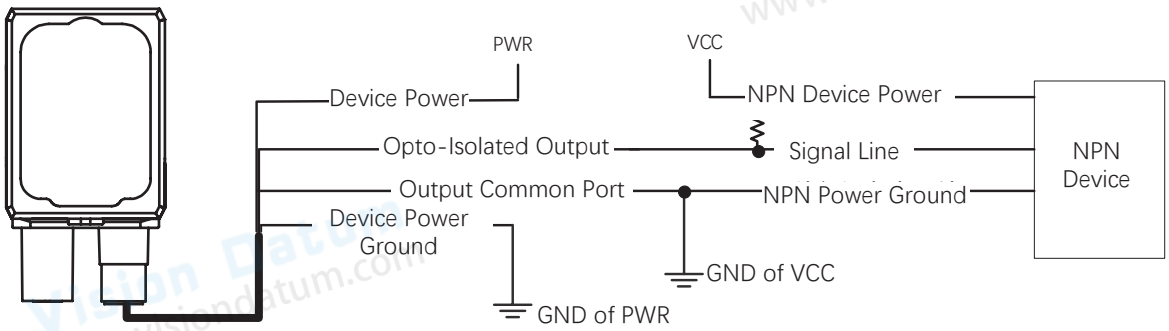


- NPN Device, two types of input wiring are available

_ If the VCC of NPN device is 12 VDC or 24 VDC and pull-up resistor is not used, its wiring is as follows.



_ If the VCC of NPN device is 12 VDC or 24 VDC and 1 KΩ pull-up resistor is used, its wiring is as follows.



i	When the device's output signal is set as NPN, the voltage of VCC should not higher than that of PWR. Otherwise, the device's output signal may have exception.

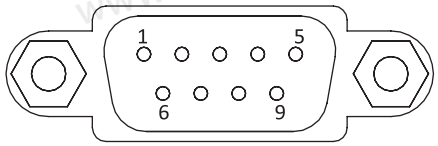
RS-232 Serial Port

The device supports outputting via the RS-232 serial port.. You can go to the communication settings of the client software to set related parameters.

RS-232 Serial Port Introduction

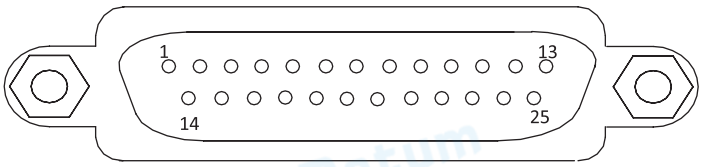
The 9-pin male connector and 25-pin male connector are commonly used serial ports, as shown below. You can refer to the table below for the specific pin name and function.

- 9-Pin Connector



Pin No.	Name	Function
2	RX	Receive Data
3	TX	Transmit Data
5	GND	Signal Ground

- 25-Pin Connector

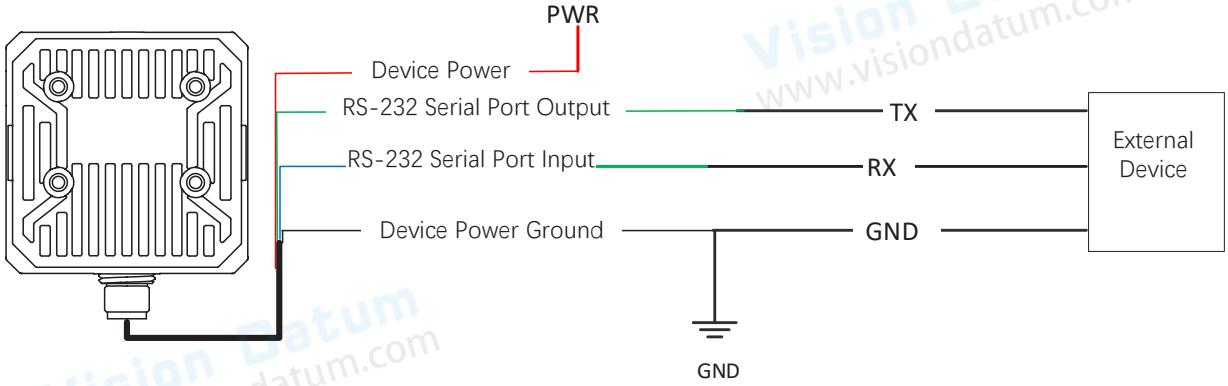


Pin No.	Name	Function
2	TX	Transmit Data
3	RX	Receive Data
7	GND	Signal Ground

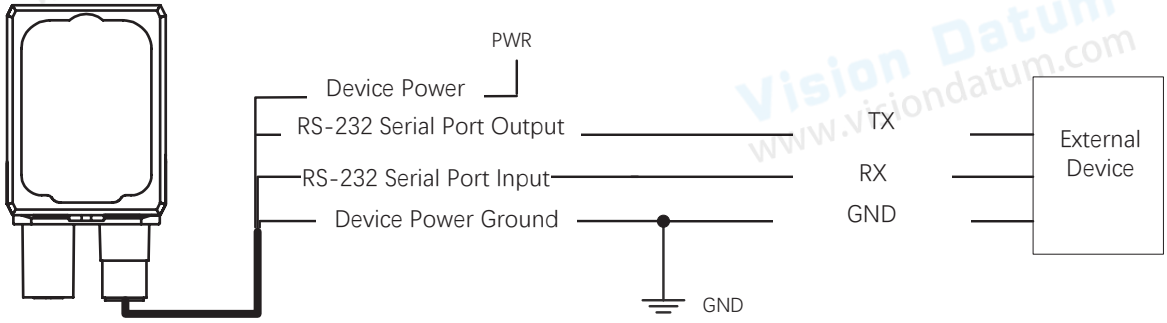
RS-232 Serial Port Wiring

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

Single Line Output Structure



Right Angle Rotation Structure



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.

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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