**Manual**

**of**

**SP5010 Series IPC Type Industrial Intelligent Computer**

# Preface

**Product introduction**

The SP series IPC type industrial intelligent computer(hereinafter referred to as “iComputer”) is a series of X86 architecture PC-based industrial intelligent universal controllers launched by SINSEGYE. This model of iComputer integrates functions such as logic control, motion control, industrial vision and HMI, and has the characteristics of localization, integrated computing and control,high real-time performance, and scalability. In addition to providing rich interfaces, this product also supports I/O interface terminals and PCIE interface expansion modules for functional expansion, meeting complex industrial field application needs.

**User and scope of scope**

This manual is specifically designed for trained and qualified technical personnel to install, operate, and maintain the equipment. Only professionals or trained and qualified personnel can install, replace, and repair this equipment.

**Version change record**

|  |  |  |
| --- | --- | --- |
| Version No. | Modification date | Description of changes |
| V1.0 | 2024-05 | First version of basic information |
| V2.0 | 2024-010 | Integrated information description of the first version |
| V2.1 | 2024-011 | 1. Add version change record 2. Alternation in product naming rules |
| V2.2 | 2024-12 | Amended some details |

**To obtain manual and other resources**

This manual is not delivered with the product. Resort to the following channels for the electronic or paper version:

* Log in to SINSEGYE website, https://www.sinsegye.com.cn and download intended manual and other resources from the relevant information list.
* Obtain the manual and resources from the technology support party or sales agency.
* Search and follow SINSEGYE WeChat official account, and get the manual and other resources.

# Safety precautions

**Safety requirements**

The equipment shall be used according to the instructions in this manual.

**Power supply requirements**

1. AC220V
2. Before you power the device, make sure that the power supply voltage meets the requirements of the device.

**Routine maintenance**

1. Do not open or disassemble the equipment randomly. The equipment should only be opened by professional maintenance personnel.
2. Before cleaning the equipment with a damp rag, unplug the power cord from the outlet. Do not use liquids or decontamination sprayers to clean the equipment.
3. In case not using the equipment for a long time, please turn off the computer normally and disconnect the power cord to avoid the equipment being damaged by the instantaneous voltage.
4. Prevent any liquid from flowing or spilling into the equipment to avoid short circuits or fires.

**Operating environment**

1. Please ensure that the equipment is placed on a reliable flat surface before installation, accidental dropping or overturning may cause damage to the equipment.
2. The openings in the enclosure of the equipment are for air convection and prevent the equipment from overheating, and forbid to cover or seal these openings.
3. Please do not use the equipment in a humid environment.

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# 1. Product information

## 1.1 Controller appearance



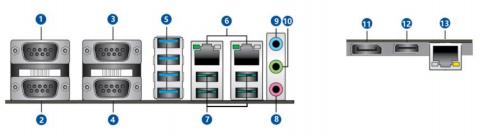
## 1.2 Controller interface

* **Front panel**



Power button

* **Rear panel**



|  |  |  |
| --- | --- | --- |
| **Serial No.** | **Interface name** | **Description** |
| ① | COM2 port | RS485 serial port |
| ② | COM3 port | RS485 serial port |
| ③ | COM4 port | RS232 serial port |
| ④ | COM1 port | RS232 serial port |
| ⑤ | USB port | Type-A interface, USB3.0 protocol |
| ⑥ | LAN port | Gigabit Ethernet port |
| ⑦ | USB port | Type-A interface, USB2.0 protocol |
| ⑧ | Mic In | Audio signal input |
| ⑨ | Line In | Audio signal input |
| ⑩ | Line Out | Audio signal output |
| ⑪ | DP port | DP display interface |
| ⑫ | HDMI port | HDMI display interface |
| ⑬ | LAN3 port | Ethercat master |

# 2.Product specification

|  |  |
| --- | --- |
| Product model | SP5010 |
| Operating system | Linux+Windows10 |
| Processor | HYGON 3350 |
| Memory | 16GB ，up to 128GB |
| System hard disk | 256G SATA SSD +512G SATA SSD |
| MAX axis capability | 128 axes |
| Axis capability | 16 axes/500us  32 axes/1ms |
| LAN Ethernet | 2 onboard channels + 1 expansion channel |
| COM serial port | 2\*COM(RS485)+2\*COM(RS232) |
| USB interface | 4\* USB 3.0+5\*USB 2.0 |
| DIDO interface | Not supported |
| Display interface | 1\*HDMI+1\*DP |
| Audio interface | 1\* Mic In + 1\* Line In + 1\* Line Out |
| Expansion slot | Not supported |
| Indicator light | Front panel: Power indicator |
| Switch | Push button switch |
| Power supply | AC220V |
| Power | Standard 350W |
| Installation manner | Rack mount |
| Exterior dimensions | 482(W)\*400(D)\*44.5(H) mm |
| Storage temperature | -20~70℃ |
| Operating temperature | 0~40℃ |

# 3.Mechanical installation

## 3.1 Installation precautions

Installation Considerations for Industrial Intelligent Computer(hereinafter referred to as “iComputer”):

* Before installation, make sure the product is powered off;
* Prevent the controller's housing, terminal strip, or connector from falling or being impacted to avoid damaging the controller;
* Do not disassemble the module, as this may damage the machine;
* Do not block or cover the openings on the housing of iComputer as they are for air convection.
* Prevent wires from passing the air inlet/outlet of iComputer;
* Be cautious that the heat dissipation temperature at the air outlet of iComputer is high.

## 3.2 Preparation before installation

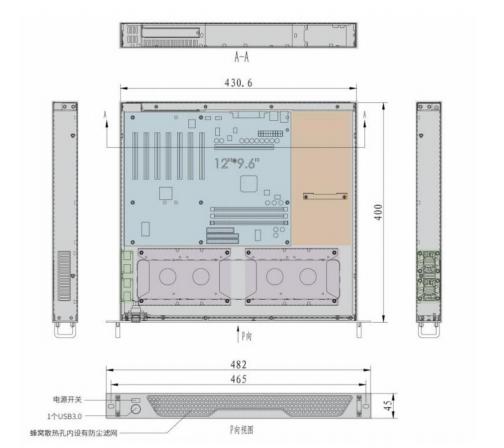
### 3.2.1 Installation environment requirements

The iComputer should be installed on the basis of full consideration of operability, maintenance, and environmental resistance. Do not install the module in the following places.

* Places where the ambient temperature exceeds the range of -10°C~ +55°C;
* Places where the ambient humidity exceeds the range of 5%RH~ 95%RH;
* Places where the temperature changes drastically and condensation is generated;
* Places with corrosive gases and flammable gases;
* Places with a lot of conductive powders such as dust and iron powder, oil mist, salt, and organic solvents;
* Places exposed to direct sunlight;
* Places where strong electric and magnetic fields occur;
* Places where the body will be subjected to direct vibration and conductive impact.

## 3.3 Installation dimension

● Installation dimensions (unit: mm.)



# 4. Electrical installation

## 4.1 Wiring recommendations

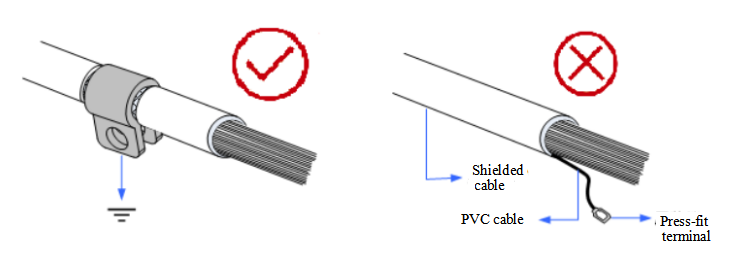
### 4.1.1 Grounding requirements

This type of iComputer is equipped with a three-pin power plug, one pin of which is dedicated to grounding. To connect the metal shell of the iComputer with the ground wire, the power socket with three pins must be offered, which shall be properly connected with the ground wire of the electrical system of the building.

* **Shielded cable grounding**

Shielded cables must be used for communication signals. The ground point shall be as close as possible to the module, so that the grounded cable is not affected by electromagnetic induction from the cable before grounding. For the bared shielding part of the shielded cable after the outer skin is peeled off, it should be grounded with a large area as much as possible to ensure good contact.

For welding PVC wires to the shielding part of shielded cables, grounding the front end will increase high-frequency impedance and weaken the shielding effect and such method should be avoided as much as possible. The shielded cables of communication signal cable need to be grounded at both ends.



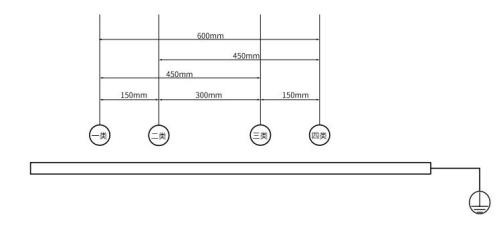
Schematic Diagram of Signal Cable Grounding 1

### 4.1.2 Wiring requirements

Low-voltage cables (<1KV) are generally divided into four categories, only the same type of cable can be put together to form a cable bundle. Different types of cables should be separated to avoid being crossed and overlapped. Right-angle crossing shall be available if necessary.

|  |  |  |
| --- | --- | --- |
| **Serial No.** | **Category** | **Application object** |
| 1 | Category 1 | Ethernet port, EtherCAT network port |
| 2 | Category 2 | Low-speed digital communication signals (RS232, RS485, etc.) and digital I/O signals |
| 3 | Category 3 | Low-voltage AC power distribution line or DC power line (e.g. DC 24V power line for switch power supply output) |
| 4 | Category 4 | Input and output cables, welding machine cables, power converter power cables |

Different types of cables need to be spaced at a certain distance, and for cables whose length is lower than 30 meters, the minimum allowable spacing is shown in the figure below.



Schematic diagram of cabling requirements for each type of cable 1

Notes

* When the length of the cable horizontal routing increases, the spacing should be increased appropriately;
* In addition to maintaining the spacing, it is also possible to add multiple shielding plates between different types of cables to achieve shielding. To reduce cross-interference, all cables should be routed as close as possible to the structural components that are grounding connected to the cabinet, such as the cabinet’s assembly plates or brackets.

## 4.2 Communication interface wiring

### 4.2.1 Serial communication specifications

COM1 and COM2 support RS485 protocol. COM3 and COM4 support RS232 protocol.

* **Description**

By default, the serial ports are on the real-time side and do not support virtualization.

* **Communication interface diagram**



* **Serial communication interface definition**

|  |  |  |
| --- | --- | --- |
| **COM1, COM2, COM3 and COM4 PIN Assignments** | | |
| Pin | RS-232 | RS-485 |
| Signal Name | Signal Name |
| 1 | DCD | DATA- |
| 2 | RxD | DATA+ |
| 3 | TxD | NC |
| 4 | DTR | NC |
| 5 | GND | GND |
| 6 | DSR | NC |
| 7 | RST | NC |
| 8 | CTS | NC |
| 9 | RI | NC |

* **RS485 Communication specifications**

|  |  |
| --- | --- |
| **Item** | **Specification** |
| Baud rate | 4.8K, 9.6K, 19.2K, 38.4K, 57.6K, 115.2K |
| Maximum number of slave stations | 31 |
| Supported protocols | Modbus RTU protocol and free protocol |
| Isolation method | Isolation |

* **RS485 bus wiring instructions**

Notes:

At the time of wiring, forbid to bundle the extending cable with power lines (high voltage, high current) and other cables that transmit strong interference signals. Extending cable should be routed separately and avoid horizontal routing. Recommend to use cables and adapter boards for connection and select shielded cables as expansion cables to improve anti-interference capabilities.

It is recommended to use shielded twisted pair cables to connect RS485 bus. 485+ and 485- shall be connected with twisted pair cables; Only 120Ω termination matching resistors are connected at each end of the bus to prevent signal reflection; The reference ground of all node 485 signals is connected together; A maximum of 32 nodes can be connected, and the distance between the branches of each node should be less than 3 meters.

* **RS232 communication specifications**

|  |  |
| --- | --- |
| **Item** | **Specification** |
| Baud rate | 4.8K，9.6K，19.2K，38.4K，57.6K，115.2K |
| Maximum number of slave stations | 1 |
| Supported protocols | Modbus RTU protocol and free protocol |
| Isolation method | Isolation |

### 4.2.2 Network port communication specification

This series of network ports can be allocated and configured for Linux and windows and ring network setting through configuration software.

|  |  |
| --- | --- |
| **Network Port** | **Function** |
| LAN1 | Debug the network port, default IP address: 192.168.1.200 |
| LAN2 | Windows network port |
| LAN 3 | Ethercat master network port |

* **Definition of network port indicator**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Indicator** | **Function** | **Color** | **Status** | **Description** |
|  | A:Link/Act | Yellow |  | Remain OFF: Not linked |
|  | Blink: Linked and sending/receiving data |
|  | Remain ON: Linked |
| B: Speed | Green |  | Remain OFF: Not connected |
|  | Blink: 100/1000Mbps connection |
|  | Remain ON: 1000Mbps connection |

### 4.2.3 EtherCAT communication specifications

* **EtherCAT Specification**

|  |  |
| --- | --- |
| **Network Port** | **Function** |
| Number of channels | 1 |
| Communication protocols | EtherCAT Protocol |
| Support services | COE（PDO,SDO） |
| Synchronization mode | Servo: DC - Distributed Clock  IO: Input-output synchronization |
| Physical layer | 100BASE-TX |
| Baud rate | 100Mbit/s |
| Duplex mode | Full-duplex |
| Topology | Linear topology |
| Transmission medium | RJ45 network cable |
| Transmission distance | The two nodes are less than 100m |
| EtherCAT frame length | 44 bytes ~ 1486 bytes |
| Process data | A single Ethernet frame can be up to 1486 bytes |
| Jitter between two slaves | <1μm |
| Auto-scan function | Support |

### 4.2.4 Communication cable connection requirements

Communication has strict requirements for communication cables, and it is required to use super-Category 5 and above shielded network cables, and the requirements are as follows.

* **Cable requirements**

Shielded Ethernet cable

Network Port Connector Crystal Head-8P8C-3 Forks

Network Port Connector Crystal Head-8P8C-3 Forks

26AWG super-Category 5 twisted pair shielded cable

Ordinary network cables

|  |  |  |  |
| --- | --- | --- | --- |
| **Pin** | **Signal (Ethernet 1000Mbps)** | **Signal direction** | **Signal description** |
| 1 | TD+ | Output | Data transmission+ |
| 2 | TD- | Output | Data transmission- |
| 3 | RD+ | Input | Data reception+ |
| 4 | -(DC+) | - (Bidirectional) | Not used (Data C+) |
| 5 | -(DC-) | - (Bidirectional) | Not used (Data C-) |
| 6 | RD- | Input | Data reception- |
| 7 | -(DD+) | - (Bidirectional) | Not used (data D+) |
| 8 | -(DD-) | - (Bidirectional) | Not used (data D-) |

* **Note**

At 1000Mbps and 100Mbps Ethernet baud rates, the definitions of pins 4, 5, 7, and 8 are not the same.

* **Length requirements**

FastEthernet technology confirms that when the EtherCAT bus is adopted, the length of the cable between devices should not exceed 100 meters, and more than this length will attenuate the signal and affect normal communication.

* **Technical requirements**

100% conduction test, no short circuit, open circuit, misalignment or poor contact. The EtherCAT bus uses shielded cables for network data transmission, and the following network cables are recommended:

|  |  |
| --- | --- |
| **Item** | **Specification** |
| Cable type | Flexible crossover cable, S-FTP, super-Category 5 |
| Standards | EIA/TIA568A,EN50173,ISO/IEC11801  EIA/TI Abulletin TSB,EIA/TIA SB40-A&TSB36 |
| Wire section | 26AWG |
| Wire type | Twisted pair cable |
| Pairs | 4 |

* **The following table shows the relationship between the number of EtherCAT bus nodes, the cable impedance, and the transmission distance:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Maximum number of nodes | Cable impedance | 16 | 32 | 64 |
| Transmission distance | 88 ohms/km | 215m | 200m | 170m |
| 93 ohms/km | 205m | 185m | 160m |
| 157 ohms/km | 120m | 110m | 95m |

## 4.3. Specification of display interface

**4.3.1 DP interface specifications**

* **iComputer adopts standard DP display interface, and the main specifications are as follows：**

|  |  |
| --- | --- |
| **Item** | **Specification** |
| Signal type | Digital DP1.2 |
| Highest resolution | 1920x1080@60Hz |
| Whether hot plug is supported | Support |

* **Definition of DP terminal pin is as follows:**



|  |  |  |
| --- | --- | --- |
| **Serial No.** | **Describe** | **Function** |
| 1 | ML\_Lane 0（p） | Main link channel 0: differential signal |
| 2 | GND | - |
| 3 | ML\_Lane 0（n） | Main link channel 0: differential signal |
| 4 | ML\_Lane 1（p | Main link channel 1: differential signal |
| 5 | GND | - |
| 6 | ML\_Lane 1（n） | Main link channel 1: differential signal |
| 7 | ML\_Lane 2（p） | Main link channel 2: differential signal |
| 8 | GND | - |
| 9 | ML\_Lane 2（n） | Main link channel 2: differential signal |
| 10 | ML\_Lane 3（p） | Main link channel3: differential signal |
| 11 | GND | - |
| 12 | ML\_Lane 3（n） | Main link channel 3: differential signal |
| 13 | GND | - |
| 14 | GND | - |
| 15 | AUX\_CH（p） | Auxiliary channel: differential signal |
| 16 | GND | - |
| 17 | AUX\_CH（n） | Auxiliary channel: differential signal |
| 18 | Hot Plug | Hot plug detection |
| 19 | DP\_PWR Return | Interface power feedback signal |
| 20 | DP\_PWR | Power supply: +3.3V |

### 4.3.2 HDMI **interface specifications**

* **iComputer adopts standard HDMI display interface, and the main specifications are as follows：**

|  |  |
| --- | --- |
| **Item** | **Specification** |
| Signal type | Digital HDMI |
| Highest resolution | 1080P |
| Whether hot plug is supported | Support |

* **Definition of HDMI terminal pin is as follows:**



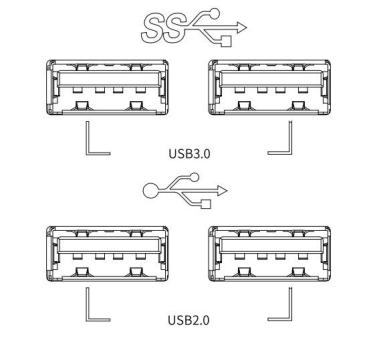
|  |  |
| --- | --- |
| **Serial No.** | **Signal** |
| 1 | TMDS Date 2+ |
| 2 | TMDS data 2 masked |
| 3 | TMDS data 2 - |
| 4 | TMDS data 1+ |
| 5 | TMDS data 1 masked |
| 6 | TMDS Data 1- |
| 7 | TMDS data 0+ |
| 8 | TMDS data 0 masked |
| 9 | TMDS data 0- |
| 10 | TMDS clock+ |
| 11 | TMDS clock masked |
| 12 | TMDS clock |
| 13 | CEC |
| 14 | HEC data |
| 15 | SCL (DDC Serial Clock) |
| 16 | SDA (DDC Serial Data Line) |
| 17 | DDC/CEC/HEC floor |
| 18 | +5V Supply (50mA Max) |
| 19 | Hot plug detection (1.3) / HEC Data + (1.4) |

## 4.4 USB interface

* **iComputer adopts a standard USB interface, and the main specifications are as follows:**

|  |  |  |
| --- | --- | --- |
| **Item** | **USB3.0** | **USB2.0** |
| Maximum communication rate | 5.0Gbp s | 480Mbps |
| 5V maximum output current | 1000mA | 500mA |
| Maximum communication distance | 3m | 5m |
| Isolation or not? | Not | Not |

* **The interface format is shown as the following figure:**



* **Note**

1. Please choose industrial-grade USB equipment for industrial applications to ensure reliability.
2. Long-term connections are not recommended for USB devices. Besides, comply with wiring standards so as to prevent the equipment from being intervened and ensure favorable communication performance.
3. In case of irrevocable interference, magnetic rings can be added at both ends of the communication cable to filter out interface and improve anti-interference performance.

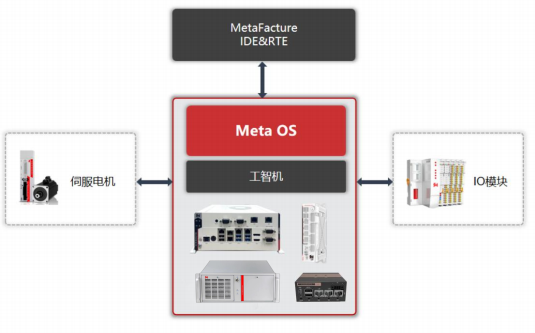
# 5. Operating instructions

## 5.1Operating system

* **MetaOS**

The MetaOS dual operating system embeds a real-time kernel in the Linux kernel to form a stable and isolated dual-kernel architecture, building a real-time domain based on the real-time kernel and a non-real-time domain based on the Linux kernel. The real-time domain specializes in handling tasks that require a certain incident response time, achieves hard real-time, and provides strict real-time assurance for tasks, while non-real-time domains provide rich operating system services for other tasks. Such two domains operate independently and do not interfere with each other. SP5000 series iComputers integrate traditional upper industrial computer and lower PLC, running real-time control tasks and data acquisition tasks in the real-time domain of

the iComputer, and deploy and apply upper-level programs in the non-real-time domain.



## 5.2 Power on

Before turning on the iComputer, make sure they are fully configured. After 50~60 seconds since the iComputer is powered on, the iComputer enters the operation mode.

* **Follow the steps below for the first startup:**

1. After installing the iComputer, connect the display device, and turn on the power supply;
2. Automatically log in for the first time and enter the operating system desktop, as shown in the figure below;



* **Note**

1. The default factory default version of Windows is not activated.

## 5.3 Power off

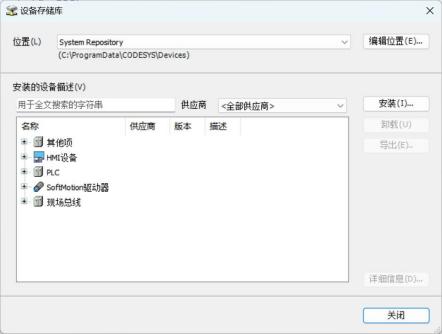
* **Please follow the steps below to turn off the iComputer**

1. Properly stop all running programs.
2. Shut down the operating system.
3. Turn off the external power to shut down the iComputer.

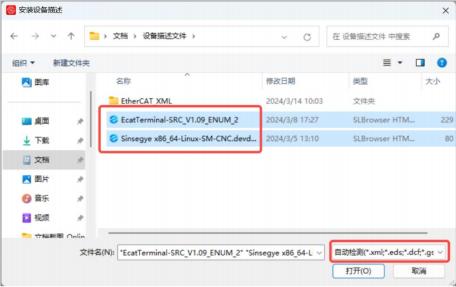
## 5.4 Programming & Debugging

### 5.4.1 Add device

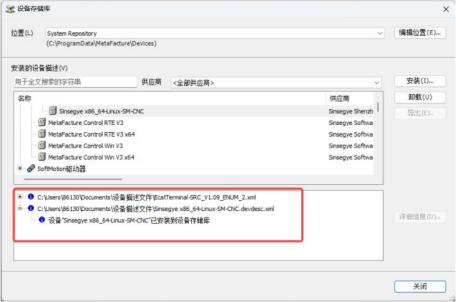
1. Download the corresponding Sinsegye device description file to the local.
2. In MetaFacture, click[Tools]> [Device repository..] in the menu bar;
3. Click [Install (I)...]



1. Find the directory where the device description file is stored, select [Auto Detect] as the file detection type in the lower right corner, select the device description file of SP5010 iComputers, “Sinsegye-x86\_64-Linux-SM-CNC.devdesc.xml”, and SRC8200 device description file, “EcatTerminal-SRC\_V1.09\_ENUM\_2.xml”, and click [Open], showing the equipment has been installed.

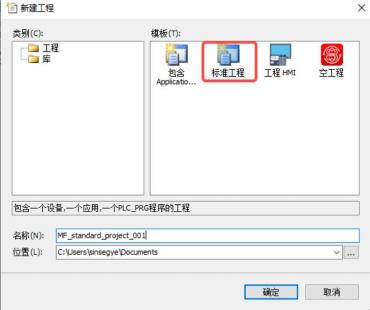


1. Close [Close] to close the dialog box.

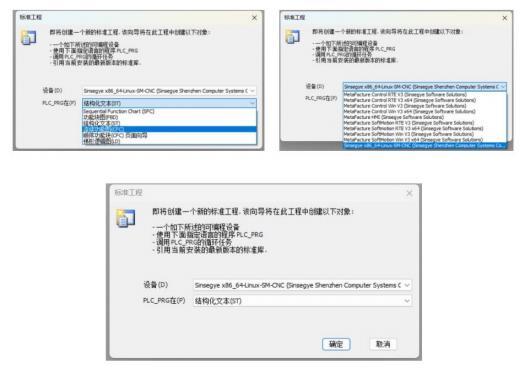


### 5.4.2 Connect the device

1. Open [New Project] panel, select[Project] for type, select [Standard Project] for the template, and enter the self-defined project name and the location where the project is saved, and click [OK].



1. Select a PLC in [Device (D)] list (if not finding the corresponding PLC, please confirm that the device has been installed correctly, please refer to “Adding a Device” for specific steps) ,and select a commonly used programming language in the [PLC\_PRG (P)] drop-down list, and click [OK].



1. In MetaFacture, double click [Device] in the device window to open the Device page. Make sure that the iComputer is connected to the network and is on the same network segment as the computer with MetaFacture installed.

Method 1: Enter the IP address of the PLC and press [Enter]

Method 2: Click [Scan Network] and select the corresponding device from the pop-up scan results



* **Note**

The default IP address of the debug port of the iComputer is 192.168.1.200.

1. (Optional) After the PLC is successfully connected, you can rename the device to facilitate future scanning of the device, click [[Equipment]] > [Rename Active Device], enter a custom device name, and click [OK].



### 5.4.3 Programing

For more information about the programming and debugging process, see *MetaFacture Basic Operations*.