中科时代
SINSEGYE

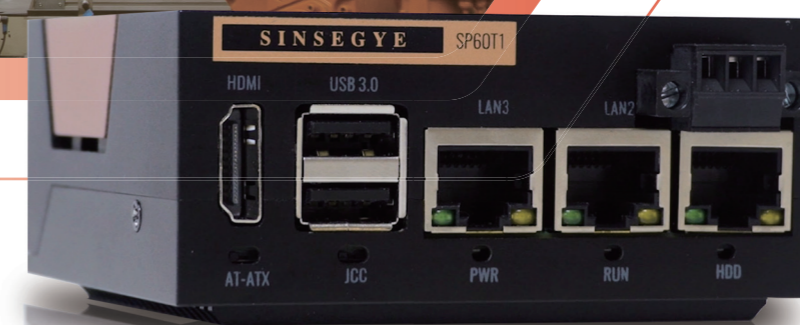## Trademark

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Manual of
SP6000 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 manual and 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

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.

Safety signs

In order to ensure work safety, please comply with the safety signs posted on the equipment. Do not damage or peel off the safety signs. The safety signs are described as follows:

Safety Signs	Content Description
	• Please read the safety manual and instructions carefully before using the equipment to avoid casualties or damage to the equipment!
	• Pay attention to the high temperature label and grounding label on the surface of the equipment. Please ground the equipment and take measures against high temperature, otherwise there will be a risk of casualties or product damage!

Power supply requirements

1. DC12-28V, support overvoltage protection, reverse connection protection, and powering-on the equipment;
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.
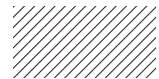3. Please do not use the equipment in a humid environment.

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1.2 Controller interface
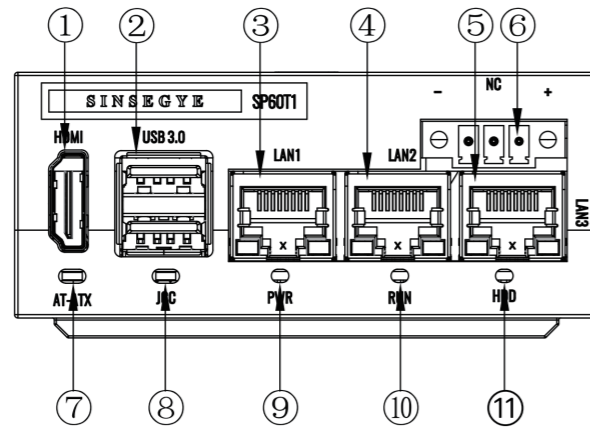
Serial No.	Interface name	Description
①	HDMI port	HDMI display port
②	USB port	Type-A interface, USB3.0 protocol
③	LAN1	Gigabit Ethernet port, IPV4: 192.168.1.200 Subnet mask: 255.255.255.0
④	LAN2	Ethercat master,network name:eth1
⑤	LAN3	Ethercat master,network name:eth2
⑥	Power supply interface	24V power supply output
⑦	AT-ATX dial	Left AT:powered-on auto start; Right ATX: non power-on auto start
⑧	JCC dial	Right clear MOS; Left not clear MOS
⑨	PWR	Power supply indicator
⑩	RUN	Run indicator
⑪	HDD	Disc indicator

2.PRODUCT SPECIFICATION

Product name	SP6000
Operating system	Linux+Windows10
Processor	Intel Atom
Memory	4GB
System hard disk	2*M.2 64G 2242
Motion control capability	16 axes
Display interface	1*HDMI
LAN ethernet	3-channel
USB	1*USB 3.0+1*USB 2.0
Power supply	12-28VDC, short circuit, overcurrent, and overload protection function
Heat dissipation	Die-cast aluminum integrated heat dissipation or copper tube heat dissipation
Installation	Wall Mount
Exterior dimensions	88(W)*85(H)*40(D)mm
Storage temperature	-40~60℃
Operating temperature	-5~60℃

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;

- Forbid to excessively tighten torque to avoid damage to the terminals and the machine;

- There should be air inlets and outlets on the left and right sides of the installation cabinet, and no wires can pass through the air inlets and outlets;

- The openings on the left and right sides of the iComputer are for ventilation, so do not block or cover them;

- The iComputer realizes heat dissipation through heat conduction by high-performance copper tube and large-area aluminum material. Be cautious to the high heat dissipation temperature at the air outlet.
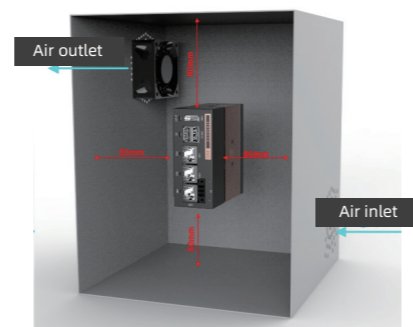
3.2 Preparation before installation

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.

3.2.2 Installation space requirements

In order to facilitate ventilation and module replacement, at least a certain amount of space should be reserved between the surrounding area of the module and the installation environment and surrounding components, as shown in the figure below.

Air outlet

Air inlet

3.2 Preparation before installation

- Installation dimensions (unit: mm.)

4. ELECTRICAL INSTALLATION

4.1 Wiring recommendations

4.1.1 Grounding requirements

A grounding point ⏚ is provided on the front ear of the industrial intelligence machine.Use the grounding wire as thick and short as possible (the wire length is less than 30cm) to ground the whole controller.

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.


Shielded cable

PVC cable

Press-fit terminal
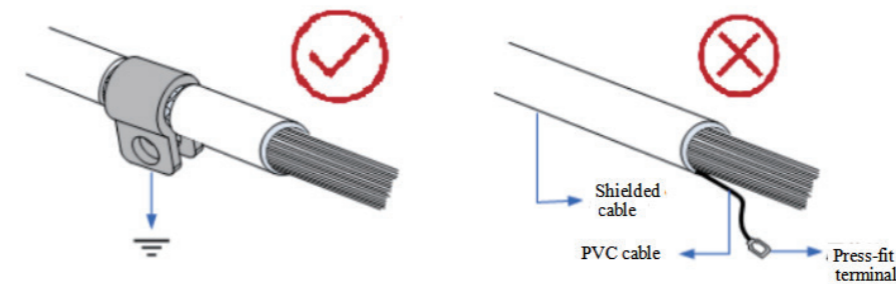
Schematic Diagram of Signal Cable Grounding 1

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.
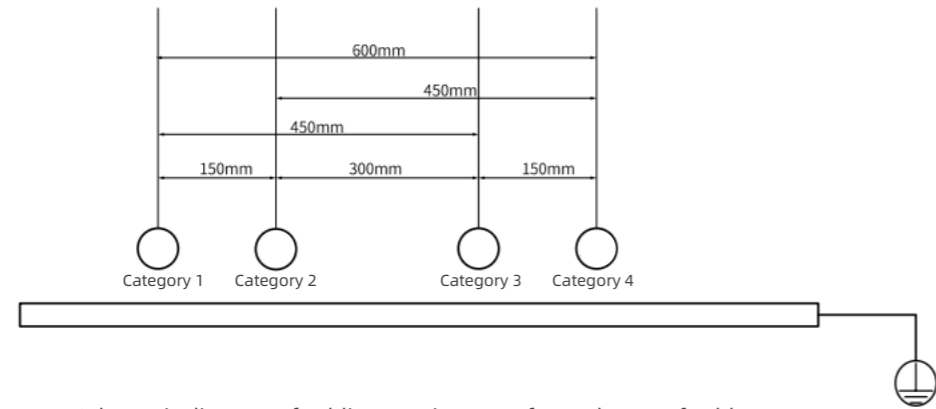
Schematic diagram of cabling requirements for each type of cable 1

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 Wiring of power supply input terminal

The power input terminal adopts pluggable 3Pin terminal fixed by screws and 3.81mm spacing. The power plug is connected to the power input interface as follows:

Definition of output terminal

Serial No.	Name of terminal	Type	Function
1	-	Output	DC input negative terminal
2	NC	Empty terminal	-
3	+	Input	DC input positive terminal

Power supply input specification

Serial No.	Item	Specification
1	Working voltage	20.4VDC~28.8VDC(21.0VDC -15%~+20%)
2	Rated voltage	24.0VDC
3	Withstand voltage	12.4VDC~36VDC
4	Power consumption	<30W
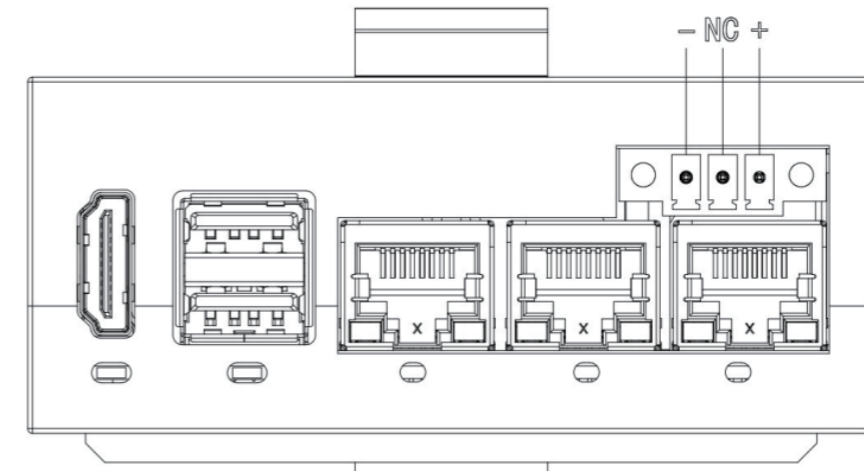
4.3 Communication interface wiring

4.3.1 Network port communication specification

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

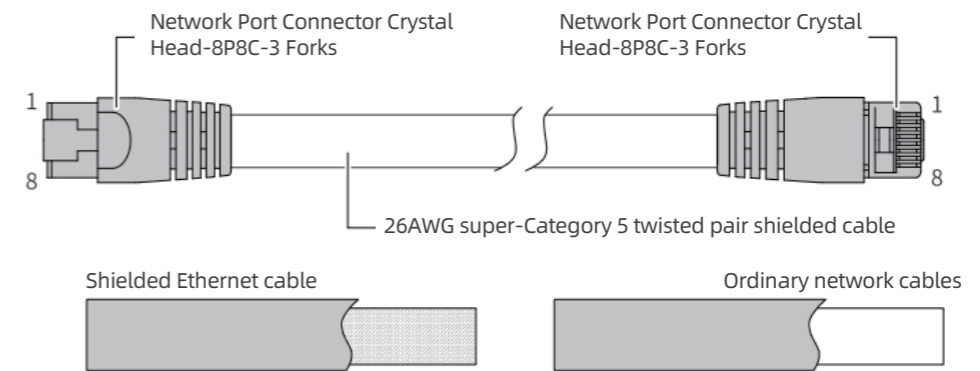| Network Port	Function
LAN1	Debug the network port, default IP address: 192.168.1.200
LAN2	Ethercat master network port
LAN3	Ethercat master network port

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

4.3.2 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

4.3.3 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

Network Port Connector Crystal Head-8P8C-3 Forks

Network Port Connector Crystal Head-8P8C-3 Forks

1

8

1

8

26AWG super-Category 5 twisted pair shielded cable

Shielded Ethernet 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-)

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
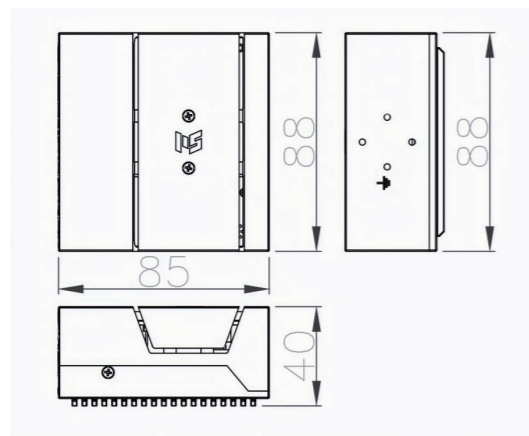
4.4 Specification of display interface

4.4.1 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:**
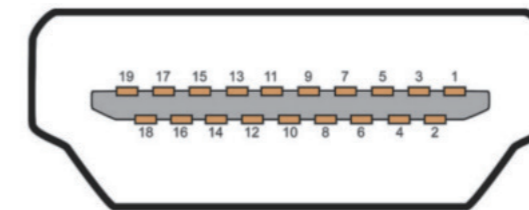
Serial No.	Signal
1	TMDS Date 2+
2	TMDS data 2 masked
3	TMDS data 2
4	TMDS data 1+
5	TMDS data 1 masked
6	TMDS Data 1-
7	TMDS data 0+
8	TMDS data 0 masked
9	TMDS data 0-
10	TMDS clock+
11	TMDS clock masked
12	TMDS clock
13	CEC
14	SCL (DDC Serial Clock)
15	SDA (DDC Serial Data Line)
16	CEC
17	DDC/CEC/HEC floor
18	+5V Supply (50mA Max)
19	Hot plug detection (1.3) / HEC Data + (1.4)

4.5 USB interface

iComputer has a total of 2 USB ports, 1 USB3.0 port, and 1 USB2.0 port, as shown in the following figure:

Item	USB3.0	USB2.0
Maximum communication rate	5.0Gbps	480Mbps
5V maximum output current	900mA	500mA
Maximum communication distance	3m	5m
Isolation or not?	Not	Not

The interface format is shown as the following figure:

USB3.0

USB2.0
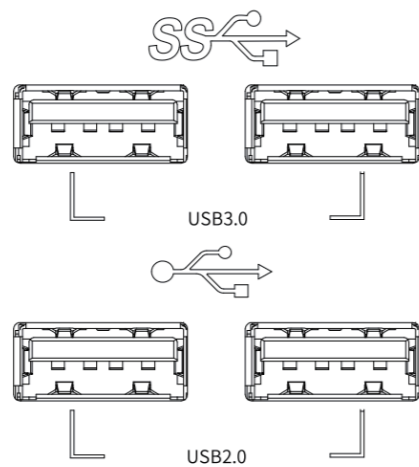
Note

- Please choose industrial-grade USB equipment for industrial applications to ensure reliability.

- 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.

- 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.

4.6 Interface of button switch

Item	Color	Status	Specification
Power supply indicator	Green	ON	The power supply is working normally
		OFF	The power supply is not working properly or there is no corresponding power loading.
Run indicator	Green	ON	The main controller is in RUN state, and the user program is running.
HDD indicator	Red	Flash	Be accessing HDD hard drive or the hard risk is normally reading/wiring.
		OFF	Unable to access or no access to HDD hard drive

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. SP60 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.
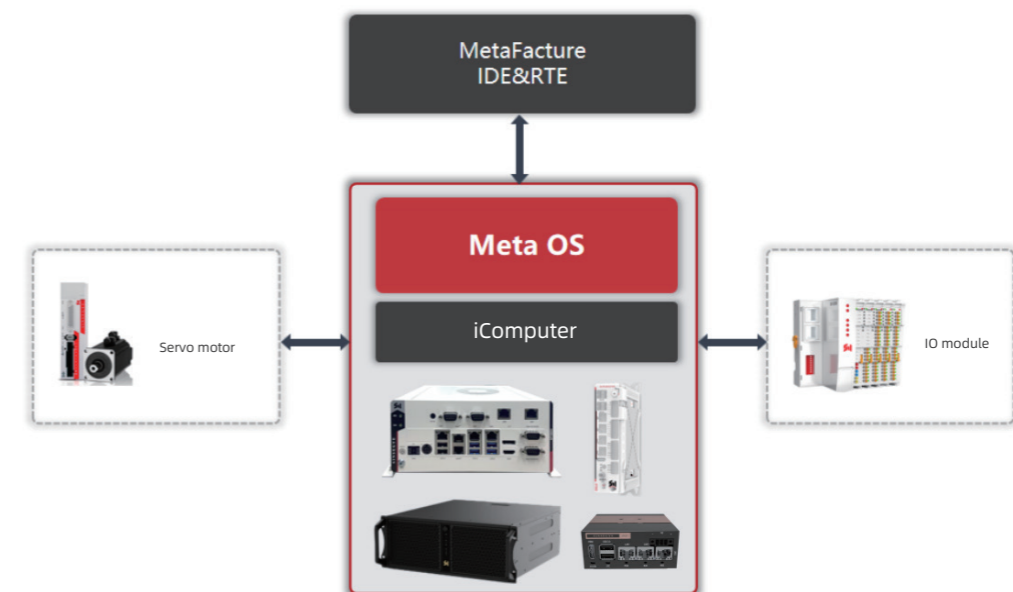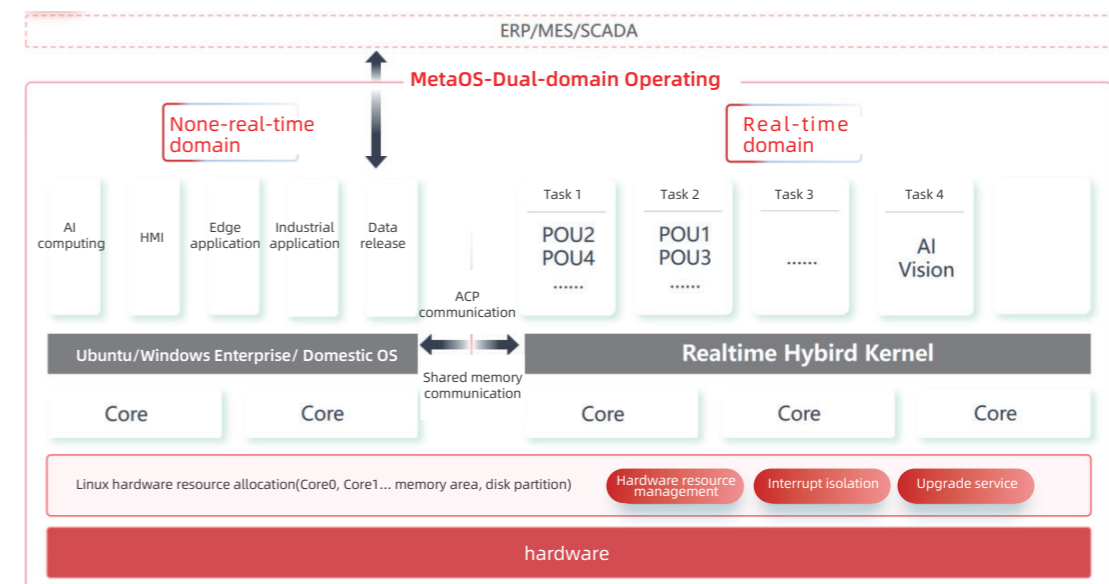
5.2 Power on

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:

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

Note

The default username for Ubuntu is Sinsegye, and the password is 1. To change the password, click on "Control Center", then "Account", and finally "Change Password" to reset the new password.

5.3 Power off

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

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

## 5.4 Programming & Debugging

5.4.1 Add device

- Download the corresponding Sinsegye device description file to the local.
- In MetaFacture, click[Tools]> [Device repository..] in the menu bar;

- Click [Install (I)...]
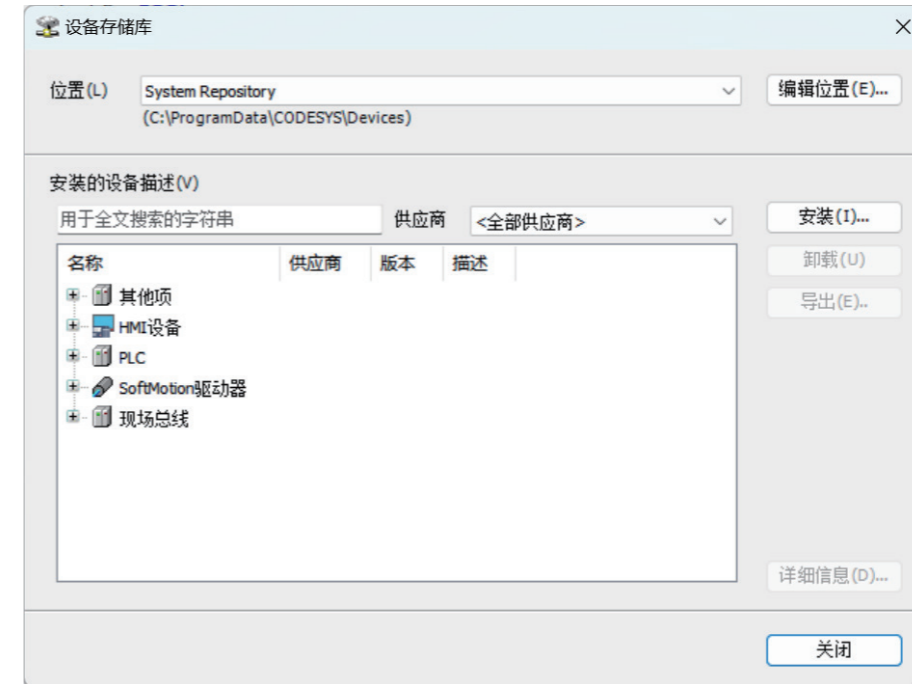
- Find the directory where the device description file is stored, select [Auto Detect] as the file detection type in the lower right corner, select the device description file of SP6000 iComputers, "Sinsegye-x86_64-Linux-SM-CNC.devdesc.xml", and SRC8200 device description file, "EcatTerminal-SRC_V1.09_ENUM_2.xml", and click [Open], showing the equipment has been installed.
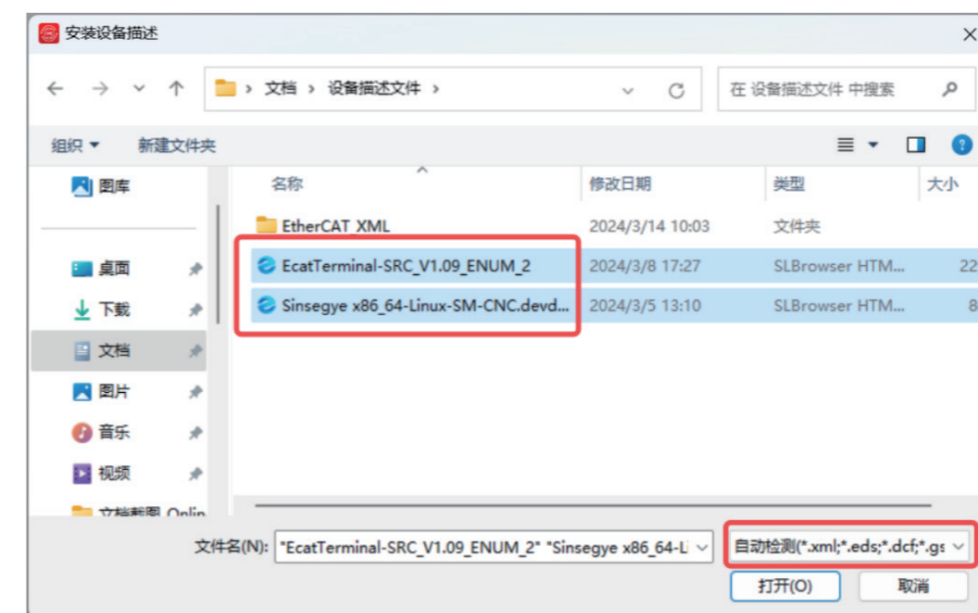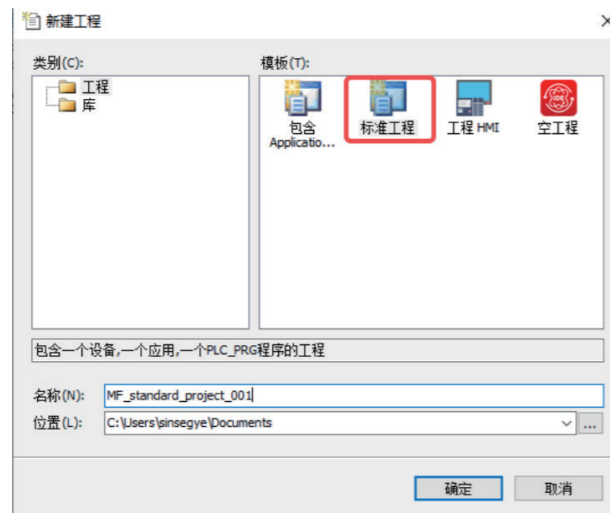
- Close [Close] to close the dialog box.
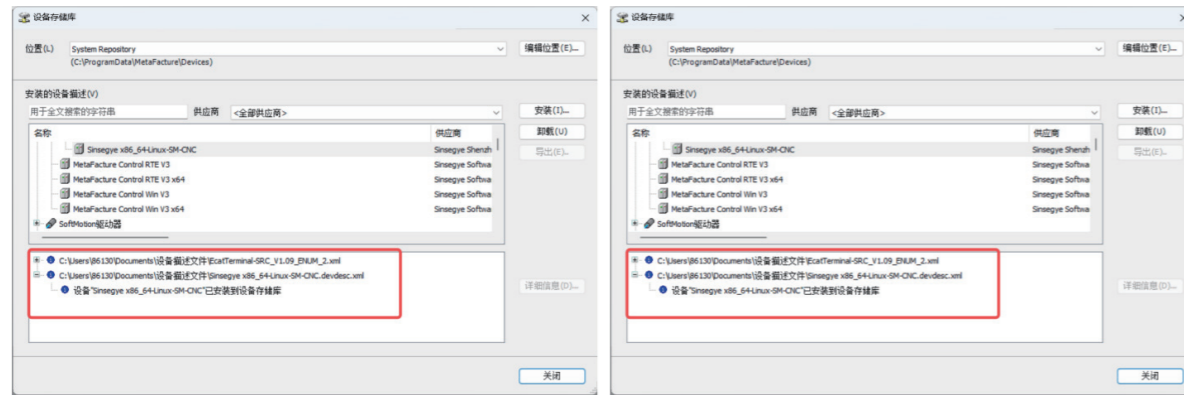
5.4.2 Connect the device

- 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].


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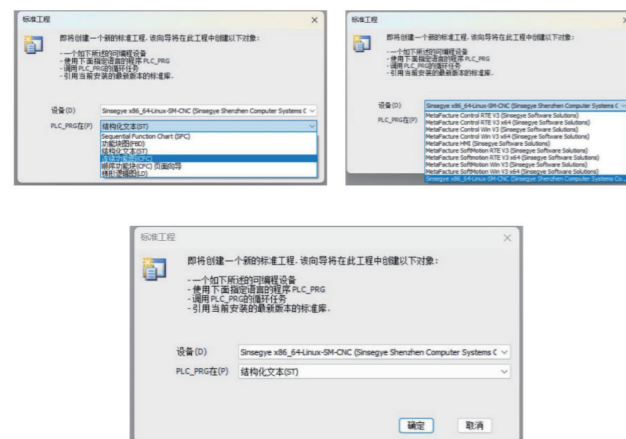
- In MetaFacture, double click [Device] in the device window to open the Device page. Make sure that the iComputer is connected to the network and is on the same network segment as the computer with MetaFacture installed.

 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
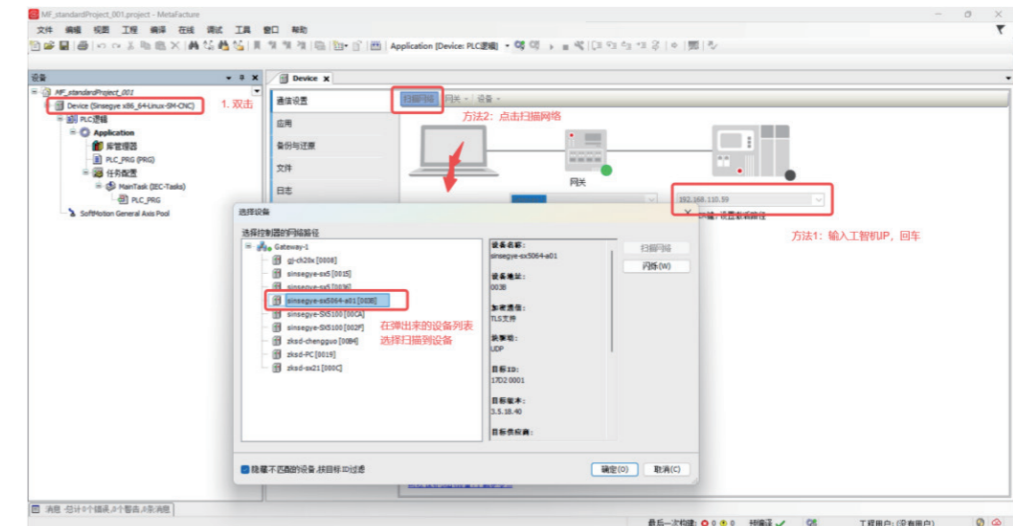
| Note |

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

- (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].
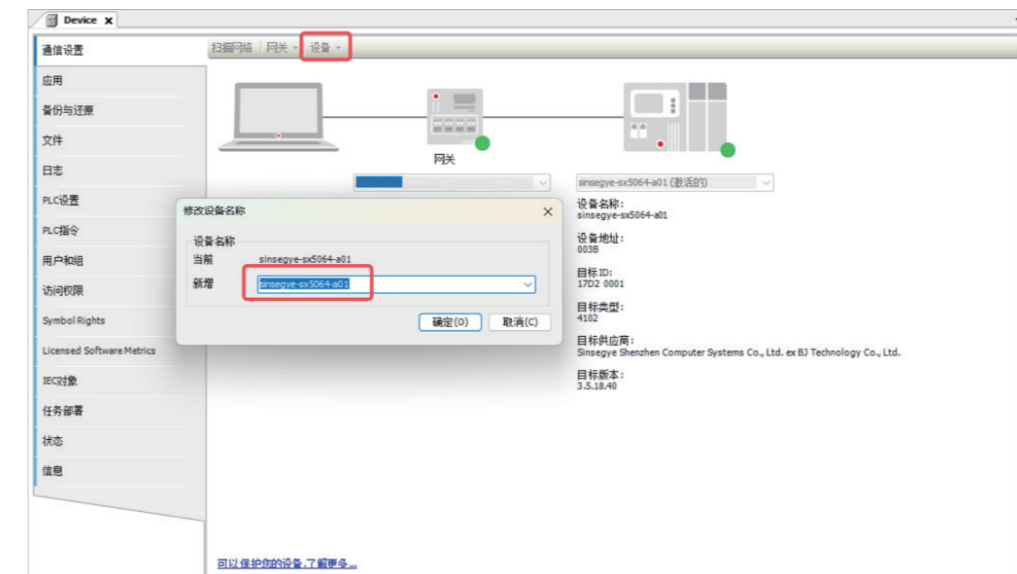
5.4.3 Programing

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