



User Manual 用户手册



APG Serie bus gateway

EtherCAT Protocol transfer
MODBUS RTURS485 master station
Model number: APG1504

CATALOGUE

1.Preface	3
1.1 Document Usage Instructions	4
1.2 Safety matters	4
1.3 Document history	4
1.4Reference document	4
2.Specification parameters	5
2.1 APG1504 Specification Parameter Table	6
3.Hardware description	7
3.1 Power interface	8
3.2 Communication interface	8
3.3 LED indication	9
3.4 Modbus Communication interface	9
4.Protocol conversion	10
4.1 Status register	11
4.2 Control Register	11
5.Product Usage Instructions	12
5.1 LAEConfig software configuration module	13
5.2 Software Interface Introduction	13
5.3 Scan the gateway module in the network	14



1.Preface

1.1 Document Usage Instructions

This document outlines the product's functional specifications, installation, operation, and settings, as well as information related to network protocols. This document is intended for use by well-trained electrical automation engineers only.

(1) Disclaimer

The author has conducted necessary checks on the document, but as the product evolves and develops, the document may contain errors in technical parameters or editing. We reserve the right to make adjustments and modifications without prior notice to the users.

(2) Trademark

Industrial Ethernet Protocol (EtherCAT) is a deterministic industrial Ethernet, which was originally developed by the German company Beckhoff.

(3) Patent Information

The designer of this product has applied for patent protection for the appearance and technical implementation method of the product. Any attempt to copy, imitate or reverse engineer may violate the law.

(4) Copyright

This document may not be copied, distributed or used without the author's authorization.

1.2 Safety matters

This product is a professional equipment designed for industrial use and can only be operated by personnel with electrical operation experience. Before use, please carefully read this manual and follow the instructions to operate it properly to avoid causing personal injury or product damage.

This product is designed with an IP20 protection level. When using it, it needs to be installed in a distribution cabinet with dust-proof and moisture-proof functions.

1.3 Document history

Version	Date	Description
V1.1	2024.9	First release

1.4 Reference document

《IEC11631-22007 Programmable controllers –Part 2:Equipment requirements and tests》；

《IEC/TR 61158 Industrial Communication Network - Fieldbus Specification》；

《IEC61784-1Industrial Communication Network - Industry Standards Part 1: Fieldbus Standards》；



2.Specification parameters

2.1 APG1504 Specification Parameter Table

EtherCAT communication parameters		
Serial Number	Item	Specification
1	Agreement	EtherCAT
2	Transmission rate	10/100 Mbaud, Automatic transmission speed recognition
3	Bus interface	RJ45
4	Transmission cable	CAT5e shielded cable
5	Port protection	Transformer isolation, 1500V DC (IEC61000-4-2)
Modbus communication format		
1	Transmission mode	Modbus_RTU
2	Physical interface	Open type connector with 5 pins (including terminal resistor interface)
3	Baud rate (kbps)	2400,4800,9600,19200,38400,57600,115200
4	Function code	01H、02H、03H、04H、05H、06H、0FH、10H
Other specifications		
1	Dimensions of the shape	(L) 114 * (W) 30 * (H) 85mm
2	Installation method	35mm guide rail
3	Protection level	IP20
4	Environmental temperature	Transportation and storage: -40°C to +70°C Operating temperature: -20°C to +55°C
5	Power supply voltage	24 VDC(±20%)
6	Rated current	110 mA (24 VDC)

Table 1 Parameter Specifications



3.Hardware description

3.1 Power interface

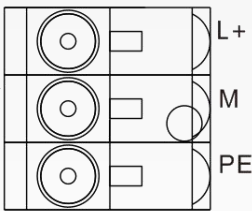


Figure 1 Power Interface

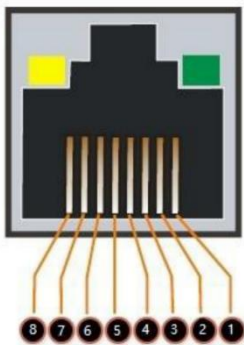
Table 2 Power Indicator

Pin	Logo	Description
1	L	24V, positive terminal of the DC power supply
2	M	negative terminal of the DC power supply
3	PE	ground connection

3.2 Communication interface

The module uses a physical interface with two RJ45 sockets for communication, which are respectively identified as IN and OUT.

Table 6 ETHERCAT Communication Interface



Pin	Signal	Description
1	TD+	Data transmission positive terminal
2	TD-	Data transmission negative terminal
3	RD+	Data reception positive terminal
4	NC	Unused
5	NC	Unused
6	RX-	Data reception negative terminal
7	NC	Unused
8	NC	Unused

3.3 LED indication

LED indications are divided into 3 types. These include power indication, Modbus status indication, and EtherCAT status indication. The definitions are as shown in Table 3.

Name	Colour	Explanation	
Power indicator			
PWR	green	Power indicator light	
Modbus Indicator light			
ALM	yellow	Modbus	Communication failure. Data timeout or incorrect data reception.
RX	green	Modbus	Data is being sent.
TX	green	Modbus	Data is being received.
EtherCAT Indicator light			
RY	Green light	The module enters the operating state and successfully establishes a connection with the main station. Cycle data exchange	
ER	Red light	The EtherCAT bus is not in the correct mode: There are communication, operation errors, or communication timing monitors	

Table 3 LED Indicator Definitions

3.4 Modbus Communication interface

The module uses its own wiring socket as the physical interface for Modbus communication, where two TRs are terminal resistance selection terminals. An internal terminal resistance of 120R is integrated within the module. When TR1 is short-circuited to DA and TR2 is short-circuited to DB, the terminal resistances are effective. The interface definition is shown in Table 4.

Table 4 Modbus Terminal Definitions

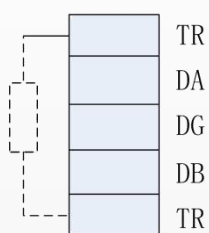


Figure 2 Modbus Interface

Pin	Signal	Description
1	TR1	Terminal resistor connection selection
2	DA	Receive/send data, line A (red)
3	DG	Data ground
4	DB	Receive/send data, line B (red)
5	TR2	Terminal resistor connection selection



4.Protocol conversion

4.1 Status register

"Status" refers to the status register of the gateway.

The definition is as follows:

Bit: 7	Bit: 6	Bit: 5	Bit: 1...4	Bit: 0
Retention	Received Error	Timeout	Error Code	Running Status

Regarding the error code 1...4 of Bit: Explanation

Bit: 4	Bit: 3	Bit: 2	Bit: 1	Decimal representation	Description
0	0	0	0	0	No errors.
0	0	0	1	1	Illegal registered address
0	0	1	0	2	Illegal parameters
0	0	1	1	3	Error in receiving data
0	1	0	0	4	Error in sending timeout
0	1	0	1	5	The host is currently busy
0	1	1	0	6	Error in executing function

4.2 Control Register

"Control" is the control register of the gateway.

It is defined as follows:

Bit: 3..7	Bit: 2	Bit: 1	Bit: 0
Keep	Reset Gateway	Error Clear	Start / Stop



5.Product Usage Instructions

5.1 LAEConfig software configuration module

The module configuration software is named "LAEConfig". LAEConfig is a software developed by our company with independent intellectual property rights. This software is developed by our company specifically for our controllers. This software can be used normally on systems prior to WIN10.

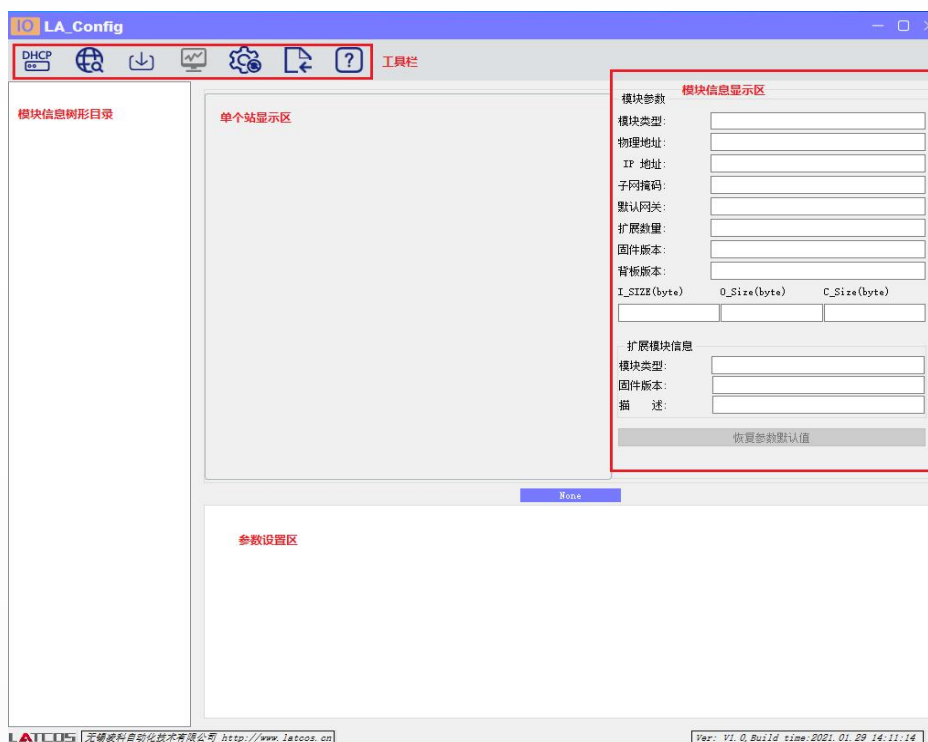


This is the installation file.



This is the desktop icon after the installation is completed.

5.2 Software Interface Introduction



The interface of this software includes: toolbar, module information tree directory, parameter setting area, module information display area, and so on.



5.3 Scan the gateway module in the network

1. Connect the power supply of APG1504 to the DC24V power source correctly.
2. Connect the DA and DB of modbus RTU to the A and B ports of the modbus slave station correctly.
3. Configure the modbus parameters of APG1504 and generate an.XML file.
 - 3.1. Install the LAECONFIG software. The version should be 5.0.10 or above in LAEConfigsetup.
 - 3.2. First, connect the Ethernet port of the computer to the debug interface port of APG1504 using a network cable.
 - 3.3. Open the LAECONFIG software on the computer and click the



Button on the toolbar to display the following interface.

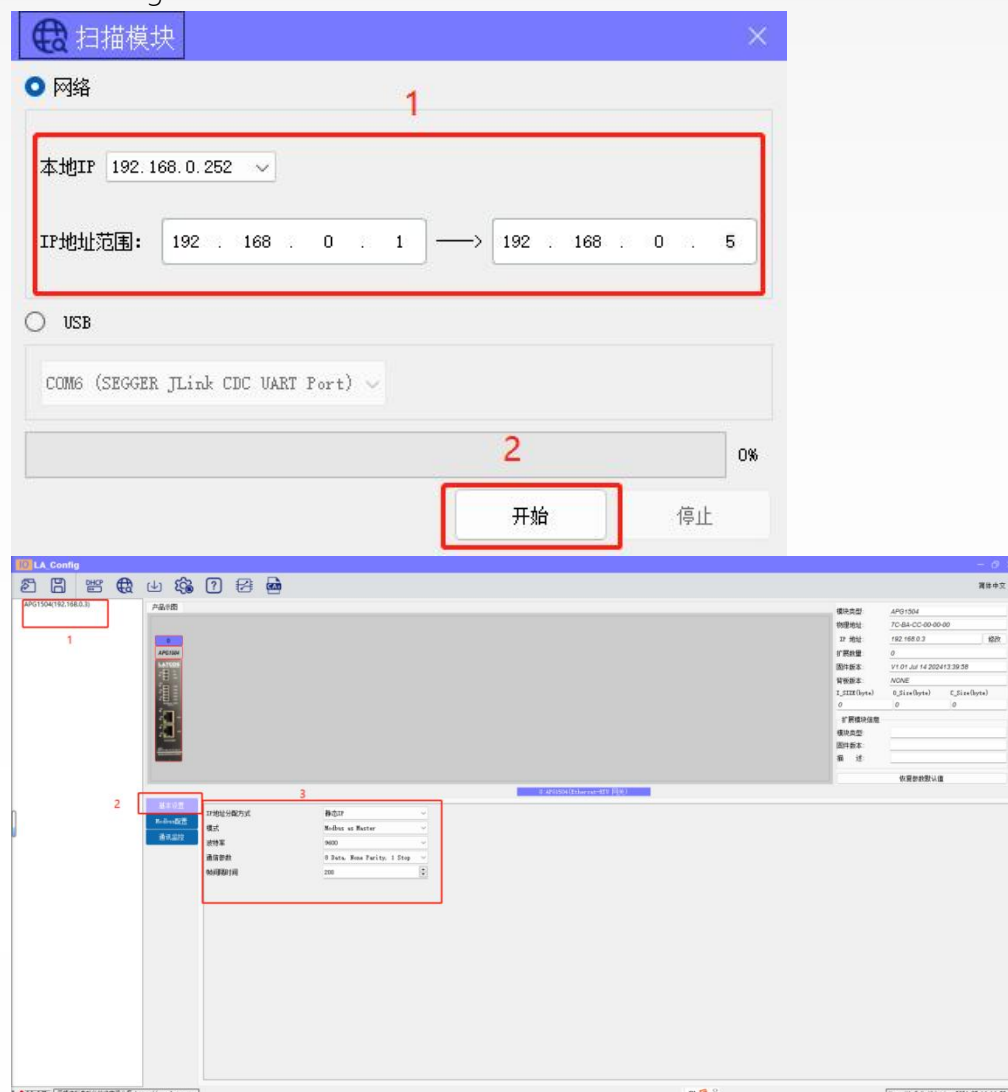


Click on the "Global Scan" option to scan all the modules within the entire local network.



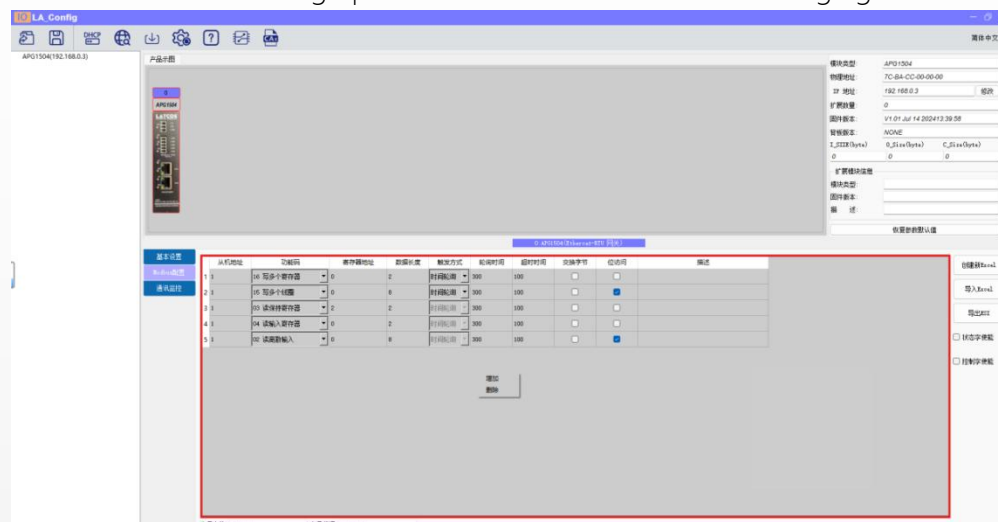
*The default IP address for the network interface of the APG1504 gateway is set to: 192.168.0.3.

3.4 First, scan the module onto the display area, and then click on the module that needs to be configured.

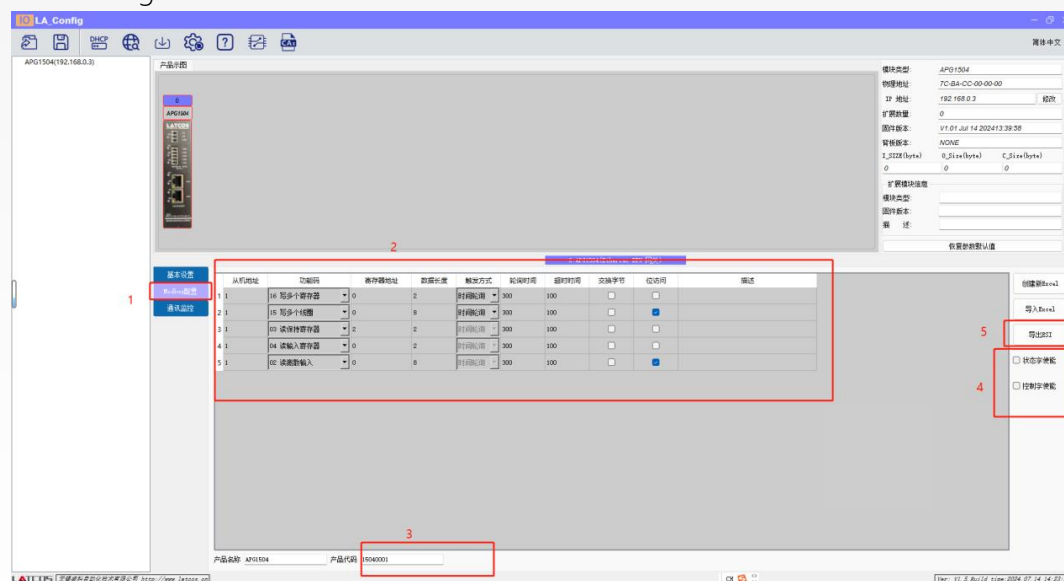


Set the MODBUS communication parameters of the module (as shown in the figure below) according to the parameters of the communication object. Keep them consistent.

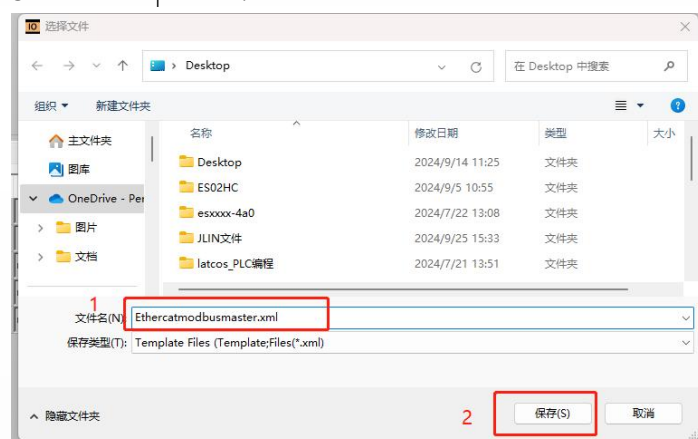
3.5 Set MODBUS message parameters. As shown in the following figure



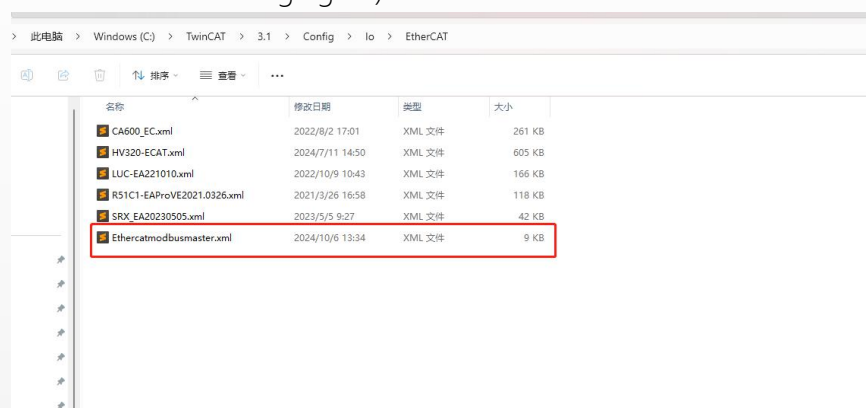
Right-click "Add" or "Delete" message within the blank area of the red box, and then set the message.



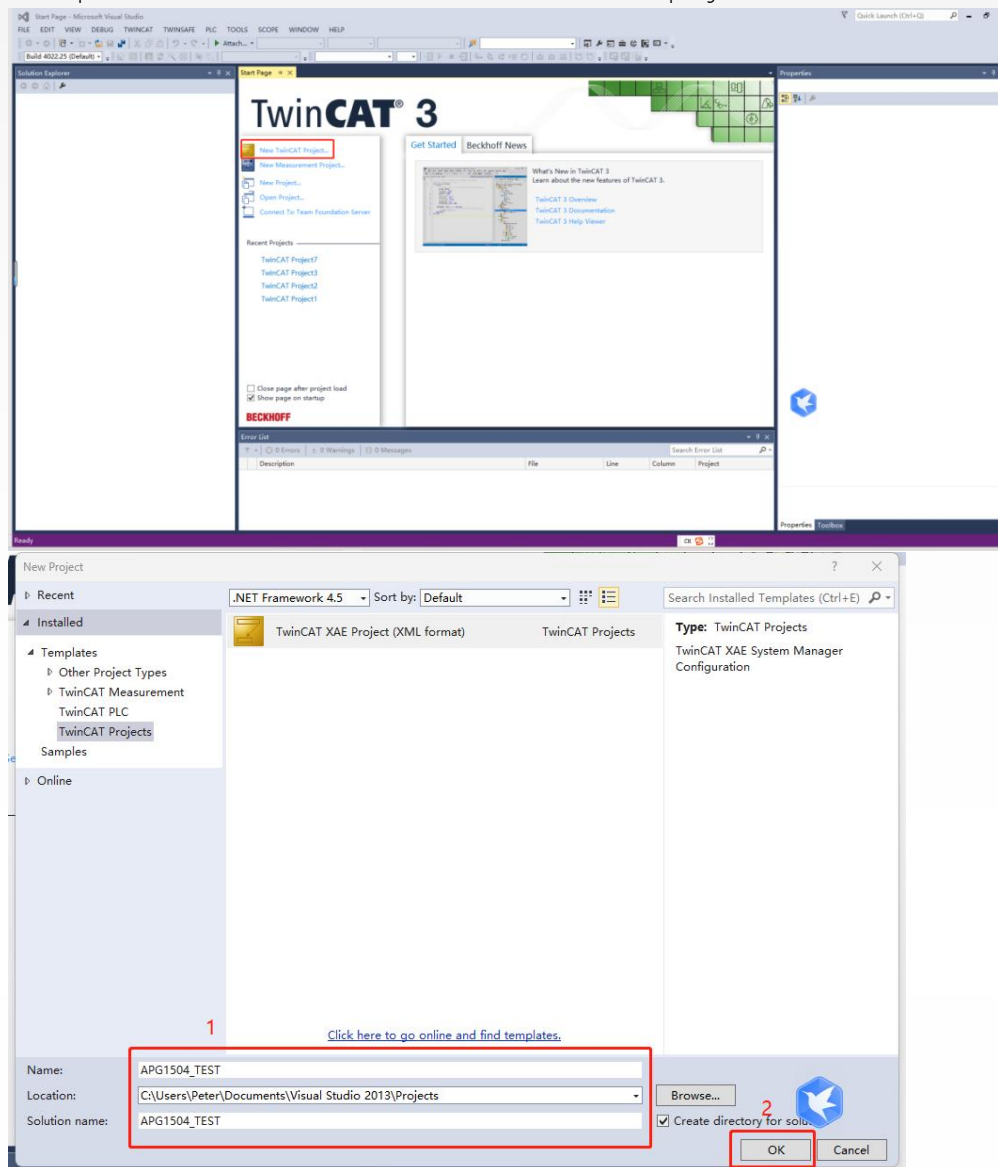
Set the message parameters in sequence, including product code (which must be unique within the unified network), status word enable, control word enable, export ESI, etc. Then download these parameters to the APG1504. Save the exported.XML file to a folder for use when configuring.



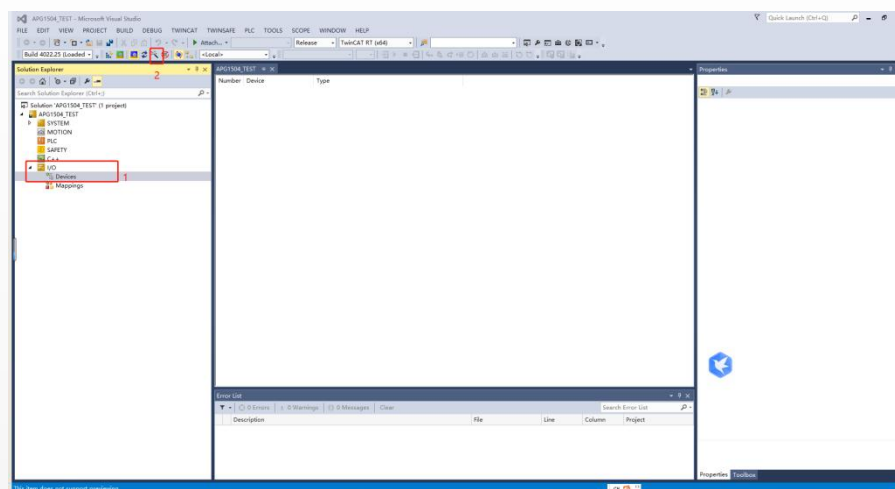
3.6 Copy the exported.XML file to the corresponding folder directory of TWINCAT3 (as shown in the following figure)

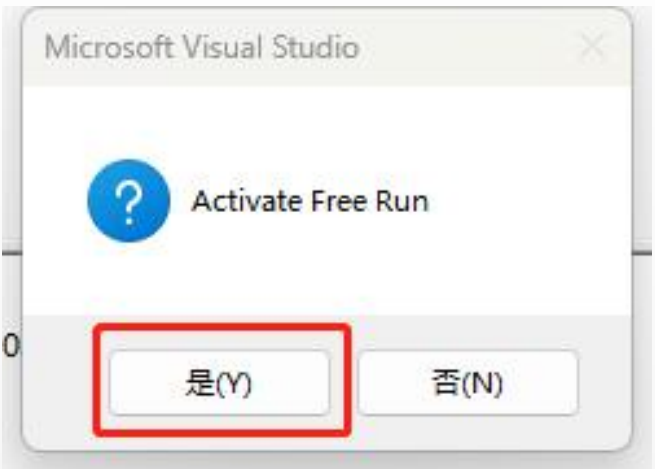
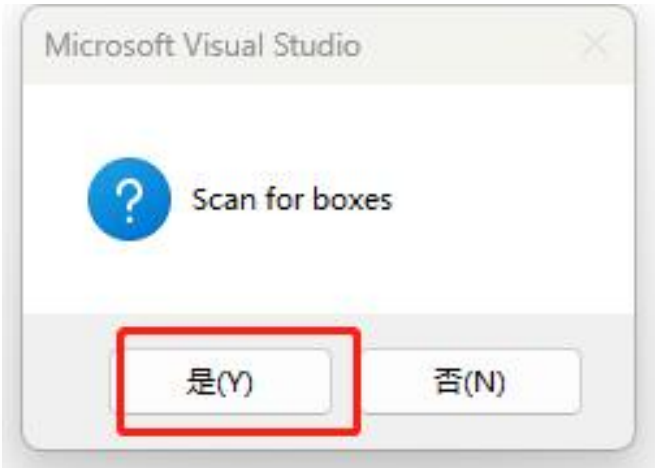
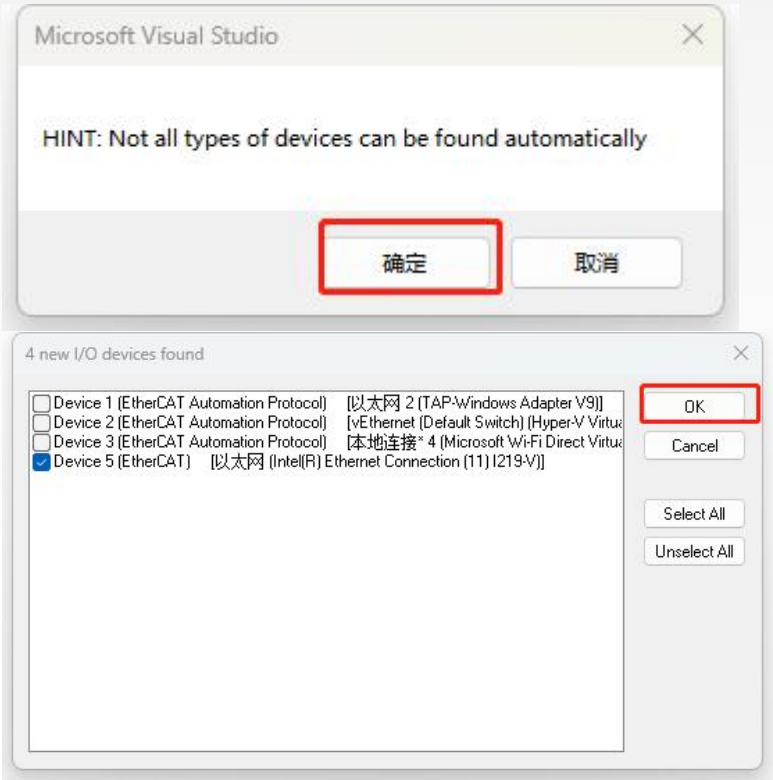


3.6 Open the TWINCAT3 software and create a new project.

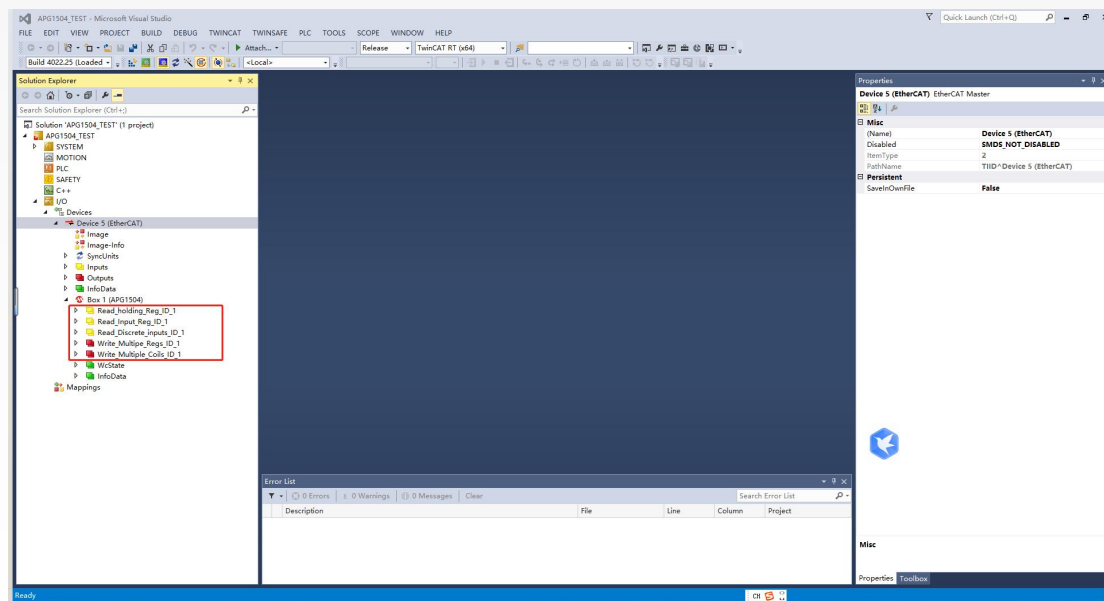


3.7 Plug the network cable into the EtherCAT interface and use the software to scan the EtherCAT devices on the network.

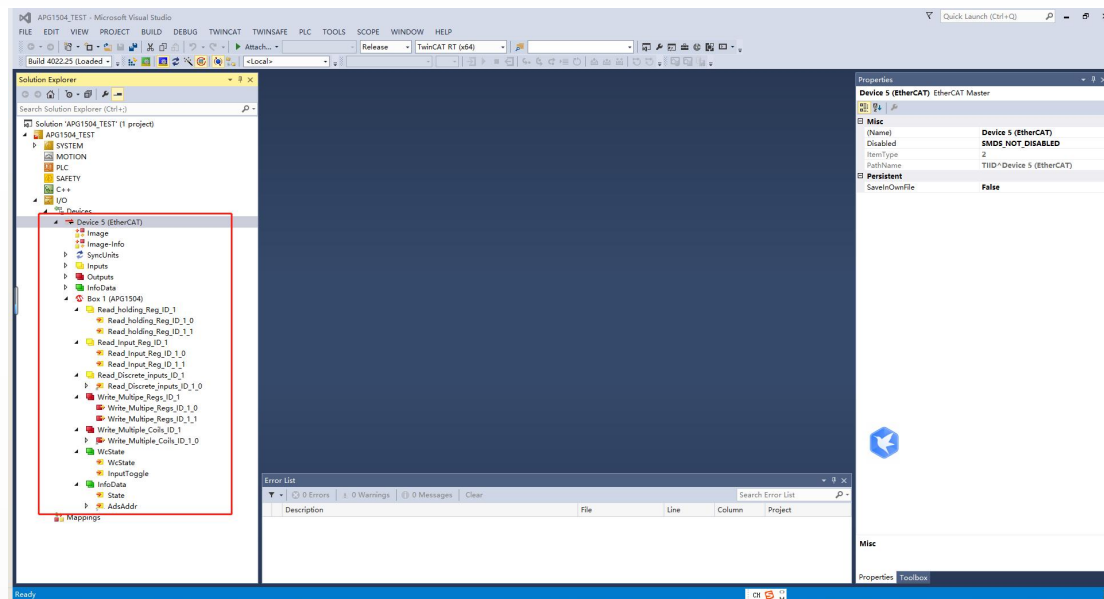


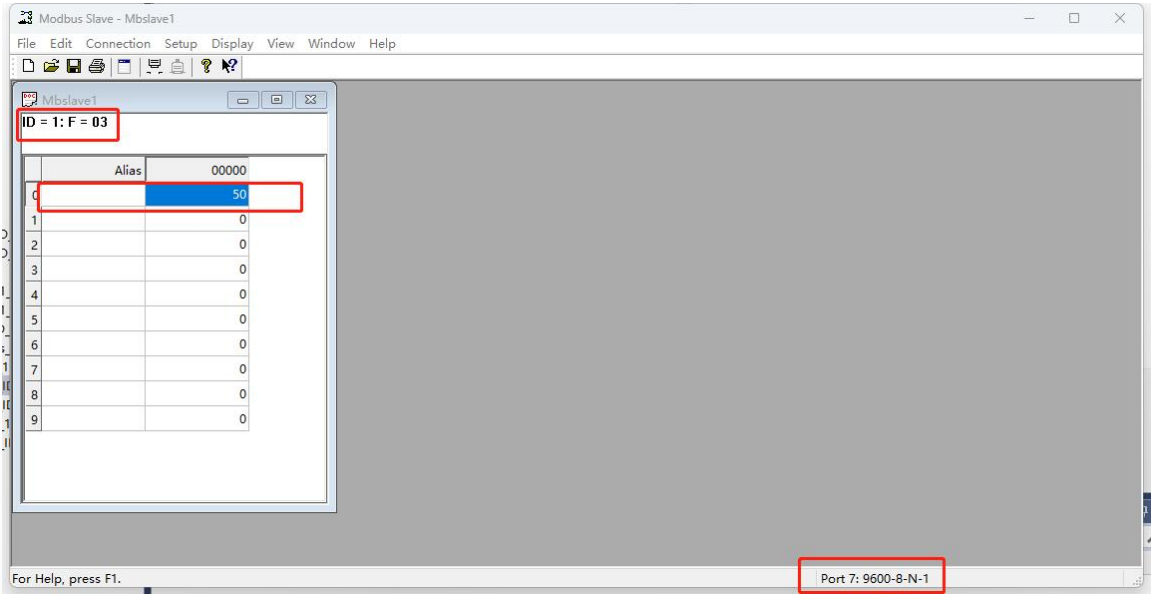
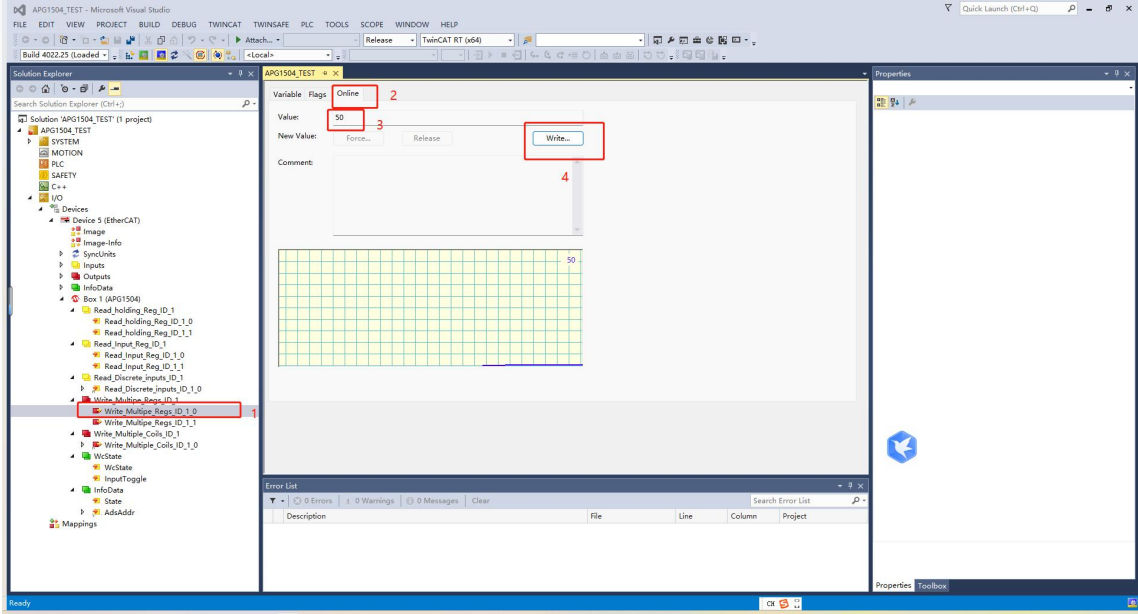


The data within the red box here is consistent with the configuration of the LAECONFIG software.



3.8 Communication Test with Modbus Slave Software





Register types	Explanation	Comparison with PLC	Examples
(Coil Status)	Output port. It allows setting the output state of the port and also enables reading the output state of this bit. It can be divided into two different operating states, such as hold type or edge-triggered type.	DO (Digital Output)	Electromagnetic valve output, MOSFET output, LED display, etc.
(Input Status)	Input port. The input status can be changed through external settings, but it is read-only and not writable.	DI (Digital Input)	Dip switch, proximity switch, etc.
(Holding Register)	Output parameters or hold parameters, certain parameters set by the controller during operation, readable and writable	AO (Analog Output)	Set values for analog output, PID operating parameters, variable valve output size, sensor alarm upper and lower limits
(Input Register)	Input parameters. Parameters obtained by the controller from external devices during operation, which are readable but not writable.	AI (Analog Input)	Analog input

Modbus register address allocation

Register types	Register PLC address	Register Modbus protocol address	Symbolic name	Read/write status
(Coil Status)	00001~09999	0000H~FFFFH	0x	Readable and writable
(Input Status)	10001~19999	0000H~FFFFH	1x	Read-only
(Holding Register)	40001~49999	0000H~FFFFH	4x	Readable and writable
(Input Register)	30001~39999	0000H~FFFFH	3x	Read-only

Official website



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