ED-PAC3020

User Manual

by EDA Technology Co., Ltd

built: 2025-08-01

1 Hardware Manual

This chapter introduces the product overview, CODESYS software, networking application, packaging list, appearance, buttons, indicators and interfaces.

1.1 Overview

The ED-PAC3020 is a real-time CODESYS programmable automation controller, pre-installed by default with a multi-core CODESYS runtime. Depending on the application scenario and user requirements, it offers programmable logic system configurations with either `2GB DDR + 128GB SSD` or `8GB DDR + 256GB SSD`.

> WARNING
>
> The ED-PAC3020 device comes pre-installed with a valid CODESYS license by default. Reinstalling the operating system will invalidate the CODESYS license. Do not attempt to install the OS on your own.

The ED-PAC3020 provides commonly used interfaces such as HDMI, USB, Ethernet, RS232, and RS485, integrates RTC, and is primarily used in industrial control and IoT fields.

The ED-PAC3020 supports connection to remote EtherCAT-based I/O modules (e.g., couplers, DI, DO, AI, AO) via an EtherCAT network. The device integrates the CODESYS Control Runtime System, supporting IEC 61131-3 programming standards and industrial communication protocols like EtherCAT and Modbus TCP. Users can optionally enable additional functionalities by licensing features such as:

- TargetVisu
- WebVisu
- Softmotion
- CNC + Robotics
- EtherCAT Master
- Modbus TCP Master
- OPC UA Server

Custom configurations are available to meet specific application requirements.

1.2 Introduction to CODESYS Software

CODESYS (Controller Development System) is an open industrial automation software development platform that provides a full-stack solution for programming, debugging, and maintaining programmable logic controllers (PLCs), industrial PCs (IPCs), and embedded control systems. Compliant with the IEC 61131-3 international standard, it supports complex logic control, multi-axis motion control, industrial communication protocol integration, and real-time data processing. It is widely used in smart manufacturing, energy management, logistics automation, and other industrial fields.

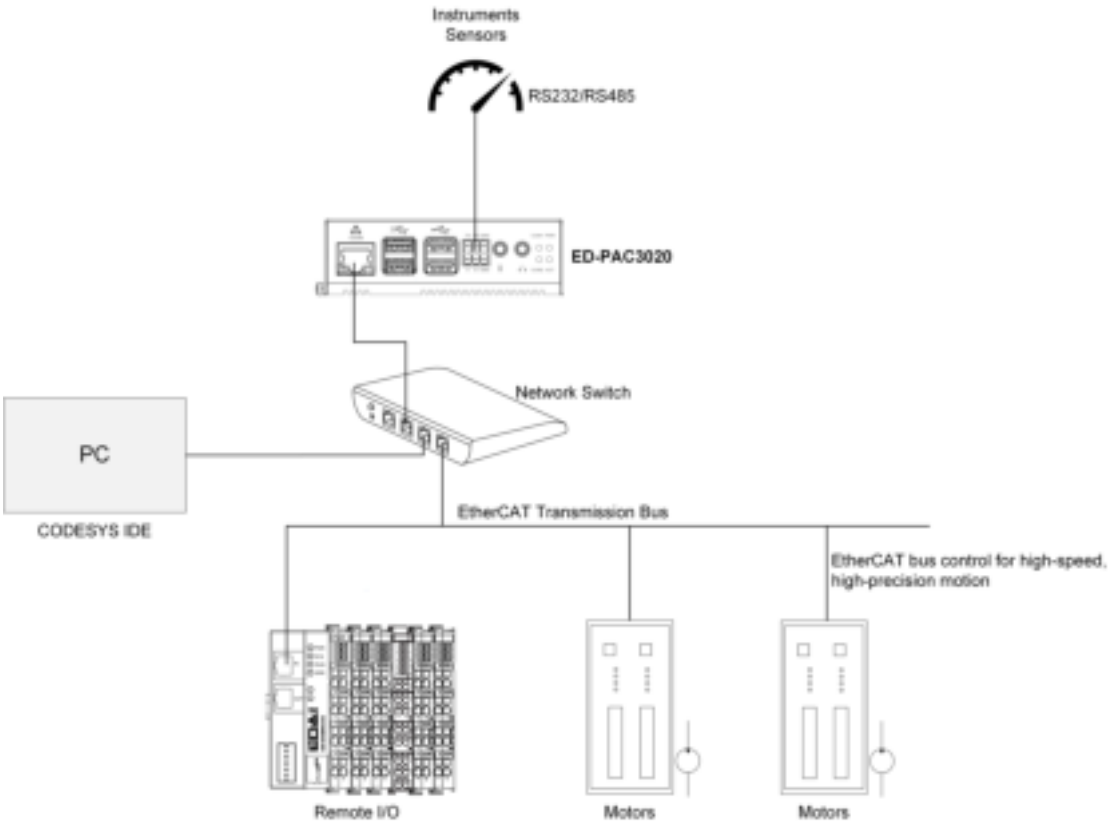
Key Features of CODESYS:

- Standardized Programming Language Support
  - Full compatibility with the IEC 61131-3 programming languages:
    - Ladder Diagram (LD)
    - Function Block Diagram (FBD)
    - Structured Text (ST)
    - Instruction List (IL)
    - Sequential Function Chart (SFC)
  - Supports Object-Oriented Programming (OOP) extensions for large-scale complex projects.
- Cross-Platform Development & Deployment
  - Development Environment: Compatible with Windows and Linux operating systems, offering a unified engineering interface.
  - Target Systems: Deployable on 2,000+ industrial controller hardware platforms, including ARM/X86 architectures.
- Modular Engineering Libraries
  - Prebuilt Libraries: Include industrial protocol stacks (Modbus/TCP, OPC UA, EtherCAT) and advanced control modules (PID control, CNC interpolation algorithms).
  - Custom Libraries: Support encapsulation and reuse of Function Blocks and POUs (Program Organization Units).
- Visual Debugging & Diagnostic Tools
  - Real-time monitoring of variables, I/O mapping, and task execution status with waveform analysis.
  - Advanced debugging tools: breakpoints, step-by-step execution, and cross-referencing for rapid fault diagnosis.
  - Integrated HMI development tools for seamless SCADA system integration.

The ED-PAC3020 supports CODESYS V3.5 SP19 and later versions.

1.3 Networking Application

The ED-PAC3020 features EtherCAT, Ethernet, RS485 and RS232 interfaces, enabling multi-layer network communication to meet diverse application requirements across various scenarios. A typical application topology is illustrated in the figure below:



1.4 Packing List

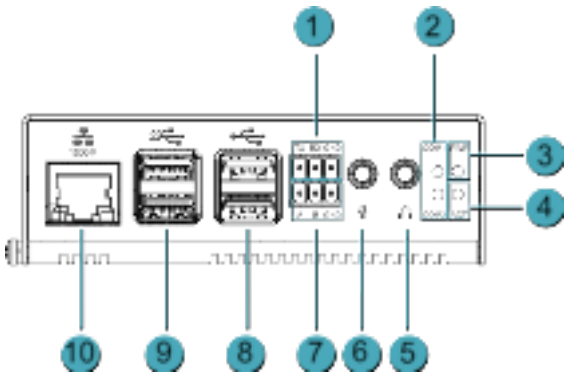
- 1 x ED-PAC3020 Unit
- 4 x Pads

1.5 Appearance

Introducing the functions and definitions of the interfaces on each panel

1.5.1 Front Panel

Introducing front panel interface types and definitions.

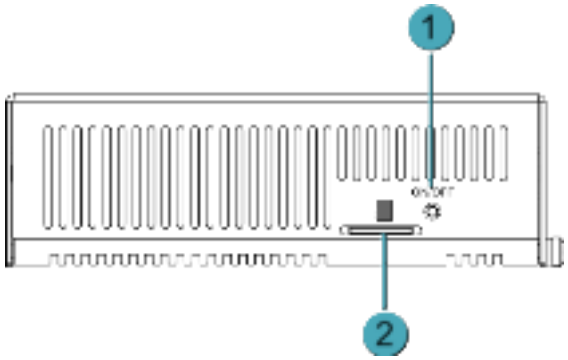


NO.	Function Definition
1	

NO.	Function Definition
	1 x RS232 port, 3-Pin 3.5mm pitch phoenix terminal, which is used to connect the third-party control equipment.
2	2 x green UART indicators, which is used to check the communication status of UART port.
3	1 x red power indicator, which is used to check the status of device power-on and power-off.
4	1 x green system status indicator, which is used to view the status of system read/write operations.
5	1 x Audio Output (HPO), 3.5mm audio jack connector (green), stereo audio output.
6	1 x Audio Input (LINE IN), 3.5mm audio jack connector (red), supporting stereo audio input.
7	1 x RS485 port, 3-Pin 3.5mm pitch phoenix terminal, which is used to connect the third-party control equipment.
8	2 x USB 2.0 ports, Type-A connector, each channel supports up to 480Mbps transmission rate.
9	2 x USB 3.0 ports, Type-A connector, each channel supports up to 5Gbps transmission rate.
10	1 x Ethernet interface (10/100/1000M auto-negotiation), RJ45 connector, EtherCAT communication interface for connecting to EtherCAT networks, with PoE (Power over Ethernet) support.

1.5.2 Rear Panel

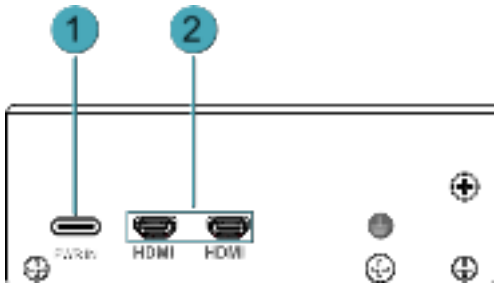
Introducing rear panel interface types and definitions.



NO.	Function Definition
1	1 x power button, which is used to turn on and turn off the device.
2	1 x Micro SD card slot, reserved for future use. Note: The device boots from the SSD by default. This Micro SD card slot is reserved for potential expansion.

1.5.3 Side Panel

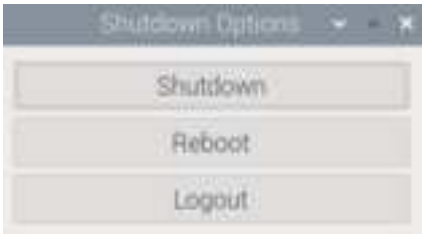
Introducing side panel interface types and definitions.



NO.	Function Definition
1	1 x DC input, USB Type-C connector, which supports 5V 5A power input.
2	2 x HDMI ports, Micro HDMI connector, which can connect a display and supports 4K 60Hz

1.6 Button

The ED-PAC3020 includes a ON/OFF button, and the silkscreen is "ON/OFF". If you run Raspberry Pi Desktop, you can initiate a clean shutdown by briefly pressing the power button. A menu will appear asking whether you want to shutdown, reboot, or logout:



> TIP
>
> If you run Raspberry Pi Desktop, you can press the power button twice in quick succession to shut down.

1.7 Indicator

This section explains the status and meanings of the indicators integrated into the ED-PAC3020 device.

Indicator	Status	Description
PWR	On	The device has been powered on.
	Blink	Power supply of the device is abnormal, please stop the power supply immediately.
	Off	The device is not powered on.
ACT	Blink	The system started successfully and is reading and writing data.

Indicator	Status	Description
	Off	The device is not powered on or does not read and write data.
COM1~COM2	On/Blink	Data is being transmitted
	Off	The device is not powered on or there is no data transmission.
Yellow indicator of Ethernet port	On	The Ethernet connection is in the normal state.
	Blink	The Ethernet connection is abnormal.
	Off	The Ethernet connection is not set up.
Green indicator of Ethernet port	On	The Ethernet connection is in the normal state.
	Blink	Data is being transmitted over the Ethernet port.
	Off	The Ethernet connection is not set up.

> TIP
>
> The function of the PWR/ACT indicator on the Raspberry Pi 5 has been transferred to the separate PWR and ACT indicators by default, so the PWR/ACT indicator remains on after the device is powered on.

1.8 Interface

Introducing the definition and function of each interface in the product.

1.8.1 Power Interface

The ED-PAC3020 device includes one power input interface, which utilizes a USB Type-C connector labeled "PWR IN" and supports a 5V 5A power input.

> TIP
>
> In order for Raspberry Pi 5 to achieve better performance, it is recommended to use a 5V 5A power adapter.

1.8.2 1000M Ethernet Interface (EtherCAT)

The ED-PAC3020 device includes one auto-negotiating 10/100/1000M Ethernet interface with an RJ45 connector featuring status LEDs, labeled as "  ". This interface serves as an EtherCAT communication port for connecting to EtherCAT networks and supports PoE (Power over Ethernet) power delivery.

1.8.3 HDMI Interface

The ED-PAC3020 device includes 2 HDMI interfaces using Micro HDMI connectors, labeled "HDMI", for connecting HDMI displays. These interfaces support video output up to 4Kp60.

> TIP
>
> Some third-party Micro HDMI cables may have shorter Micro HDMI connectors, which could cause connection issues. It is recommended to use the official Raspberry Pi Micro HDMI to Standard HDMI cable for optimal compatibility.

1.8.4 USB 2.0 Interface

The ED-PAC3020 device includes 2 USB 2.0 interfaces with standard Type-A connectors, labeled as "". These interfaces support connecting standard USB 2.0 peripherals and offer a maximum transfer rate of 480Mbps.

1.8.5 USB 3.0 Interface

The ED-PAC3020 device includes 2 USB 3.0 interfaces with standard Type-A connectors, labeled as "". These interfaces support connecting standard USB 3.0 peripherals and offer a maximum transfer rate of 5Gbps.

1.8.6 RS232 Interface

The ED-PAC3020 device includes 1 RS232 interface with a 3-Pin 3.5mm pitch Phoenix terminal, labeled "TX/RX/GND".

Pin Definition

Terminal pins are defined as follows:

Pin ID	Pin Name
1	TX
2	RX
3	GND

The RS232 interface corresponds to the following pin names on the Pi5:

Signal	Pi5 GPIO Name	Pi5 Pin Out
TX	GPIO4	UART3_TXD
RX	GPIO5	UART3_RXD

Connecting Cables

The RS232 wiring schematic is as follows:

1.8.7 RS485 Interface

The ED-PAC3020 device includes 1 RS485 interface with a 3-Pin 3.5mm pitch Phoenix terminal, labeled "A/B/GND".

Pin Definition

Terminal pins are defined as follows:

Pin ID	Pin Name
1	A
2	B
3	GND

The RS485 interface corresponds to the following pin names on the Pi5:

Signal	Pi5 GPIO Name	Pi5 Pin Out
A	GPIO12	UART5_TXD
B	GPIO13	UART5_RXD

Connecting Cables

The RS485 wiring schematic is as follows:

RS485 Terminating Resistor Configuration

The ED-PAC3020 device includes 1 RS485 interface. A 120Ω termination resistor is reserved between the A and B lines of the RS485 circuit. Inserting a jumper cap enables this termination resistor. By default, no jumper is installed, rendering the 120Ω termination resistor inactive. The termination resistor is located at J7 on the PCBA (printed circuit board assembly).

> TIP
>
> The device case must be opened to inspect the 120Ω termination resistor.

1.8.8 Audio Input

The ED-PAC3020 device includes 1 audio input interface (LINE IN), a red 3.5mm audio jack, labeled as "", which supports stereo input.

1.8.9 Audio Output

The ED-PAC3020 device includes 1 audio output interface (HPO), a green 3.5mm audio jack, labeled as "", which supports stereo output.

2 Installing the Device

The ED-PAC3020 device is designed for desktop placement by default and supports wall mounting with the optional ED-ACCBKT-L3020 wall-mount bracket from our company.

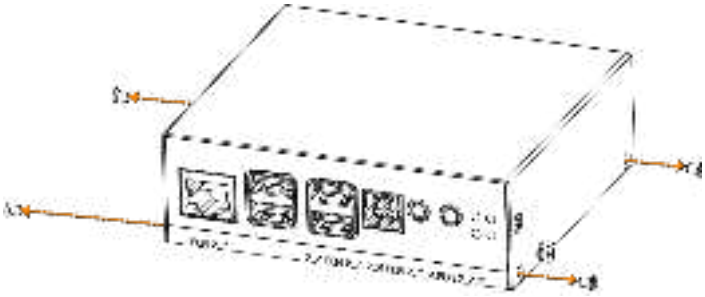
> TIP
>
> The ED-PAC3020 packaging box does not include the ED-ACCBKT-L3020 by default. Users must purchase it separately.

Preparation:

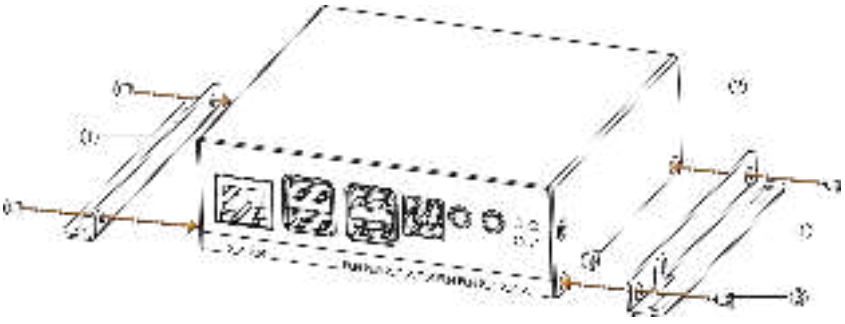
- Prepared a Phillips-head screwdriver.
- Obtained the ED-ACCBKT-L3020 wall-mount bracket.

Step:

1. Use a Phillips screwdriver to unscrew the four M2.5 screws on the side of the ED-IPC3020 counterclockwise.

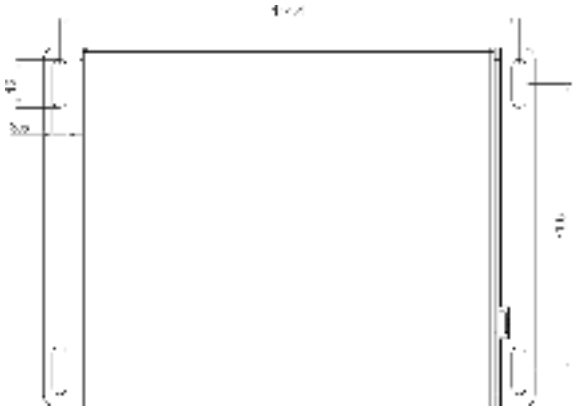


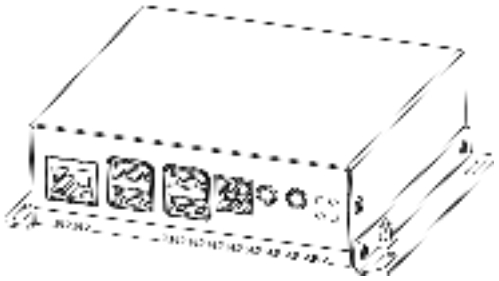
2. Align the left and right brackets of the ED-ACCBKT-L3020 with the screw holes on both sides of the ED-PAC3020, insert the four M2.5*6 screws, and tighten them clockwise with a Phillips screwdriver to secure the ED-ACCBKT-L3020 to the sides of the ED-PAC3020.



3. Based on the spacing and diameter of the wall-mounting screw holes of the ED-ACCBKT-L3020 left and right brackets (refer to the diagram below), drill holes in the wall accordingly, then proceed with wall-mounted installation of the device.

- Unit: mm
- Tolerance: 0.5-6±0.05, 6-30±0.1, 30-120±0.15





3 Booting The Device

This chapter details the specific procedures for connecting cables and powering on the device.

3.1 Connecting Cables

This section describes the procedures for connecting cables to the device.

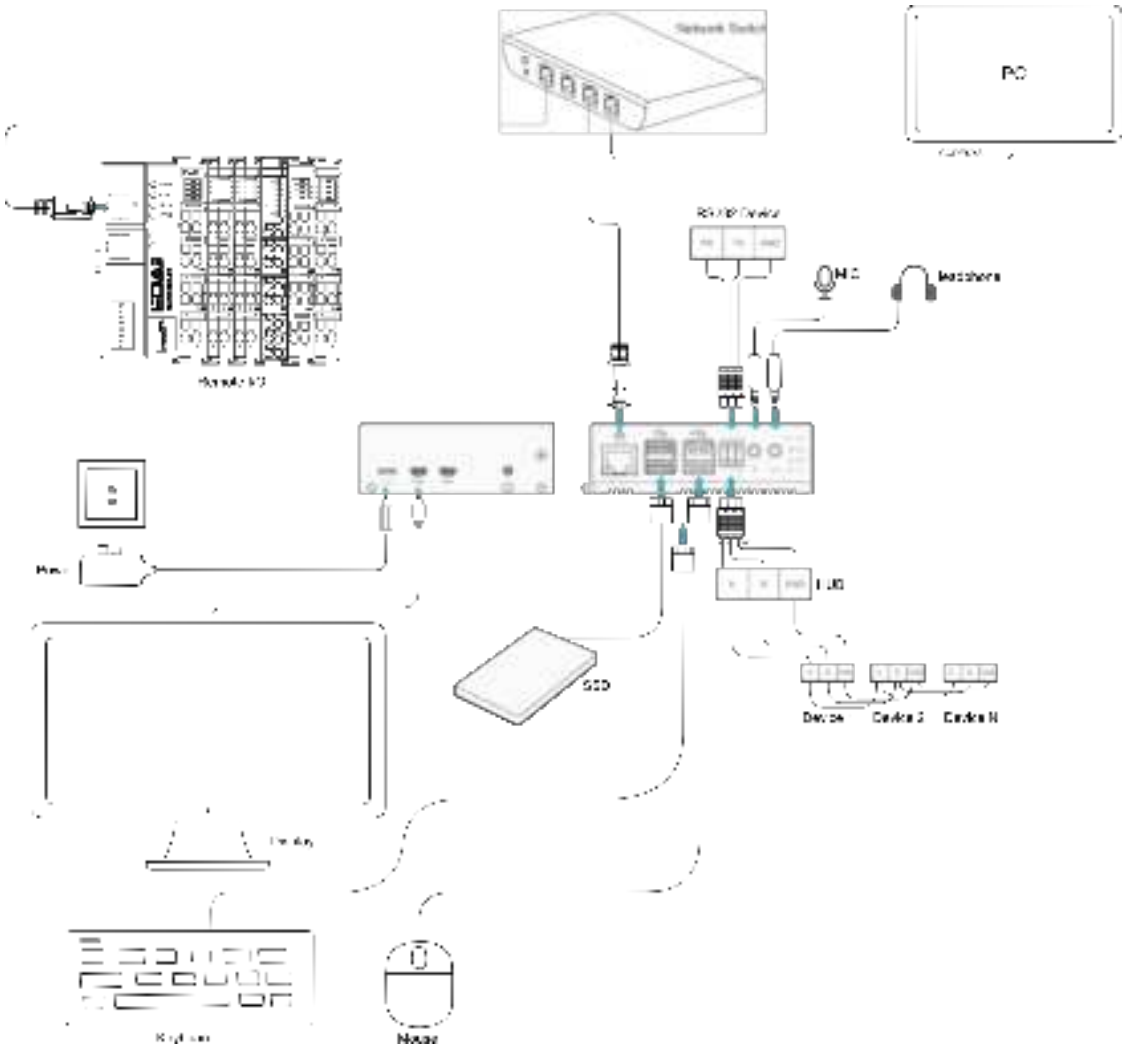
Preparation:

- Obtained fully functional accessories such as a switch, monitor, mouse, keyboard, I/O expansion module, and power adapter.
- Available functional network connection.
- Available functional cables: HDMI cable and Ethernet cable.

Schematic diagram of connecting cables:

Please refer to 1.8 Interface for the pin definition of each interface and the specific method of wiring.

> TIP
>
> Some third-party Micro HDMI cables may have shorter Micro HDMI connectors, which could cause connection issues. It is recommended to use the official Raspberry Pi Micro HDMI to Standard HDMI cable for optimal compatibility.



3.2 Booting The System For The First Time

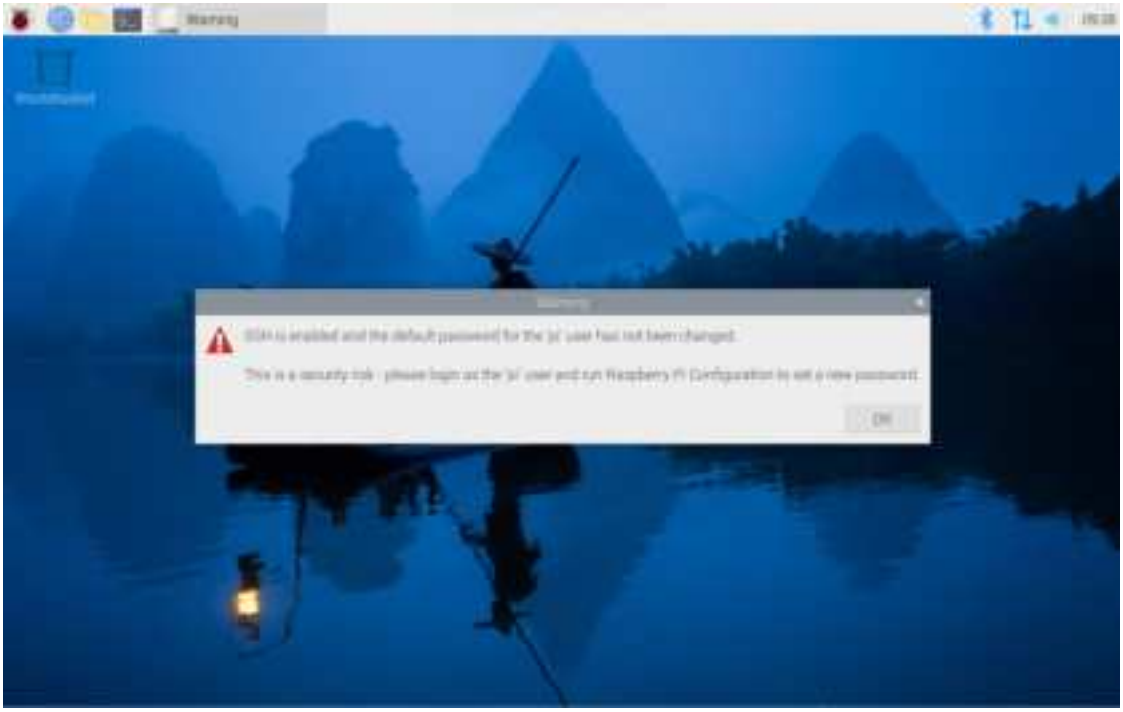
Once the ED-PAC3020 is connected to power, the system will begin to boot up.

- Red PWR indicator: Lights up to indicate the device is receiving power.
- Green ACT indicator: Blinks to signal normal system startup. The Raspberry Pi logo will then appear in the upper-left corner of the screen.

> TIP
>
> Default username is `pi` , default password is `raspberry` .

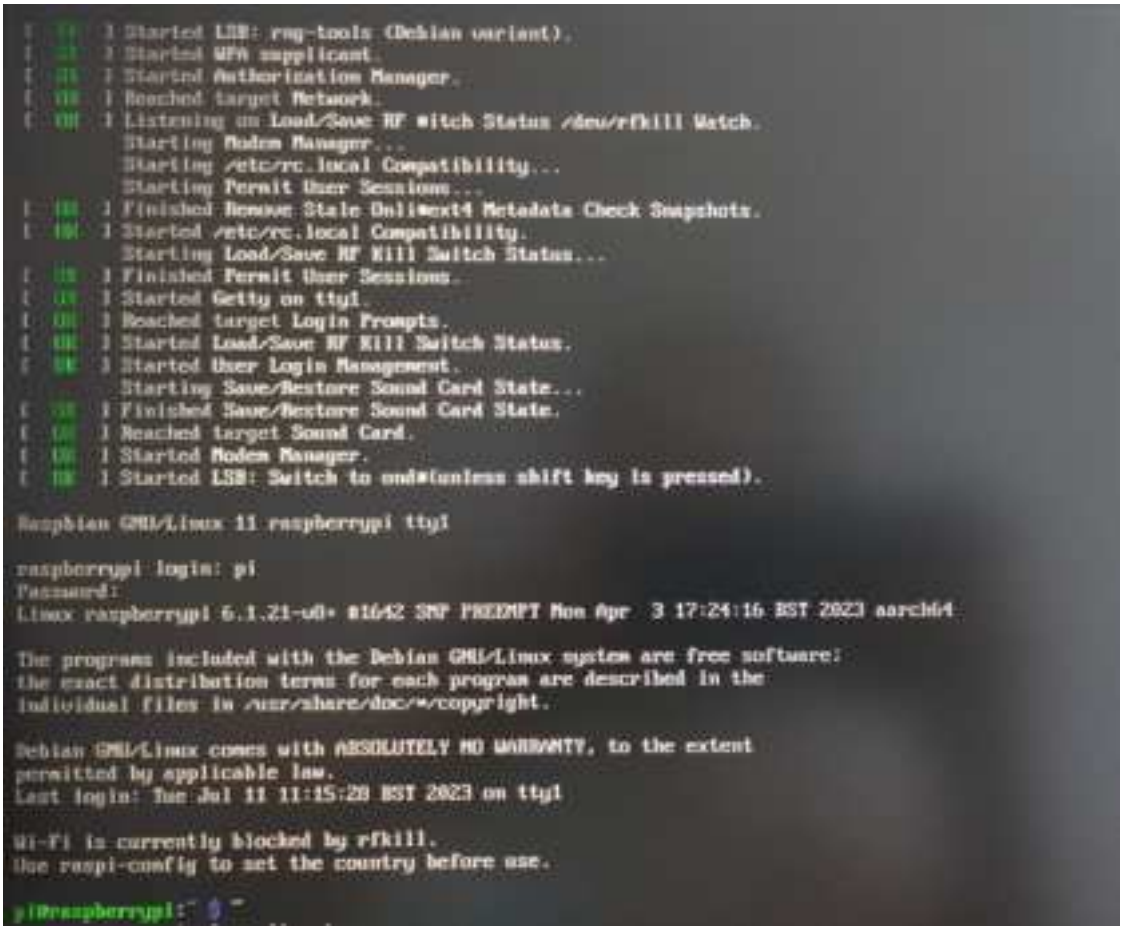
3.2.1 Raspberry Pi OS (Desktop)

If the device is factory-installed with the Desktop OS, it will boot directly into the desktop interface upon startup, as shown in the figure below.



3.2.2 Raspberry Pi OS (Lite)

If the device is factory-installed with the Lite OS, it will automatically log in using the default credentials after startup. The figure below indicates that the system has booted successfully.



4 CODESYS Programming

This chapter details the specific operations involved in using CODESYS.

> WARNING
>
> The ED-PAC3020 device comes pre-installed with a valid CODESYS license by default. Reinstalling the operating system will invalidate the CODESYS license. Do not attempt to install the OS on your own.

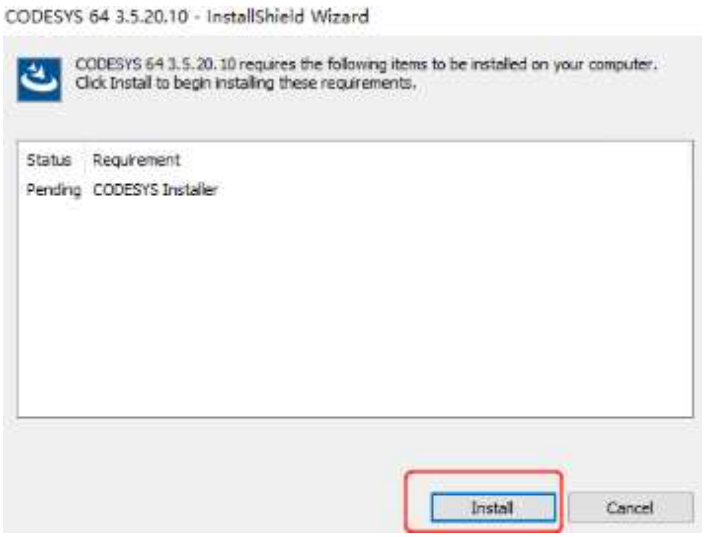
4.1 CODESYS Software Download and Installation

> TIP
>
> The installed CODESYS IDE version must be 3.5.19 or higher, and the PC operating system must be Windows 10 or Windows 11 (64-bit recommended).

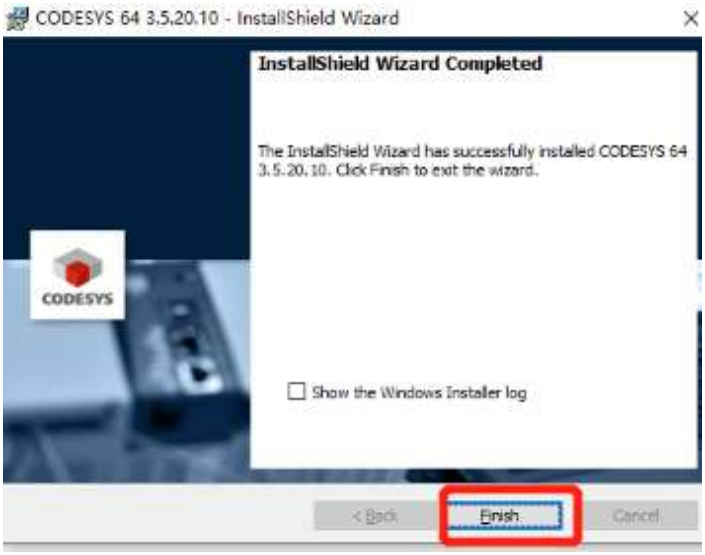
1. Download the installation package from the official CODESYS website. The download URL is https://store.codesys.com/de/ (https://store.codesys.com/de/) .

> TIP
>
> When downloading from the CODESYS official website for the first time, you must first register and log in to your account.

2. Right-click the downloaded installer and select "Run as administrator" from the context menu.
3. Click "Install" in the opened installation interface, and keep the default configuration during the installation process.



4. After the installation is complete, click "Finish" to close the installation interface.



4.2 Obtaining and Installing Device Description File

Before connecting to the device via CODESYS, you need to download and install the device description file first.

4.2.1 Obtaining Device Description File

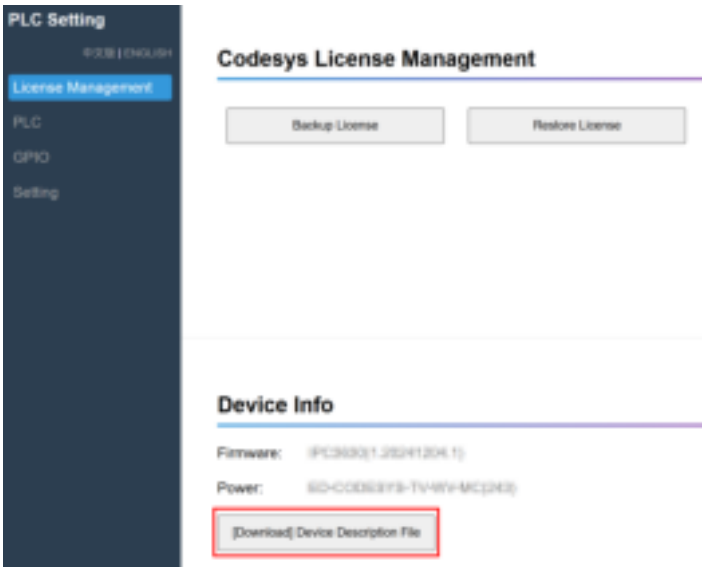
> TIP
>
> The device's default Ethernet port IP address is 192.168.0.100. To modify it, refer to Configuring Ethernet IP.

Preparation:

- A CODESYS-authorized ED-PAC3020 is available.
- A functional Ethernet cable is available.
- A Windows PC is prepared, with its IP address configured to the same subnet as the device. For example, if the device's IP (1000M Ethernet port) is `192.168.0.100`, set the PC's IP to `192.168.0.99`.

Steps:

1. Connect the device's Ethernet port to the PC via an Ethernet cable, then power on the device.
2. Enter `http://192.168.0.100:8100` in the PC's web browser to access the "PLC Setting" interface.
3. In the "Device Info" section, click the "[Download] Device Description File" button to download the corresponding ".xml" format device description file.



> TIP
>
> Also available directly in the document ED-PAC3020 Device File (https://vip.123pan.cn/1826505135/17964309) .

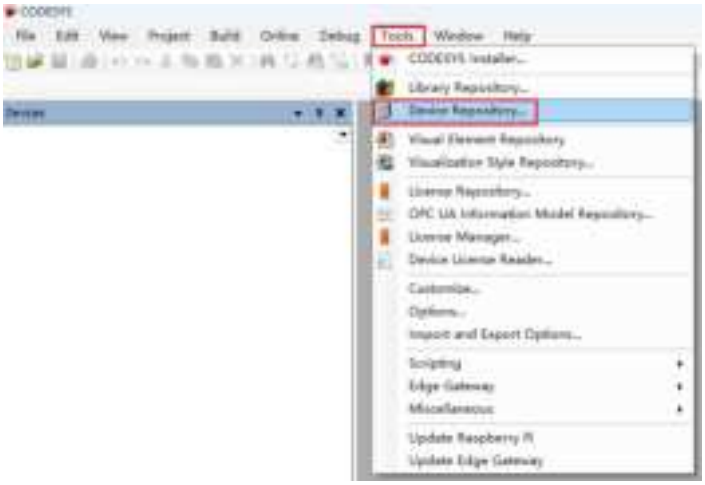
4.2.2 Installing Device Description File

Preparation:

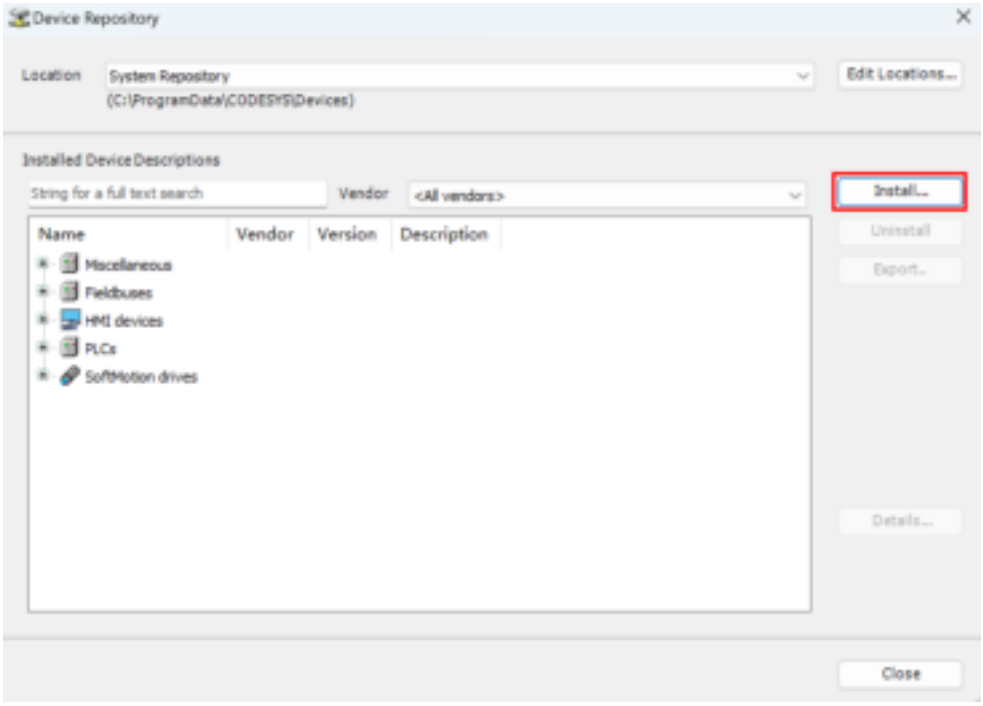
- A PC installed with CODESYS software version V3.5 SP19 (64-bit).
- An ED-PAC3020 device with a valid CODESYS license and its corresponding device description file.
- Connect both the PC and ED-PAC3020 to the network, ensuring their IP addresses are within the same subnet.

Steps:

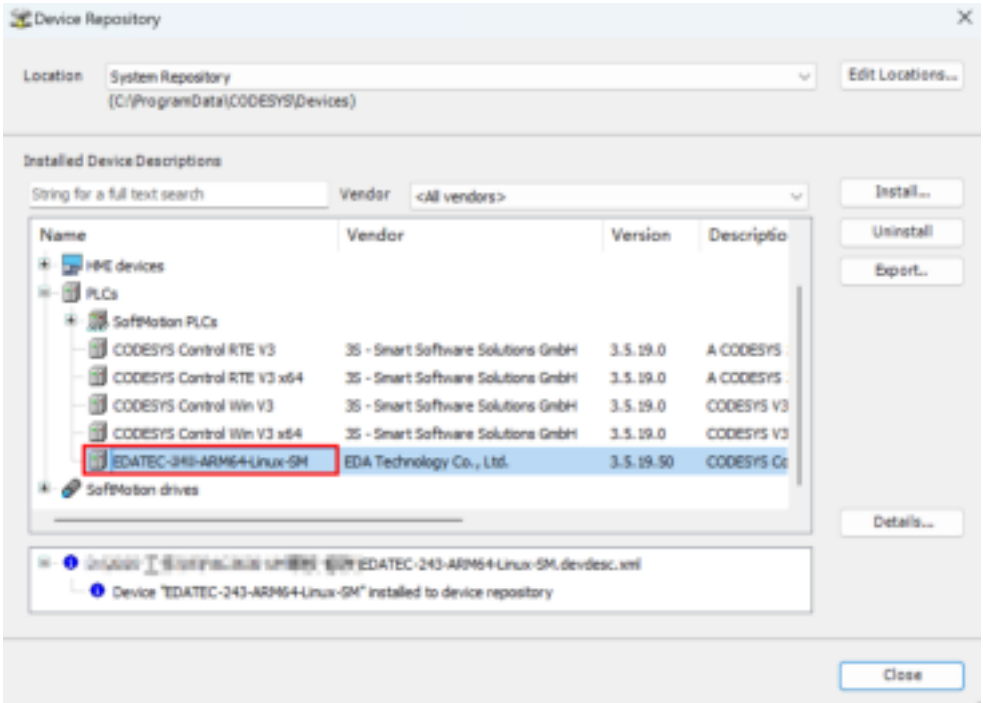
1. Double-click the CODESYS icon on the PC desktop to open the CODESYS software. From the menu bar, select “Tools” → “Device Repository”.



2. In the opened "Device Repository" pane, click "Install".



3. In the pop-up "Install Device Description" pane, select the device description file to be installed and click "Open" to proceed with the installation.
4. After successful installation, you can verify in the "Device Repository" that the device description file have been added successfully.



4.2.3 Installing Remote I/O Device Description File

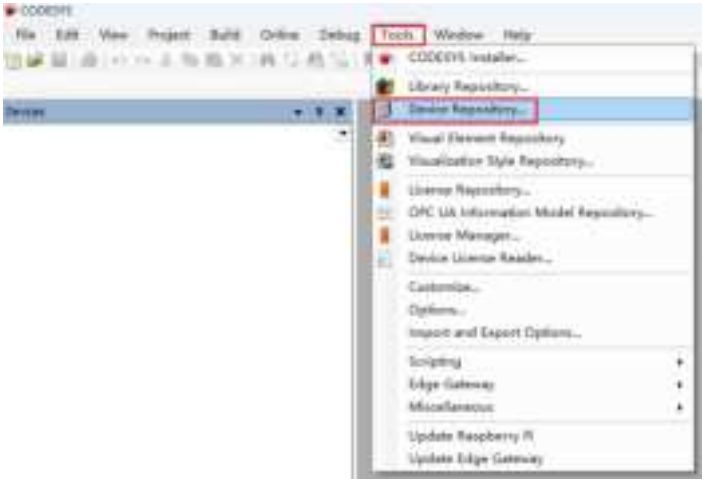
Preparation:

- A PC installed with CODESYS software version V3.5 SP19 (64-bit).
- An ED-PAC3020 device with a valid CODESYS license.
- The remote I/O device description files have been downloaded from: Remote I/O Description Files (https://vip.123pan.cn/1826505135/16632390) .

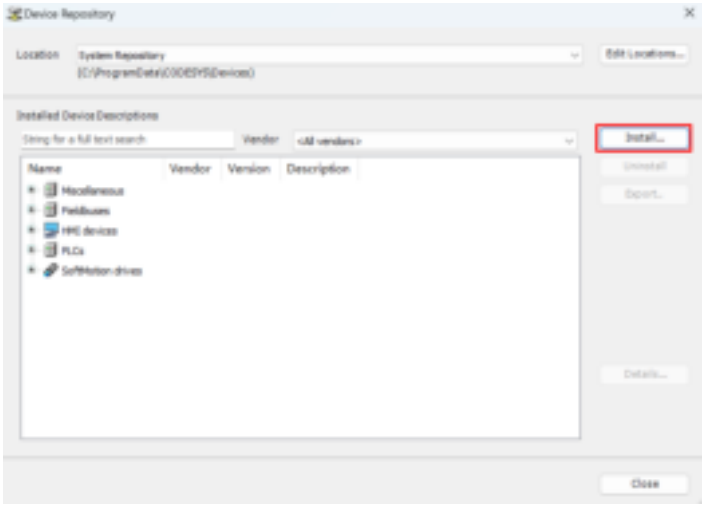
- Connect the PC, ED-PAC3020, and remote I/O devices to the same switch. Ensure that the IP addresses of the PC, ED-PAC3020, and remote I/O devices are within the same subnet.

Steps:

1. Double-click the CODESYS icon on the PC desktop to open the CODESYS software. From the menu bar, select “Tools” → “Device Repository”.



2. In the opened "Device Repository" pane, click "Install".



3. In the pop-up "Install Device Description" pane, select the I/O device decirption file to be installed and click "Open" to proceed with the installation.
4. After successful installation, you can verify in the "Device Repository" that the I/O device description file have been added successfully.

4.3 Hardware Configuration

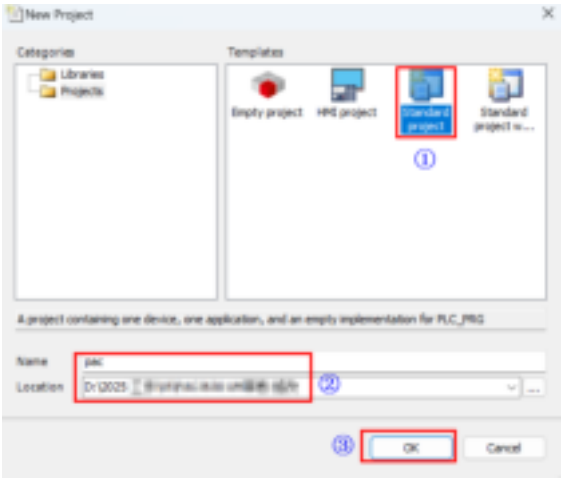
Preparation:

- A PC installed with CODESYS software version V3.5 SP19 (64-bit).
- The device description files and remote I/O device description files have been installed.
- Connect the PC, ED-PAC3020, and remote I/O devices to the same switch. Ensure that the IP addresses of the PC, ED-PAC3020, and remote I/O devices are within the same subnet.

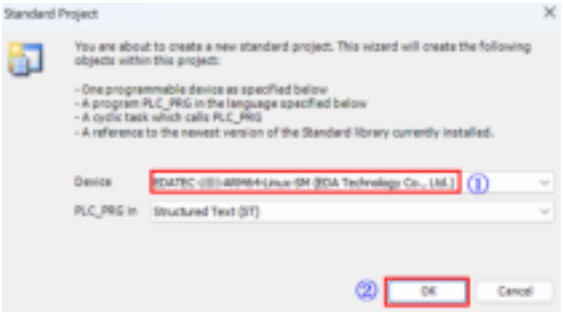
4.3.1 Create a New Project and Connect to the Device

Steps:

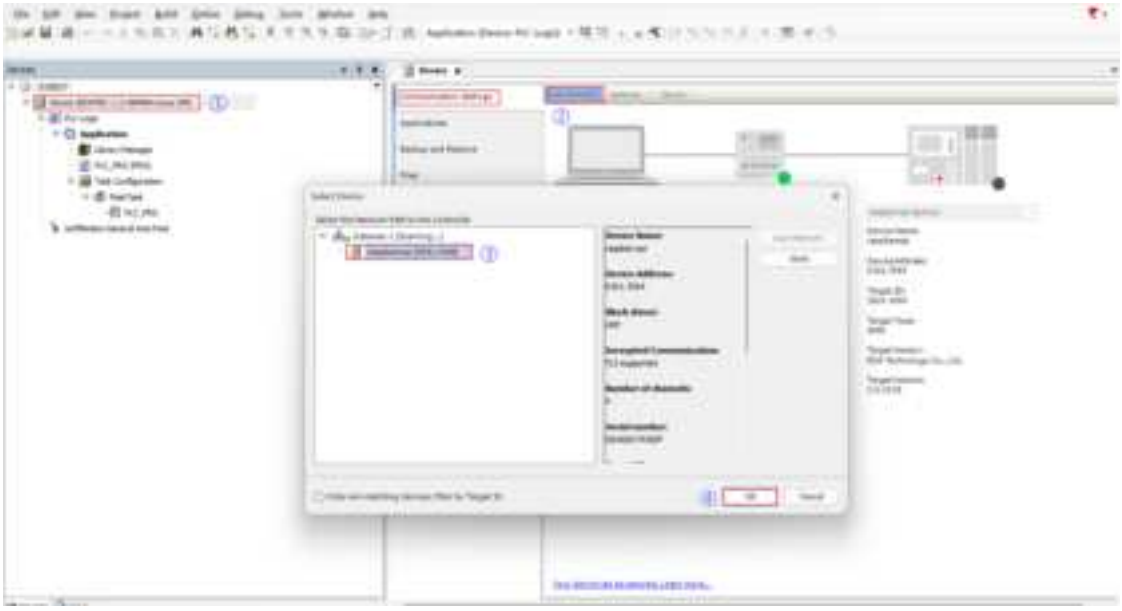
1. Power on the ED-PAC3020 and the remote I/O modules. Open the CODESYS software on the PC, select "File" → "New Project" in the menu bar to open the "New Project" pane, and create a standard project.



2. Select the installed device description file and click "OK".



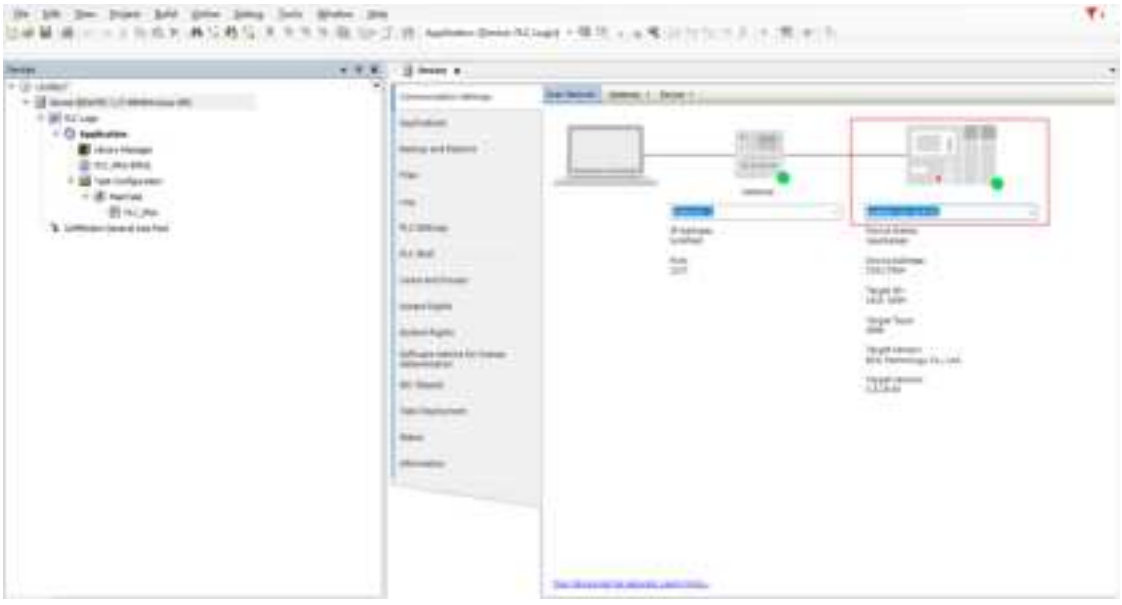
3. Double-click the device, select "Scan Network" on the right, then choose the detected device from the scan results, and click "OK" to confirm.



TIP

- If the device cannot be detected during scanning, manually enter the IP address in the target device settings to connect.
- If a device login prompt appears, log in with your credentials (username and password) or follow the instructions to register a new account.

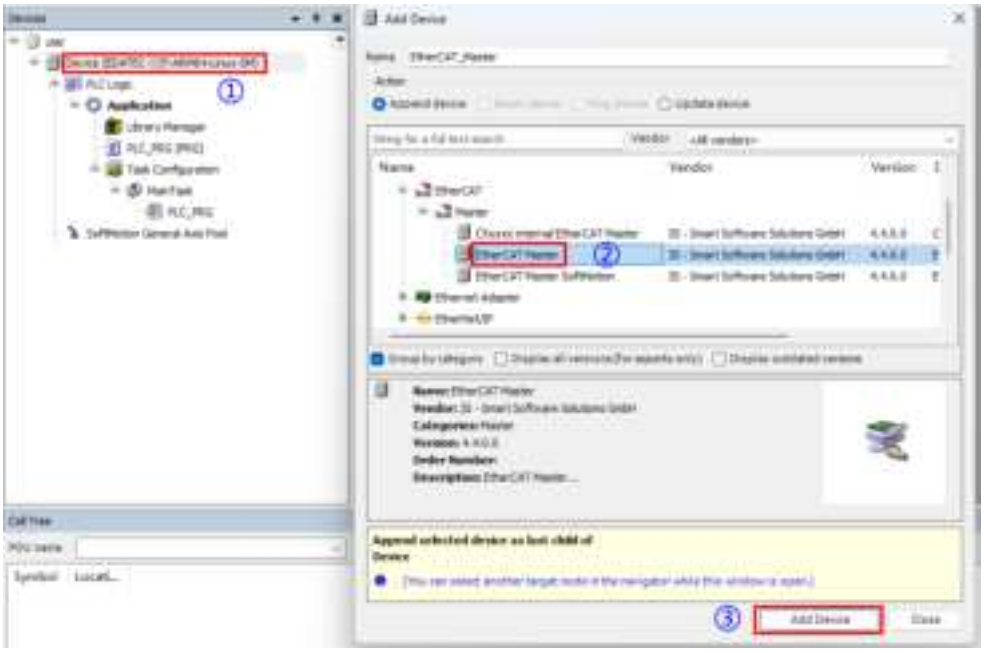
4. As shown in the figure below, this indicates the device is successfully connected.



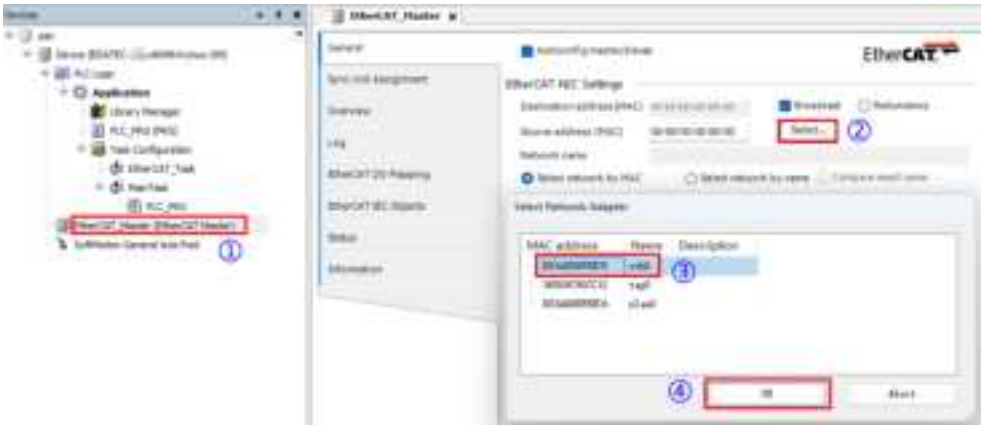
4.3.2 Adding Remote I/O Modules

Steps:

1. Right-click “Device” and select “Add Device” in the menu to add the EtherCAT Master.

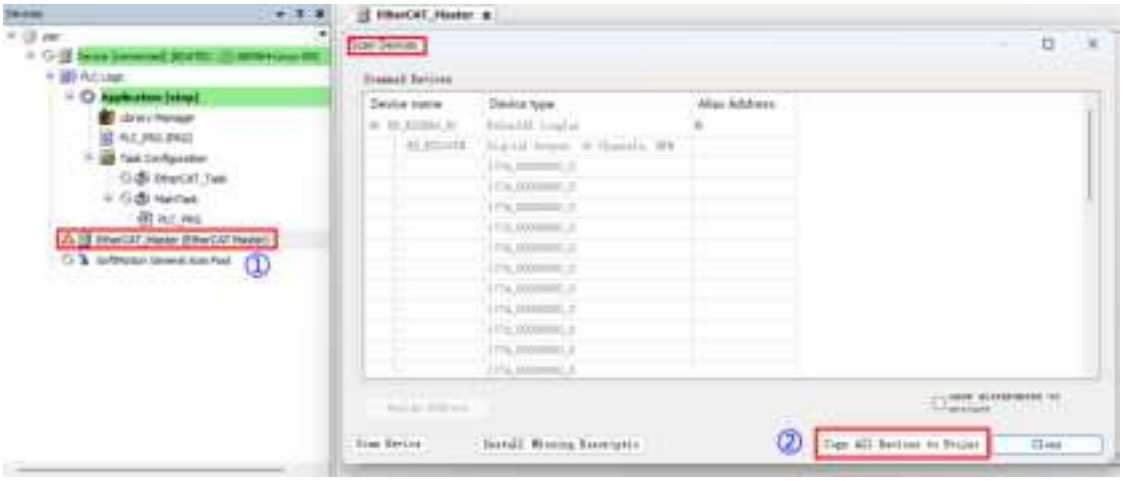


2. Double-click on the EtherCAT Master device to set the source address (Select the EtherCAT port, which corresponds to the device's eth0 port).

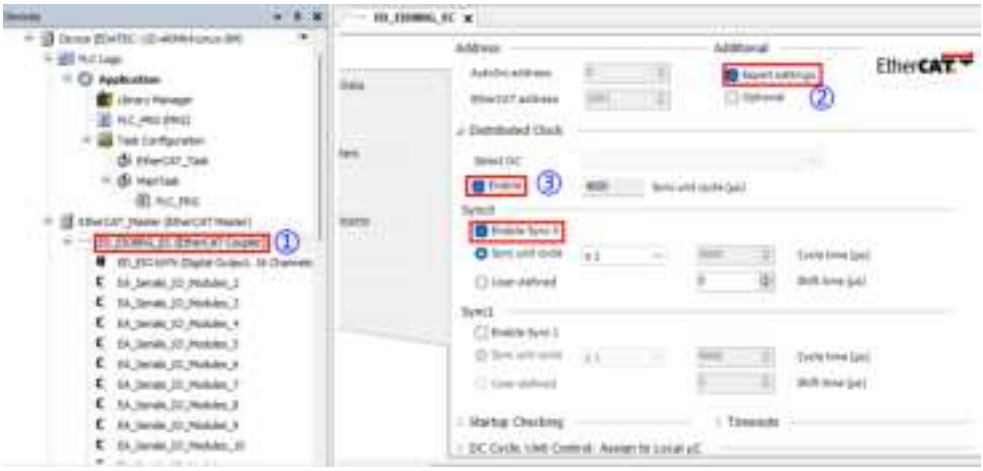


3. Click the button to log in to the device. A successful login is shown in the figure below.

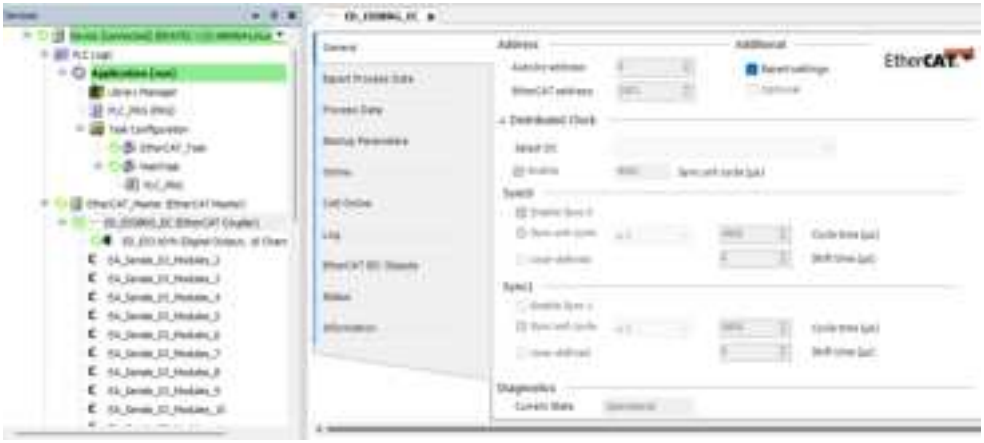
4. Click on the EtherCAT Master device, select “Scan for Devices” in the right-click menu, and copy all devices to the project after scanning is completed.



5. Click the button to log out of the device.
6. Double-click the slave device, configure the relevant parameters in the right-hand interface, enable "Expert settings", select "Enable" under Select DC section, and select "Enable Sync0".



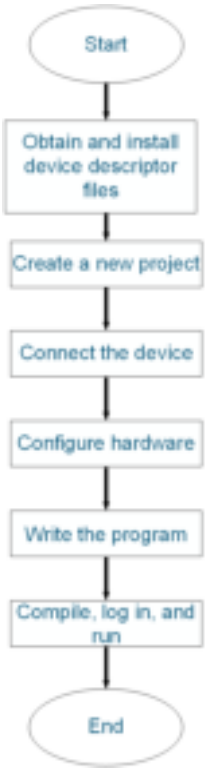
7. Click the button to download the program to the device, then click the button to run it. As shown in the figure below, this indicates a successful operation.



4.4 Programming

The following example demonstrates practical programming using a specific coding scenario.

4.4.1 Programming Process



4.4.2 Programming Example

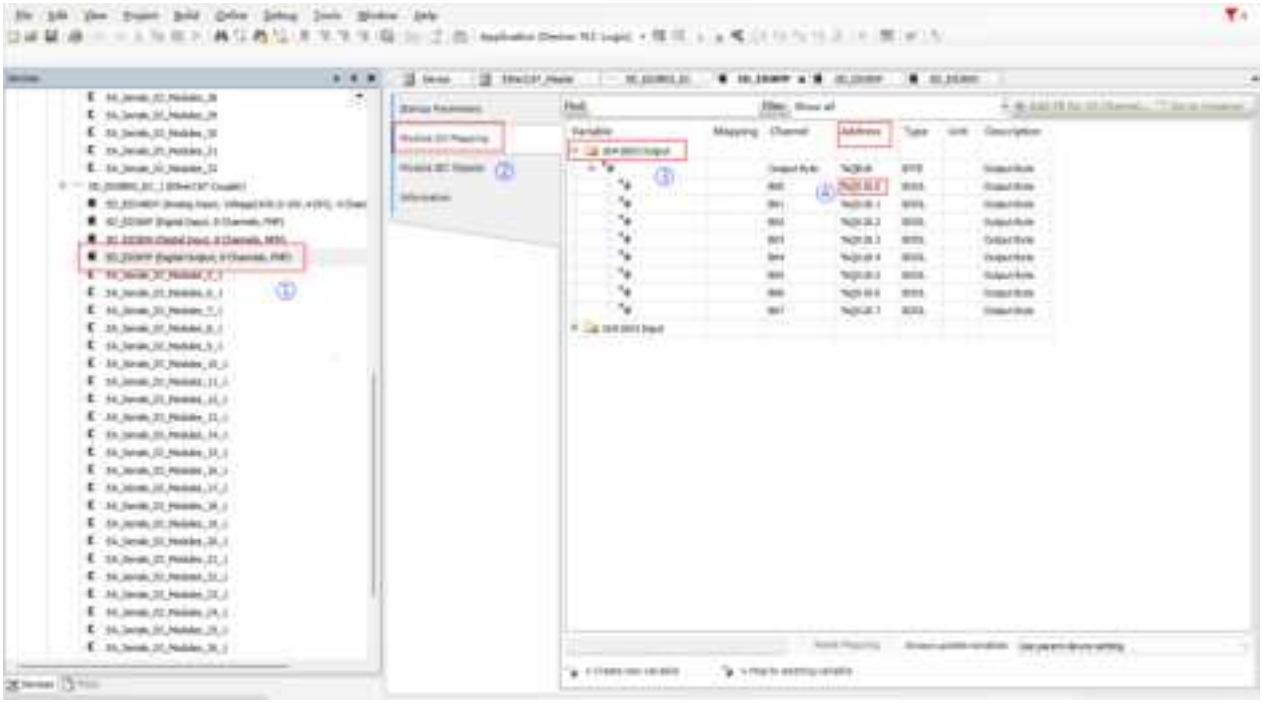
Complete the development and debugging of a program for a timed blinking LED using a PNP-type 8-channel digital output (DO) module.

Preparation:

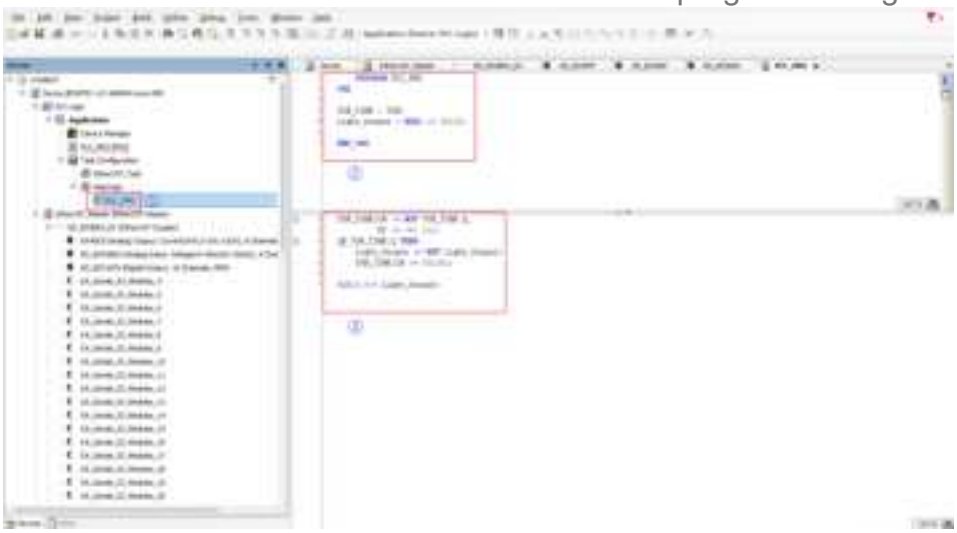
- A standard project has been created.
- Hardware configuration has been completed.
- A 24V compact LED lamp has been connected to the first output port of the remote DO (Digital Output) module.

Steps:

1. Double-click the DO module, select "Module I/O Mapping" → "Output" in the right-hand interface, and view the addresses of all output ports. As illustrated below, the first output port's address is `%QX18.0`.



2. Click "PLC_PLG" to open the programming interface, where the upper section is the variable declaration area and the lower section is the main program editing area.



3. Write the program code as follows:

```sh
    PROGRAM PLC_PRG
VAR

TON_TIME : TON;
Light_Output : BOOL := FALSE;

END_VAR
```

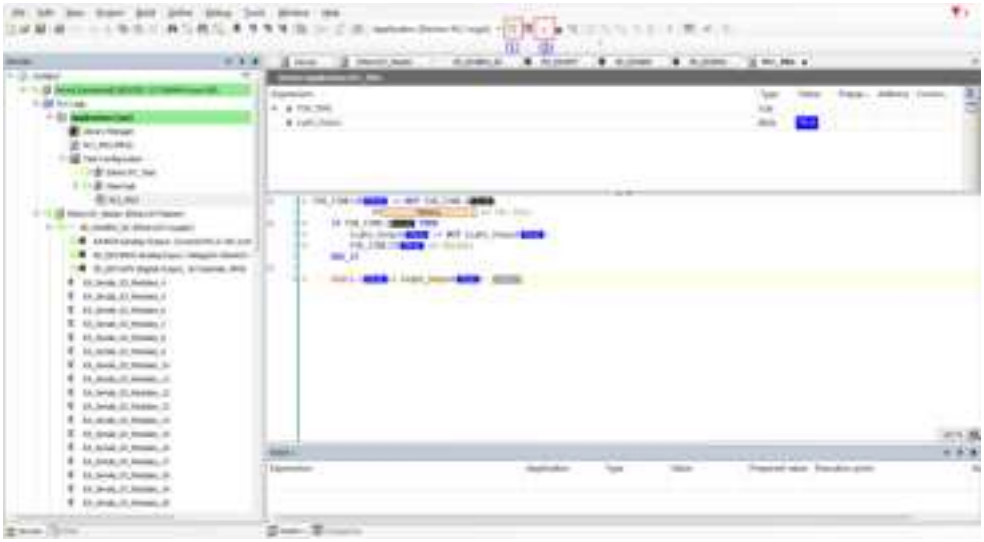
```sh
TON_TIME(IN := NOT TON_TIME.Q,
         PT := T#0.5S);
IF TON_TIME.Q THEN
    Light_Output := NOT Light_Output;
```

```
    TON_TIME(IN := FALSE);
END_IF

%QX18.0:= Light_Output;
```

4. After completing the program, click "" to compile it and ensure there are no errors.

5. Click Login to download the program to the device, then click Run to observe the LED blinking every 0.5 seconds.



4.5 Operation and Maintenance

After downloading the program to the device, you can perform the Run and Stop operations.

Status	Operations
Run Program	In the main menu of the software interface, click the Login button.
Stop Program	In the main menu of the software interface, click the stop button.

5 Configuring System

This chapter introduces how to configure system.

> WARNING
>
> The ED-PAC3020 device comes pre-installed with a valid CODESYS license by default. Reinstalling the operating system will invalidate the CODESYS license. Do not attempt to install the OS on your own.

5.1 Finding Device IP

Finding Device IP

5.2 Remote Login

Remote Login

5.3 Configuring Wi-Fi

Configuring Wi-Fi

5.4 Configuring Ethernet IP

Configuring Ethernet IP

5.5 Configuring Bluetooth

Configuring Bluetooth

5.6 Configuring Buzzer

The buzzer is controlled using GPIO6.

Execute the following command to turn on the buzzer:

```sh
pinctrl set 6 op dh
```

Execute the following command to turn off the buzzer:

```sh
pinctrl set 6 op dl
```

5.7 Configuring RTC

Configuring RTC

5.8 Configuring Serial Port

This chapter introduces the configuration method of RS232 and RS485.

5.8.1 Installing Picocom Tool

In the Linux environment, you can use the picocom tool to debug the serial ports RS232 and RS485.

Execute the following command to install the picocom tool.

```sh
sudo apt-get install picocom
```

5.8.2 Configuring RS232

The ED-PAC3020 contains 1 RS232 interface, and its corresponding COM port and device files are listed in the table below:

Number of RS232 Ports	Corresponding COM Port	Corresponding Device File
1	COM1	/dev/com1

Preparation:

The RS232 ports of ED-PAC3020 has been connected with external device.

Steps:

1. Execute the following command to open the serial port com1, and configure the serial port baud rate to 115200.

```sh
picocom -b 114200 /dev/com1
```

2. Input commands as needed to control external device.

5.8.3 Configuring RS485

The ED-PAC3020 contains 1 RS485 interface, and its corresponding COM port and device files are listed in the table below:

Number of RS485 Ports	Corresponding COM Port	Corresponding Device File
1	COM2	/dev/com2

Preparation:

The RS485 ports of ED-PAC3020 has been connected with external device.

Steps:

1. Execute the following command to open the serial port com2, and configure the serial port baud rate to 115200.

```sh
picocom -b 115200 /dev/com2
```

2. Input commands as needed to control external device.

5.9 Configuring Audio

Configuring Audio

5.10 CODESYS License Management

The ED-PAC3020 device comes pre-installed with a CODESYS license by default. You can back up and restore the license by accessing the "PLC Setting" interface.

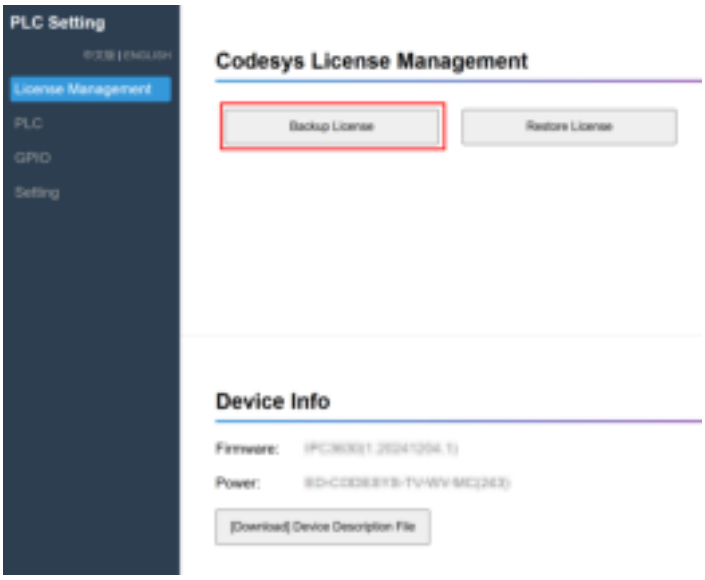
5.10.1 License Backup

Preparation:

- A Windows PC has been set up with an IP address in the same subnet as the device. For example, if the device's IP (1000M Ethernet port) is `192.168.0.100`, set the PC's IP to `192.168.0.99`.
- A functioning Ethernet cable has been prepared.

Steps:

1. Connect the device's 1000M Ethernet port to the PC via an Ethernet cable, then power on the device.
2. Enter `http://192.168.0.100:8100` in the PC's web browser to access the "PLC Setting" interface.
3. In the "Codesys License Management" interface, click "Backup License" to download the license file and save it locally.



> TIP
>
> The backed-up license file can only be restored on the same device.

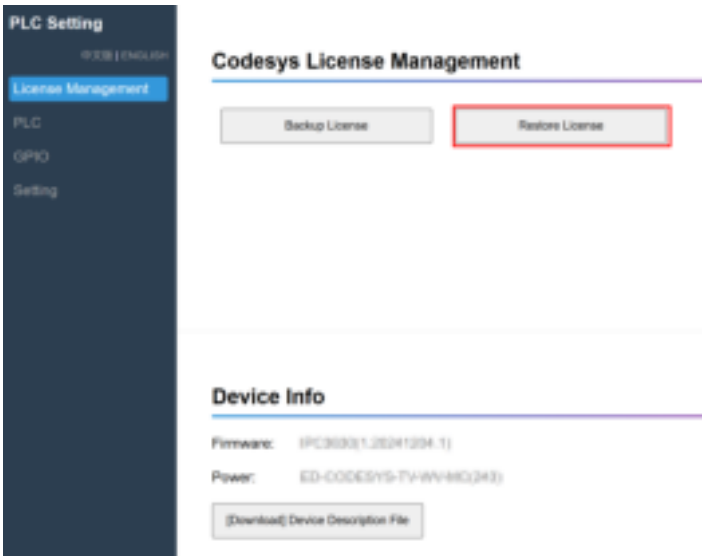
5.10.2 License Restore

Preparation:

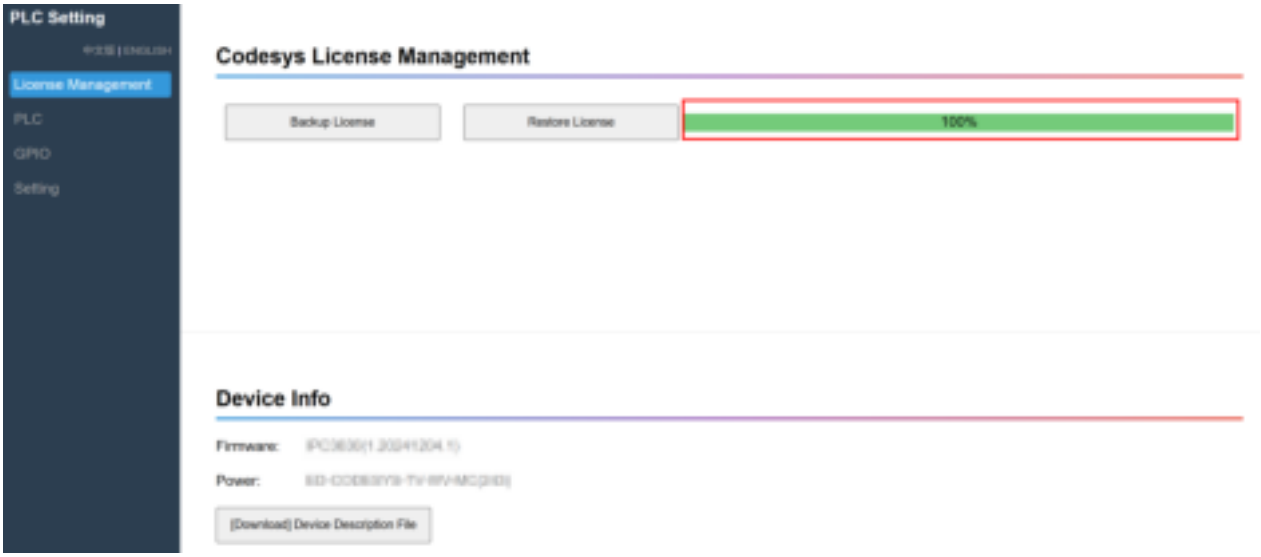
- A Windows PC has been set up with an IP address in the same subnet as the device. For example, if the device's IP (1000M Ethernet port) is `192.168.0.100`, set the PC's IP to `192.168.0.99`.
- A functioning Ethernet cable has been prepared.
- The backed-up license file has been obtained.

Steps:

1. Connect the device's 1000M Ethernet port to the PC via an Ethernet cable, then power on the device.
2. Enter `http://192.168.0.100:8100` in the PC's web browser to access the "PLC Setting" interface.
3. In the "Codesys License Management" interface, click "Restore License".



4. As prompted, select the obtained license file under a custom path.
5. After a successful License Restore, a 100% progress bar will be displayed in the right-hand panel.



6. Open the device's terminal command pane, execute the following command, and restart the device.

```sh
sudo reboot
```