Technical data

ZQ600

CodeSys User Manual

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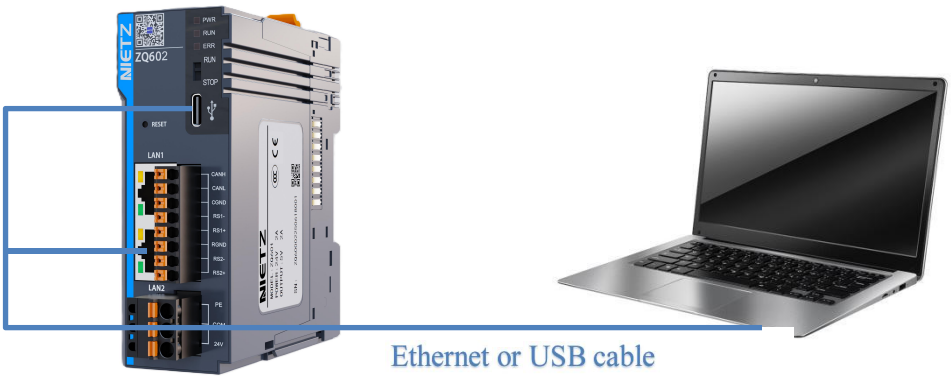
1. CODESYS Overview

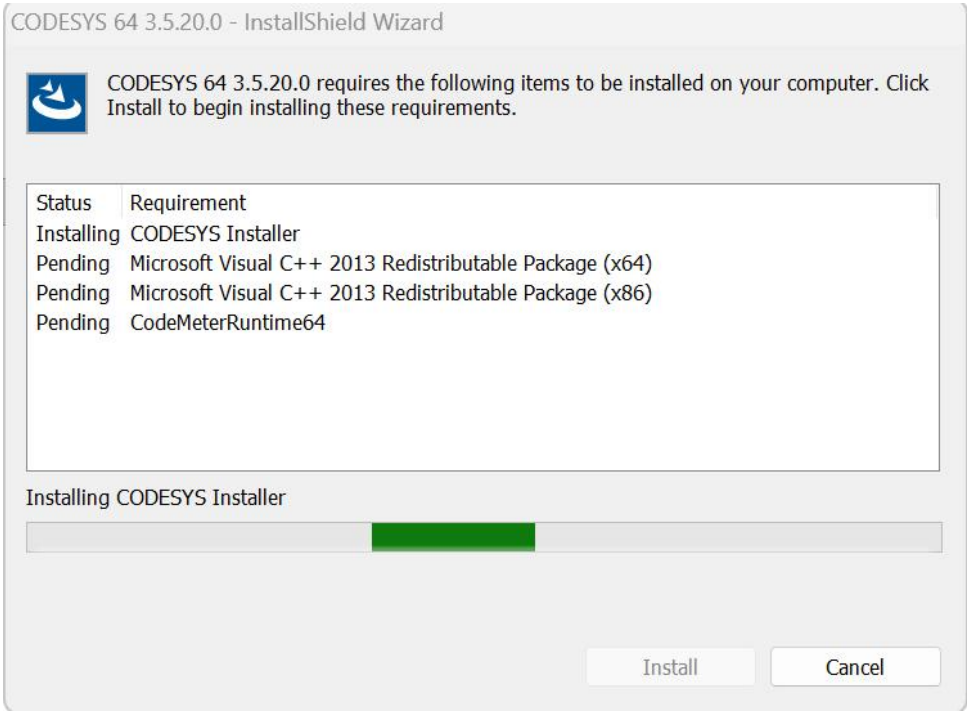
1.1 Connection with Hardware

The programming device can be connected to a medium-sized PLC via Ethernet (through a hub, switch, etc.) or USB cable. User programs are written using CODESYS software, downloaded to the PLC, and then monitored and controlled by the program.

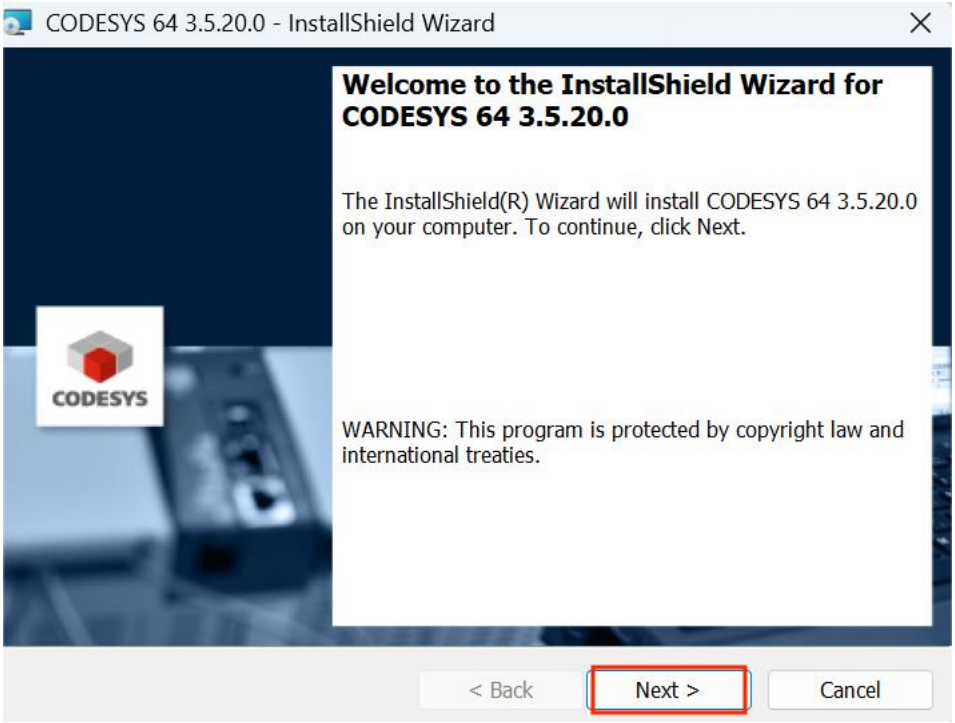


1.2 Software Installation

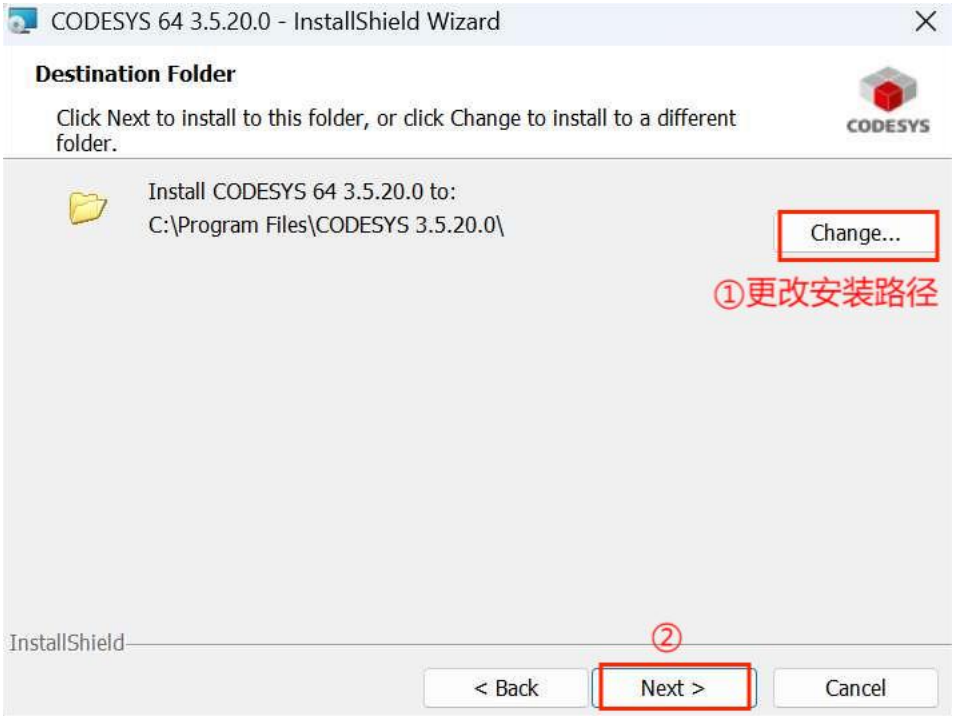
1. Using Windows Explorer, double-click CODESYS.exe in the directory where the installation files are located. After starting the installation, you will see the following interface, indicating that you have entered the installation preparation stage.



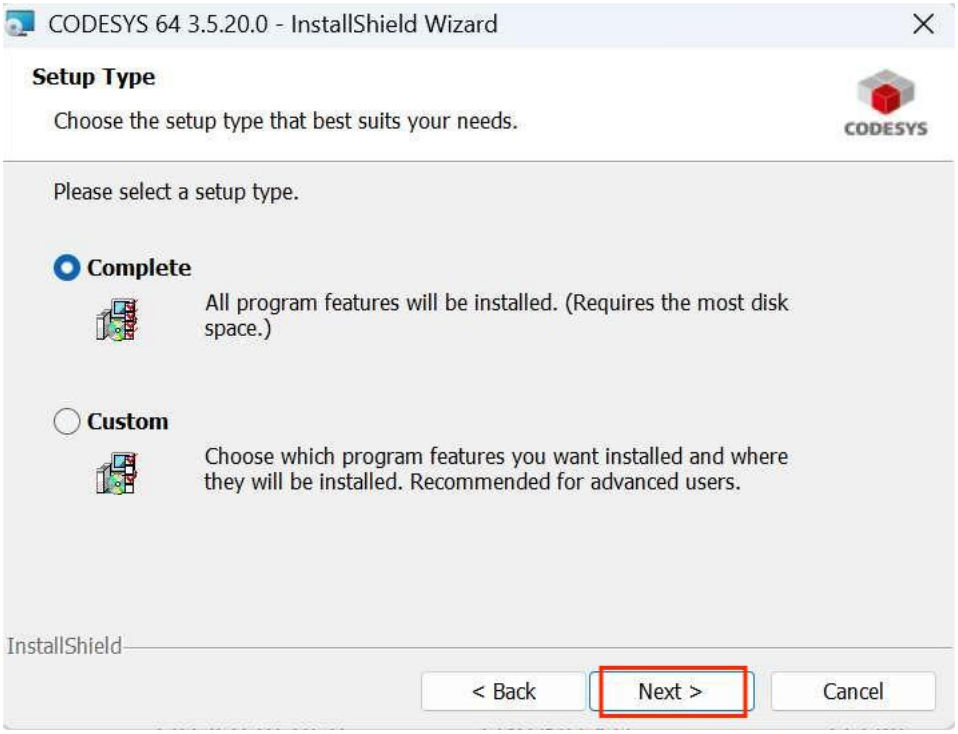
2. After the following prompt appears, click "Next" to begin the installation.



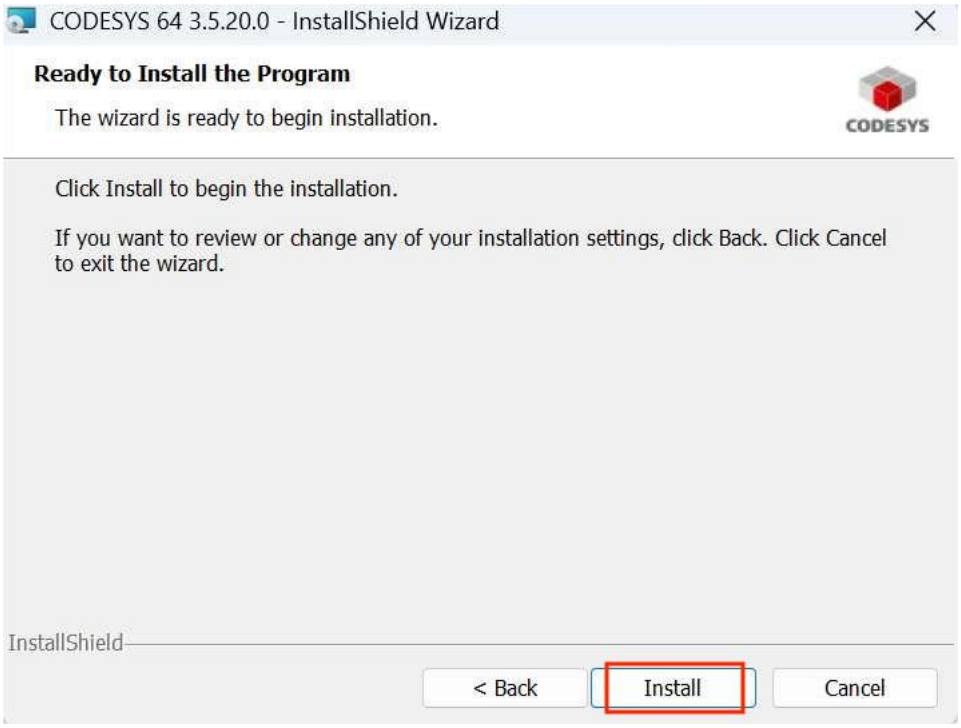
3. After setting the software installation path, click "Next" to proceed to the next step.



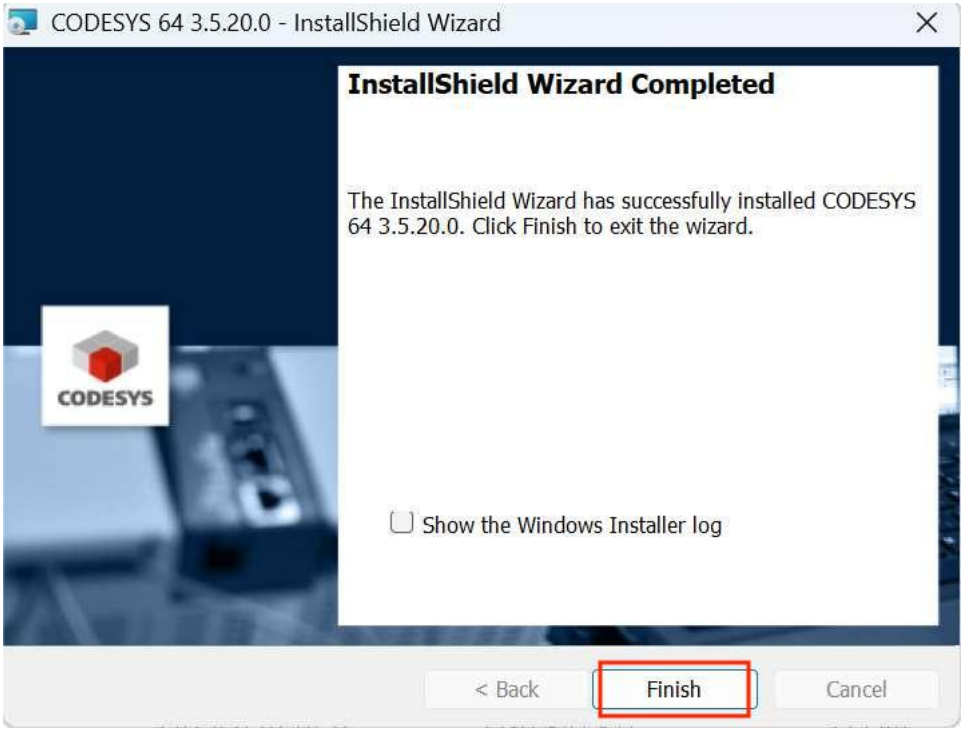
4. Enter the installation component selection interface. You can customize the selection. If you don't have any special needs, you can leave the default selections and click "Next".



5. When the following prompt appears, click "Install".



6. Wait for the installation progress bar to appear until the interface shown in the image below appears. Click "Finish" to complete the CODESYS software installation.



1.3 Software Uninstallation

CODESYS using the standard Windows system software uninstallation method . The specific steps are as follows:

1. Exit the CODESYS software and confirm that Gateway is closed.

2. If the CODESYS icon exists in the operating system taskbar , you can right-click on the icon and select "Exit" to close "Gateway".

3. Select "Start > Settings > Control Panel".

4. Double-click "Add or Remove Programs".

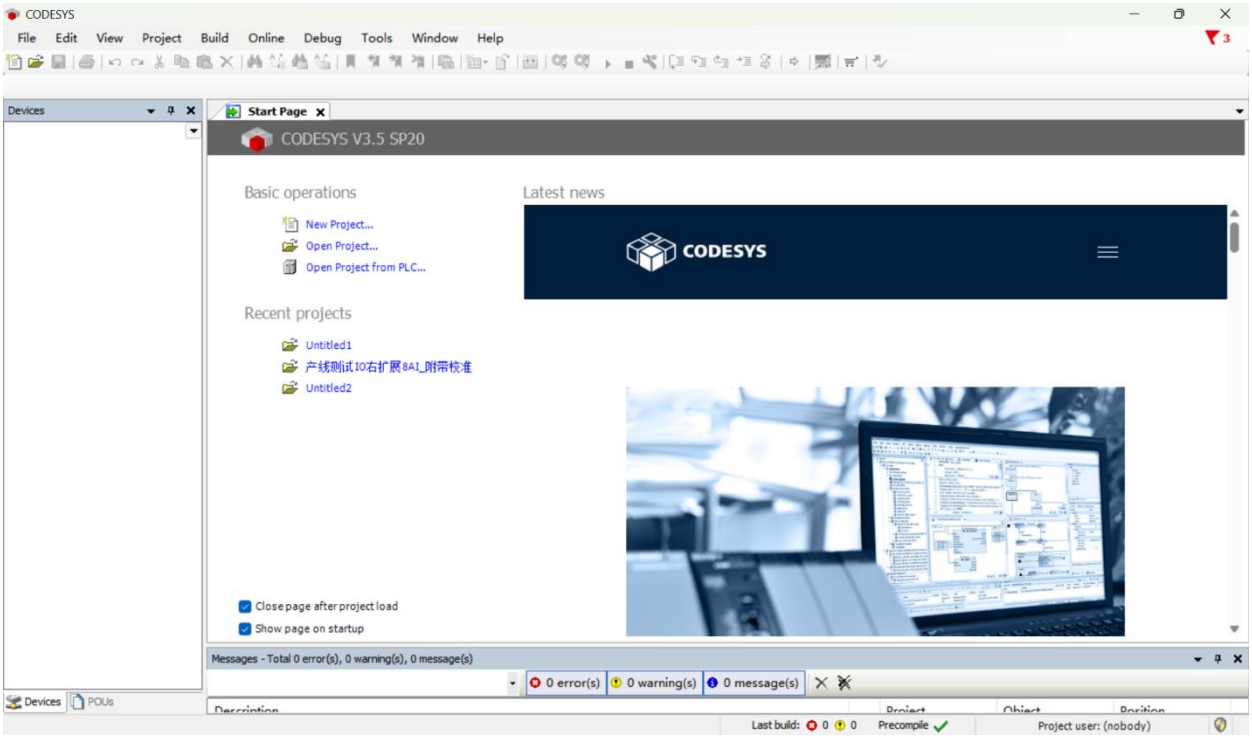
5. Select the software item you want to uninstall and find " CODESYS ".

6. Right-click the software, select "Uninstall", and confirm the uninstallation.

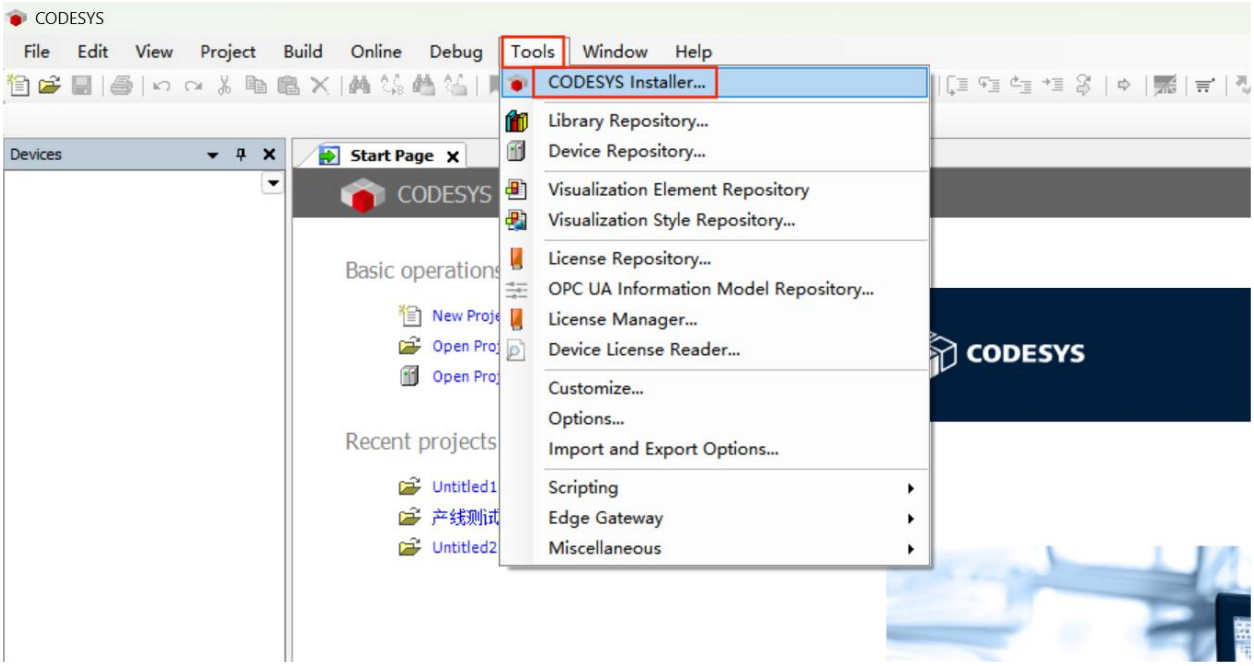
2. Quick Start

2.1 Package Installation

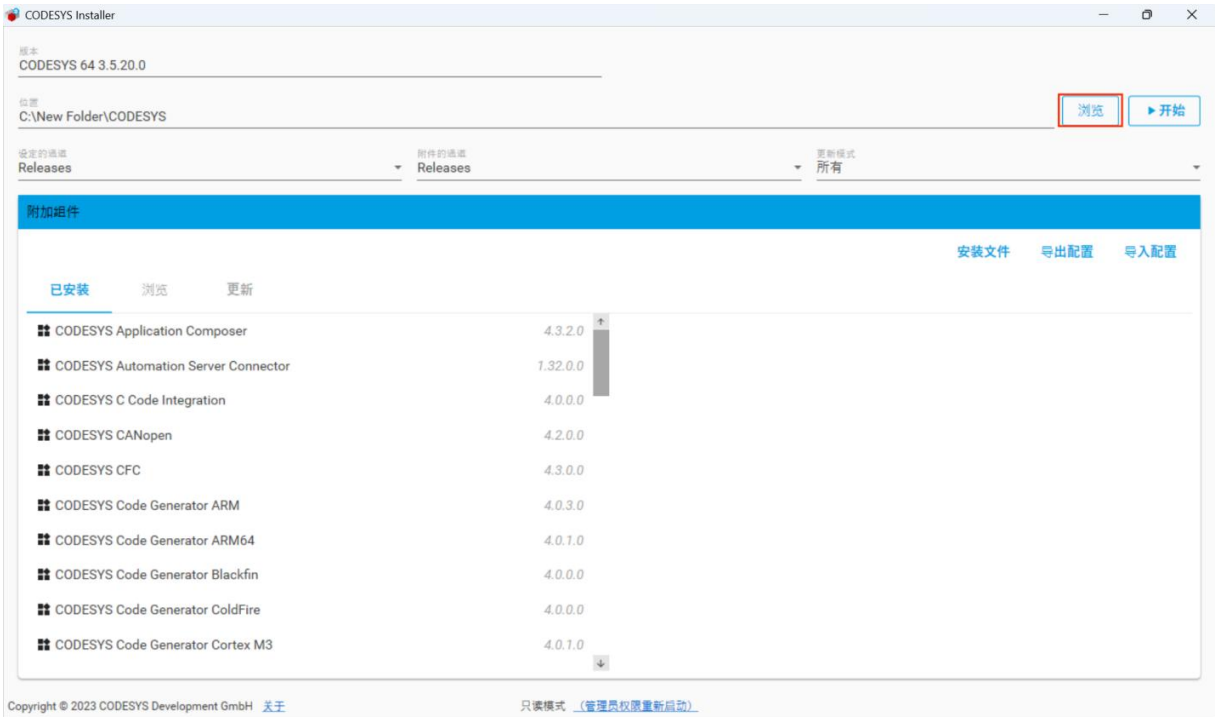
1. Double-click the desktop programming software shortcut  . The homepage interface is shown in the image below.



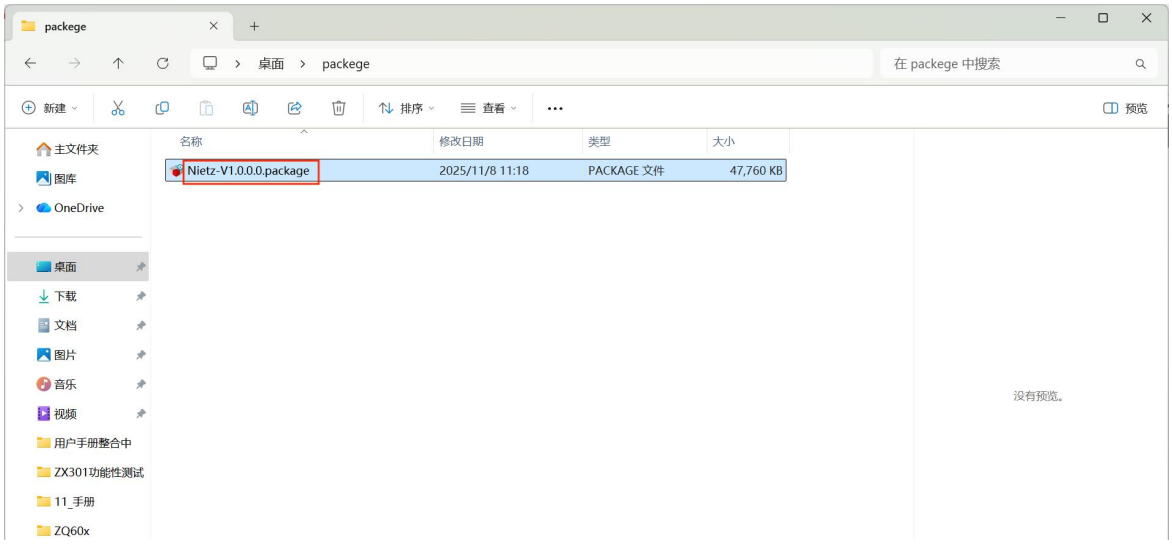
2. Select "Tools" in the menu bar, and click "CODESYS Installer", as shown in the figure below.



3. Click "Browse" on the redirected page, as shown in the image below.

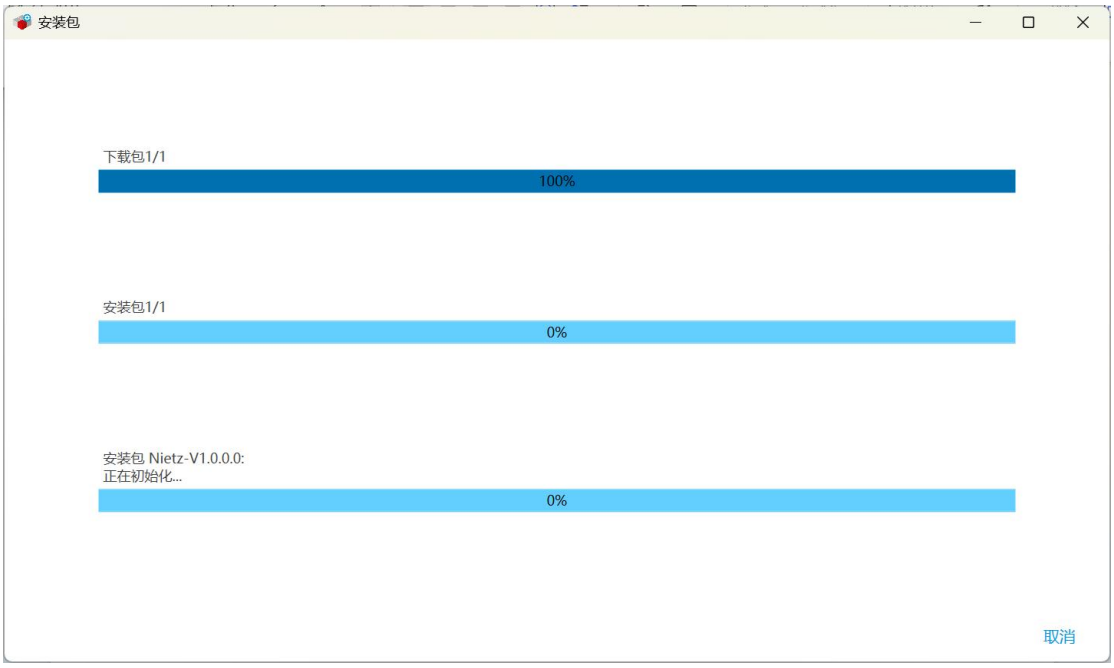


4. Locate the package file in the relevant path, double-click to open it, as shown in the image below.

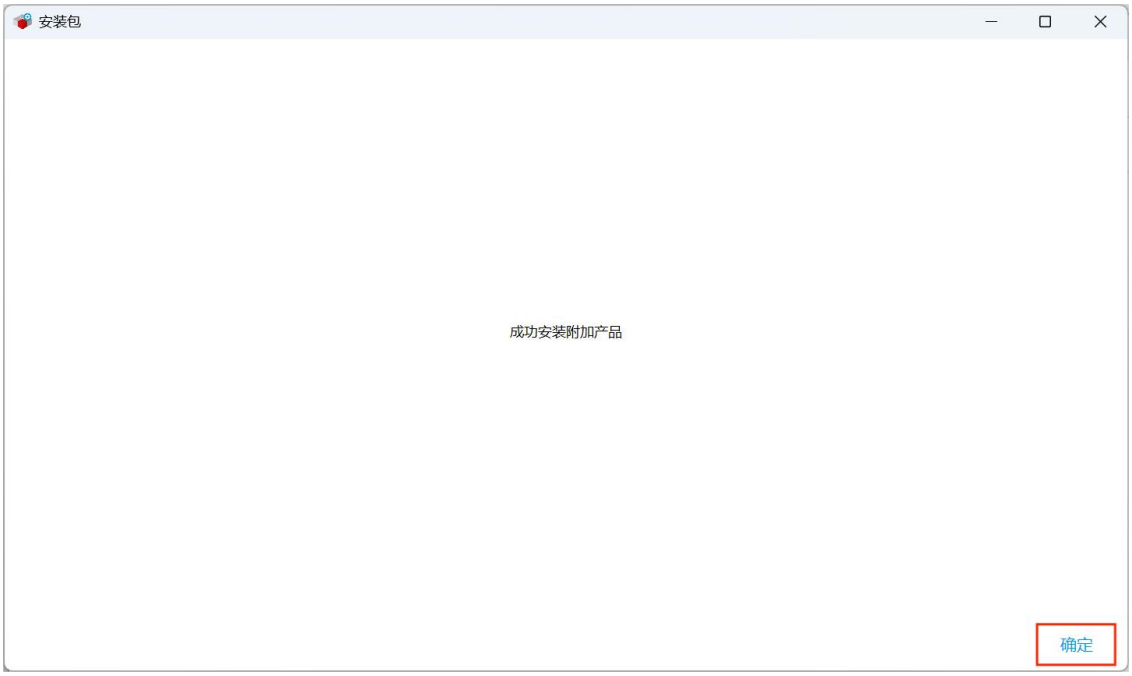


5. In the pop-up window, check the box and click "Continue", as shown in the image below.

6. Waiting for installation.

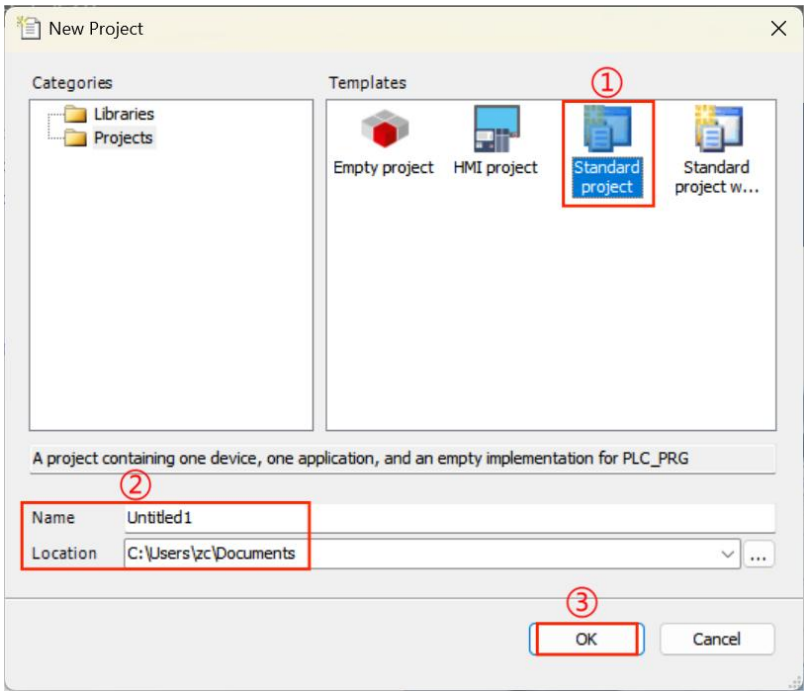


7. Installation complete. Click "OK", as shown in the image below.

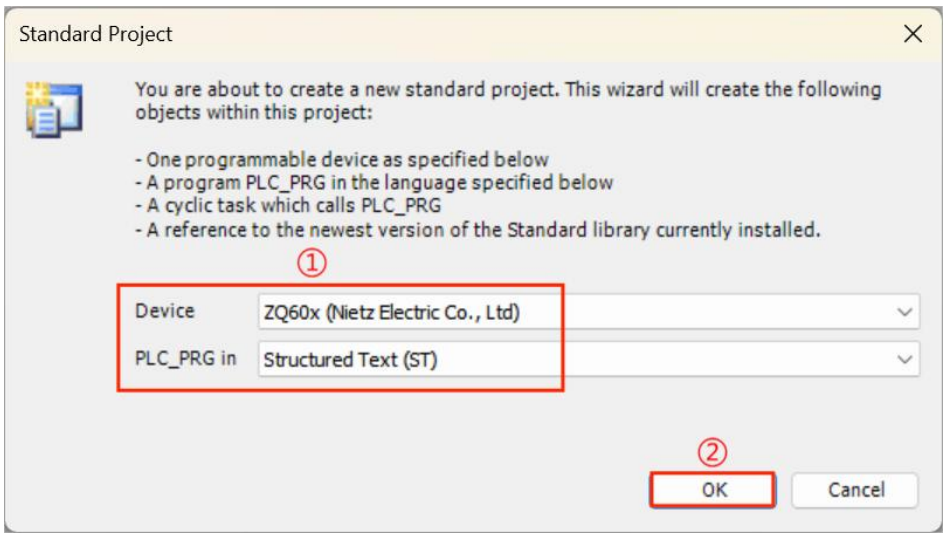


2.2 Starting the programming environment

1. On the start page, click “New Project” or select “File>New Project” in the menu bar, click “Standard project”, specify the project name and save location, and finally click “OK”, as shown in the figure below.



2. In the standard engineering interface that appears, select the device type and programming language (you can select the ZQ60X device after completing the operation in section 2.1), and click "OK", as shown in the figure below.

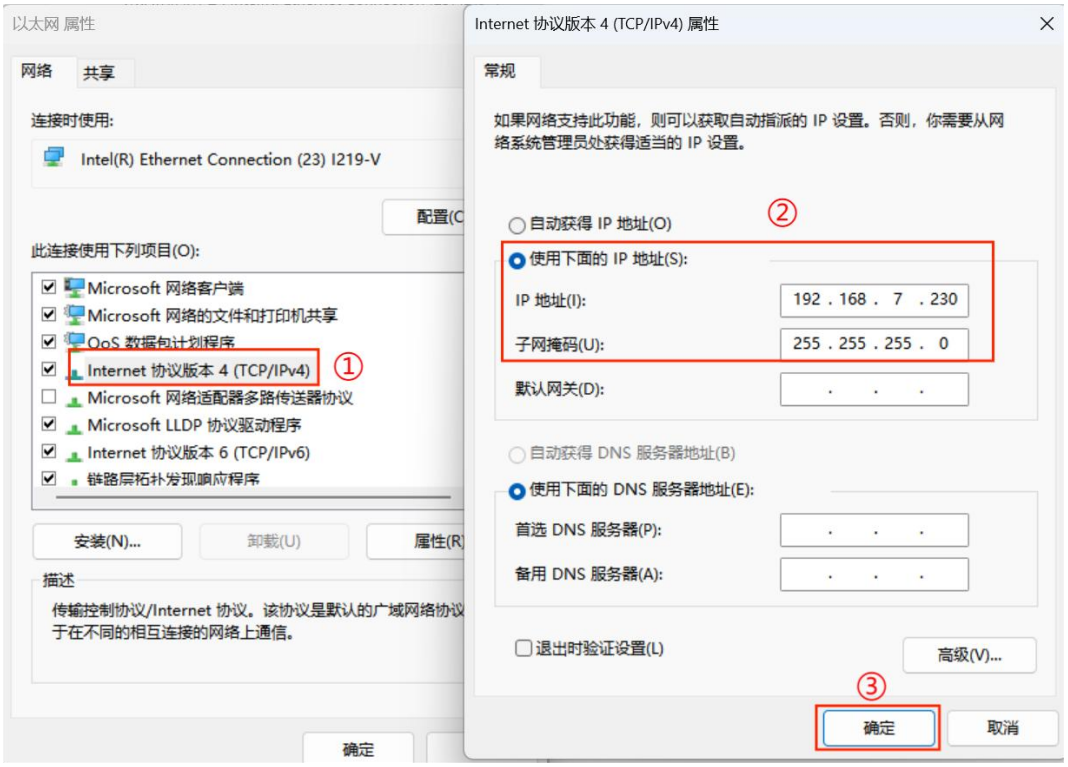


2.3 Scan and download

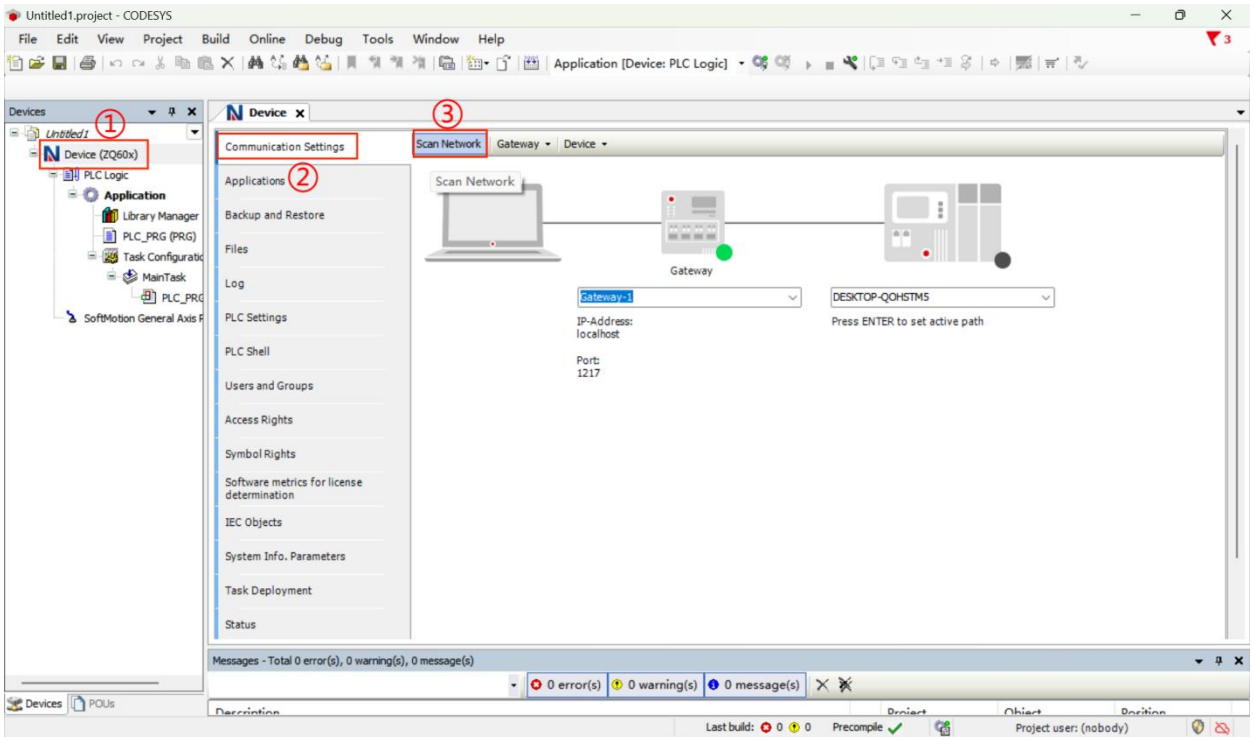
2.3.1 Downloading via Ethernet

1. Open Settings, select "Network & Internet", and click "Advanced network settings". Expand Ethernet, and click "Edit" to the right of "More adapter options", as shown in the image below.

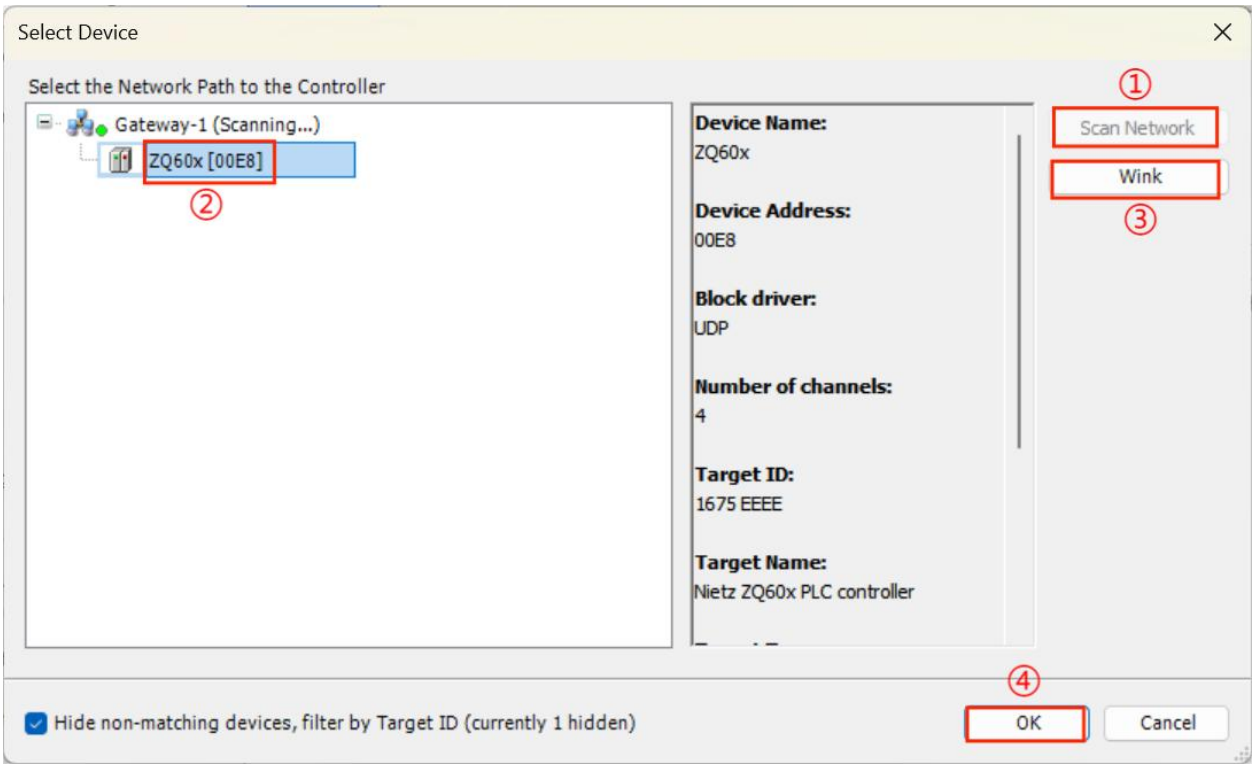
2. This experiment connects to the host computer via LAN2 port . Double-click "Internet Protocol Version 4 (TCP/IPv4)", and manually change the IP address in the pop-up dialog box to ensure it is in the same network segment as the IP address of the ZQ600 series PLC's LAN2 port (the IP address set here must not be exactly the same as the LAN2 port's IP address) . Click "OK", as shown in the figure below.



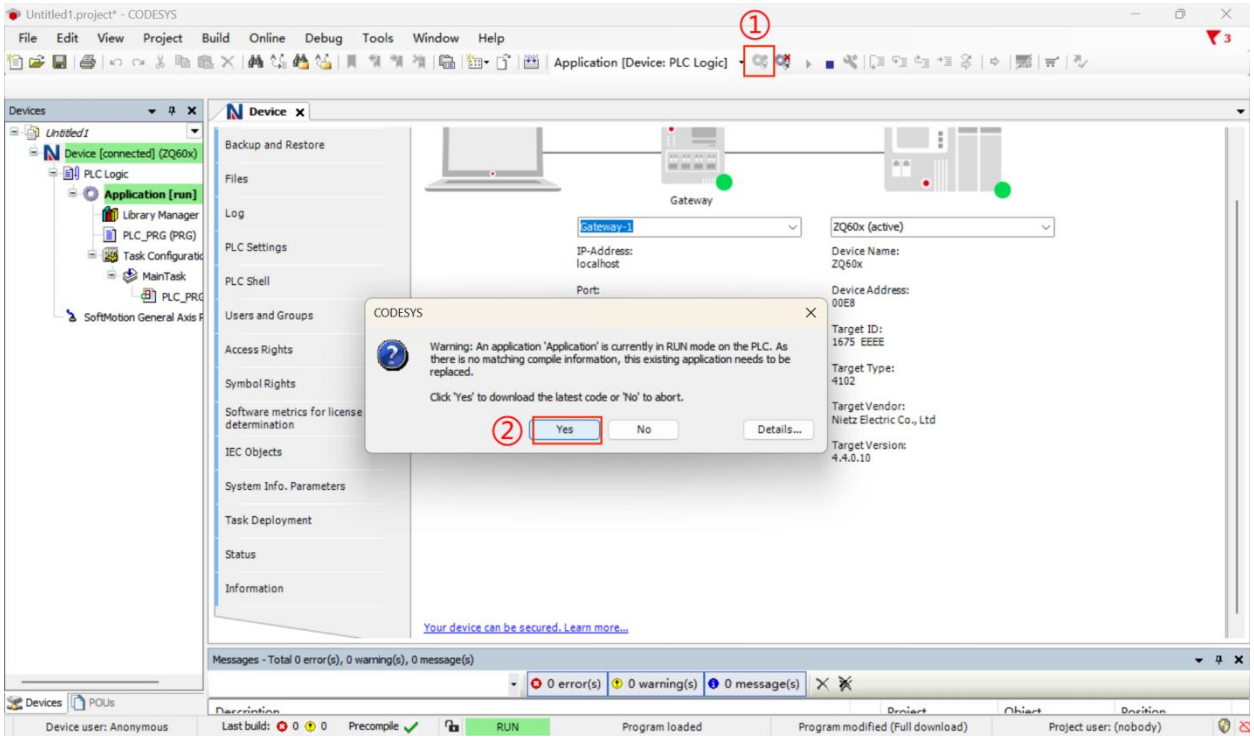
3. Return to CODESYS , double-click "Device" in the left-hand tree menu, and then click "Scan Network" in the "Communication Settings" subpage on the right, as shown in the figure below.



4. In the pop-up window, click "Scan Network". If multiple devices are detected and you are unsure which device it is, click " Wink ". The RUN and ERROR lights of the selected device will flash for 5 seconds to indicate which device has been selected. After selecting the desired device, click " OK ".

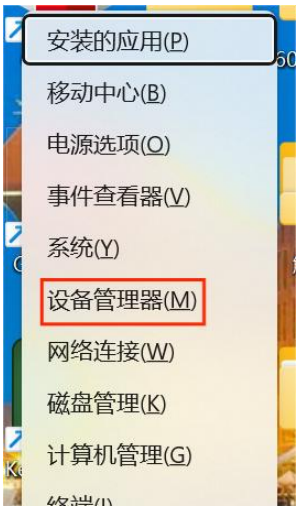


5. Click "Login" to download, and select "Yes" in the pop-up window, as shown in the image below.

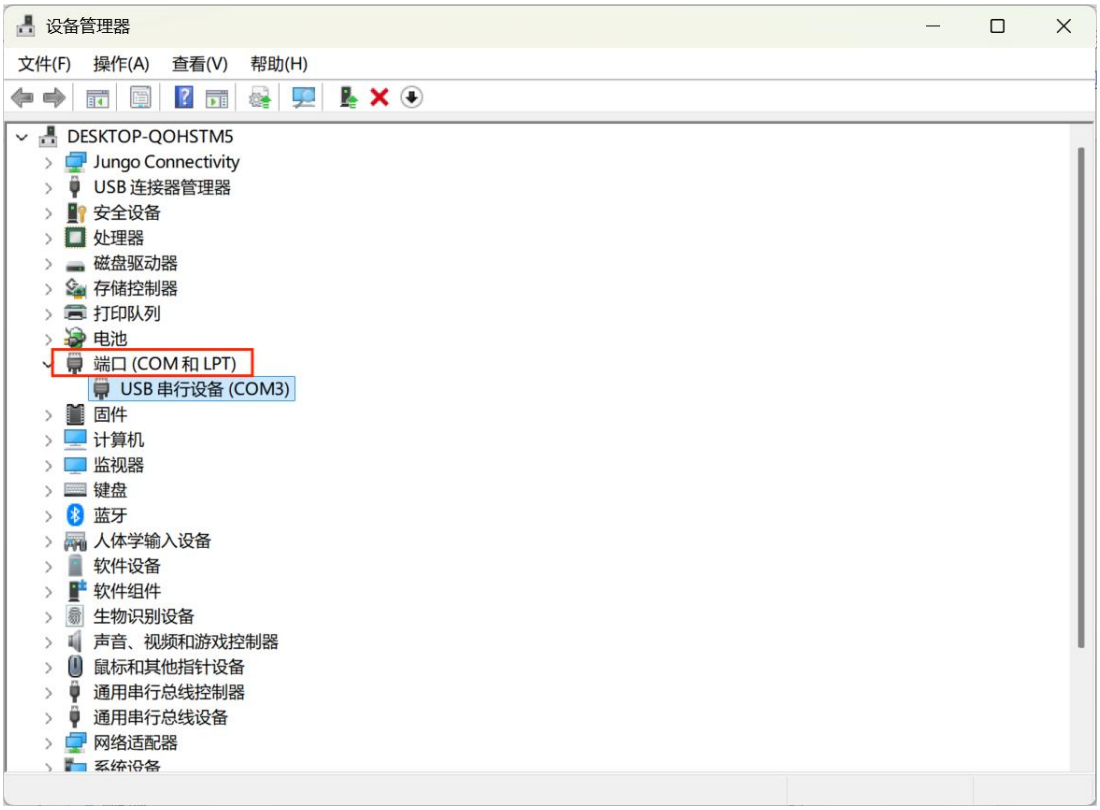


2.4.2 Downloading via USB

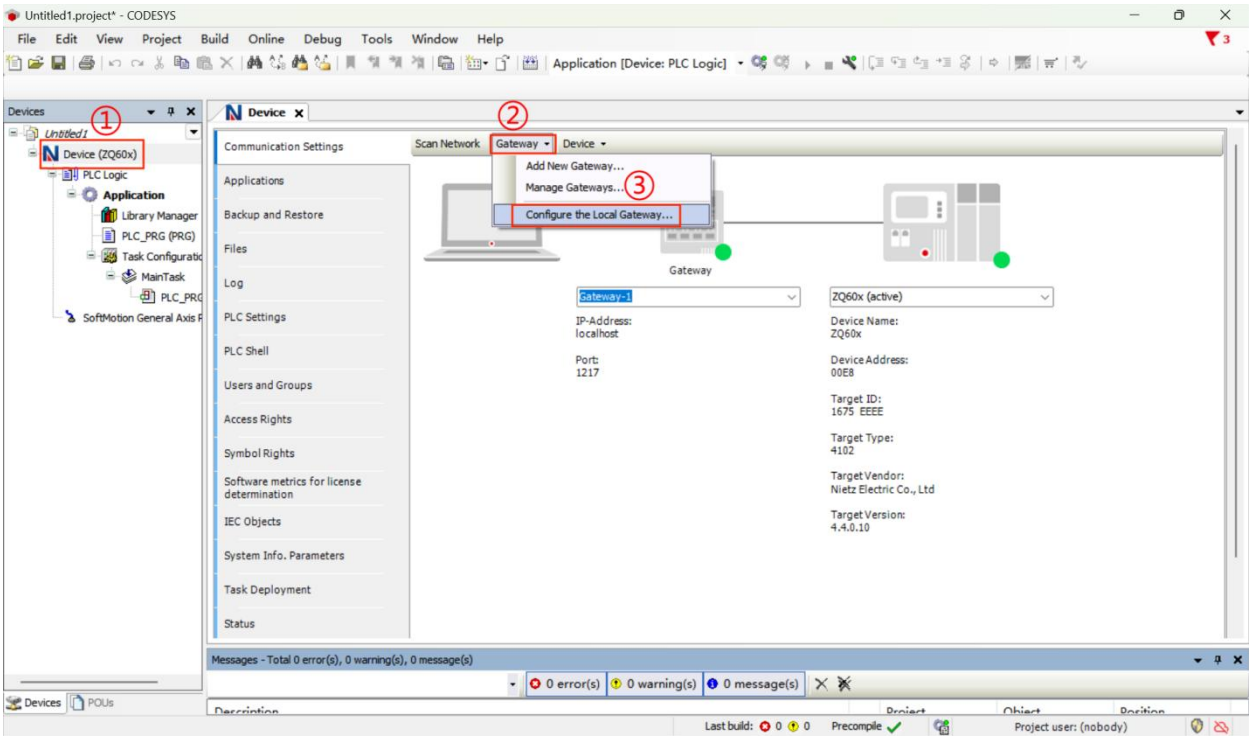
1. Press the shortcut keys Win+X, select "Device Manager", as shown in the picture below.



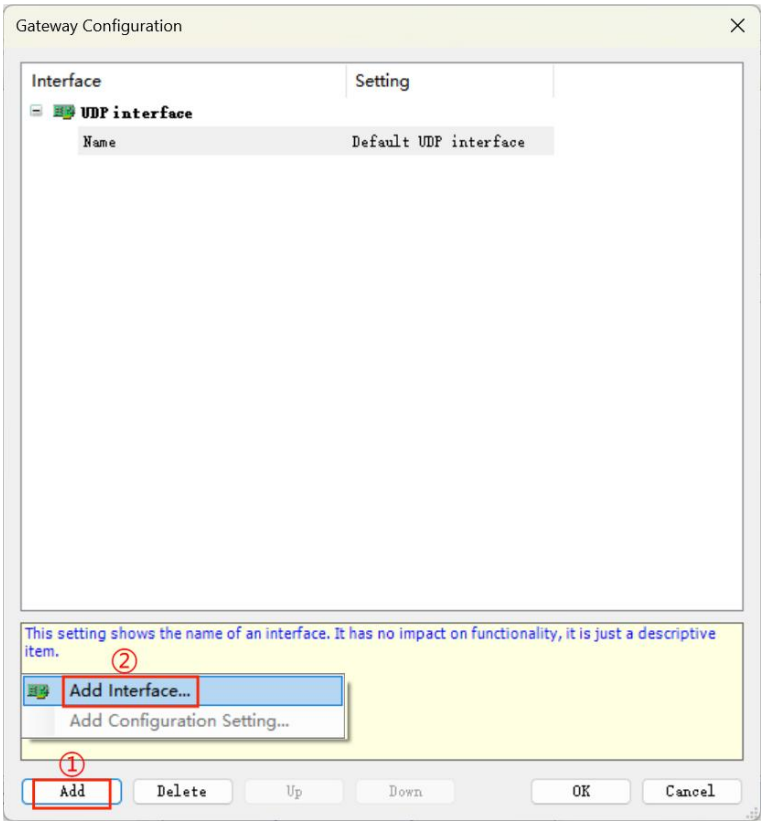
2. Expand "Ports (COM and LPT)", as shown in the image below. USB uses port number COM3.



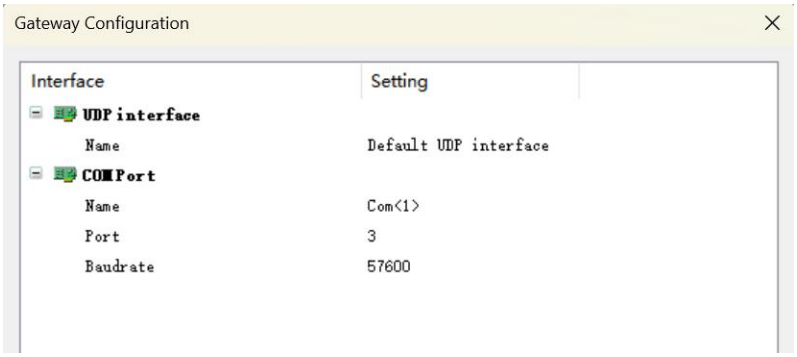
3. Return to CODESYS, double-click "Device" in the left-hand tree menu, and then click "Gateway" > "Configure the Local Gateway" in the "Communication Settings" subpage on the right, as shown in the figure below.



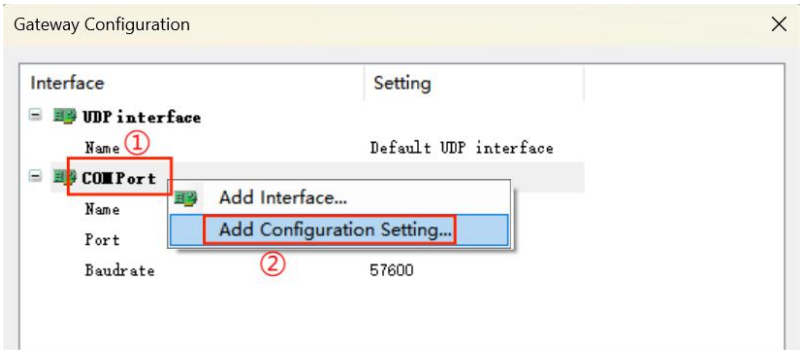
4. In the pop-up gateway configuration interface, click "Add" > "Add Interface", as shown in the figure below.



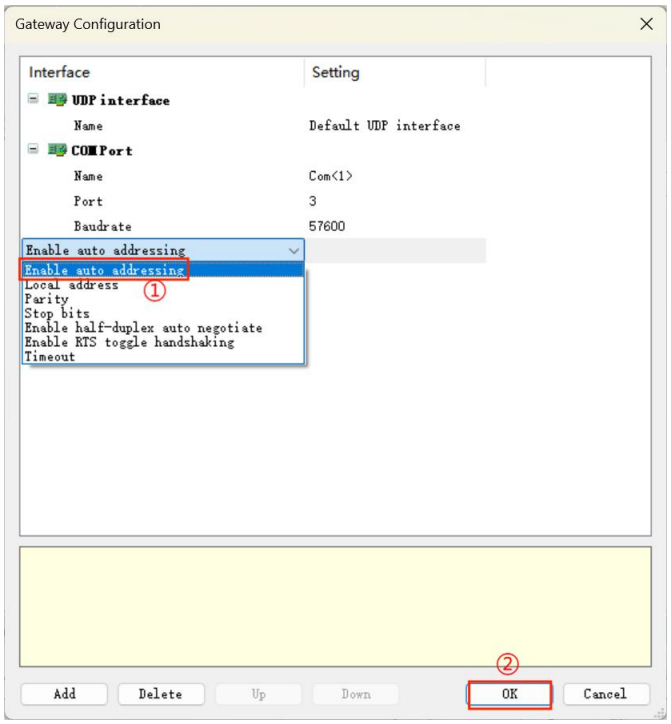
5. Select Com Port, change the port to 3, and leave the name and baud rate as default, as shown in the image below.



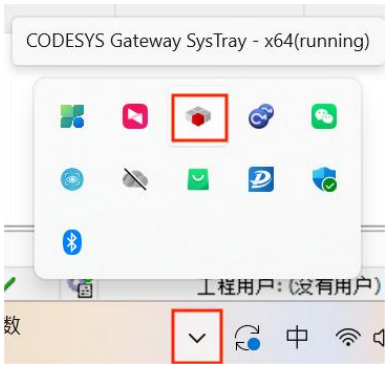
6. Right-click ComPort and click "Add Configuration Setting", as shown in the image below.



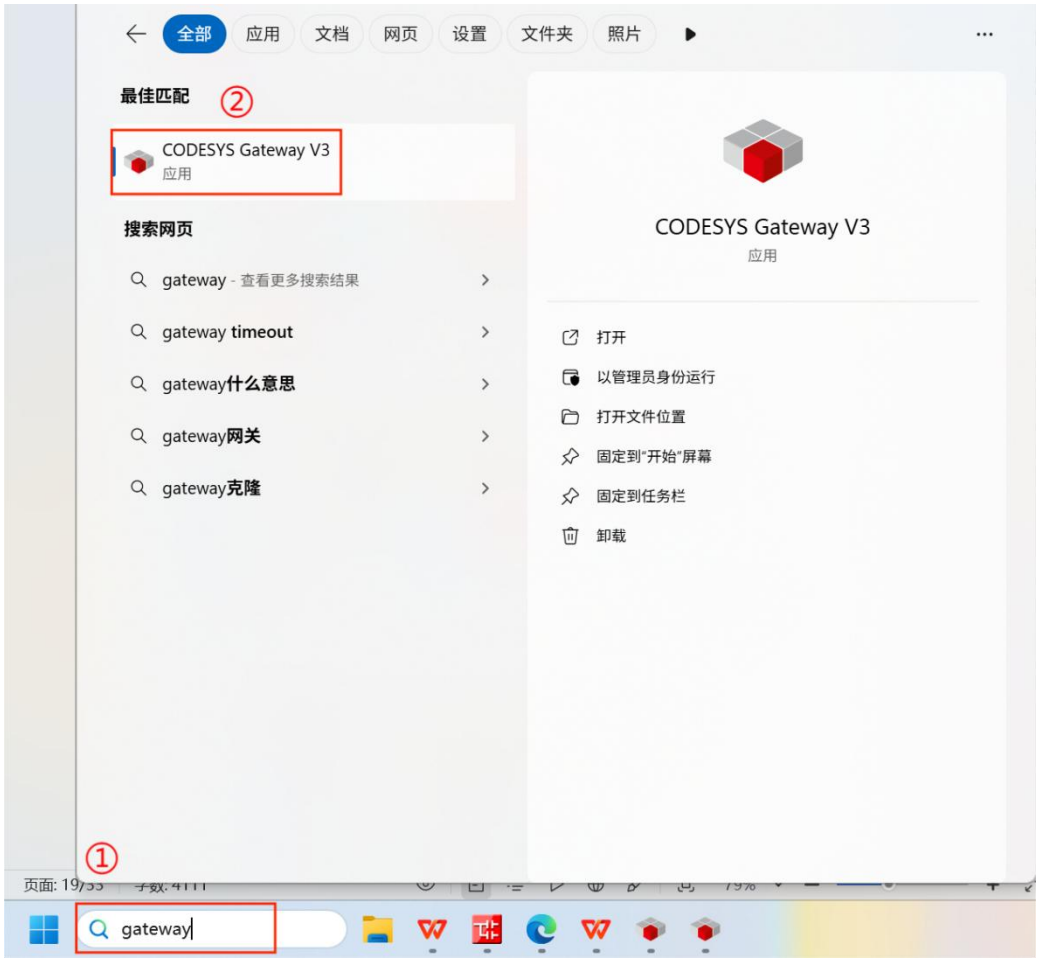
7. Select "Enable auto addressing" from the drop-down menu and click "OK", as shown in the image below.



8. Configuration complete. The gateway needs to be restarted. Click "CODESYS Gateway SysTray " > "Stop Gateway" in the drop-down menu at the bottom right of your computer to turn off the gateway, as shown in the image below.

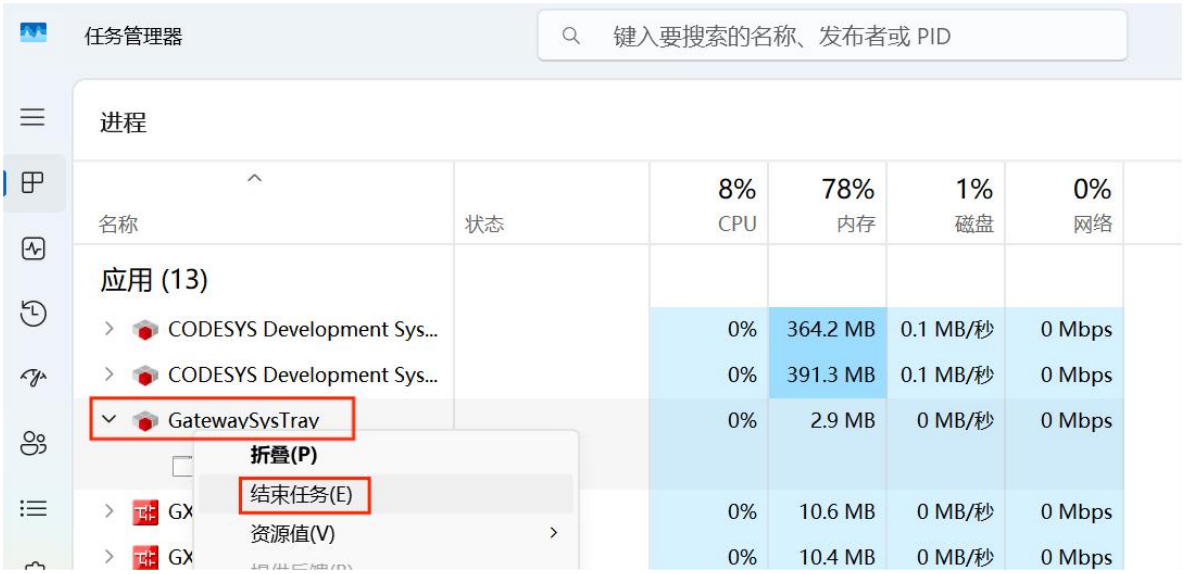


If there is no icon, search for "gateway" directly in the taskbar at the bottom of your computer and double-click to open it.

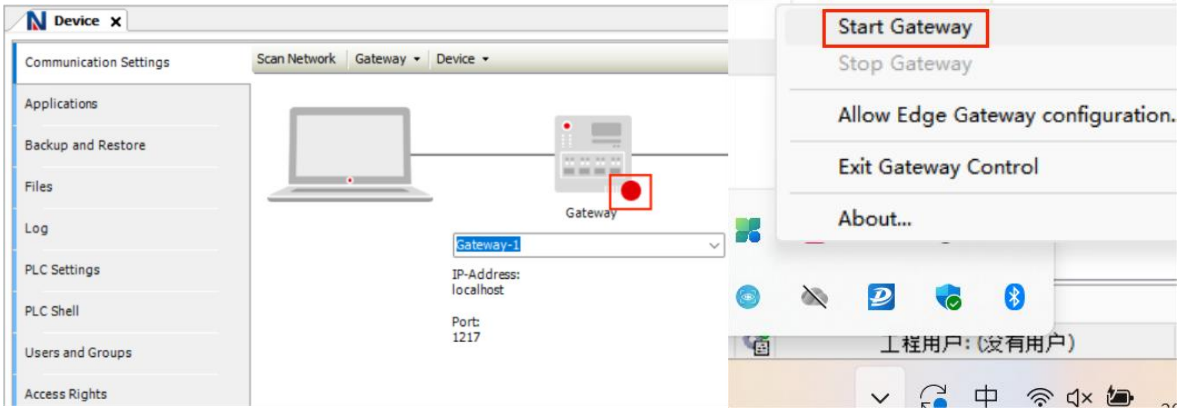


If a warning appears that another application is running, you can force close that application in Task Manager to disable the gateway.

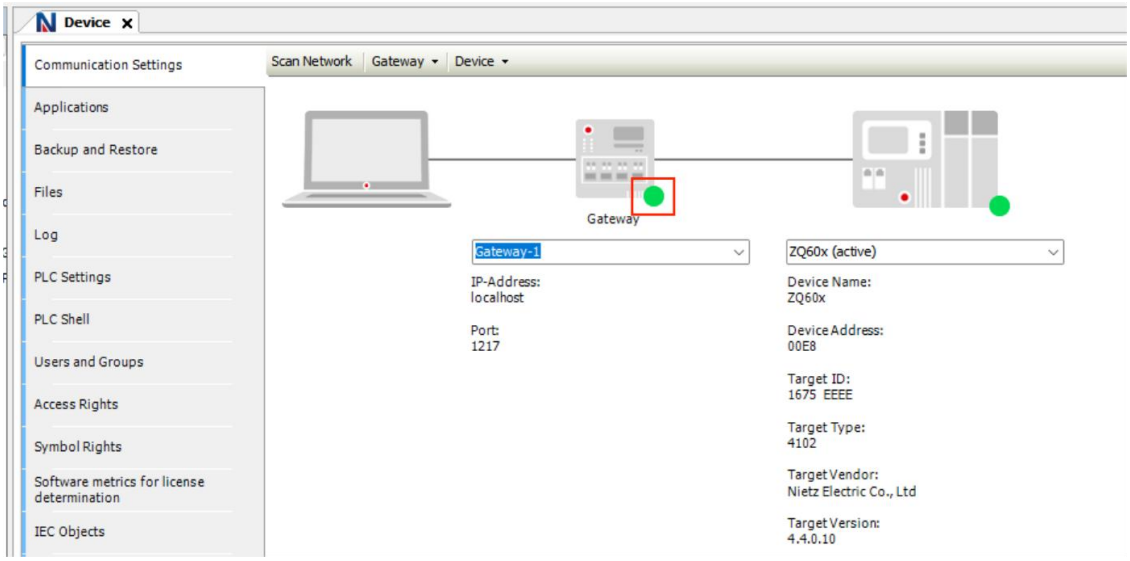
Right-click the taskbar and open Task Manager. Select "GatewaySysTray", right-click and select "End Task" to force the gateway to shut down.



9. Wait until the gateway icon on the "Device" communication settings subpage turns red, indicating that the gateway is disconnected, then turn the gateway back on.



10. After the gateway icon turns green, scan the network to log in and download. Please refer to Ethernet Download (section 2.4.1) for operation steps.

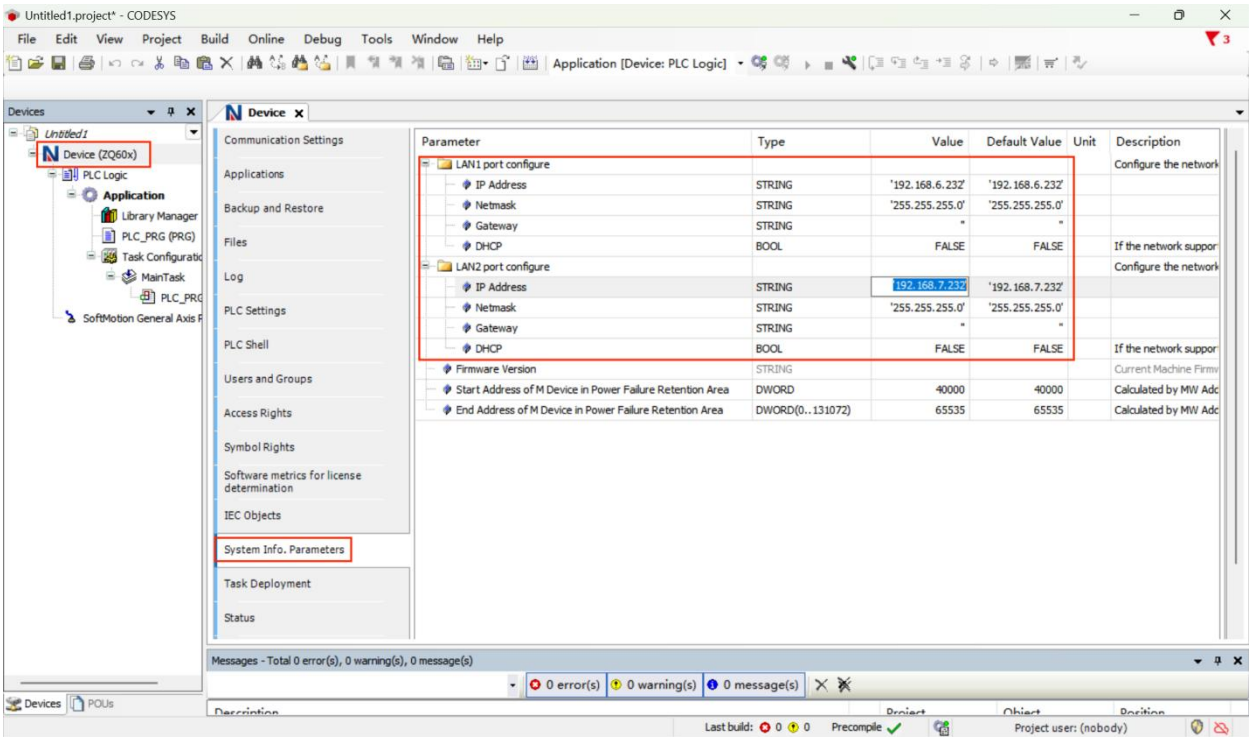


3. Network Configuration

3.1 Gateway Modification and Usage

3.1.1 Modify IP address

The default IP address for LAN 1 is 192.168.6.232 , and the default IP address for LAN 2 is 192.168.7.232 . To change these addresses, double-click "Device" in the left-hand tree menu, then double-click the IP address in the System Info.Parameters subpage on the right and enter the value . Log in and then log out for the changes to take effect .

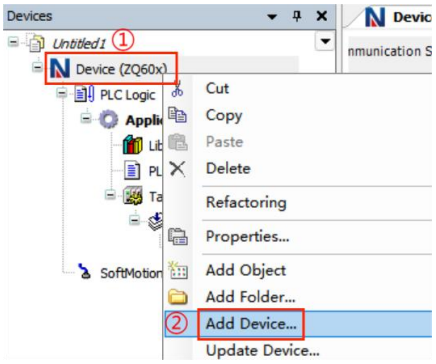


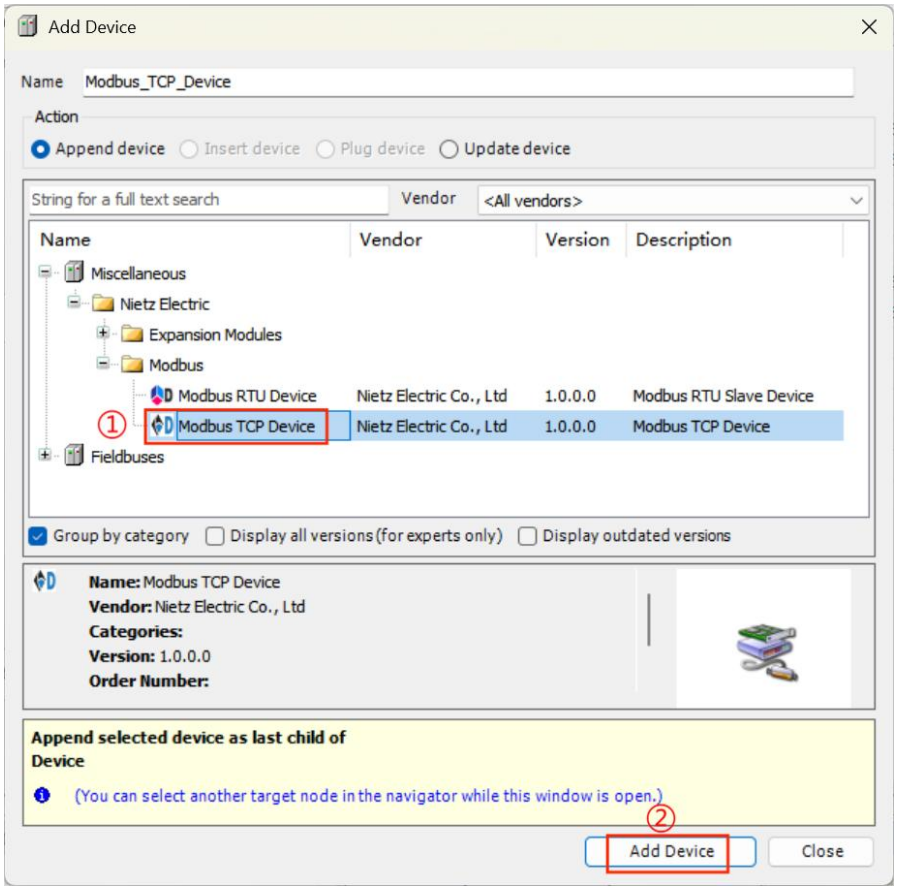
3.2 Modbus TCP Communication Configuration

3.2.1 Modbus TCP Slave Function Configuration

- Add slave station

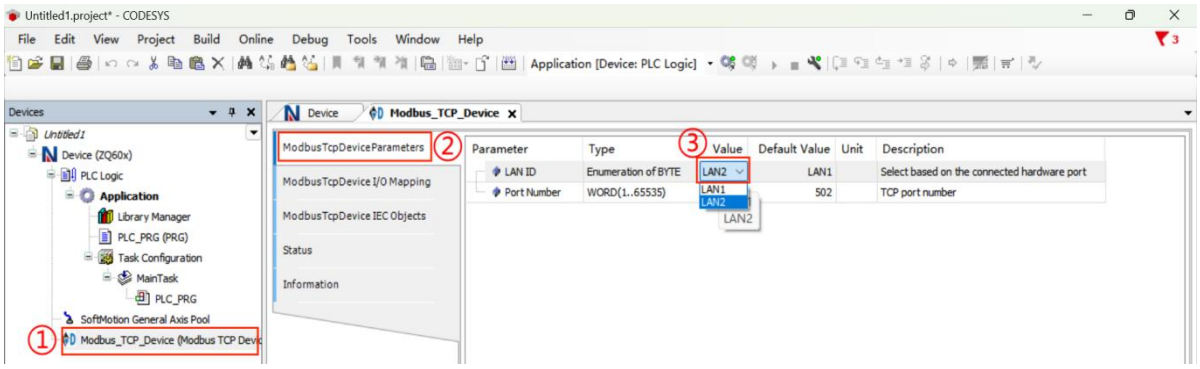
Right-click "Device" in the left-hand tree menu > "Add Device" . In the pop-up "Add Device" dialog box, open "Miscellaneous" > "Nietz Electric" > "Modbus" and select " Modbus" . TCP Finally, click "Add Device".





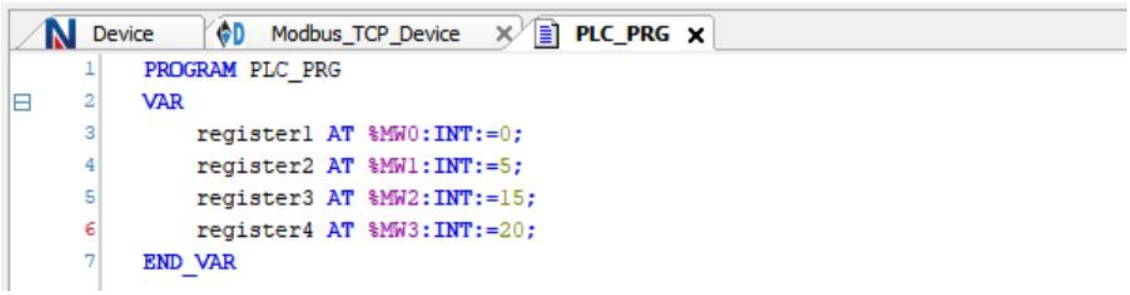
- Configure slave station

Double-click “Modbus_Tcp_Device” > “ ModbusTcpDevice Parameters” , and select LAN 2 according to the LAN port connected to the host computer and ZQ600 . The port number is 502 by default.



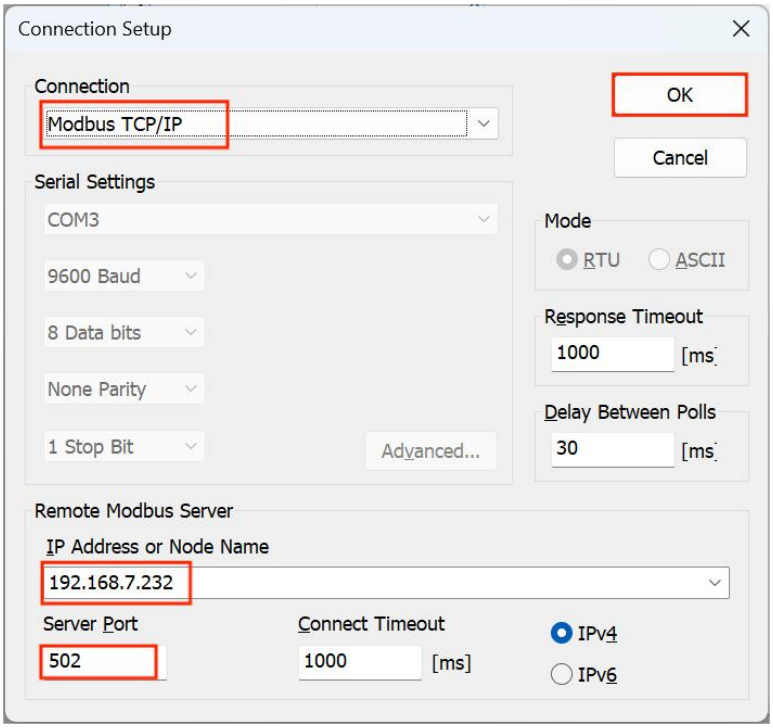
- Communication variable configuration

Create four new variables in “ PLC_PRG ” , map their addresses and assign values , log in, download to the device, and start it.

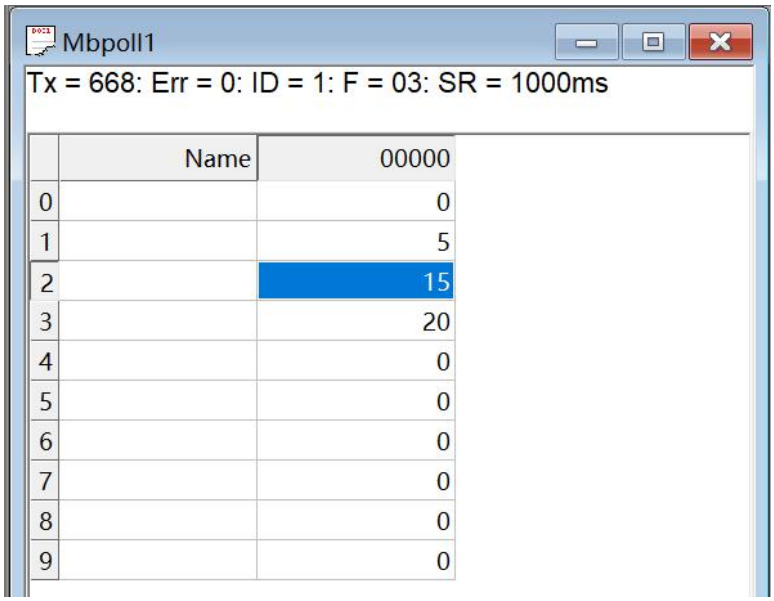


- Slave Function Debugging

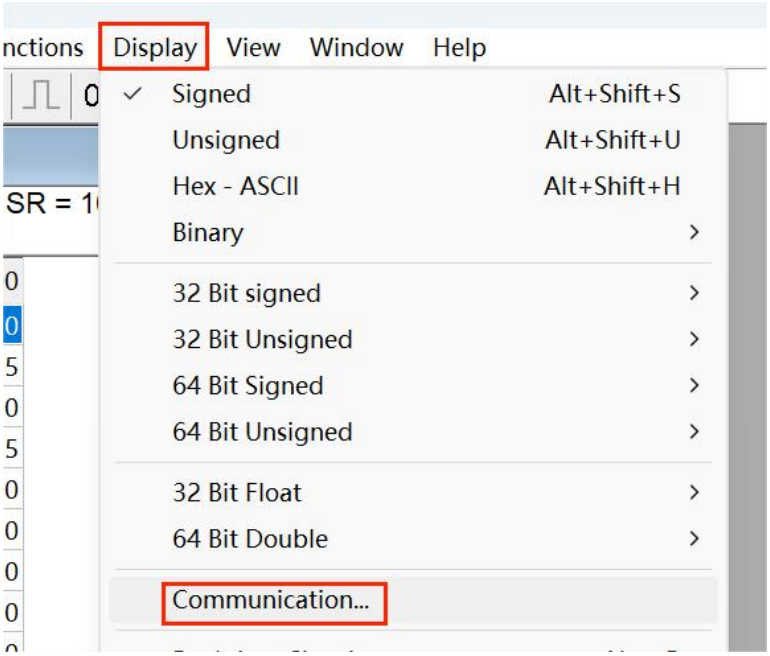
Open the TCP test tool (main site), click " Connection " > " Connect " in the menu bar or press the shortcut key F3, and configure the parameters in the pop-up window . Select Modbus as the connection method . For TCP /IP, set the remote IP address to 192.168.7.232 (the same as the LAN2 port IP address), and the default remote port number is 502. Click "OK" after setting. .

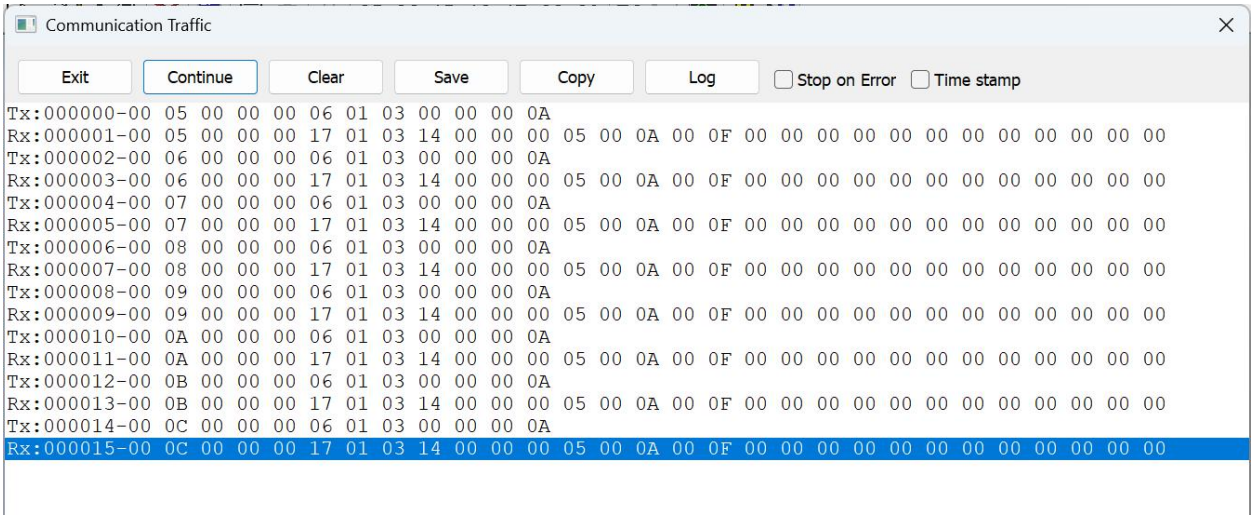


At this point, the connection is successful, and the registers have read the data from the slave station. Registers 0 to 3 are decimal 0, 5, 10, and 15 respectively , which are consistent with the variable values written in the program. The master station has successfully read the values of the corresponding registers from the slave station.



" Display " in the debugging software menu bar , select " Communication ," and open the message sending and receiving details page . For information on the Modbus TCP message data structure and slave Modbus addresses, please refer to section 5.3, Modbus Communication .



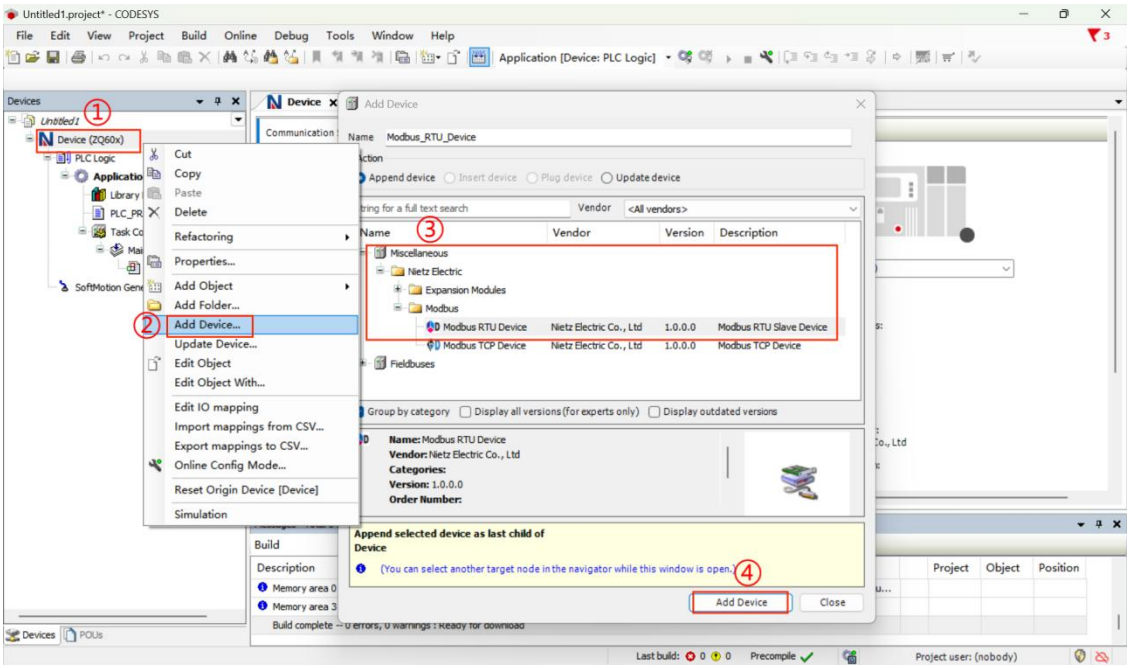


3.3 Modbus RTU Communication Configuration

3.2.1 Modbus RTU Slave Function Configuration

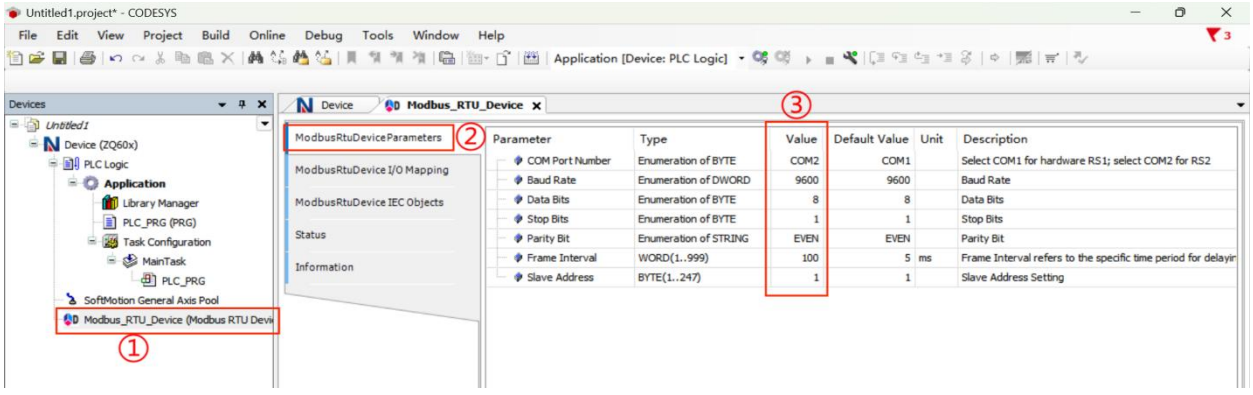
- Add slave station

" Device " in the left-hand tree menu , select "Add Device," and in the pop-up dialog box, open "Miscellaneous" > "Nietz Electric" > "Modbus ," then select " Modbus." Then click "RTU Device " and finally click "Add Device" .



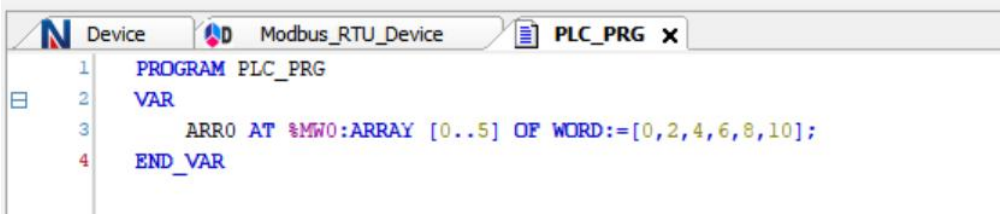
- Configure slave station

- click “ Modbus_RTU_Device ” , select “ ModbusRtuDevice Parameters ” , and configure as shown in the following figure:



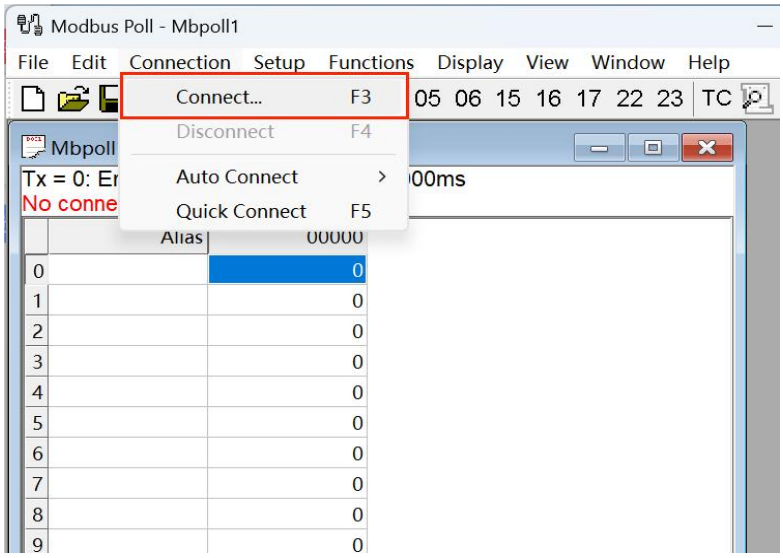
- Communication variable configuration

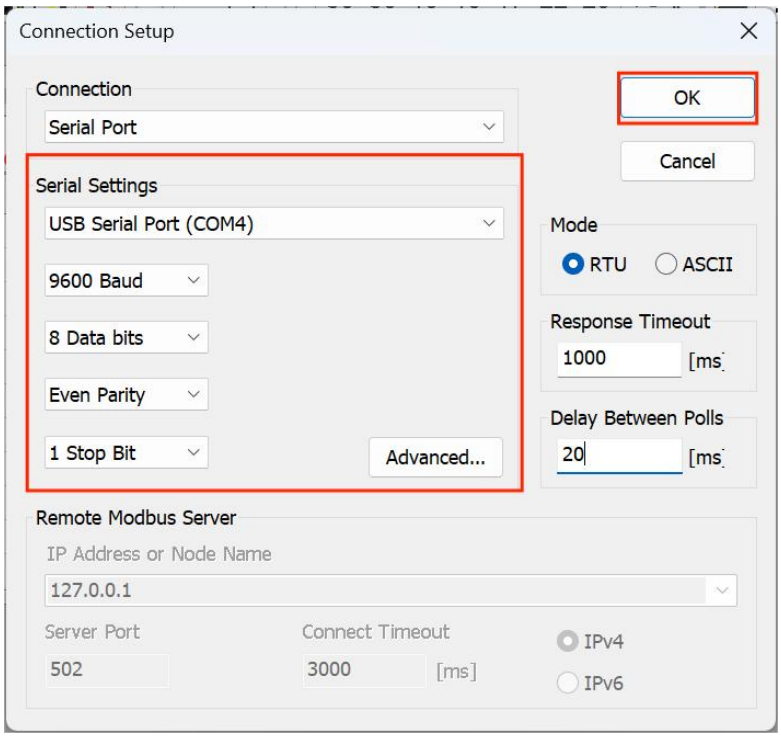
Write the following program in " PLC_PRG " :



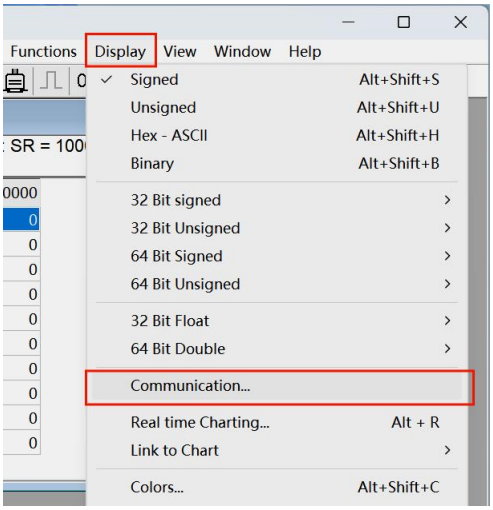
- Slave Function Debugging

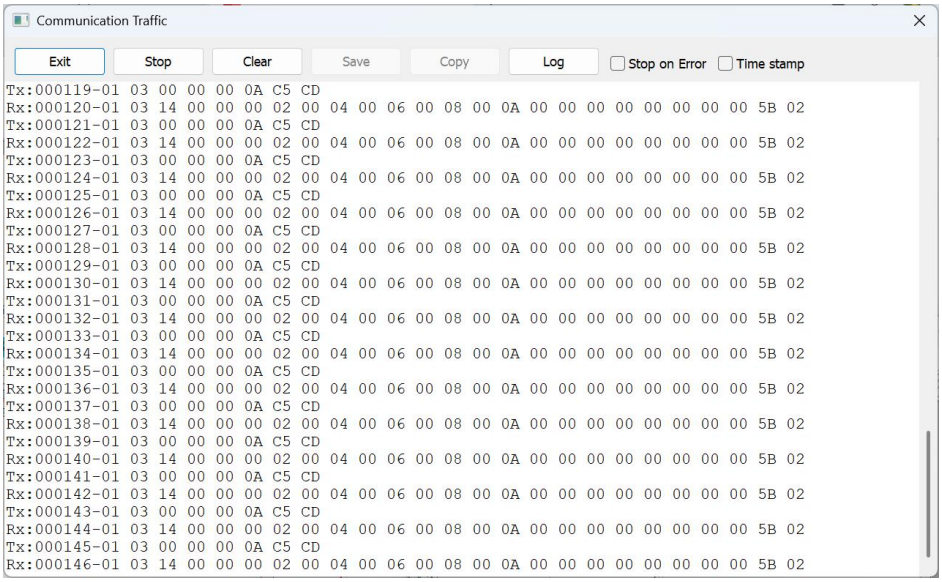
Open the ModbusRTU debugging tool (master station), click "Connection" in the menu bar and select " Connect " or press the shortcut key F3. Configure the parameters in the pop-up window, which must be consistent with the configuration for the slave station in CODESYS. Finally, click " OK " in the upper right corner to complete the connection.



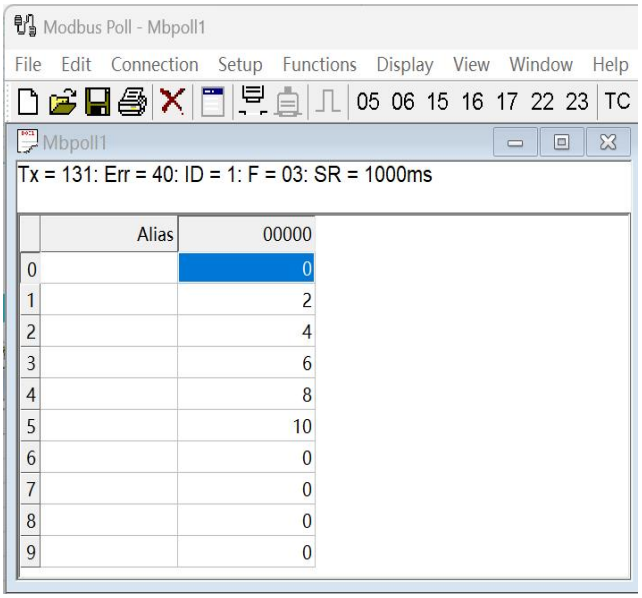


" Display " in the debugging software menu bar , select " Communication ," and open the message sending and receiving details page . For information on the Modbus RTU message data structure and slave Modbus addresses, please refer to section 5.3, Modbus Communication .





You can see the data stored in the debug software registers, which is the value in the array " ARR0 " in the program.



4. Error message

4.1 Indicator Light Description

- PWR LED Light Instructions

R WR LED is used to indicate the power-on status of the motion controller .

LED light status	Display instructions	processing method
Green light	Power supply is normal	No processing required
Lights off or flashing	Power supply error	Check if the controller's power supply (24V) is normal.

- RUN LED light display instructions

The RUN LED is used to display the program running status of the motion controller.

LED light status	Display instructions	processing method
Green light	The controller is in operation.	No processing required
Lights off	The controller is in a stopped state.	Switch the PLC to running mode as needed.

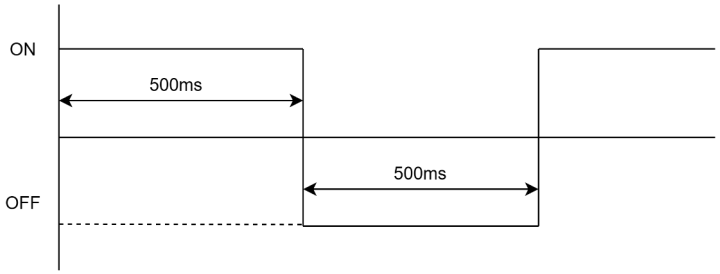
- ERR LED Light Instructions

The ERR LED is used to indicate the error status of the motion controller.

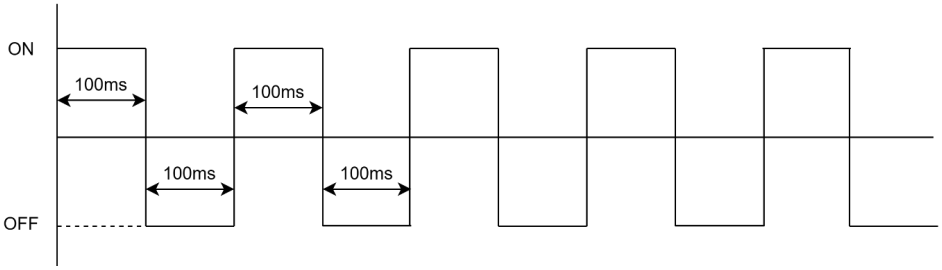
LED light status	Display instructions	processing method
Lights off	The controller is in normal condition.	No processing required
Red light flashing	1. Power supply malfunction 2. The module contains a serious error. 3. The number of axes exceeds the controller's limit. 4. Low voltage of RTC battery 5. M device power failure retention setting error	1. Check the controller's 24V power supply and power it back on. 2. Use the software to check the specific errors. 3. Reduce the number of axes 4. Replace the battery 5. Check software settings and re-download.
Red light flashing slowly	An error occurred in the extension module.	Use the software to check the specific cause of the error.
Red light hazard	Controller reset complete	Reset complete and power on again

lights		
Red light always on	A serious error occurred in the controller.	If the error persists after powering on again, please contact the manufacturer.

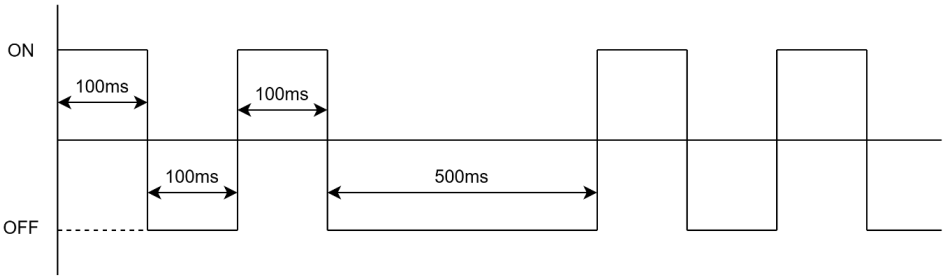
Red light flashing slowly (1Hz):



Red light flashing rapidly (10Hz):

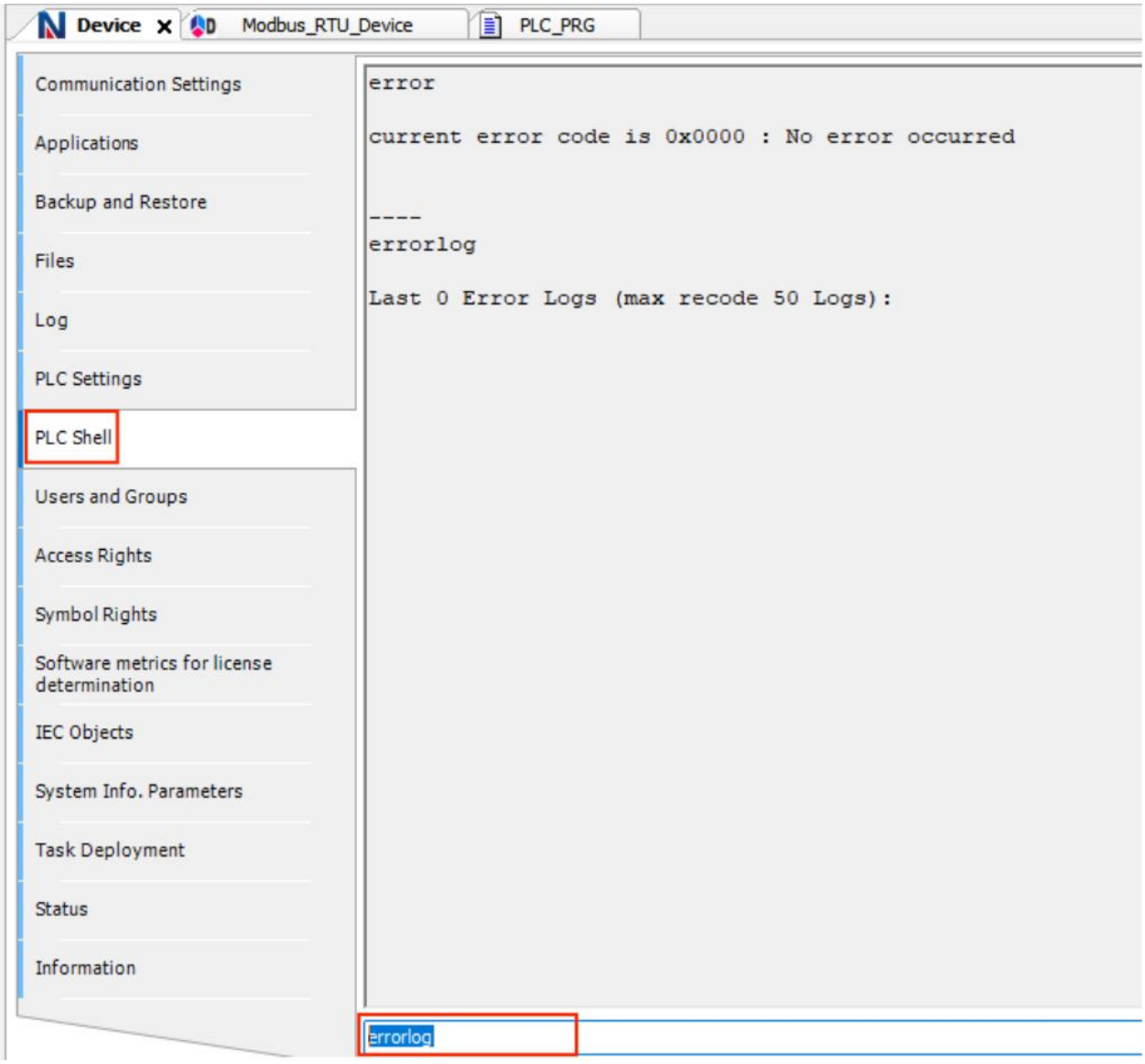


Red hazard lights:



4.2 Error Code Explanation

Ensure the device is scanned and logged in. Double-click "Device" in the left-hand tree menu. In the "PLC Shell " subpage on the right, as shown in the image below, enter "error" in the input box to display the controller's current errors; enter "errorlog" to display the most recently occurring error logs.



The specific error codes for the controller are defined in the table below:

System error codes (hexadecimal)	meaning	processing method
0	No errors	No processing required
1000	IO system initialization failed	If the error persists after powering on again, please contact the manufacturer.
1001	ZBUS bus initialization failed.	If the error persists after powering on again, please contact the manufacturer.
1002	RTC device initialization failed.	If the error persists after powering on again, please contact the manufacturer.
1003	File failed to open	If the error persists after powering on again, please contact the manufacturer.
2000	Low power supply voltage detected	Check if the 24V power supply is normal.
2001	The extension module exceeded the maximum limit.	Please keep the number of units below 32.
2002	Unsupported extension modules	Firmware upgrade support
2100~211F	Expansion module disconnected	Check for any issues with the connections between modules, check for any problems with the module power supply, and check that the end cover is properly connected ; after

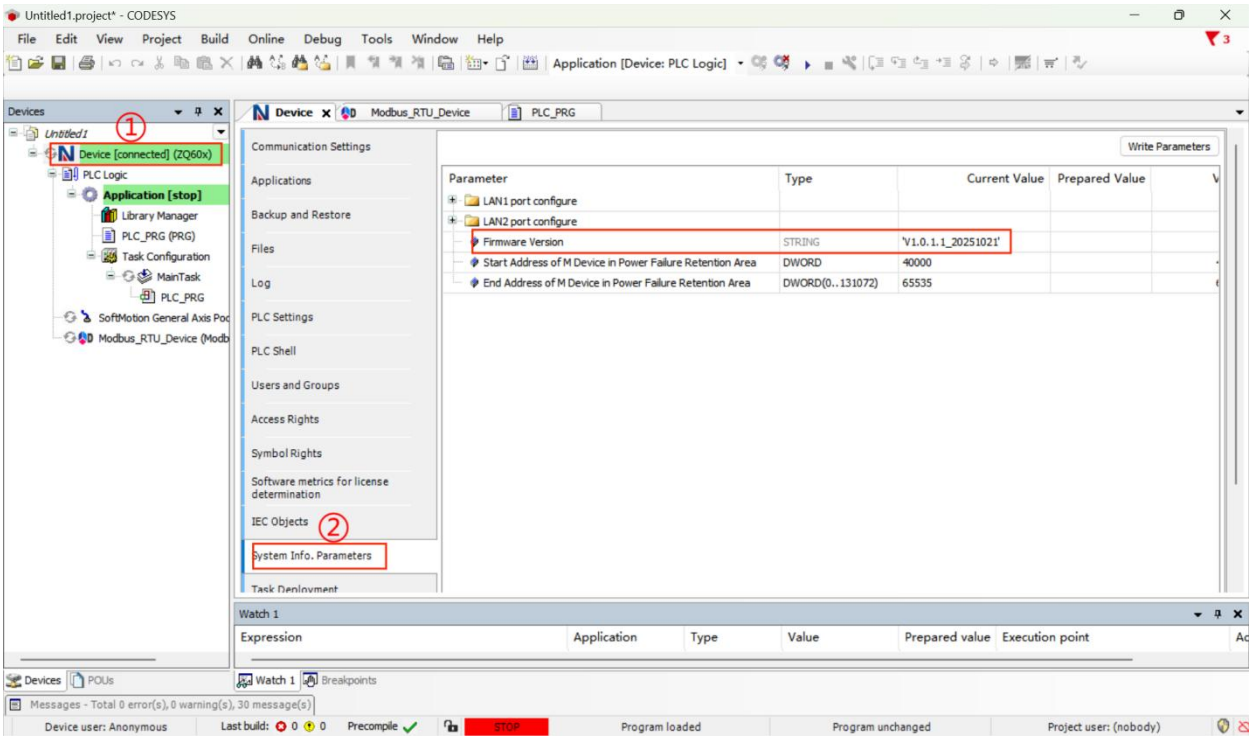
System error codes (hexadecimal)	meaning	processing method
		confirming these checks, power on again.
2200~221F	The extension module is in boot mode.	The module may not function properly due to a failed firmware upgrade. Please upgrade the module's firmware again and then test.
2300	RTC battery voltage is low.	Replace the RTC battery and reset the perpetual calendar.
2400~241F	in the module firmware is shorter than the parameter length configured in the XML.	Compared to the module firmware, the module's XML file contains more parameters. Please upgrade the module firmware or revert to an older version of the XML file before use.
2501	The address setting of device M in the power outage retention area is incorrect.	Please check if the starting address is larger than the ending address; reset it and then download the program.
2502	Number of axes exceeds controller maximum limit	Reduce the number of axes and re-download the program.
3000	actual connected right-side expansion module does not match the configuration.	Please rescan the configuration to confirm the extended module configuration, then download and test again .
3001	The module's XML configuration parameters are shorter than the parameters in the actual connected module firmware.	The module XML version is relatively old, but the module firmware version is newer (the new firmware has added module parameters), so it does not affect usage. You can upgrade the XML to the latest version and then download the program again to use it.
3100~311F	An error occurred in the extension module.	Use Codesys software to check for module errors and refer to the module manual to find the cause of the error.

5. Appendix

5.1 Frequently Asked Questions

5.1.1 Check version

Ensure the device is scanned and logged in. Double-click "Device" in the left-hand tree menu. The PLC version V1.0.1.1 will be displayed in the system information parameters subpage on the right, as shown in the figure below.



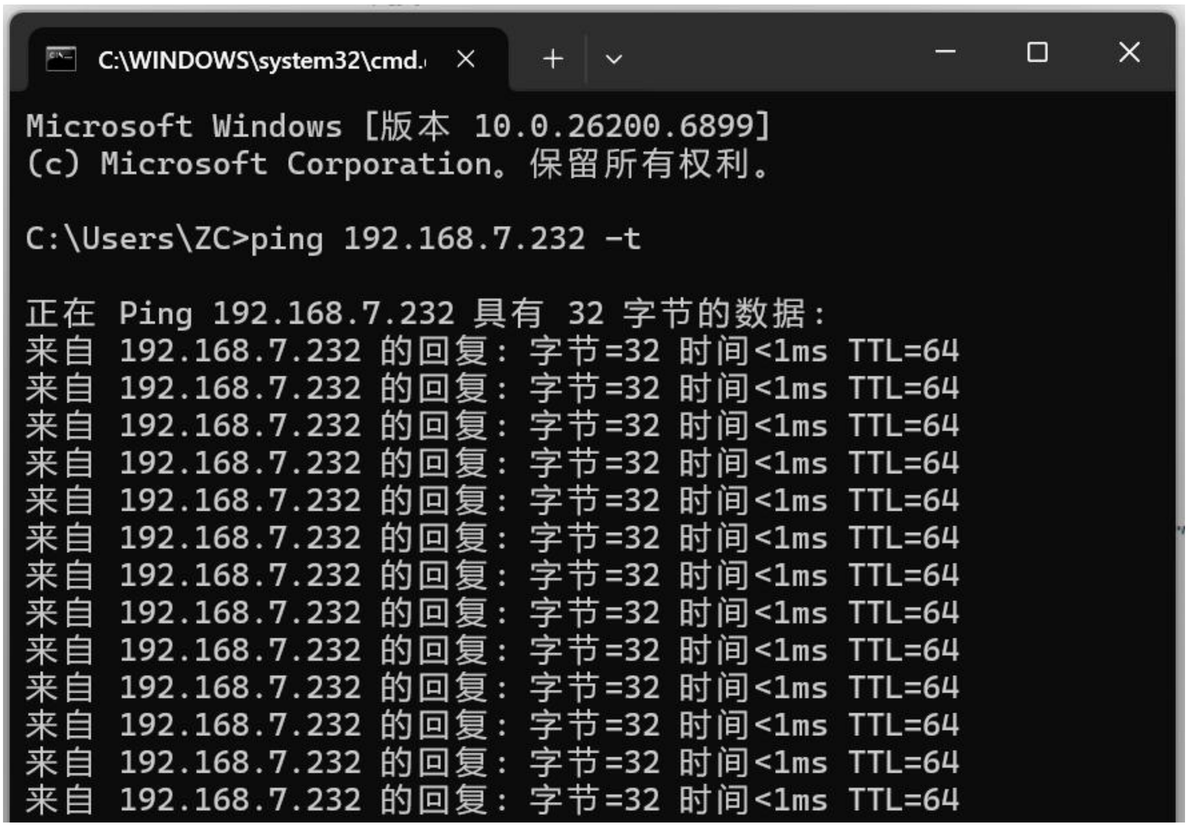
5.1.2 Device not detected

If the device cannot be detected by scanning the network , you can troubleshoot using the following steps;

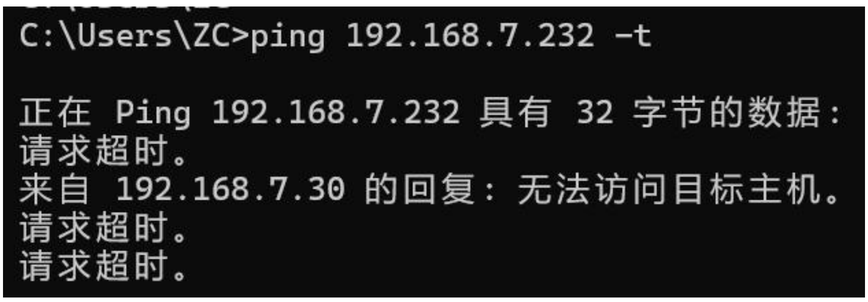
1. First , ensure the device's network is working properly : Use the Windows built-in cmd command (Win+R).

Enter the ping command and the controller's IP address to test (if you forget the IP address, you can restore the default factory IP address by pressing and holding the RESET button for 3 seconds; or refer to section 5.1.3 to obtain it) .

If the result looks like the image below, it means the communication is normal, and you can proceed to the next step for confirmation .

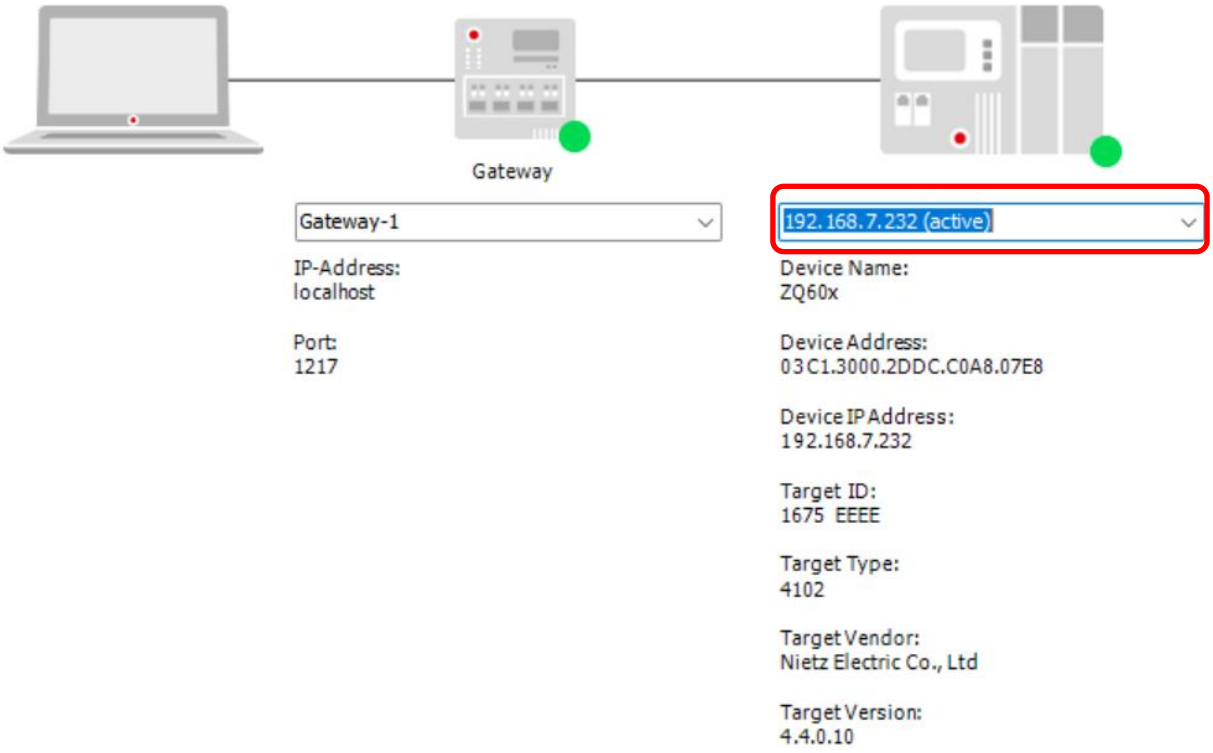


If the image below shows an error, it indicates a network problem. Please confirm that the controller's IP address and the computer's IP address are on the same network segment .



2. Directly input the device's IP address for processing .

in the image below and press Enter; if there is a normal response, the icon will turn green, and basic information will be displayed below .

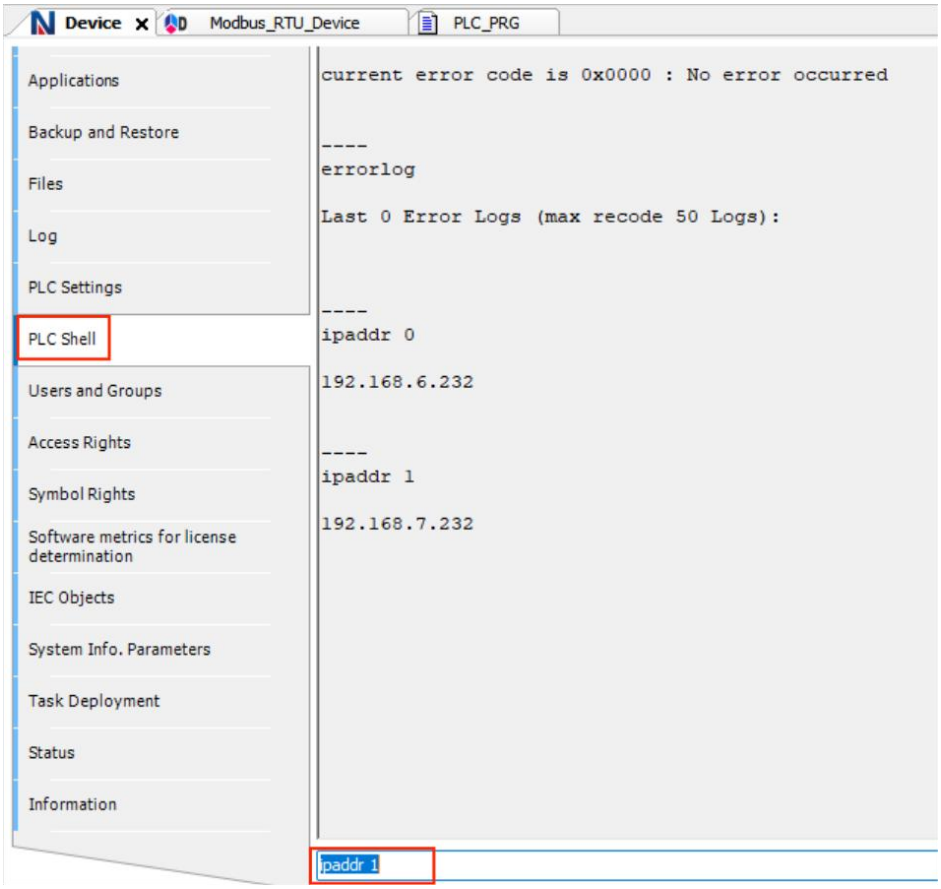


3. If you still cannot connect to the controller after the above two steps, switch the controller's RUN/STOP DIP switch to the STOP side (to rule out whether the user program is malfunctioning and causing the malfunction to occur), and then power on the controller again; restart step 1 .

4. If you are still unable to connect the controller after following the above steps , please contact the manufacturer for technical support.

5.1.3 How to obtain the current IP address

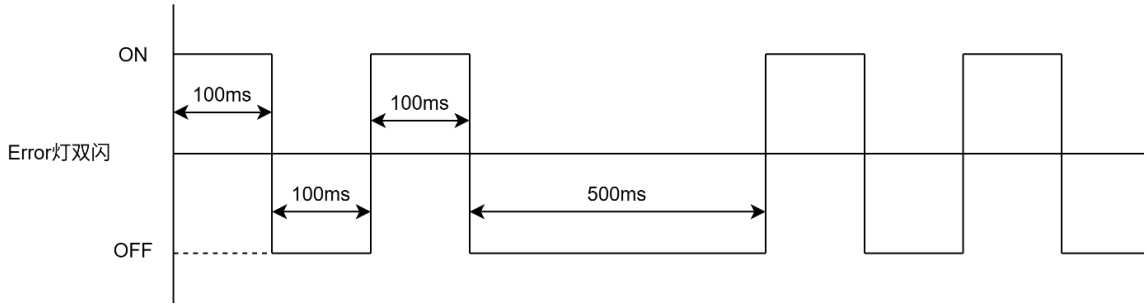
First, connect the controller via USB (refer to section 2.4.2 for details); then, use the following method:



In the PLC instruction input box, enter: ipaddr 0 (0 represents LAN1; 1 represents LAN2); after entering, press Enter to display the IP address of the network port .

5.1.4 Restore factory settings

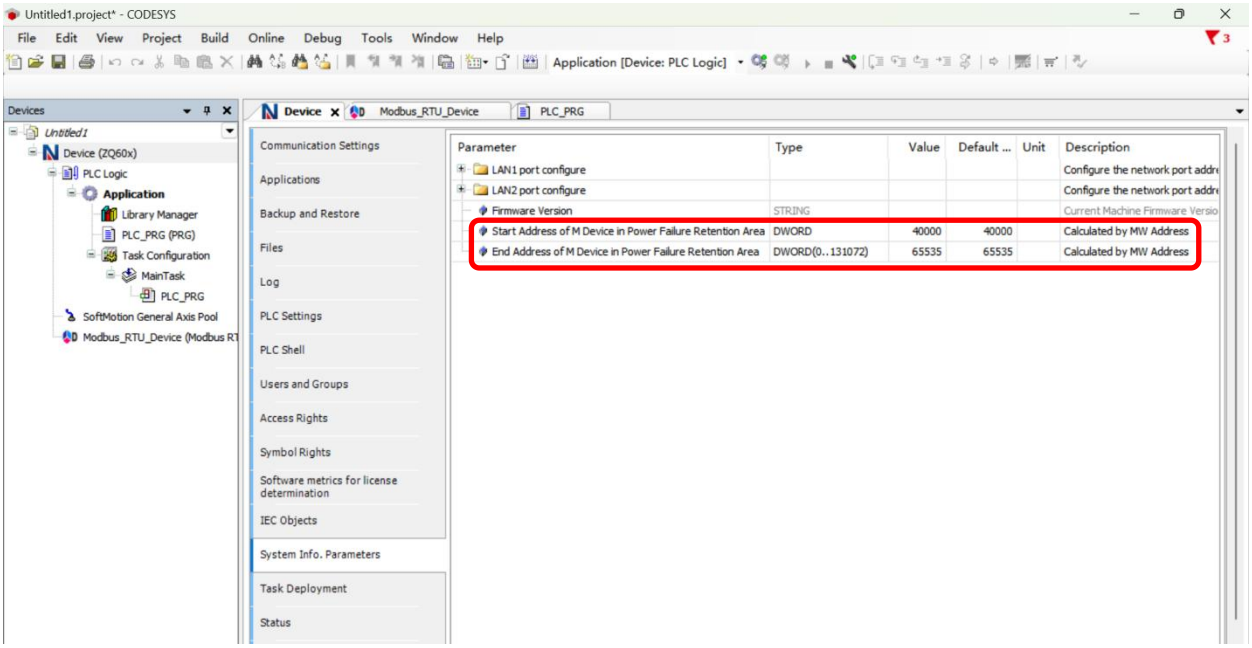
RESET button on the front of the controller for more than 3 seconds until the ERROR indicator on the controller flashes as shown below, indicating that the factory reset was successful (the controller's IP address is restored to the default value, and the user has successfully cleared it); then power it on again .



5.1.5 Setting the power-off retention area

Configure the settings according to the red box in the diagram (the value can be set from 0 to 131072); if the starting address is set to a value smaller than the ending address, the controller

will report an error after downloading, and the controller will retain the settings from MW40000 to MW65535 by power failure according to the default settings .



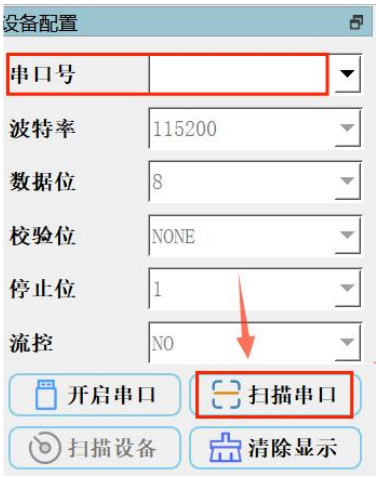
5.2 USB Firmware Burning

Prerequisites

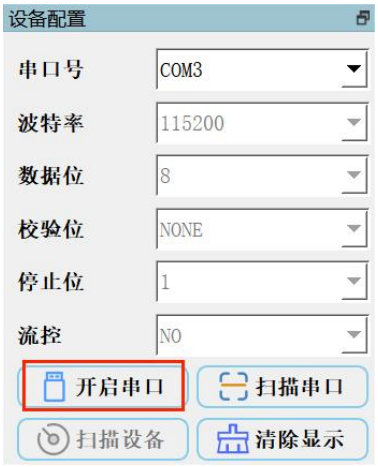
- USB cable is ready.
- You can contact an engineer to obtain the firmware flashing file.

Operating steps

1. Connect the device via USB cable.
2. Open the ZCProLoader host computer software.
3. If the serial port number is empty after opening, click "Scan Serial Port".



4. After the serial port number appears, click "Open Serial Port".

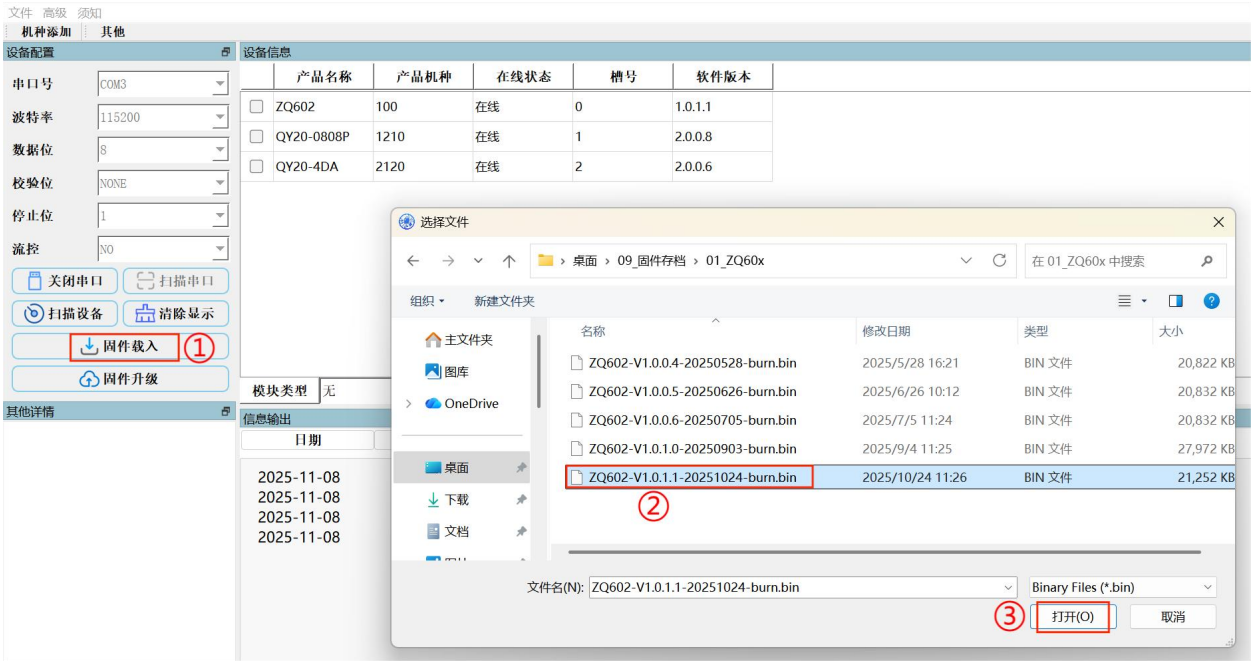


5. If all goes well, the scanned devices should appear in the device information panel on the right; if there is no response, click "Scan Devices".

6. Update firmware

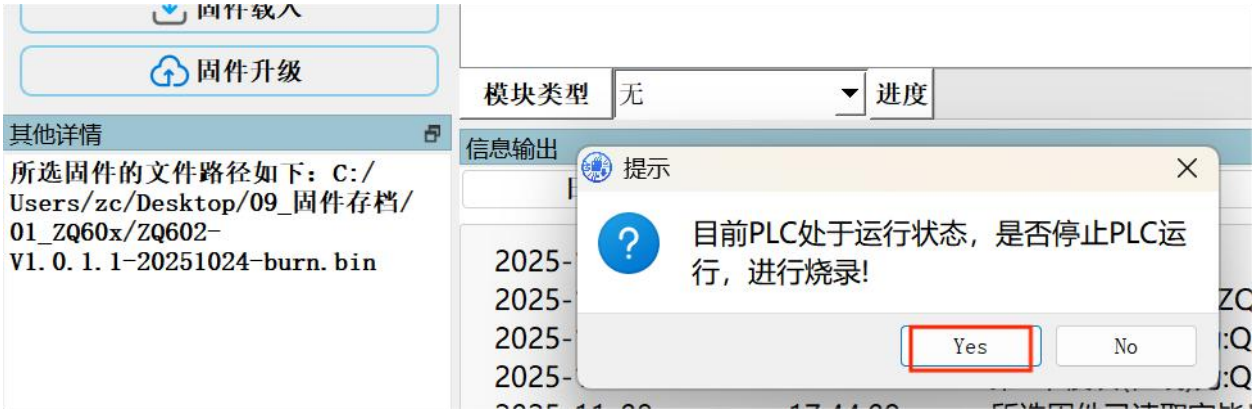
(1) ZQ600 Programmable Controller

a. Click "Firmware Load", select the firmware file you want to update, and click "Open".

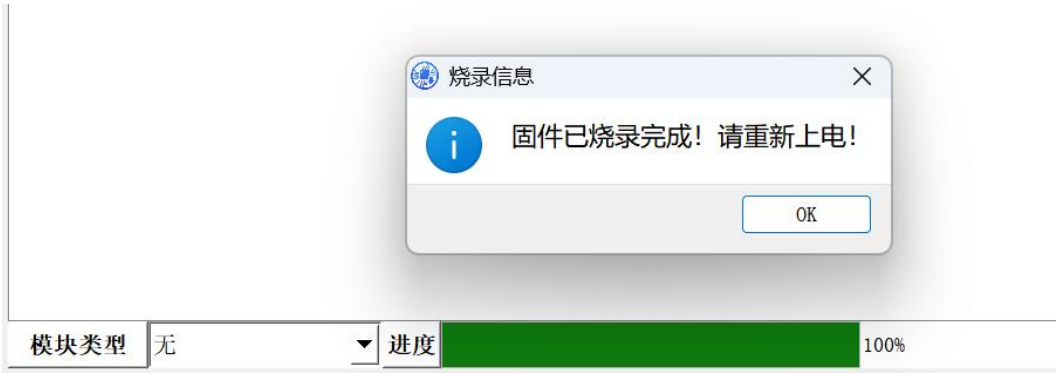


b. The information output bar will display "Selected firmware has been read successfully." Click "Firmware Upgrade" again.

c. Select "yes" for all pop-up prompts and begin the burning process.



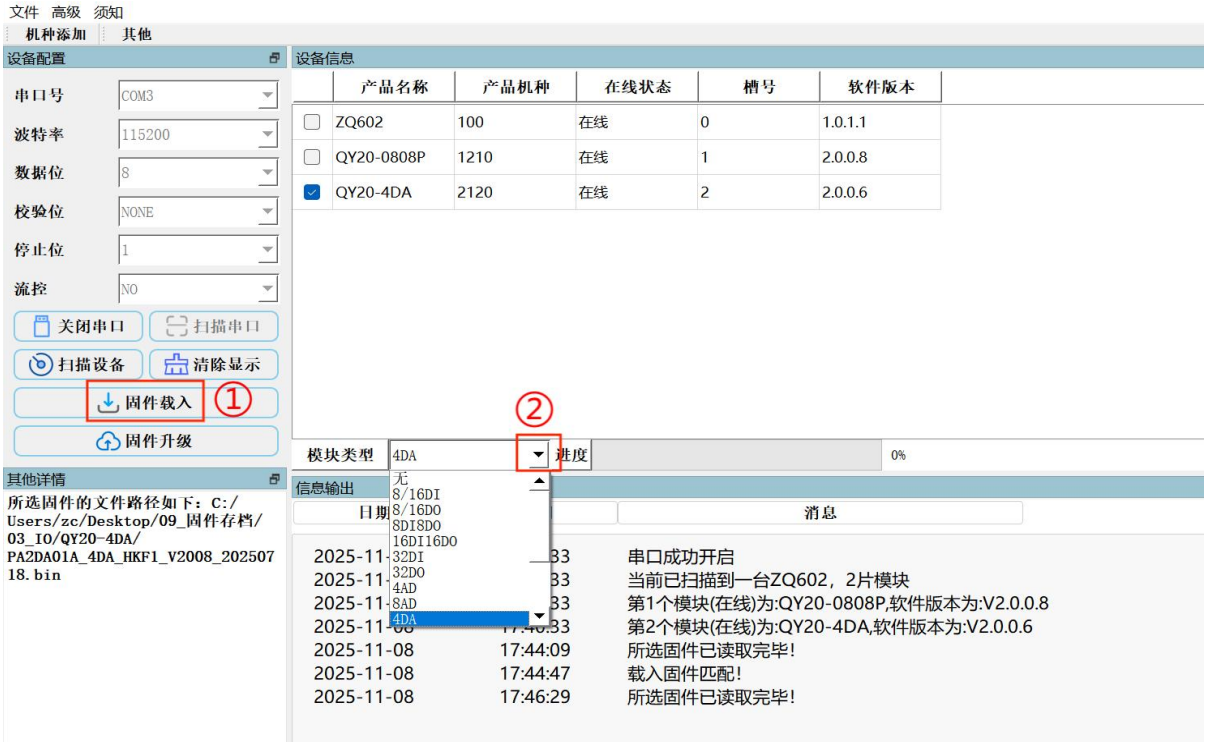
d. The progress bar has finished, the firmware burning is complete. Remember to power it back on.



(2) Right extension module

Compared to a PLC, the module has an additional step for selecting the type.

After the firmware is loaded, select the corresponding type from the drop-down menu. The modules under the device information bar will be automatically selected. Then click "Firmware Upgrade". The other steps are the same.



5.3 Modbus Communication

5.3.1 Modbus TCP Datagram Structure

Modbus is a request/response protocol that provides services defined by function codes. The message structure of Modbus TCP is described below.

Take the following request and response messages as an example:

Request message: 0 0 0 5 00 00 00 0 6 01 03 00 00 00 0A				
	Example	length	illustrate	Remark
Map header	0x00	1	Transaction identifier Hi	Client initiates, server replicates, used for transaction pairing.
	0x05	1	Transaction identifier Lo	
	0x0000	2	Protocol Identifier	Client initiates, server replicates Modbus protocol = 0
	0x0006	2	length	From the next byte to the last byte, a total of 6 bytes.
	0x01	1	Unit identifier	Client initiates, server replicates Remote terminal identifier on serial port link or other bus
Function code	0x03	1	Read multiple registers	Reference standard Modbus protocol
data	0x0000	2	Starting address	
	0x000A	2	Number of registers	Read 10 registers

Response message : 0 0 0 5 00 00 00 17 01 03 14 00 00 00 05 00 0A 00 0F 00 00 00 00 00 00 00 00 00 00 00 00				
	Example	length	illustrate	Remark
Map header	0x00	1	Transaction identifier Hi	Client initiates, server replicates, used for transaction pairing.
	0x05	1	Transaction identifier Lo	
	0x0000	2	Protocol Identifier	Client initiates, server replicates Modbus protocol = 0
	0x0017	2	length	From the next byte to the last byte, there are a total of 23 bytes.
	0x01	1	Unit identifier	Client initiates, server replicates Remote terminal identifier on serial port link or other bus
Function code	0x03	1	Read multiple registers	Reference standard Modbus protocol
data	0x14	1	Register length	10 registers, totaling 20 bytes
	0x0000	2	Reading values	The content of memory at address 0 000
	0x0005	2	Reading values	The content of memory at address 0 001
	0x000A	2	Reading values	The contents of memory at address 0 002
	0x000F	2	Reading values	The contents of memory at address 0 003
	0x0000	2	Reading values	The contents of memory at address 0 004
	0x0000	2	Reading values	The content of memory at address 0 005
	0x0000	2	Reading values	The contents of memory at address 0 006
	0x0000	2	Reading values	The contents of memory at address 0 007
	0x0000	2	Reading values	The content of memory at address 0 008
	0x0000	2	Reading values	The content of memory at address 0 009

5.3.2 Modbus RTU Data Message Structure

Modbus is a request/response protocol that provides services defined by function codes. The message structure of Modbus RTU is described below.

Take the following request and response messages as an example:

Request message: 01 03 00 00 00 0 A C 5 CD				
	Example	length	illustrate	Remark
domain name	0x01	1	From station number	Station numbers range from 1 to 247
Function code	0x03	1	Read multiple registers	Reference standard Modbus protocol
data	0x0000	2	Starting address	
	0x000A	2	Number of registers	Read 10 registers
check	0xC5CD	2	Verification code	

Response message : 01 03 14 00 00 00 02 00 04 00 06 00 08 00 0A 00 00 00 00 00 00 00 00 5B 02				
	Example	length	illustrate	Remark
domain name	0x01	1	From station number	Station numbers range from 1 to 247
Function code	0x03	1	Read multiple registers	Reference standard Modbus protocol
data	0x14	1	Register length	10 registers, totaling 20 bytes
	0x0000	2	Reading values	The content of memory at address 0 000
	0x0002	2	Reading values	The content of memory at address 0 001
	0x0004	2	Reading values	The contents of memory at address 0 002
	0x0006	2	Reading values	The contents of memory at address 0 003
	0x0008	2	Reading values	The contents of memory at address 0 004
	0x000A	2	Reading values	The content of memory at address 0 005
	0x0000	2	Reading values	The contents of memory at address 0 006
	0x0000	2	Reading values	The contents of memory at address 0 007
	0x0000	2	Reading values	The content of memory at address 0 008
	0x0000	2	Reading values	The content of memory at address 0 009
check	0x5B02	2	Verification code	

5.3.3 Function Code and Address Description

The function codes are defined as follows:

Function code	describe	Access type	Internal address of the site	Data types	Number of operations
0x01	coil	read	%QX0.0 ~ %QX8191.7	Bit	Single/Multiple
0x02	Discrete Input	read	%IX0.0 ~ %IX8191.7	Bit	Single/Multiple
0x03	Holding register	read	%MW0 ~ %MW65535	Character	Single/Multiple
0x04	Input register	read	%MW0 ~ %MW65535	Character	Single/Multiple
0x05	single coil	Write	% QX0.0 ~% QX8191.7	Bit	one
0x06	single register	Write	%MW0 ~ %MW65535	Character	one

0x0F	Multiple coils	Write	% QX0.0 ~% QX8191.7	Bit	many
0x10	Multiple registers	Write	%MW0 ~ %MW65535	Character	many
0x17	Multiple registers	Reading/Writing	%MW0 ~ %MW65535	Character	many

The Modbus register address allocation is shown in the table below:

Internal address of the site	Applicable functions	Register types	Read/Write Status
%QX0.0 ~ %QX8191.7	01H	coil	Readable
%QX0.0 ~ %QX8191.7	05H 0FH	coil	writable
%IX0.0 ~ %IX8191.7	02H	Discrete Input	Readable
%MW0 ~ %MW65535	04H	Input register	Readable
%MW0 ~ %MW65535	03H 06H 10H 17H	Save registers	Readable and writable