User Manual of SP6000 Series IPC
iComputer

Preface

Product introduction

SP series IPC iComputer is a series of PC-based industrial intelligent universal controllers based on X86 architecture, launched by Sinsegye. This series of iComputer integrates many functions such as logic control, motion control, industrial vision, and HMI. It has the characteristics of localization, integrated control and computation, high real-time performance and expandability. In addition to the abundant interfaces provided by the product body, some products support body I/O and PCIE interface expansion to meet various complex industrial field application requirements.

Manual user and scope

This manual is intended for the assembly, operation and maintenance of the equipment by technicians who have received the necessary training and obtained qualifications. Only professionals or trained and qualified personnel can assemble, replace and repair this equipment.

Version change record

Version No.	Revision date	Change content
V1.0	2024-05	First version of basic information
V2.0	2024-10	Integration Summary Notes of Revision 1
V3.0	2025-03	1.Proofread some details 2.Optimize the document layout
V4.0	2025-07	1.Proofread some details 2.Exterior Design Revision of iComputer

Access to this manual and resources

This manual is not shipped with the product. If you need an electronic version or a paper version, you can obtain it through the following channels:

- Log in to the official website of Sinsegye (https://www.sinsegye.com.cn) for download.
- Contact with the front technical support or sales agent to get it.
- Search and follow the WeChat official account of Sinsegye to obtain it from the official account.

Safety Precautions

Safety requirements

Please follow the instructions in this manual.

Power supply requirements

1、DC12-28V, supporting overvoltage protection and reverse connection protection, power-on startup.

2、Before you supply power to the equipment, please confirm that the power supply voltage meets the equipment requirements.

Routine maintenance

1、Do not open or disassemble the equipment by yourself. For safety reasons, this equipment can only be opened by professional service personnel.

2、Before cleaning the equipment with a damp cloth, the power cord must be unplugged from the outlet. Do not use any liquid or decontamination sprayer to clean the equipment.

3、If the equipment is not used for a long time, the power cord must be disconnected to prevent the equipment from being damaged by transient voltage.

4、Do not allow any liquid to flow into or spill into the equipment to avoid short circuit or fire.

Working environment

1、Please ensure that the equipment is placed on a secure flat surface before assembly. Accidental dropping or tipping over may cause damage to the equipment.

2、Do not cover or seal the openings in the equipment housing, which are used for air convection to prevent overheating of the equipment.

3、Do not use the equipment in a wet environment.

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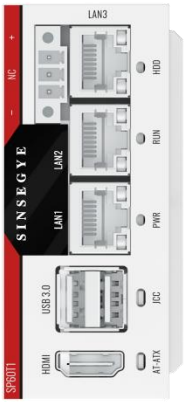
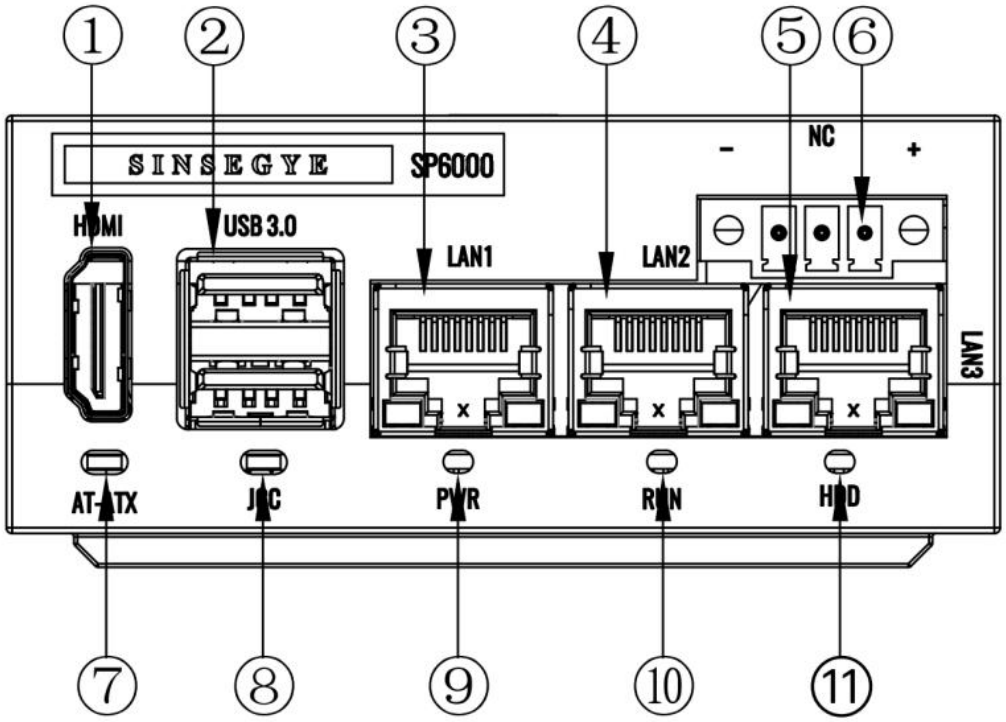
1. Product information

1.1. Controller appearance



1.2. Controller interface



No.	Interface name	Description
①	HDMI port	HDMI display interface
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 interface	24V power input
⑦	AT-ATX DIP Switch	Left AT: Power-on Auto-start; Right ATX: No Power-on Auto-start
⑧	JCC DIP Switch	Right: reset BIOS to factory default settings; Left: normal state
⑨	PWR	Power indicator
⑩	RUN	Running indicator
⑪	HDD	HDD indicator

2. Product specifications

Product model	SP6000-0000
Operating system	Linux
Processor	Intel Atom
Memory	4GB
System hard drive	2*M.2 64G
Motion control capability	32 axes
Display interface	1*HDMI
LAN Ethernet	3 channels
USB	1*USB 3.0+1*USB 2.0
Power input	24VDC
Power	30W
Mounting mode	Fastening to the rail
Dimensions	88 (W)*85 (H)*40 (D) mm
Storage temperature	-20~70℃
Operating temperature	0~40℃

3. Mechanical assembly

3.1. Assembly precautions

Precautions for iComputer assembly:

● Please ensure that the product is in power-off state before assembly;

● Do not let the housing, terminal strip and connector of the iComputer fall or be impacted to avoid damaging the controller;

● Do not disassemble any module. Otherwise, the machine may be damaged;

● Do not tighten the machine with excessive torque to avoid damaging the terminals and the machine;

● The panel of iComputer adopts aluminum plate for heat dissipation. Please pay attention to safety during use.

3.2. Preparation before assembly

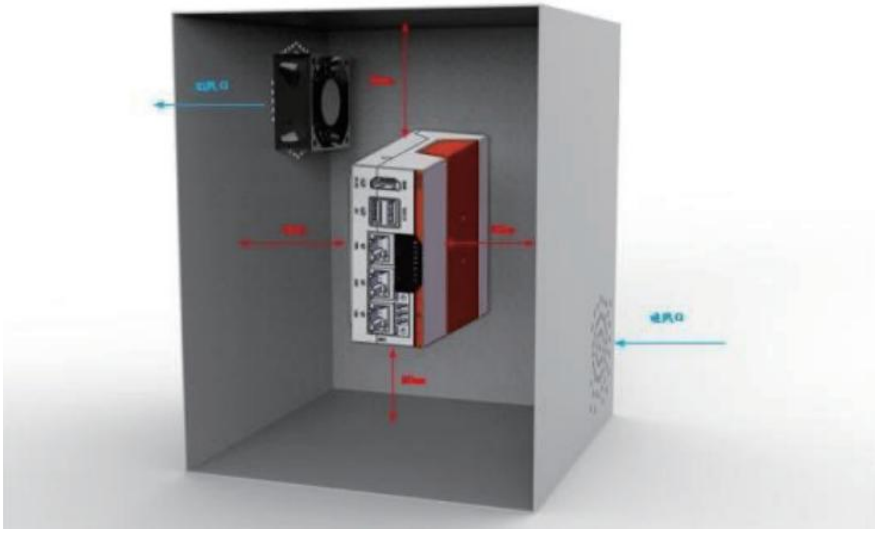
3.2.1. Requirements for assembly environment

The iComputer shall be assembled on the basis of full consideration of operability, maintainability and environmental resistance. Do not assemble the module in the following locations.

- Places where the ambient temperature exceeds 0°C-40°C;
- Places where the ambient humidity exceeds 10%RH~95%RH;
- Places with severe temperature change and condensation;
- Places with corrosive gas and combustible gas;
- Places with dust and iron powder and other conductive powder, oil mist, salt and organic solvents;
- Places under direct sunlight;
- Places with strong electric field and strong magnetic field;
- Places where the machine body may generate direct vibration and be subjected to conductive impact.

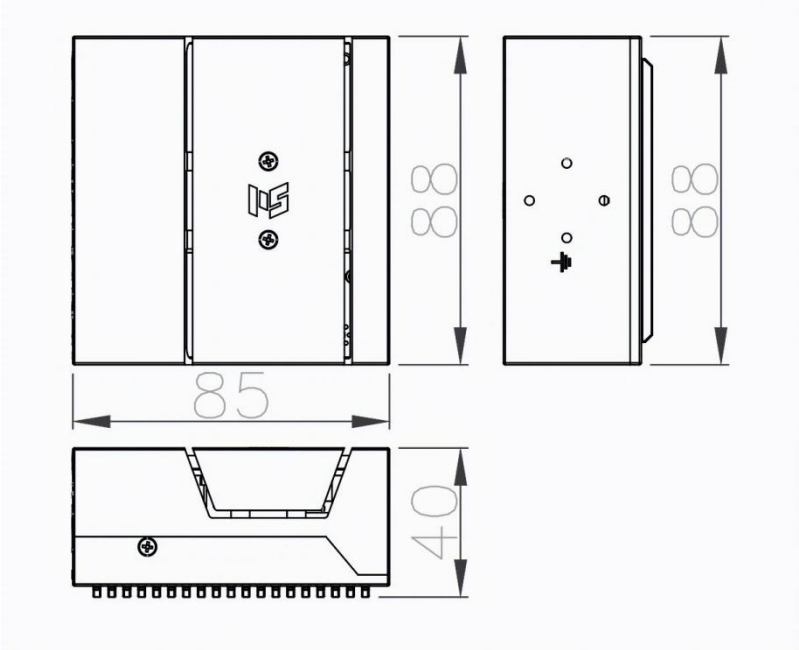
3.2.2. Assembly space requirements

In order to facilitate ventilation and module replacement, at least a certain space shall be reserved between the periphery of the module and the assembly environment and the surrounding parts. The reserved space and ventilation duct are shown in the diagram below



3.3. Assembly dimensions

● Assembly dimensions (unit: mm)



4. Electrical installation

4.1. Wiring recommendations

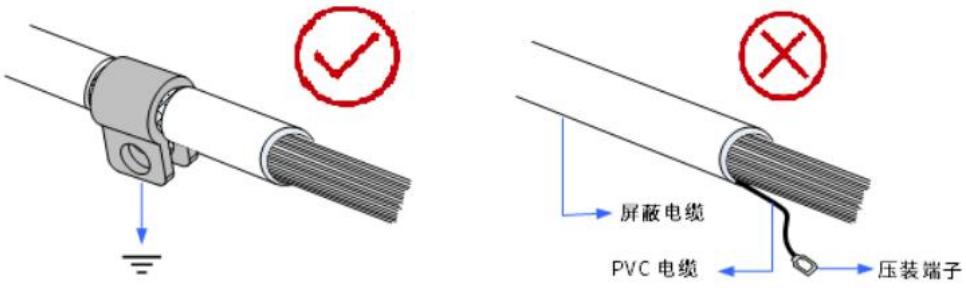
4.1.1. Grounding requirements

A grounding point  is arranged on the rear hanger of the iComputer. Ground the entire controller with a grounding wire as short and thick as possible (the wire length is less than 30cm).

- **Shielded cable grounding**

The cable for communication signals must be a shielded cable. The cable shall be grounded as close to the module as possible so that the grounded cable is not affected by the electromagnetic induction of the cable before grounding. The exposed shielded part of the shielded cable after partial sheath stripping shall be grounded with a large area with the grounding point as far as possible to ensure good contact.

For welding PVC wires to the shielded part of the shielded cable, the method of grounding through the front end will increase the high-frequency impedance and weaken the shielding effect. Care should be taken to avoid using this method. The shielded wire of communication signal cables shall be grounded at both ends.



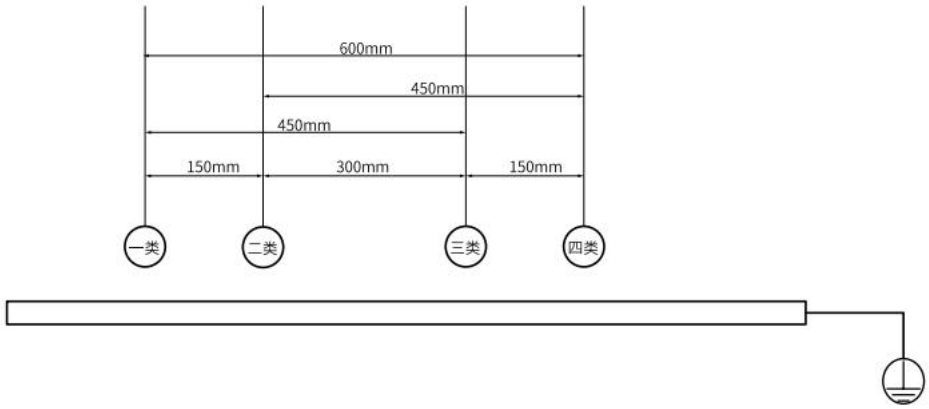
Schematic Diagram 1 of Grounding Requirements for Shielded Cables

4.1.2. Wiring requirements

Low-voltage cables (<1KV) are generally divided into four categories. Only the same category of cables can be put together to form a cable bundle. Different categories of cables shall be routed separately and shall not be crossed or overlapped generally. When crossing is unavoidable, right-angle crossing shall be adopted.

No.	Category	Application object
1	Category I	Ethernet port and EtherCAT port
2	Category II	Low-speed digital communication signals (RS232, RS485, etc.) and digital I/O signals
3	Category III	Low-voltage AC distribution wire or DC power cable (e.g. DC 24V power cable for SMPS output)
4	Category IV	Input and output cables, welding machine cables, and power converter power cables

Certain spacing is required between different categories of cables. For cables with a length of less than 30m, the minimum allowable spacing is as shown in the diagram below



Schematic Diagram 2 of Wiring Requirements for Various Cables

Description

- When the length of parallel cable runs is increased, the spacing shall be increased appropriately.
- In addition to keeping the spacing, a plurality of spliced shielding plates can be additionally arranged between different categories of cables to realize shielding. To reduce cross interference, all cables shall be routed as close as possible to structural parts (grounded) that are connected to the ground wire of the cabinet, such as the panel or rack parts of the cabinet.

4.2. Power input terminal wiring

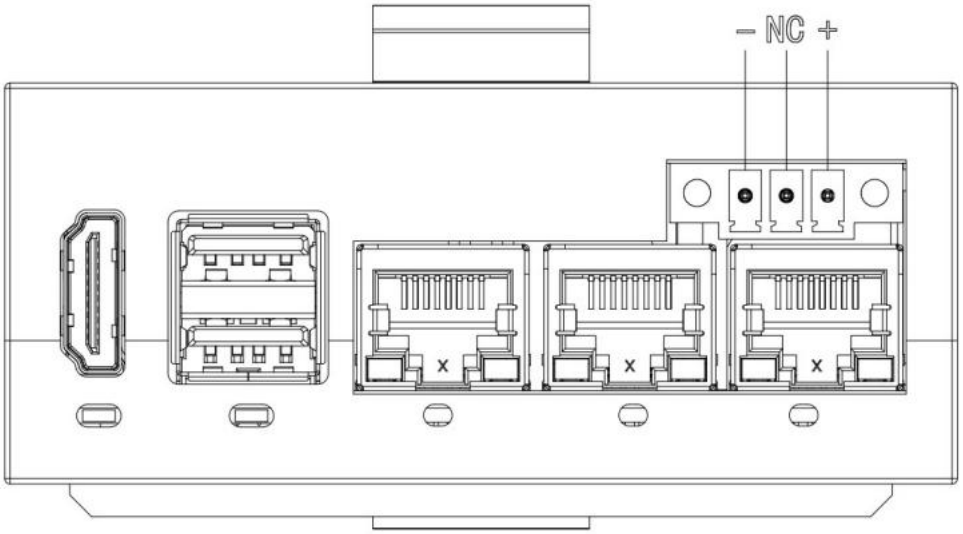
The power input terminals are screw-fixed, pluggable and 3.81mm-spaced 3Pin terminals. The power plug is connected to the power input interface as follows:

- **Input terminal definition**

S/N	Terminal name	Type	Function
1	-	Input	DC input negative terminal
2	NC	Empty terminal	-
3	+	Input	DC input positive terminal

- **Input power specifications**

S/N	Item	Specification
1	Operating voltage	20.4VDC~28.8VDC(21.0VDC -15%~+20%)
2	Rated voltage	24.0VDC



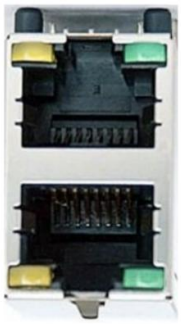
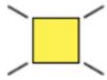
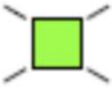
4.3. Communication interface wiring

4.3.1. Communication specification of network port

This series of network ports can be used for Linux allocation and ring network setup through configuration software.

Network port	Function
LAN1	Debug the network port, default IP: 192.168.1.200
LAN2	Ethernet port of Ethercat master station
LAN3	Ethernet port of Ethercat master station

- **Definition of network port indicators**

Indicator	Function	Color	Status	Description
	A:Link/Act	Yellow		Always Off: Not Connected
				Flashing: Connected and Data Transmitting/Receiving
				Always On: Connected
	B:Speed	Green		Always Off: Not Connected
				Flashing: 100/1000Mbps Connection
				Always On: 1000Mbps Connection

4.3.2. EtherCAT communication specifications

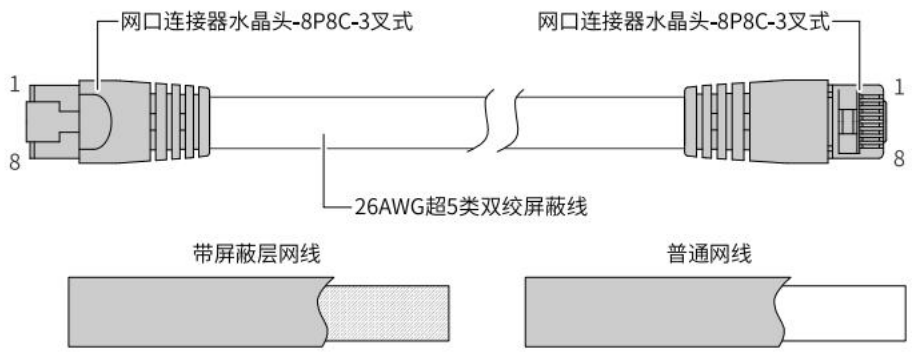
- **EtherCAT specifications**

Network port	Function
Number of channels	1
Communication protocol	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	Distance between adjacent nodes under 100 meters
EtherCAT frame length	44 bytes to 1486 bytes
Process data	Maximum 1486 bytes for a single Ethernet frame
Jitter between two slave stations	<1μs
Automatic scanning function	Support

4.3.3. Communication cable connection requirements

Communication has strict requirements for cables, and Cat5e or higher shielded network cables must be used. The specific requirements are as follows:

- **Cable requirements**



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+) *	- (two-way)	Not used (data C+)
5	-(DC-)	- (two-way)	Not used (data C-)
6	RD-	Input	Data reception -
7	-(DD+)	- (two-way)	Not used (data D+)
8	-(DD-)	- (two-way)	Not used (data D-)

- **Description**

  * When Ethernet baud rate is 1000Mbps and 100Mbps, the definitions of pins 4, 5, 7, and 8 are different.

- **Length requirements**

FastEthernet technology confirms that when the EtherCAT bus is used, the length of the cable between devices cannot exceed 100 m. If it exceeds 100 m, it will attenuate the signal and affect normal communication.

- **Technical requirements**

It shall pass the 100% continuity test, with no short circuit, open circuit, dislocation or poor contact. The Ethernet CAT bus adopts shielded cable for network data transmission. The following specifications of network cable are recommended:

Item	Specification
Cable type	Elastic crossover cable, S-FTP, Cat5e
Criteria	EIA/TIA568A，EN50173，ISO/IEC11801 EIA/TI Abulletin TSB，EIA/TIA SB40-A&TSB36
Conductor cross-section	26AWG
Conductor type	Twisted pair
Wire pair	4

- **The relationship between the number of EtherCAT bus nodes, cable impedance and transmission distance is shown in the table below:**

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

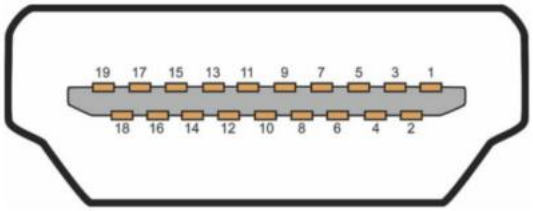
4.4. Display interface specifications

4.4.1. HDMI interface specifications

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

Item	Specification
Signal type	Digital HDMI
Maximum resolution	1080P
Whether hot plug is supported	Support

- **The HDMI terminal pins are defined as follows:**



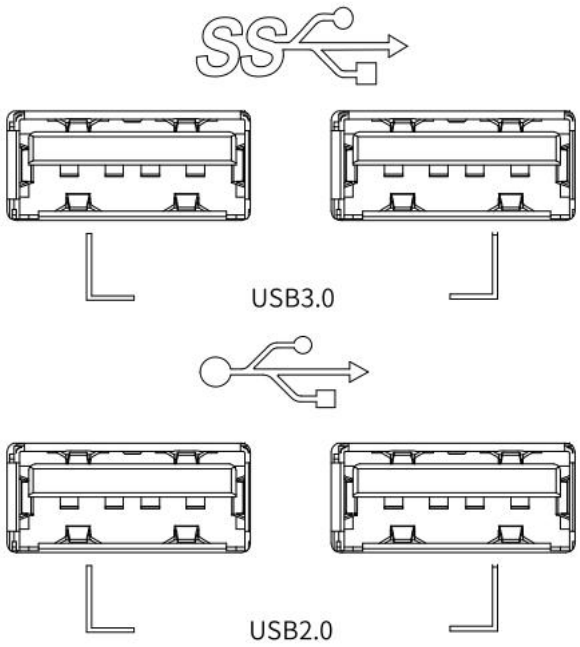
S/N	Signal
1	IDS Data 2+
2	TMDS Data 2 shield
3	TMDS Data 2-
4	TMDS Data 1+
5	TMDS Data 1 Shield
6	TMDS Data 1-
7	TMDS Data 0+
8	TMDS Data 0 Shield
9	TMDS Data 0-
10	TMDS Clock+
11	TMDS Clock Shield
12	TMDS Clock-
13	Ground
14	HEC Data
15	SCL (DDC Serial Clock)
16	SDA (DDC Serial Data Line)
17	DDC/CEC/HEC Ground
18	+5V Power (Max 50mA)
19	Hot Plug Detect (1.3)/HEC Data+ (1.4)

4.5. USB interface

- **The iComputer is provided with 2 USB ports, 1 USB3.0 port and 1 USB2.0 port. The port types are as shown in the diagram below:**

Item	USB3.0	USB2.0
Maximum communication rate	5.0Gbps	480Mbps
Maximum output current at 5V	1000mA	500mA
Maximum communication distance	3m	5m
Isolated or not	No	No

- **The interface forms are shown in the diagram below:**



- **Description**

1) For industrial applications, industrial-grade USB devices shall be selected to ensure the reliability of use.
2) USB devices should avoid long - cable connections, and proper wiring practices must be followed to prevent communication performance degradation due to interference.
3) When the interference cannot be eliminated, magnetic rings can be added at both ends of the communication cable for filtering, so as to improve the anti-interference performance.

4.6. Indicator specification

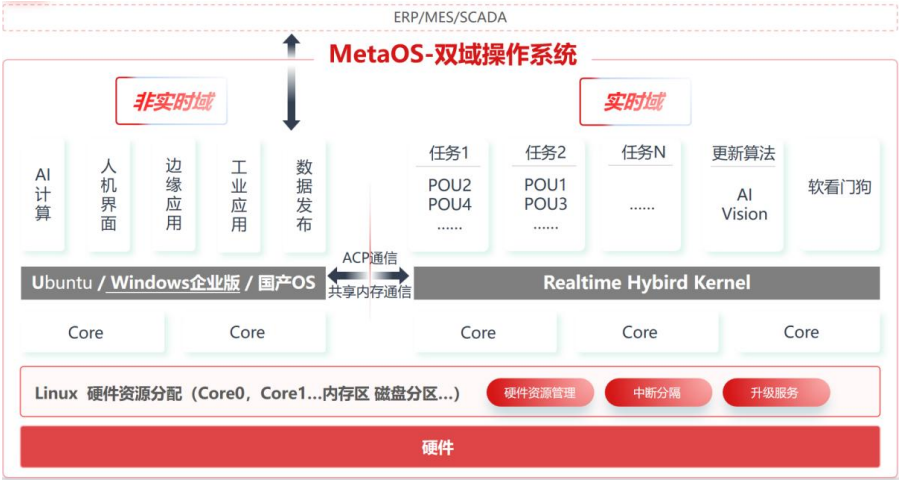
Item	Color	Status	Specification
Power indicator	Green	On	The power supply is working normally
		Off	The power supply is not working normally or the corresponding power supply is not loaded
Operation indicator	Green	On	The master controller is in the RUN state and the user program is running.
HDD indicator	Red	Flashing	The HDD is being accessed, or normal read/write operations are in progress.
		Off	The HDD cannot be or is not accessed

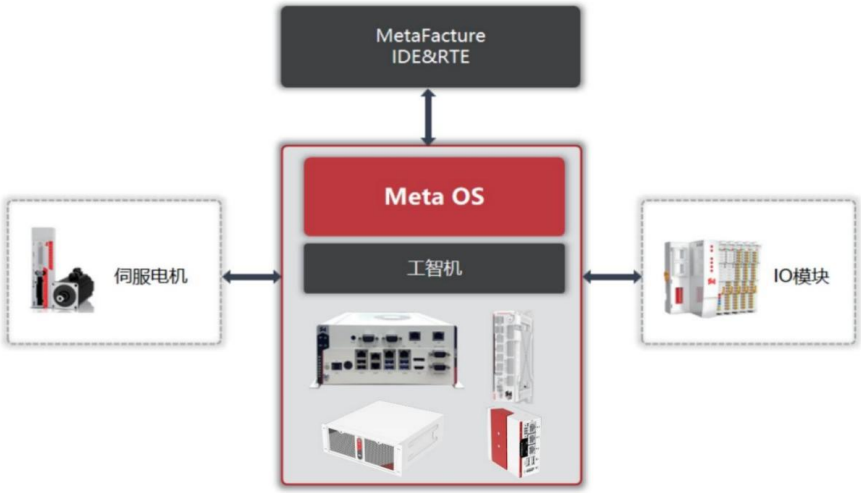
5. Operating instructions

5.1. Operating system

- **MetaOS**

In MetaOS dual operating system, a real-time kernel is embedded in Linux kernel, forming a stable and isolated dual-kernel architecture, that's, constructing a real-time domain based on real-time kernel, and constructing a non-real-time domain based on Linux kernel. The real-time domain is dedicated to processing the event response time tasks that need to be determined, realizes hard real-time and provides strict real-time guarantee for the tasks; meanwhile, the non-real-time domain provides rich operating system services for other tasks. The two domains operate independently and do not interfere with each other. SP6000 series iComputer integrates the traditional upper industrial computer and lower PLC into one. It can run a real-time control task and a data acquisition task in the real-time domain of the iComputer, and deploy and apply the upper program in the non-real-time domain.





5.2. Power on

Before turning on the iComputer, make sure the iComputer is fully configured. From power - on, the iComputer enters the operating mode after 50 to 60 seconds.

- **Follow these steps to power on the first time:**

1) After assembling the iComputer and connecting the display device, power on the system.
2) Log in automatically for the first time and enter the operating system desktop, as shown in the following diagram

- **Description**

  The default username of Ubuntu is Sinsegye, and the password is 1. To change the password, click “Control Center”→ "Account”→ “Change Password” to reset a new password

5.3. Power off

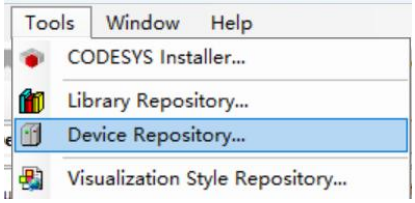
- **Please turn off the iComputer as follows**

1) Stop all running programs correctly.
2) Shut down the operating system.
3) Turn off the external power supply to turn off the iComputer.

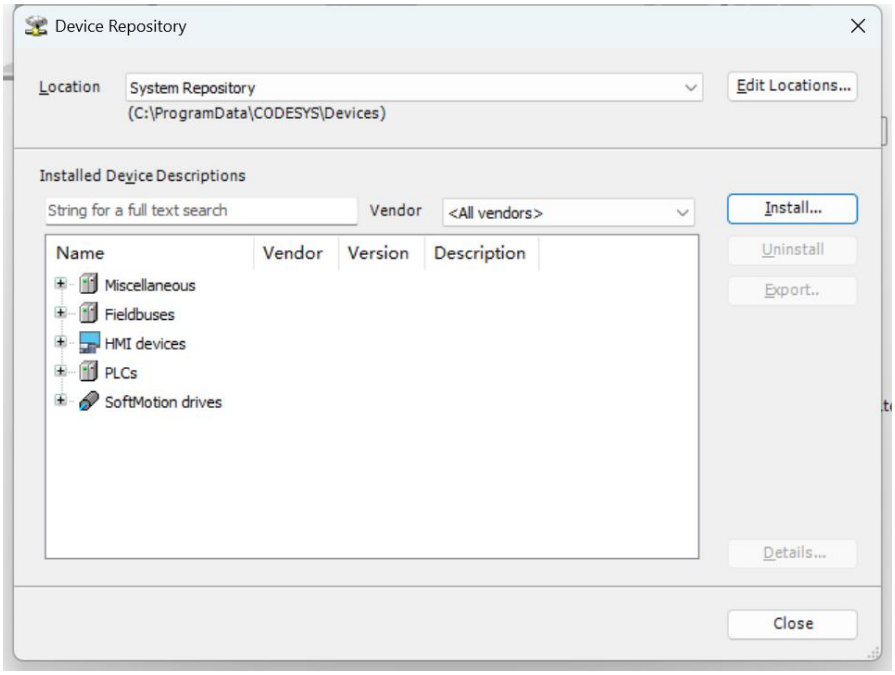
5.4. Programming and debugging

5.4.1. Add Device

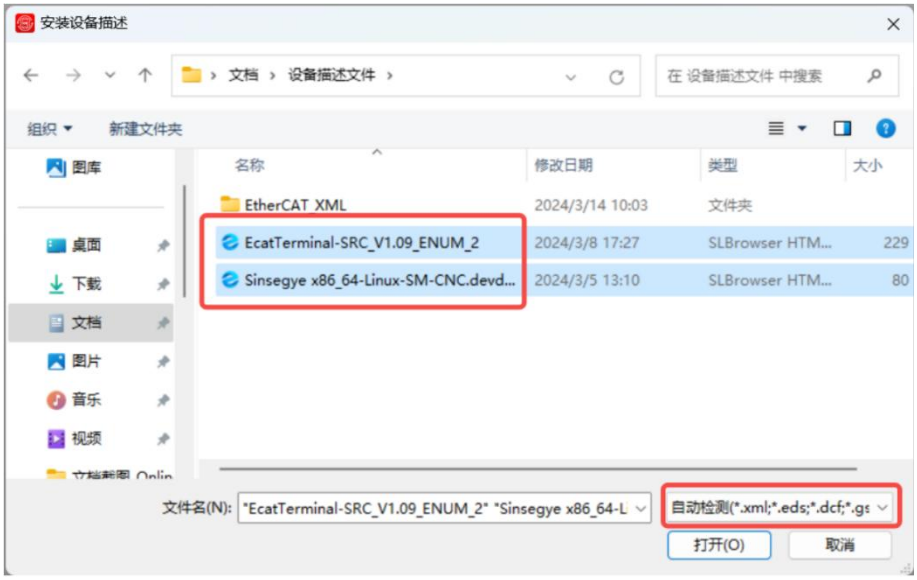
1) Download the corresponding Sinsegye device description file locally.
2) In MetaFacture, click the menu bar Tools > Device Repository...



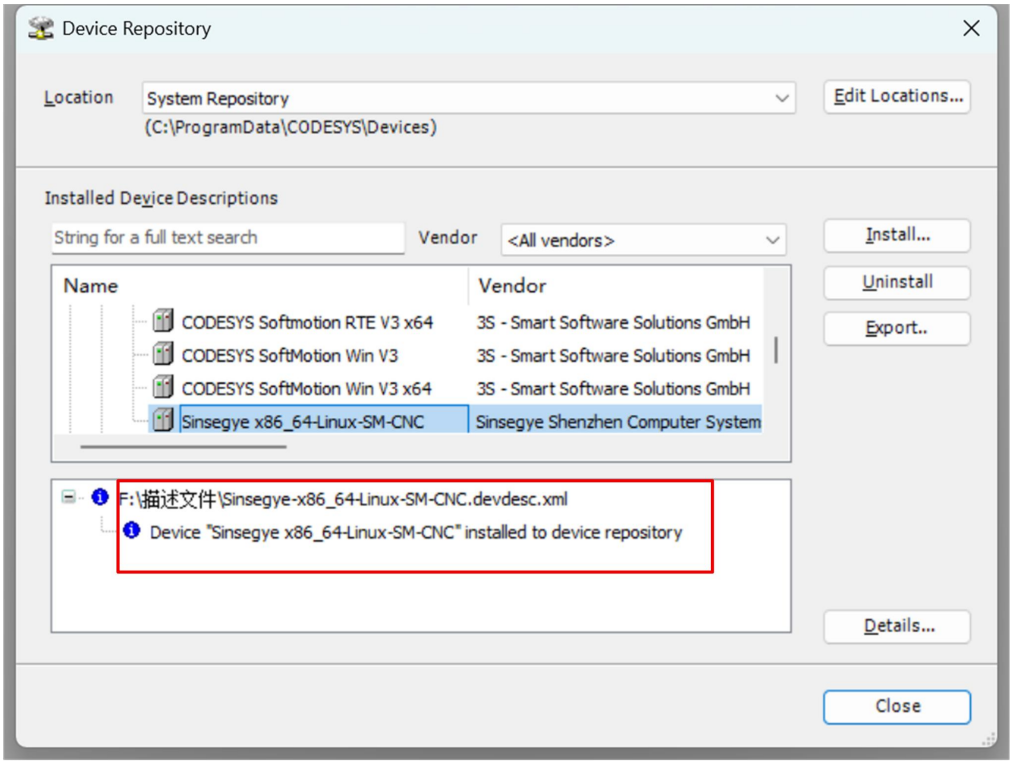
3) Click [Install (1)...]



4) Find the directory where the device description file is stored, select [Automatic Detection] for the file detection type at the lower right corner, select SP6000 iComputer device description file "Sinsegye-x86_64-Linux-SM-CNC.devdesc.xml" and SRC8200 device description file "EcatTerminal-SRC_V1.09_ENUM_2.xml", and click [Open] to complete the installation.

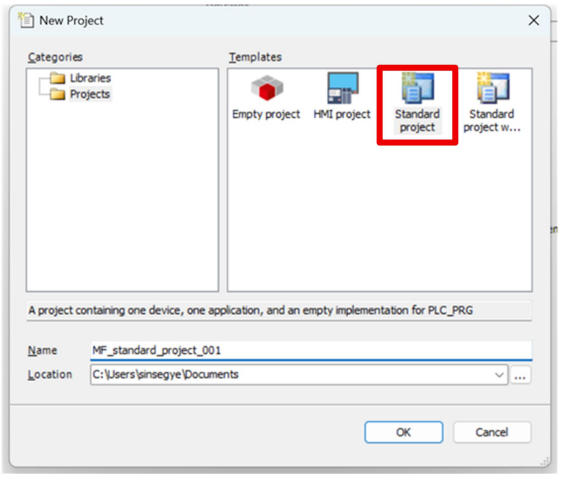


5) Click [Close] to close the dialog box.

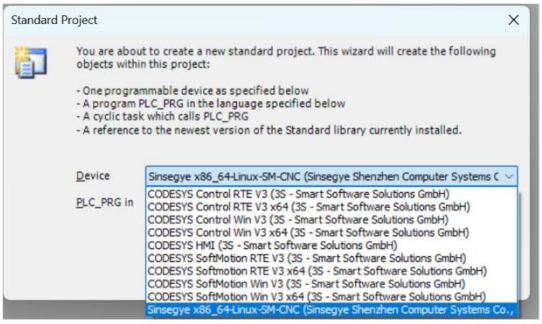


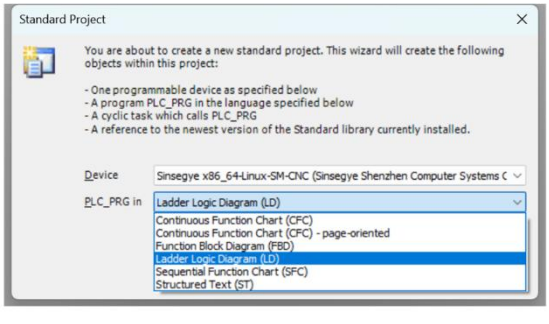
5.4.2. Connect Device

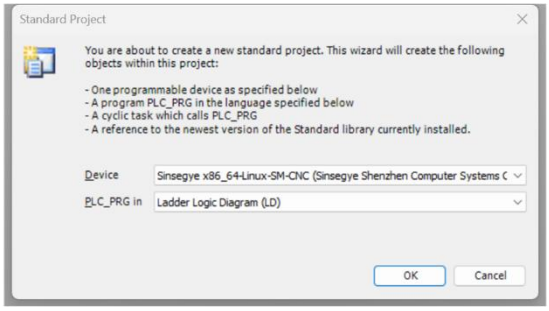
1) Open the [New Project] panel, select [Project] for the category and [Standard Project] for the template, and enter the custom project name
and the location where the project is saved, click [OK].



2) Select a PLC in the [Device (D)] list (if the corresponding PLC is not found, please confirm that the device has been installed correctly, and please refer to “Add Device” for specific steps). Select a common programming language in the [PLC_PRG in (P)] drop-down list, and click [OK].



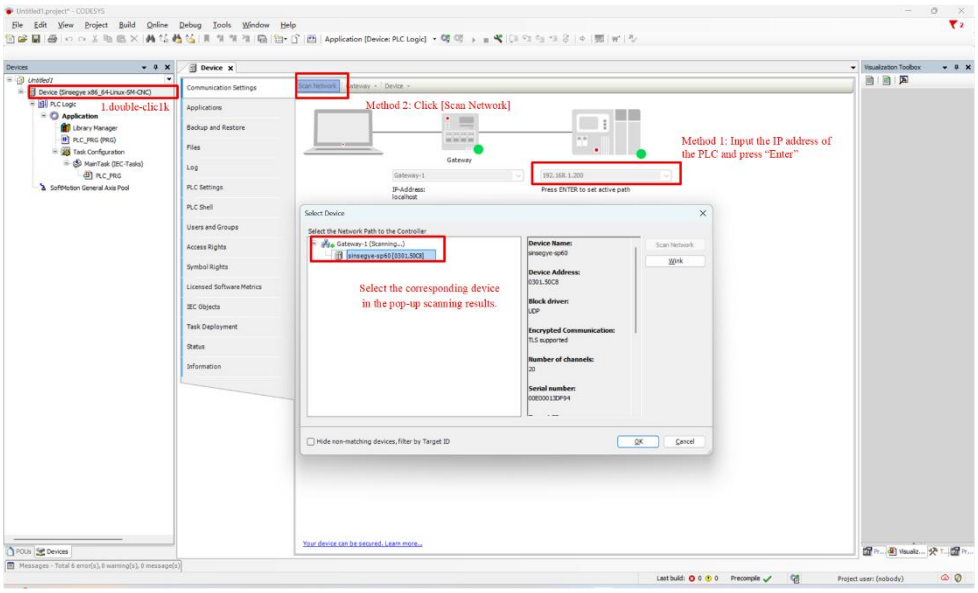




3) In MetaFacture, double-click [Device] in the device window to open the Device page. Make sure the iComputer has been connected to the network and it is in the same network segment as the computer where MetaFacture has been installed.

Method 1: Input the IP address of the PLC and press “Enter”

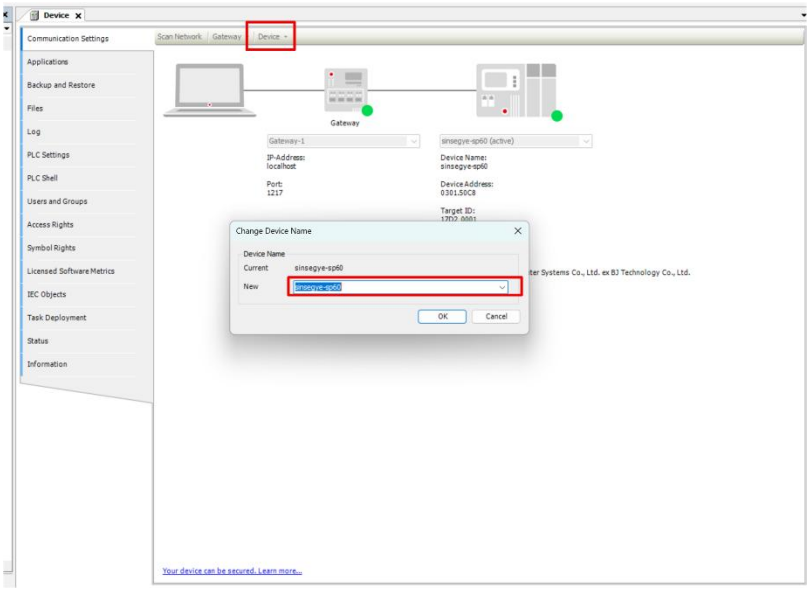
Method 2: Click [Scan Network] and select the corresponding device in the pop-up scanning results.



- **Description**

  Default IP of iComputer debugging port: 192.168.1.200

4) (Optional) After the PLC is successfully connected, the device can be renamed in order to scan the device in the future. Click [Device] > [Rename Active Device], enter the user-defined device name, and click [OK].



5.4.3. Programming

For the programming and debugging process, please refer to Basic Operation of MetaFacture for details.