circuit

EtherCAT
C2S-EC Series Valve Terminal
User Manual

Nanjing Solidot Electronic Technology

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Nanjing Solidot Electronic Technology Co., Ltd.

Address: 11F, Ang Ying Building, No.91 Shengli Road, Jiangning District, Nanjing City, Jiangsu Province, China

Postal code: 211106

Telephone: 4007788929

Website: http://www.solidotech.com/en

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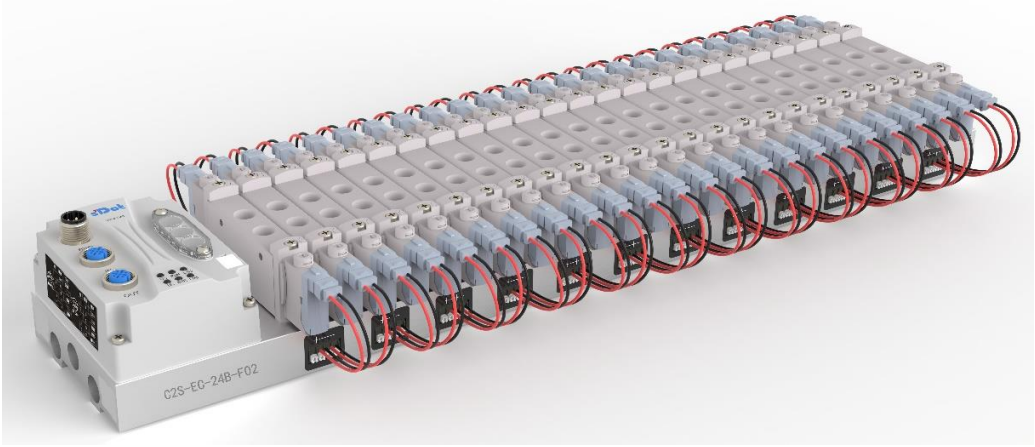
1 Product Overview

1.1 Product Introduction

The C2S-EC series valve terminal is a control module integrating valve terminal technology and EtherCAT bus technology. It can realize centralized and distributed control, optimize system design, facilitate construction, and simplify debugging, performance testing & diagnostic maintenance of complex systems in the industrial field. The product adopts a modular structure and occupies little space with the addition of pluggable terminals, leading to fast wiring. Moreover, it has easy configuration and supports most of the mainstream EtherCAT master stations, so it can be widely used in industrial control systems.



1.2 Product Features

- Support EtherCAT industrial Ethernet protocol
- Support cascade communication with M12 bus interface
- Support up to 24 double solenoid valves
- Modular structure and small footprint
- Simple wiring, fast construction and easy maintenance
- Support mainstream solenoid valves and customization, providing easy and fast choices
- Support remote diagnosis, which reduces troubleshooting difficulties

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2 Designation Rules

2.1 Designation Rules

C2S - EC - 24 B - F01
(1) (2) (3) (4) (5)

Item	Value	Description of the Values				
(1)	Product line	C2S				
(2)	Bus type	EC: EtherCAT				
(3)	Valve positions	08： 8	12：12	16：16	20：20	24：24
(4)	Valve Type	B：Double solenoid（Single solenoid supported）				
(5)	Solenoid valves model number	See below Solenoid Valve Model Code Table				

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Solenoid Valve Model Code Table:

Brand	Code	Valve Distance	Series	Supported Solenoid Valve Models
AirTAC	A01	19	4V1	4V110/ 4V120/ 4V130
	A02	23	4V2	4V210/ 4V220/ 4V230
	A04	10.5	7V0	7V0510/ 7V0520/ 7V0530
	A05	16	7V1	7V110/ 7V120/ 7V130
	A06	19	7V2	7V210/ 7V220/ 7V230
	A07	19	5V1	5V110/ 5V120/ 5V130
	A08	23	5V2	5V210/ 5V220/ 5V230
FESTO	F01	10.5	VUVG-LK10	vuvg-lk10-t32/ vuvg-lk10-m52 vuvg-lk10-B52/ vuvg-lk10-p52
			VUVG-L10	vuvg-l10-t32/ vuvg-l10-m52 vuvg-l10-B52/ vuvg-l10-p52
	F02	16	VUVG-LK14	vuvg-lk14-t32/ vuvg-lk14-m52 vuvg-lk14-B52/ vuvg-lk14-p52
			VUVG-L14	vuvg-l14-t32/ vuvg-l14-m52 vuvg-l14-B52/ vuvg-l14-p52
SMC	S01	10.5	SY3	SY3120/ SY3220/ SY3320 SY3420/ SY3520
	S02	16	SY5	SY5120/ SY5220/ SY5320 SY5420/ SY5520
	S03	19	SY7	SY7120/ SY7220/ SY7320/ SY7420/ SY7520
CKD	C01	10.5	4GD1	4gd119r/ 4gd129r/ 4gd139r 4GD149R/ 4GD159R
	C02	16	4GD2	4gd219r/ 4gd229r/ 4gd239r 4GD249R/ 4GD259R

Note: Valve spacing (K value) in mm.

2.2 Model List

Model Number	Product Description
C2S-EC-08B-()	Valve terminal with 8 valve positions (double solenoid valves)
C2S-EC-12B-()	Valve terminal with 12 valve positions (double solenoid valves)
C2S-EC-16B-()	Valve terminal with 16 valve positions (double solenoid valves)
C2S-EC-20B-()	Valve terminal with 20 valve positions (double solenoid valves)
C2S-EC-24B-()	Valve terminal with 24 valve positions (double solenoid valves)

Note: “()” represent solenoid valve model code, support customization.

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3 Product Parameters

3.1 General Parameters

Interface Parameter	
Bus protocol	EtherCAT
Data transmission medium	CAT5e: UTP or STP（STP recommended）
Transmission distance	≤100 m（distance between stations）
Transmission rate	100 Mbps
Bus interface	2xM12，4Pin，D-code，female
Technical Parameters	
System power supply	18~36 VDC
Rated current consumption	30 mA
Electrical isolation	500 V
Load power	24 VDC（±25%）
Number of outputs	0~48
Single channel current	Max：250 mA
Power interface	M12，5Pin，A-code，male
Power interface surge protection	YES
Power interface reverse connection protection	YES
Channel short circuit protection	YES
Channel open-circuit diagnostics	YES
Channel short-circuit diagnostics	YES
Weight	Depand on different models
Size	Depand on different models（See 5.1 Outline Dimensional Drawing）
Working temperature	-5~+50℃
Storage temperature	-20~+75℃
Relative humidity	95%, non-condensing
Protection degree	IP20

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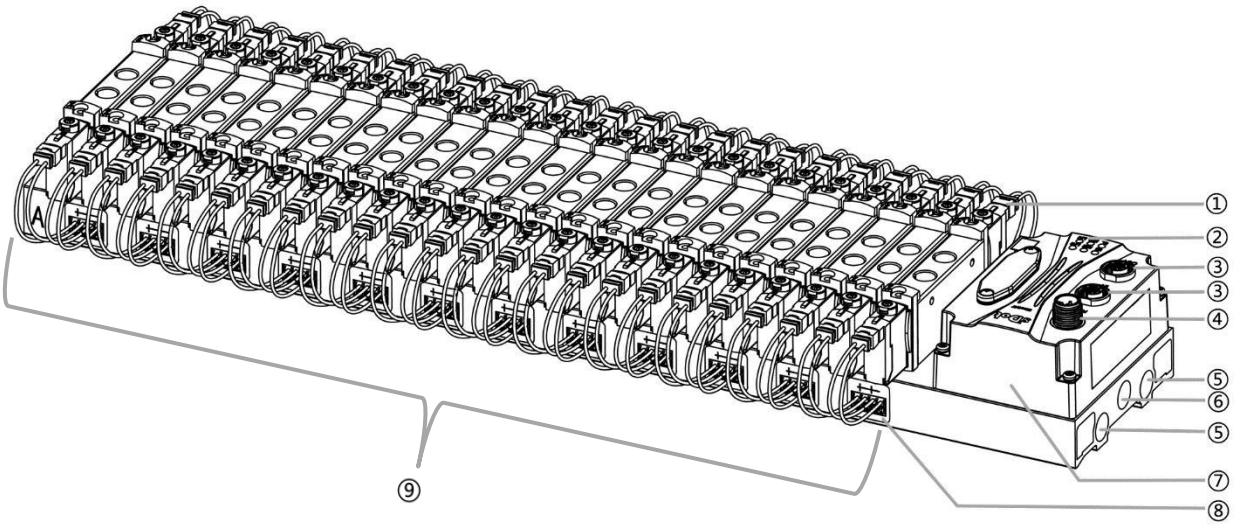
4 Panel

4.1 Product Structure

Name and function description of each parts of the product



Code	Name	Description
①	Solenoid valves	See “Solenoid Valve Model Code Table”
②	LED indicator	Power ID, operation and bus status
③	Bus interface	2×M12，4Pin，D-code，female
④	Power interface	1×M12，5Pin，A-code，male
⑤	Exhaust port	G1/4
⑥	Intake port	G1/4
⑦	Communication unit	Valve terminal communication and controller
⑧	Solenoid valve wiring socket	4Pin
⑨	Manifold base	Main structure, silk screened with“A”and“B”on both ends

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4.2 Indicator Function

Name	ID	Color	Status	Status description
System power indicator	US	Green	ON	Normal status of working power supply
			OFF	Unpowered or abnormal power supply
Load power indicator	UL	Green	ON	Normal status of working power supply
			OFF	Unpowered or abnormal power supply
Network indicator IN	L/A0	Green	Flashing	Network connection established with data interaction
			OFF	No data interaction or abnormal connection
Network indicator OUT	L/A1	Green	Flashing	Network connection established with data interaction
			OFF	No data interaction or abnormal connection
Operation status indicator	RUN	Green	ON	Network connection established
			Flashing	1Hz：The device has not established a connection, but an IP address was obtained; the IP address is duplicated; the device is undergoing a power-up test
			OFF	The device has not been given an IP address or is in an unpowered state
Alarm indicator	ERR	Red	ON	The valve is shorted/over-tempered or is bECng restored to factory settings
			OFF	Normal system operation or power off

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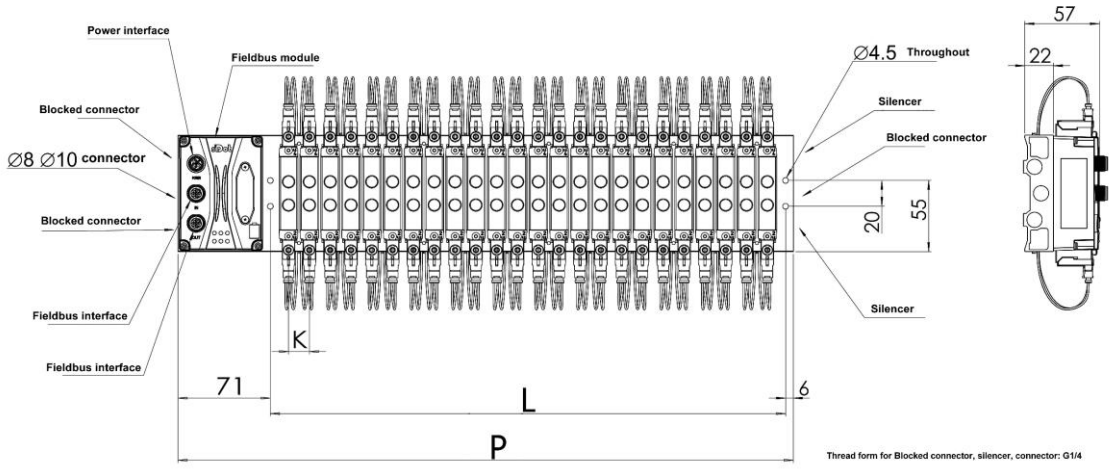
5 Installation

5.1 Outline Dimensional Drawing

Outline Specifications (mm)



L size											
Position	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**24**
K=10.5	59.5	80.5	101.5	122.5	143.5	164.5	185.5	206.5	227.5	248.5	269.5
K=16	76	108	140	172	204	236	268	300	332	364	396
K=19	88	126	164	202	240	278	316	354	392	430	468
K=23	103	149	195	241	287	333	379	425	471	517	563
P size											
Position	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**24**
K=10.5	136.5	157.5	178.5	199.5	220.5	241.5	262.5	283.5	304.5	325.5	346.5
K=16	153	185	217	249	281	313	345	377	409	441	473
K=19	165	203	241	279	317	355	393	431	469	507	545
K=23	180	226	272	318	364	410	456	502	548	594	640

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5.2 Solenoid Valve Assembly Sequence

- **Supported solenoid valve for valve terminal**

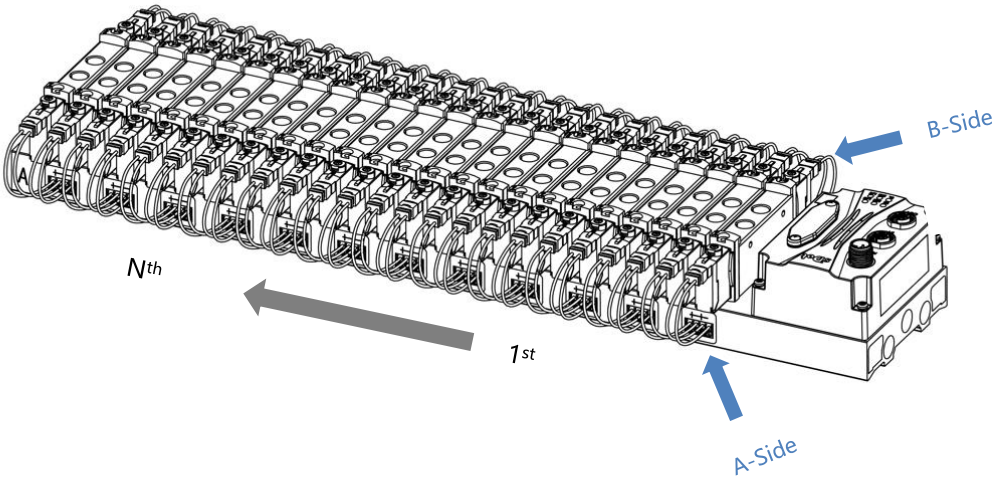
  For details, see Solenoid Valve Model Code Table

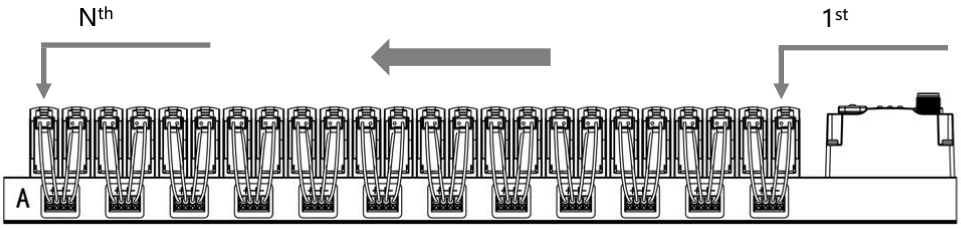
- **Solenoid valve assembly sequence**

  The solenoid valves are installed in order from the communication unit end.

  Assembly sequence for double solenoid valves: Starting from the communication unit end, install valves from the 1st to the Nth position in sequence, as is shown in the figure below.

  Assembly sequence for single solenoid valves: Starting from the communication unit end, install valves from the 1st to the Nth positio on the A side, as is shown in the figure below.





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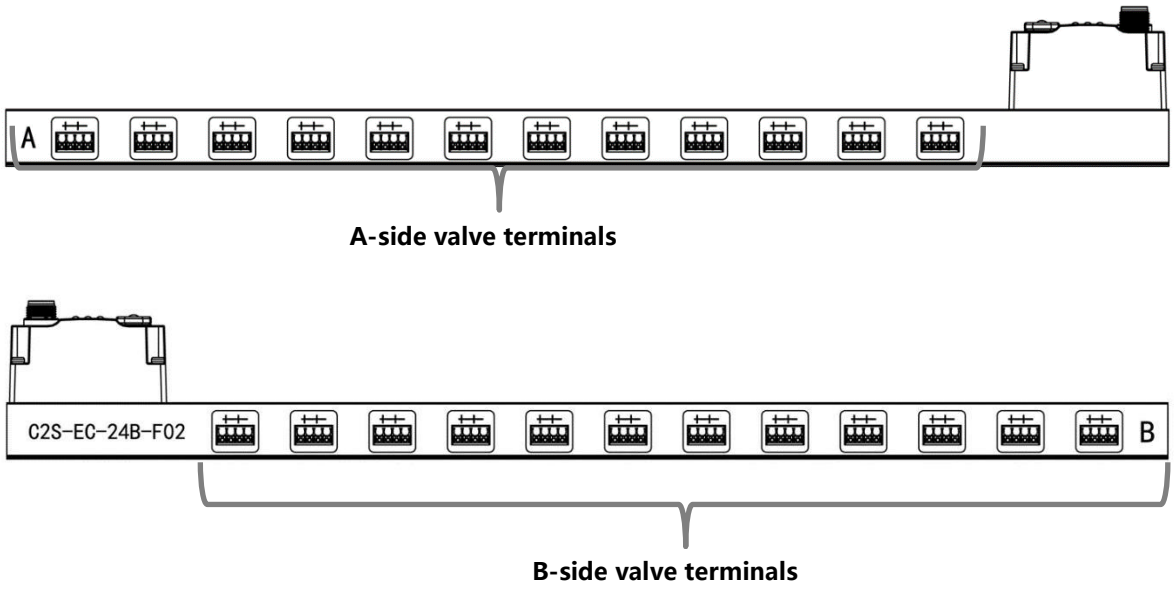
6 Wiring

6.1 Solenoid Valve Wiring

Terminal Connectors Distribution

Terminal connectors are distributed on both sides of the valve terminal manifold base, A-side and B-side respectively. A and B side can be distinguished according to the silkscreen on the end of the manifold base. Take C2S-EC-24B-F02 as an example, the distribution of A-side and B-side terminal connectors is shown in the figure below.



Wiring Terminals		
Terminal	Number of poles	4P
	Wire gauge	22~17 AWG 0.3~1.0 mm²

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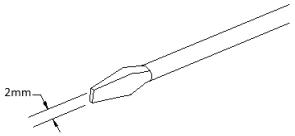
Wiring Tool Requirements

As the terminals are based on a screw-free design, cable installation and removal can be realized with a slotted screwdriver (size: ≤ 2 mm).



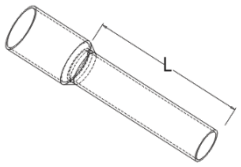
Stripping length requirements

Recommended stripping length: 10 mm

Wiring Method

For a single-strand hard wire, after stripping a required length, press the button while inserting the single-strand wire

For a multi-strand flexible wire, after stripping a required length, directly connect it or use a compatible cold-pressed terminal (tubular insulated terminal, as shown in the table below). Press the button whiling inserting the wire.

Specification of tubular insulated terminal		
Specification	Model	Cable section area (mm²)
 Length of tubular insulated terminal L ≥10 mm	E0310	0.3
	E0510	0.5
	E7510	0.75
	E1010	1.0

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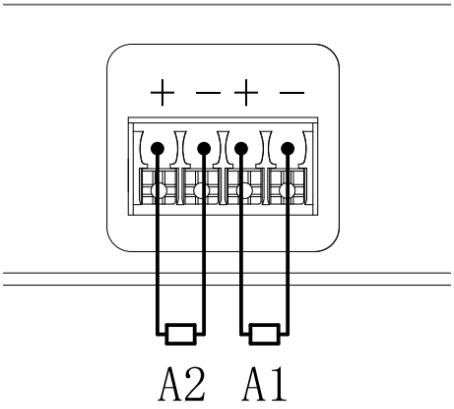
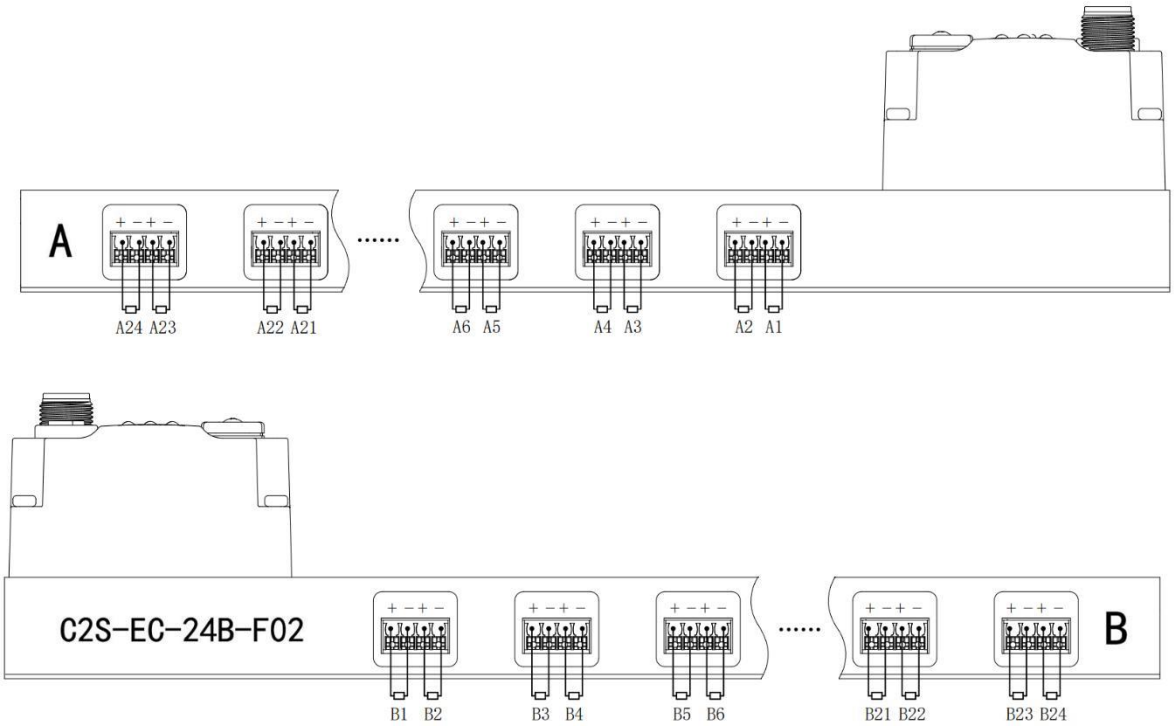
- **Solenoid valve wiring**

The number of 4-pin sockets, which are installed on both side of the manifold base, based on the number of valve positions of different valve terminal models. A pair of “+” and “-” can drive a solenoid valve coil. As shown in the figure below, A1 and A2 can drive a solenoid valve coil respectively.



- **Valve terminal wiring**

Starting from the communication unit end, the solenoid valve coils on the A side of the manifold base correspond to B side, and the correspondence between the channels and the solenoid valve coils is shown in the figure below.



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Solenoid valve wiring principles:

- Install the solenoid valve in accordance with "5.2 Solenoid Valve Assembly Sequence".
- AX and BX can be connected to a double solenoid valve, and AX can be connected to a single solenoid valve. For wiring, please strictly follow the table below, otherwise the solenoid valve will not work or misoperate. "×" means no wiring.

Double solenoid valve wiring (all valves are double solenoid valves)									
Terminals	A1	B1	A2	B2	A3	B3	A4	B4	……
Solenoid valve number	1		2		3		4		……

Terminals	……	A22	B22	A23	B23	A24	B24
Solenoid valve number	……	22		23		24	

Note: C2S-EC-24B-() valve terminal and 24 solenoid valves were taken as an example. Wirings are different considering different specifications of the valve terminal.

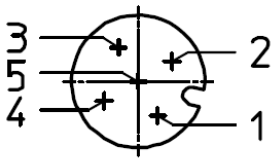
Double solenoid valve wiring (all valves are single solenoid valves)									
Terminals	A1	B1	A2	B2	A3	B3	A4	B4	……
Solenoid valve number	1	×	2	×	3	×	4	×	……

Terminals	……	A22	B22	A23	B23	A24	B24
Solenoid valve number	……	22	×	23	×	24	×

Note: C2S-EC-24B-() valve terminal and single solenoid valve were taken as an example. Wirings are different considering different specifications of the valve terminal.

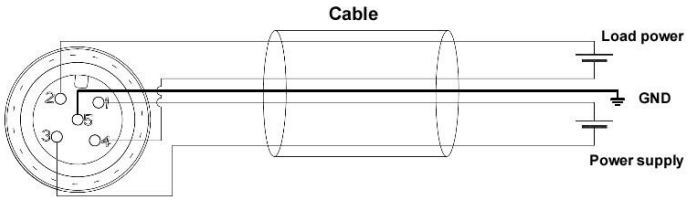
6.2 Power Wiring

Power interface, M12, A-code



Pin	Functions	Cable Core Color
1	24 VDC, Operating Power	Brown
2	24 VDC, Load Power	White
3	GND, Operating Power	Blue
4	0 V, Load Power	Black
5	PE, Protective Earthing	Gray

The power supply wiring is shown below:



Precautions

- The module system-side power supply and the field-side power supply are configured and used separately, so do not mix them.
- PE needs to be reliably grounded.

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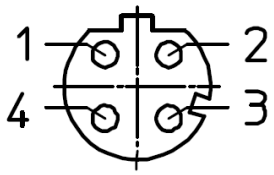
6.3 Bus Wiring

Fieldbus Interface, M12, D-code		
	Pin	Function
	1	TD+, Transmit Data+
	2	RD+, RecECve Data+
	3	TD-, Transmit Data-
	4	RD-, RecECve Data-
	-	Housing, Shielded/Protected Ground

Precautions

- Double shielded cables of category 5 or higher (braided mesh + aluminum foil) like STP cables are recommended.
- The length of the cables between the devices must not exceed 100 m.

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7 Operation

7.1 Control Method

Solenoid valves installed on the valve terminal are controled by bytes and one byte control 4 valves. They can also be controlled by bits, in which 8 bits in a group, controlling 1 to 8 channels. The channel value of 1 means solenoid valve is open, the channel value of 0 means solenoid valve is closed. 24 duoble solenoid valves have 6 groups of control positions and control 48 channels. Take 24-position double solenoid valve as an example to introduce the output control function of the valve terminal, the control mode is shown in the table below.

Control Method	**valve[1..4]**							
Channel Address	**valve [1..4] [0]**	**valve [1..4] [1]**	**valve [1...4] [2]**	**valve [1...4] [3]**	**valve [1...4] [4]**	**valve [1...4] [5]**	**valve [1...4] [6]**	**valve [1...4] [7]**
Coils	A1	B1	A2	B2	A3	B3	A4	B4
Solenoid Valve Number	1		2		3		4	

Control Method	**valve[5..8]**							
Channel Address	**valve [5..8] [0]**	**valve [5...8] [1]**	**valve [5...8] [2]**	**valve [5...8] [3]**	**valve [5...8] [4]**	**valve [5..8] [5]**	**valve [5...8] [6]**	**valve [5...8] [7]**
Coils	A5	B5	A6	B6	A7	B7	A8	B8
Solenoid Valve Number	5		6		7		8	

Control Method	**valve [9...12]**							
Channel Address	**valve [9..12] [0]**	**valve [9...12] [1]**	**valve [9...12] [2]**	**valve [9...12] [3]**	**valve [9...12] [4]**	**valve [9...12] [5]**	**valve [9...12] [6]**	**valve [9...12] [7]**
Coils	A9	B9	A10	B10	A11	B11	A12	B12
Solenoid Valve Number	9		10		11		12	

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Control Method	valve [13...16]							
Channel Address	Valve [13...16] [0]	Valve [13...16] [1]	Valve [13...16] [2]	Valve [13...16] [3]	Valve [13...16] [4]	Valve [13...16] [5]	Valve [13...16] [6]	valve [13...16] [7]
Coils	A13	B13	A14	B14	A15	B15	A16	B16
Solenoid Valve Number	13		14		15		16	

Control Method	valve[17..20]							
Channel Address	valve [17...20] [0]	valve [17...20] [1]	Valve [17...20] [2]	valve [17...20] [3]	valve [17...20] [4]	valve [17...20] [5]	valve [17...20] [6]	valve [17...20] [7]
Coils	A17	B17	A18	B18	A19	B19	A20	B20
Solenoid Valve Number	17		18		19		20	

Control Method	valve [21...24]							
Channel Address	valve [21...24] [0]	valve [21...24] [1]	valve [21...24] [2]	valve [21...24] [3]	valve [21...24] [4]	valve [21...24] [5]	valve [21...24] [6]	valve [21...24] [7]
Coils	A21	B21	A22	B22	A23	B23	A24	B24
Solenoid Valve Number	21		22		23		24	

7.2 Diagnostic Function

The C2S-EC valve terminal has an open load, a short-circuit and over temperature detection. An open load can only be monitored if the valve is closed and a short circuit can only be monitored if the valve is open.

The diagnostic function works the same as the control method as it sends diagnostic information in byte or bit. Under the condition that the valve is closed, the value 0 means normal status and 1 means the valve is in open-circuit condition. Under the condition that the valve is opened, the value 0 means normal status and 1 means the valve is in short-circuit or over temperature condition.

The channel diagnostic information of open load, short-circuit and over temperature corresponds the solenoid valve coils. Taking open-circuit diagnosis as an example, the correspondence is shown in the table below.

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Diagnostic Function	Open load[0..7]							
Channel Address	Open [0..7] [0]	Open[0..7] [1]	Open [0..7] [2]	Open [0..7] [3]	Open [0..7] [4]	Open [0..7] [5]	Open[0..7] [6]	Open[0..7] [7]
Coils	A1	B1	A2	B2	A3	B3	A4	B4
Solenoid Valve Number	1		2		3		4	

Note: Open load is abbreviated as Open in the table, same as all below tables.

Diagnostic Function	Open load[8..15]							
Channel Address	Open [8..15] [0]	Open [8..15] [1]	Open [8..15] [2]	Open [8..15] [3]	Open [8..15] [4]	Open [8..15] [5]	Open [8..15] [6]	Open [8..15] [7]
Coils	A5	B5	A6	B6	A7	B7	A8	B8
Solenoid Valve Number	5		6		7		8	
Diagnostic Function	**Open load[16..23]**							
Channel Address	Open [16..23] [0]	Open [16...23] [1]	Open [16...23] [2]	Open [16...23] [3]	Open [16...23] [4]	Open [16...23] [5]	Open [16...23] [6]	Open [16...23] [7]
Coils	A9	B9	A10	B10	A11	B11	A12	B12
Solenoid Valve Number	9		10		11		12	

Diagnostic Function	Open load[24..31]							
Channel Address	Open [24..31] [0]	Open [24..31] [1]	Open [24..31] [2]	Open [24..31] [3]	Open [24..31] [4]	Open [24..31] [5]	Open [24..31] [6]	Open [24..31] [7]
Coils	A13	B13	A14	B14	A15	B15	A16	B16
Solenoid Valve Number	13		14		15		16	

Diagnostic Function	Open load [32..39]							
Channel Address	Open [32..39] [0]	Open [32..39] [1]	Open [32..39] [2]	Open [32..39] [3]	Open [32..39] [4]	Open [32..39] [5]	Open [32..39] [6]	Open [32..39] [7]
Coils	A17	B17	A18	B18	A19	B19	A20	B20
Solenoid Valve Number	17		18		19		20	

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Diagnostic Function	**Open load[40..47]**							
Channel Address	**Open [40..47] [0]**	**Open [40..47] [1]**	**Open [40..47] [2]**	**Open [40..47] [3]**	**Open [40...47] [4]**	**Open [40...47] [5]**	**Open [40...47] [6]**	**Open [40..47] [7]**
Coils	A21	B21	A22	B22	A23	B23	A24	B24
Solenoid Valve Number	21		22		23		24	

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7.3 Parameter Description

7.3.1 Output Signal Clear/Hold Function

The output signal of the valve terminal has clear/hold function, and it can configure the output action of the valve terminal in the abnormal state of the bus.

Clear Output: When communication is disconnected, the output channel automatically clears the output signals.

Hold Output: When communication is disconnected, the output channel keeps on outputting.

The function supports all-channel setting, single-channel setting and 8-channel batch setting according to the driver chip grouping, which can better meet the actual use requirements.

This manual takes KV STUDIO Ver.10G as an example to introduce the parameter configuration method, the specific steps are detailed in 7.4.1 Application in TwinCAT3 Software Environment.

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7.4 Configuration Applications

7.4.1 Application in TwinCAT3 Software Environment

1、 Preparations

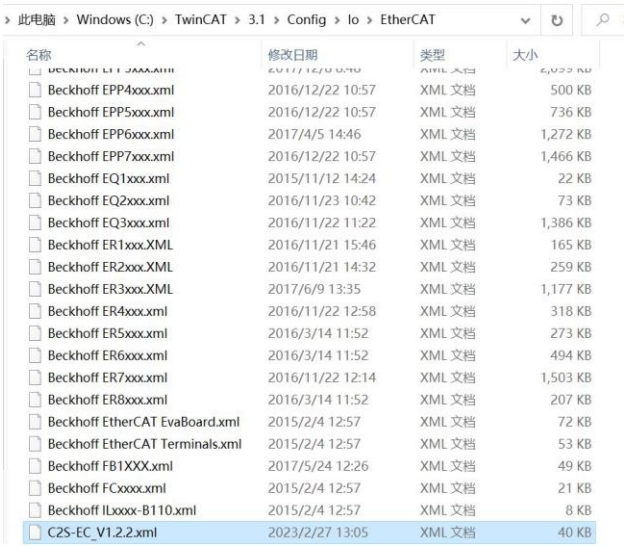
- **Hardware Environment**
  - **Valve terminal model C2S-EC-24B**
  - **A computer with TwinCAT3 software**
  - **Shielded cables for valve terminals**
  - **One switching power supply**
  - **Device configuration files**

    Configuration file access: https://www.solidotech.com/documents/configfile
- **Hardware Configuration and Wiring**

  Please follow "5 Installation" and "6 Wiring".

2、 Preset Profiles

Place the ESI configuration file (C2S-EC_V1.2.2.xml) in the TwinCAT installation directory under "C:\TwinCAT\3.1\Config\Io\EtherCAT" as shown in the figure below:



3、 Create A Project

a. Click on the TwinCAT icon in the lower right corner of the desktop and select "TwinCAT XAE (VS xxxx)" to open the TwinCAT software as shown below:

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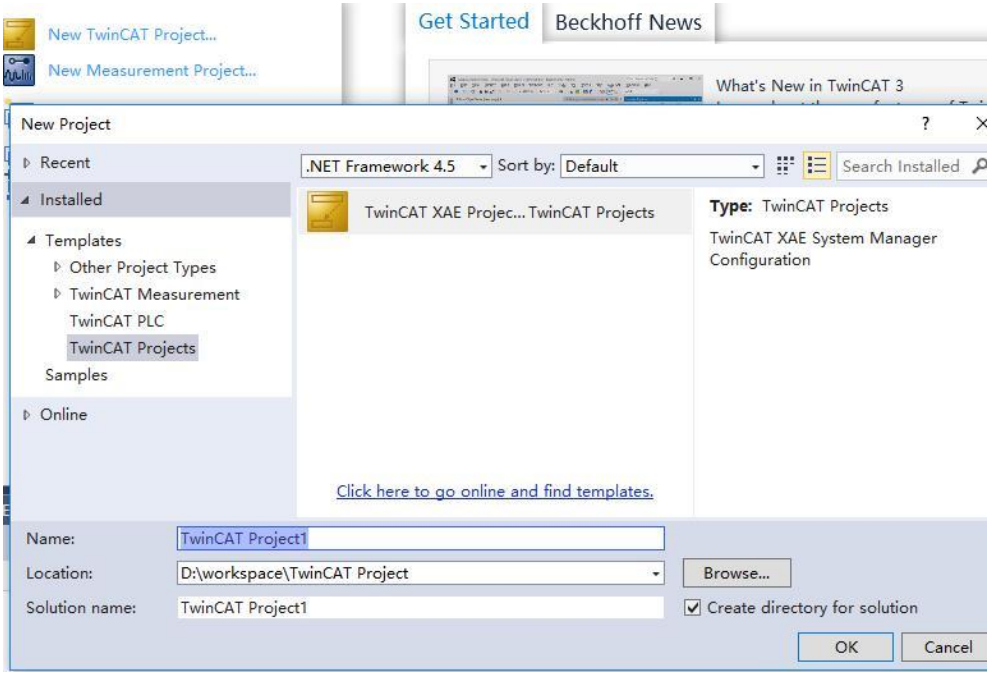
b. Click "New TwinCAT Project". In the pop-up window, "Name" and "Solution name" correspond to the project name and solution name respectively, and "Location" corresponds to the project path. These three items can be selected by default, then click "OK", the project is created successfully, as shown in the figure below:



4、Scanning Device

a. After creating the project, right-click on the "Scan" option under "I/O -> Devices" to perform a slave device scan, as shown in the figure below:

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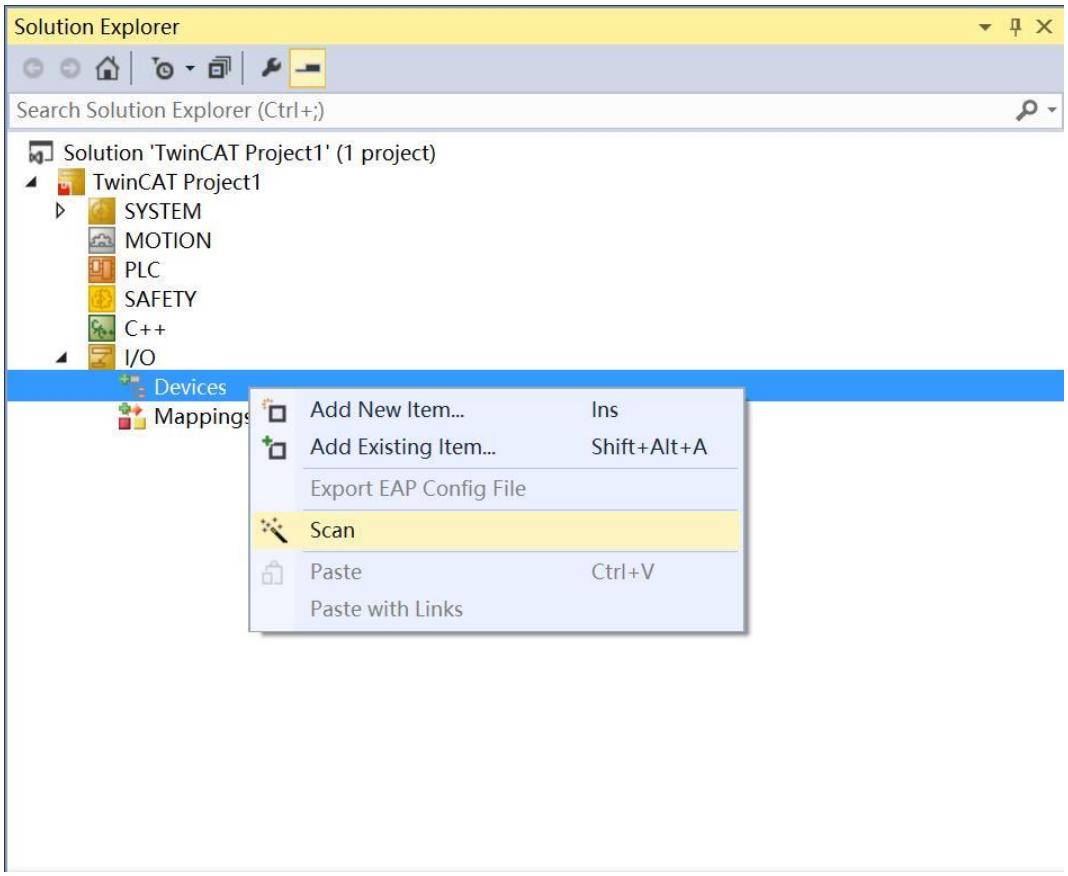
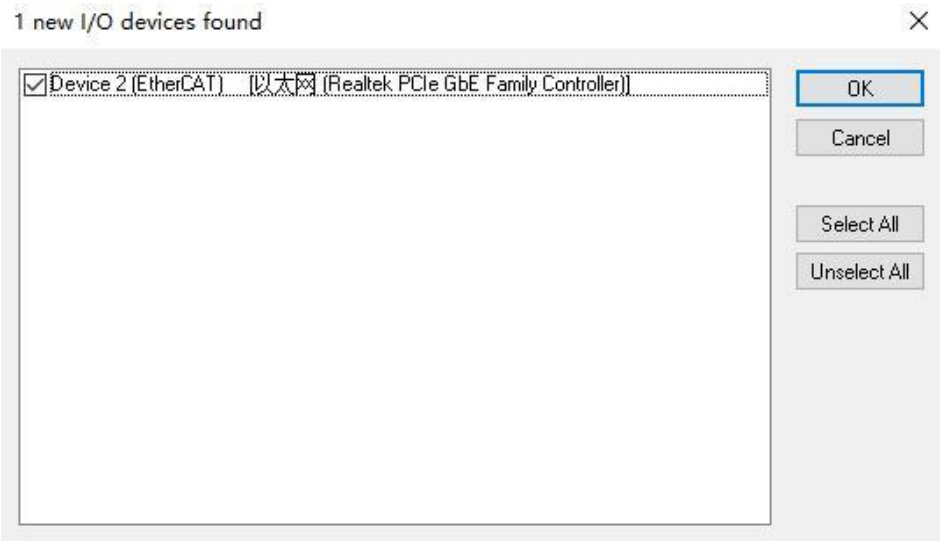


b. Check the "Local Connection" box, as shown in the figure below:



c. Select "Yes" on the pop-up window "Scan for boxes"; Select "Yes" on the pop-up window "Activate Free Run", as shown in the figure below:

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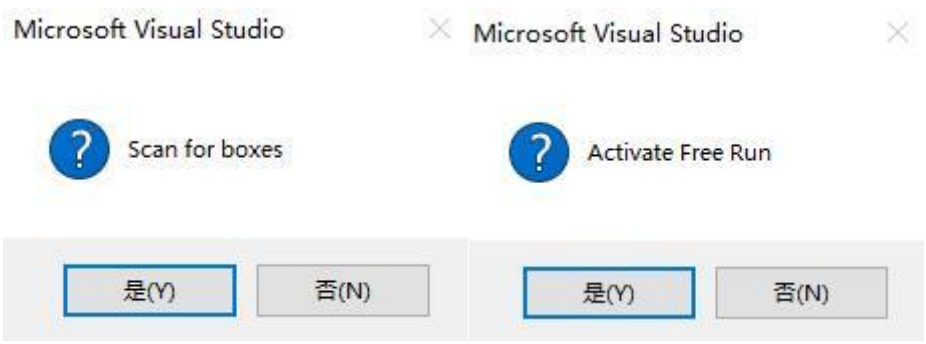
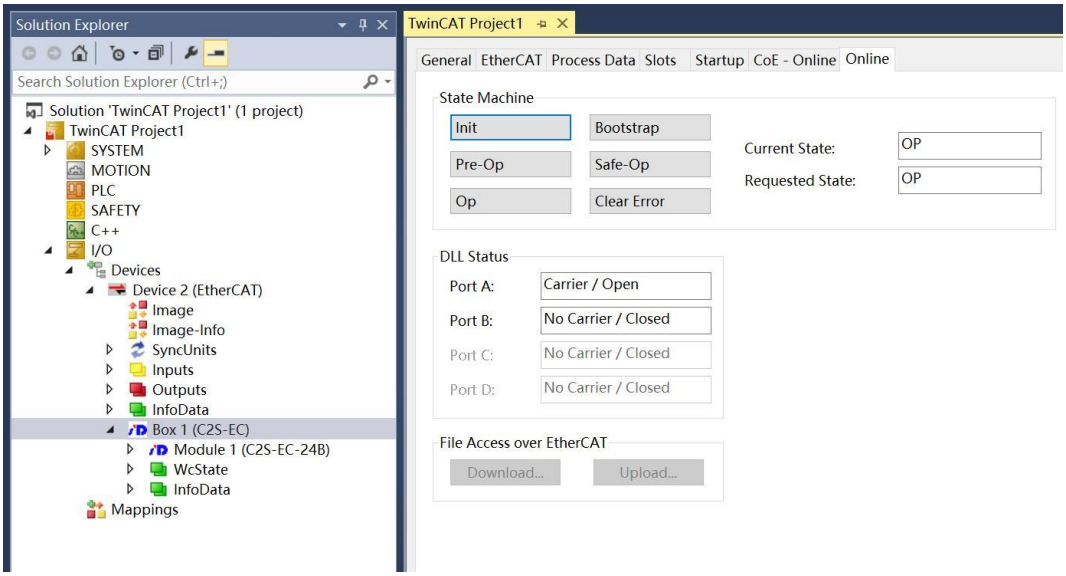


d. After scanning to the device, you can see Box1 (C2S-EC) -> Module1 (C2S-EC-24B) in the left navigation tree, double-click on the device, and you can see the device is in the "OP" state at "Online". Then you can observe that the RUN light of the slave device is always on, as shown in the figure below:



5、 Check Function Page

a. Valve Terminal Output Control Page

Click "Outputs" option in the left navigation tree "Box1 (C2S-EC) -> Module1 (C2S-EC-24B)" to expand the menu, you can view the output control function page of the valve terminal. 24 double solenoid valve are grouped into 6 groups of channels according to the driver chip types, which are valve[1..4], valve[5..8], valve[9..12], valve[13..16], valve[17..20], valve[21..24]. Each group has 8 channels, so there is a total of 48 channels output control, as shown in the figure below:

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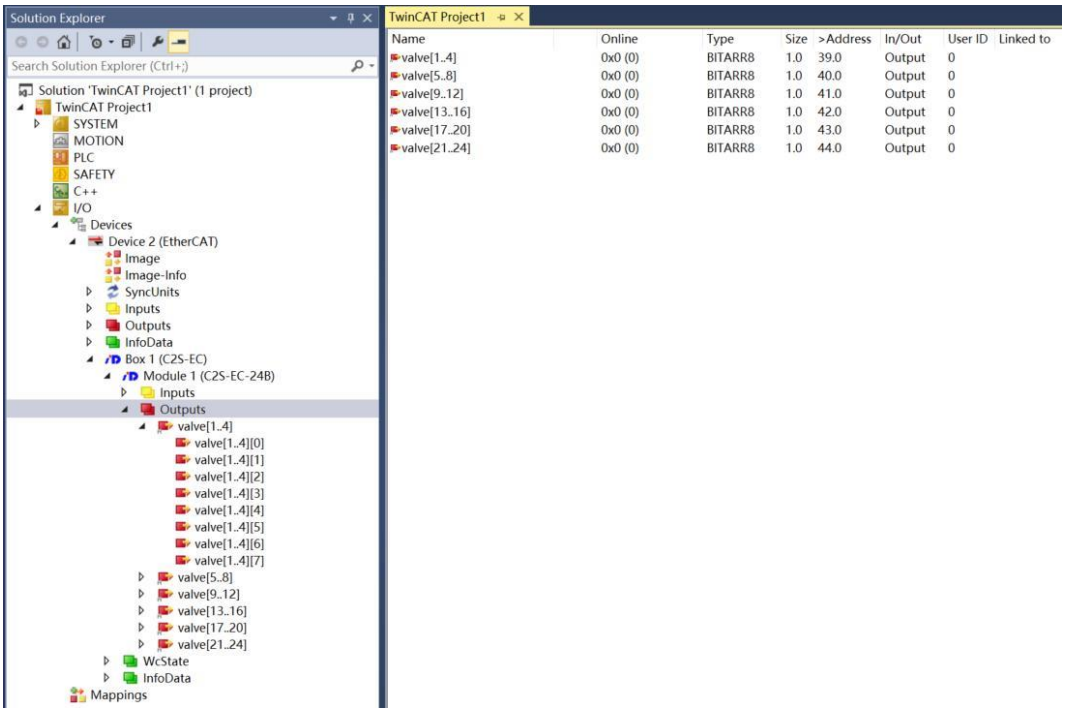

b. Valve Terminal Diagnostics Function Page

Click the "Inputs" option in the "Box1 (C2S-EC) -> Module1 (C2S-EC-24B)" expanding menu on the left navigation tree to view the Diagnostic Functions page for the valve terminal.

Open Load Detection

Open load[0..7], Open load[8..15], Open load[16..23], Open load[24..31], Open load[32..39], Open load[40..47], in total 48 channels can be diagnosed independently.

Short Circuit Or Overtemperature Detection

Short circuit or overtemperature[0..7], Short circuit or overtemperature[8..15], Short circuit or overtemperature[16..23], Short circuit or overtemperature[24..31], Short circuit or overtemperature[32..39], Short circuit or overtemperature[40..47], in total 48 channels can be diagnosed independently, as shown in the figure below:

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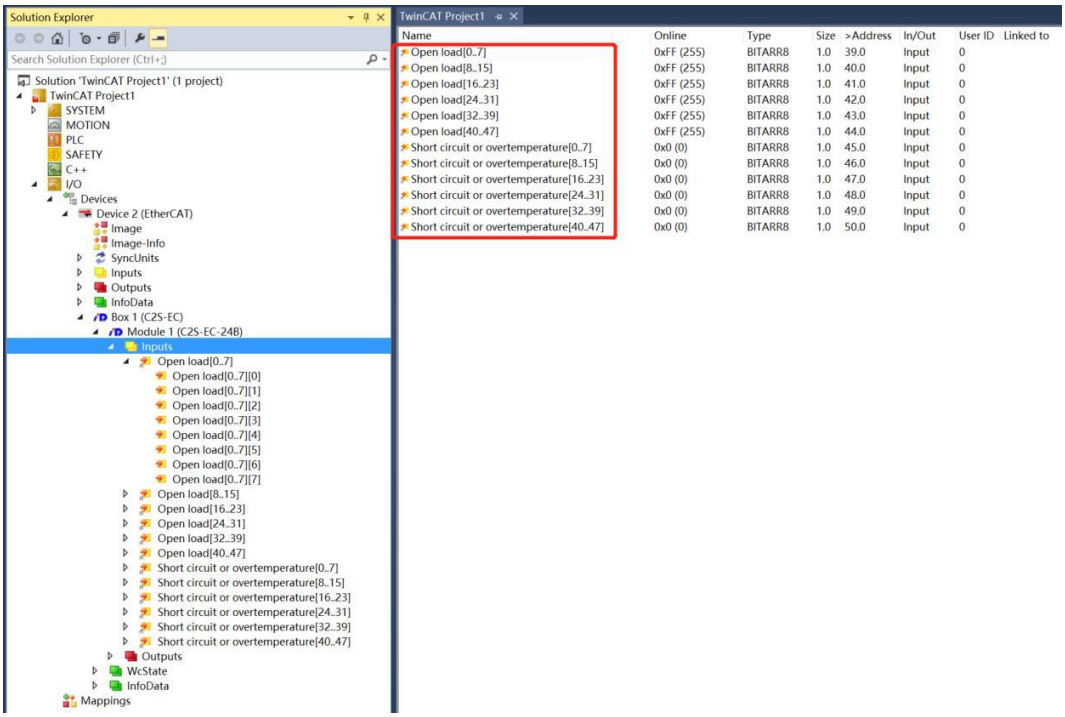

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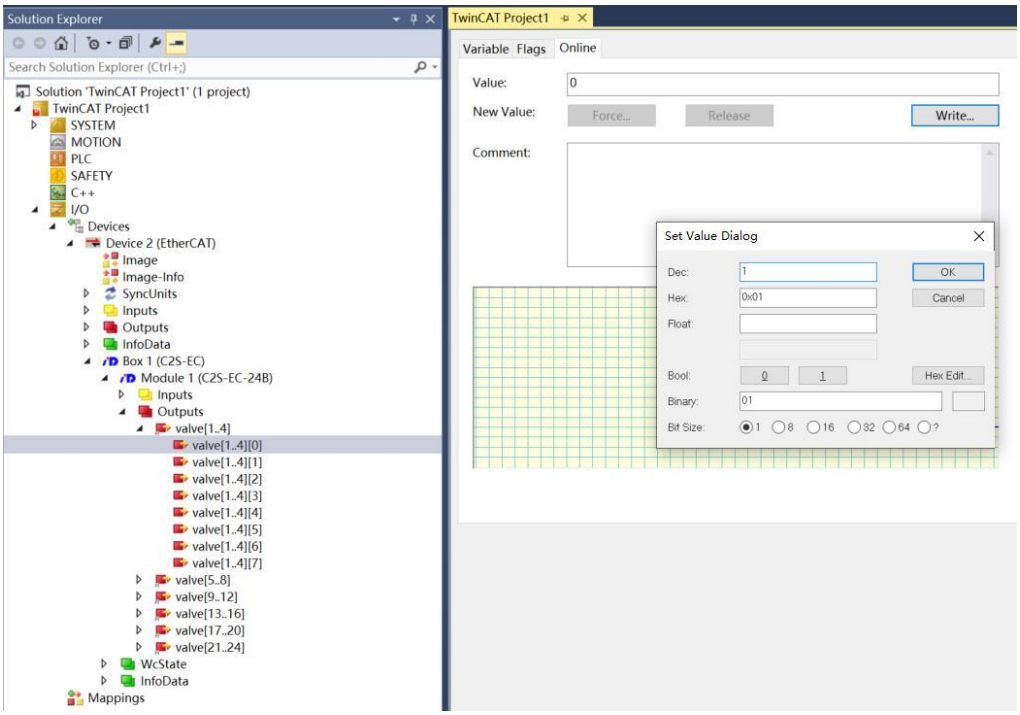
6、 Data Interaction

a. Channel Output Control

If you want to turn on any solenoid coil output of the valve terminal, take the first channel as an example, you can click "valve[1..4] -> valve[1..4][0]" under “Outputs” in the left navigation tree, click "Write" at the corresponding "Online", enter the value "1" at "Dec" in the corresponding dialog box, and click the "OK" button. Then you can open the first solenoid coil channel, as shown in the figure below:



If you want to control the output of a group of solenoid valve coils, take the first group of channels as an example, you can click "valve[1...4]" under “Outputs” in the left navigation tree, click "Write" in the corresponding "Online", enter the value "255" in the corresponding "Dec" in the dialog box, and then click "OK". Then you can open the first group of solenoid valve coil channels, as shown in the figure below:

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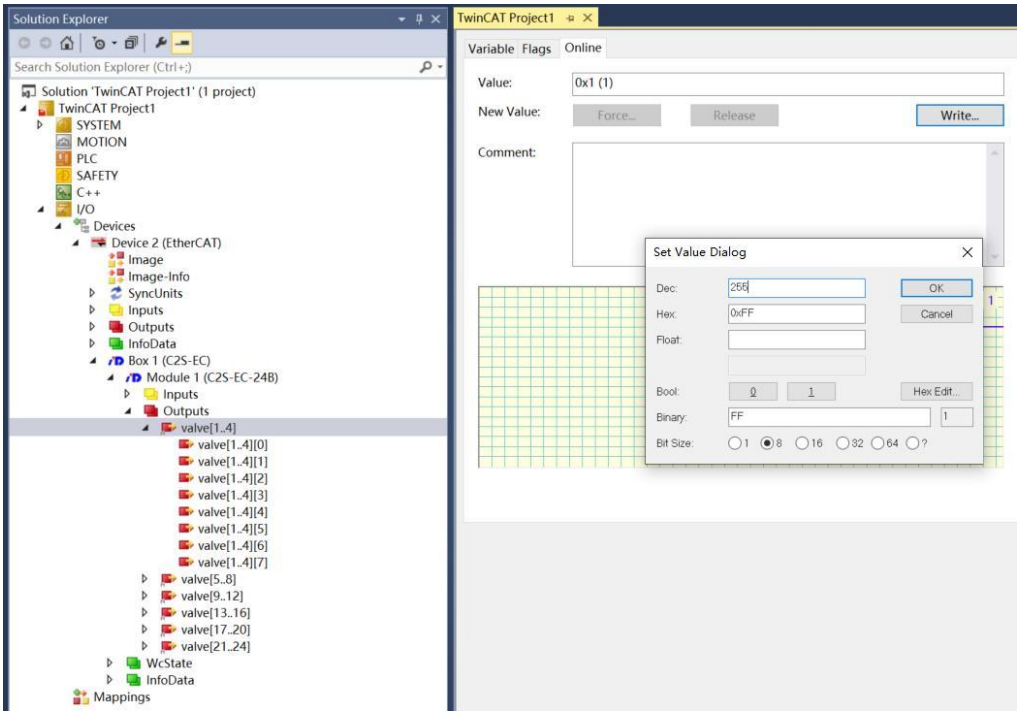
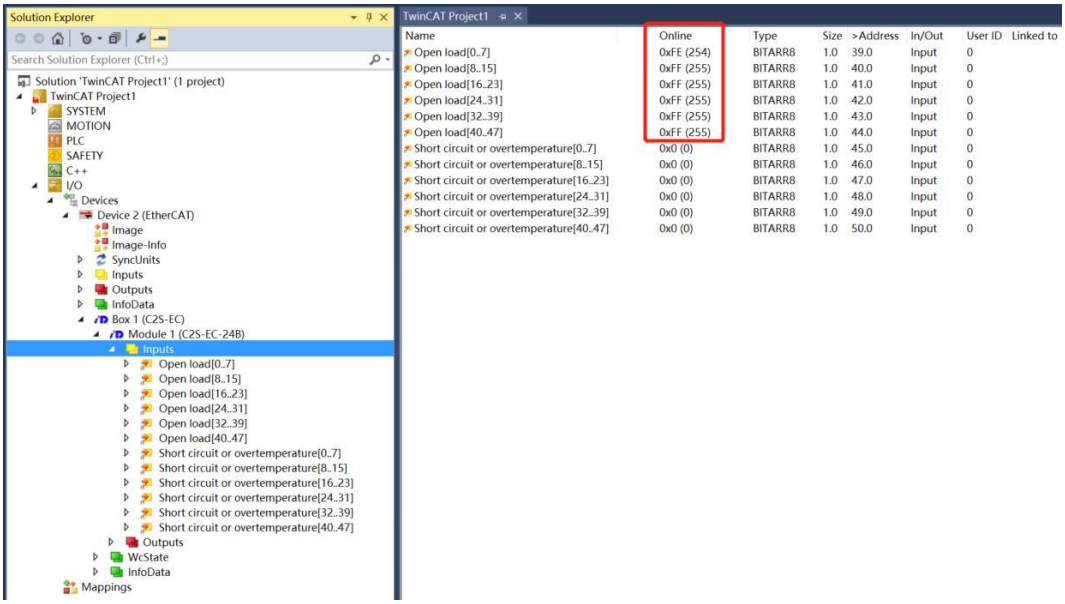


b. Open Load Detection

The diagnostic value of Open load is valid when the output of the channel solenoid coil is off (i.e. 0). Click "Box1(C2S-EC)-> Module1(C2S-EC-24B)" to expand the "Inputs" option in the menu, and in the "Online" section corresponding to Open load on the right side, you can view the corresponding solenoid valve open circuit value for each group of channels in the valve terminal. A group of channels with normal status of solenoid valve coils is 0, and an open circuit status is not 0, as shown in the figure below:



Expand a set of Open loads in the left navigation tree and click on any channel to view the open diagnostic value of the solenoid valve. For example, click the folding symbol to expand Open load[0..7], click Open

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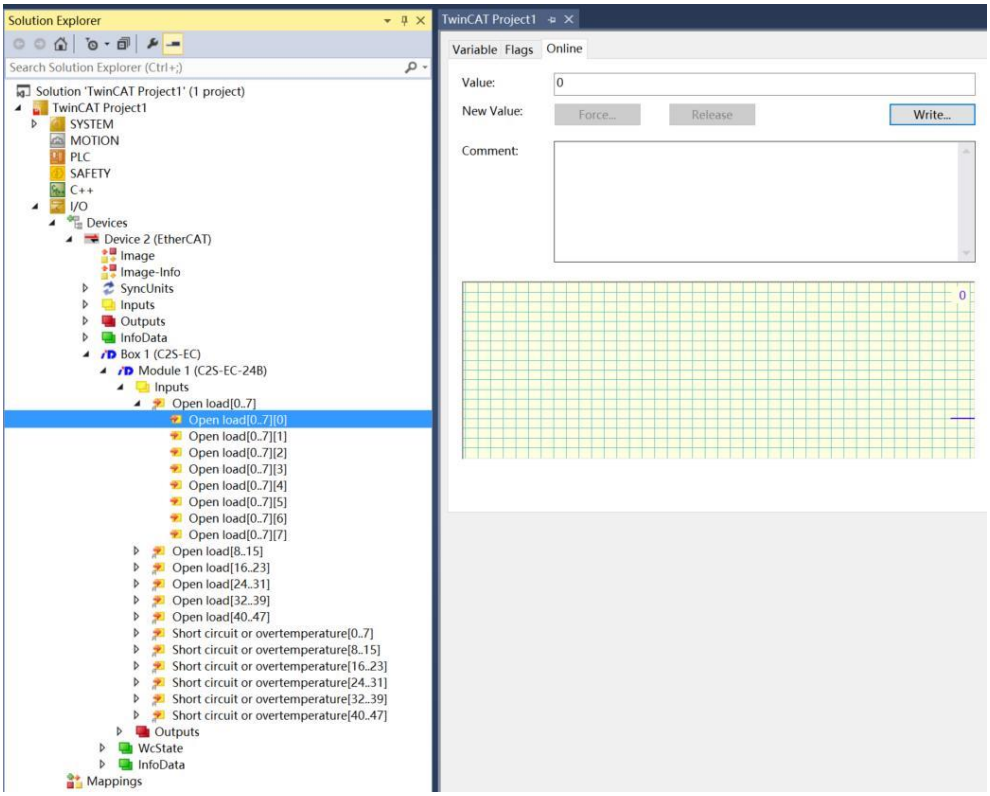
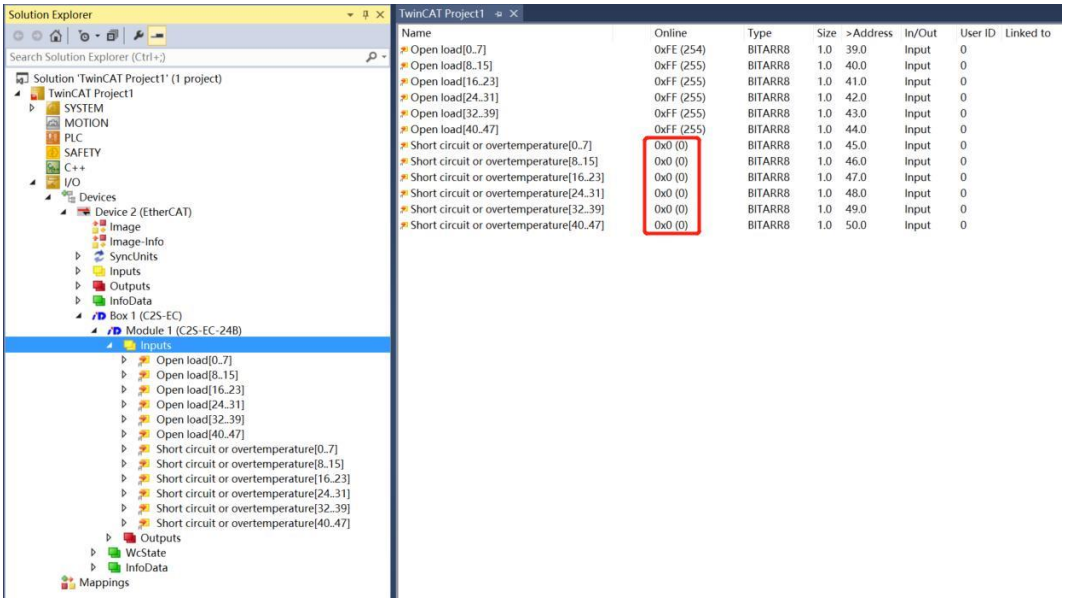
load[0..7][0], check the value of "Online" on the right side, if the value is 1, then the valve is open-circuited, and if the value is 0, then it is normal, as shown in the figure below:



c. Short Circuit/Over Temperature Diagnostic Function

Short circuit or overtemperature diagnostics are valid when the channel solenoid coil output is on (i.e. 1). Click the "Inputs" option in the "Box1 (C2S-EC) -> Module1 (C2S-EC-24B)" expanding menu, and at the "Online" on the right side of Short circuit or overtemperature, you can view the short circuit/overtempertaure diagnostic value of each channel's solenoid valve, the value 1 means the short circuit/overtempertaure status, the value 0 means normal status, as shown in the figure below.



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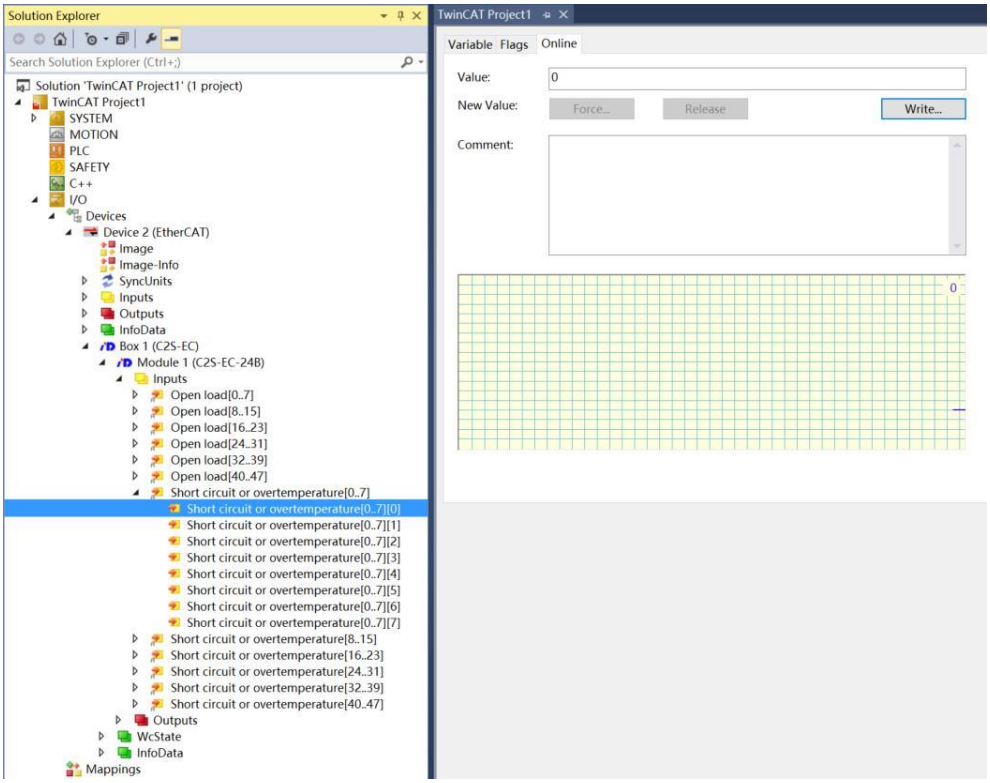
Expand the Short circuit or overtemperature group in the left navigation tree and click on any channel to view the short circuit/over temperature diagnostic values for the solenoid valve. For example, click the collapse symbol to expand Short circuit or overtemperature[0..7], click Short circuit or overtemperature[0..7][0], check the Value in the "Online" on the right side. If the value is 1, then the solenoid valve is short circuit/over temperature, if the value is 0, then the solenoid valve is not short circuit/over temperature, as shown in the figure below:



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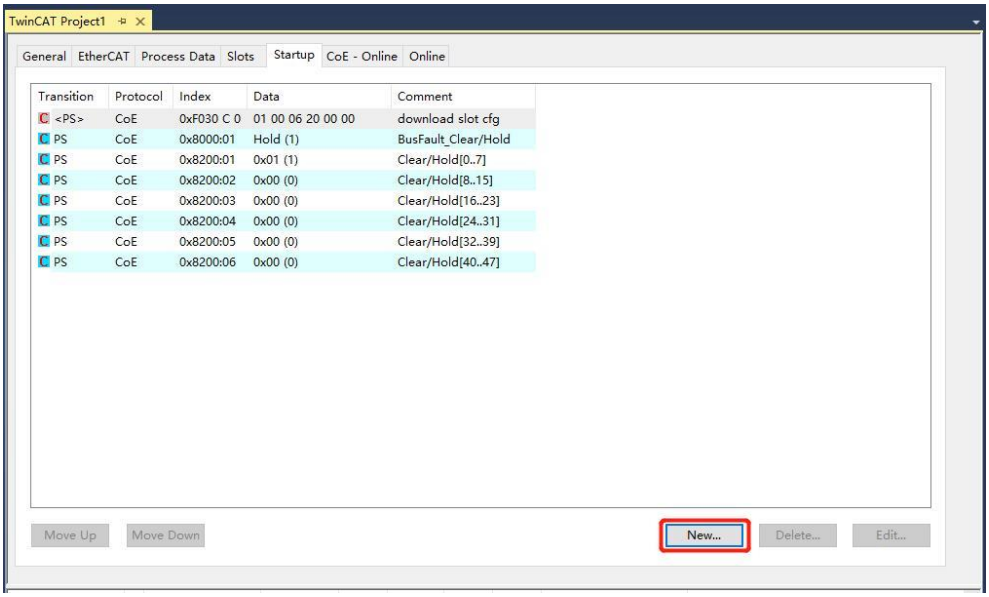
7、 Parameter Configuration Method

a. After scanning the valve island in TwinCAT3 software, click "Box1 (C2S-EC) -> Module1 (C2S-EC-24B)" in the left navigation tree, and then click "Startup" in the right configuration interface. Click "Startup" in the right configuration interface, and then click the "New" button at the bottom to enter the "Edit CANopen Startup Entry" interface, as shown in the figure below:



b. In the "Edit CANopen Startup Entry" interface, you can see the setting parameters 8000:0 and 8200:0. After expanding the parameters, 8000:0 is the function of setting parameters for all channels uniformly, and 8200:0 is the function of setting parameters for a single channel or a group of channels, as shown in the figure below:

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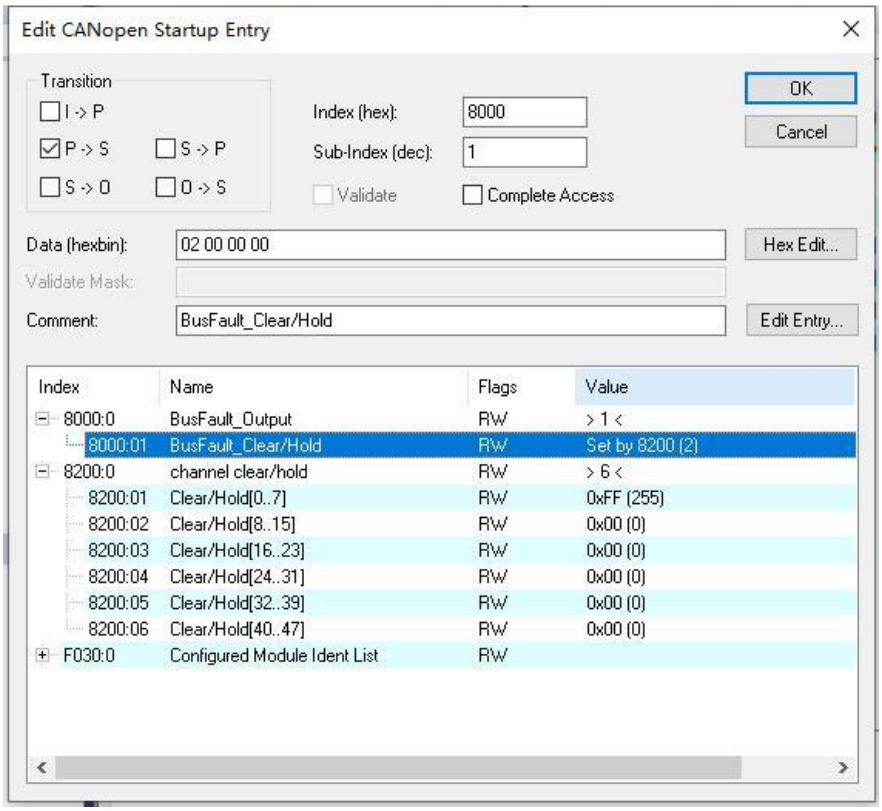

c. In the "Edit CANopen Startup Entry" interface, double click "8000:01 BusFault_Clear/Hold", select "Clear" or "Hold" in the "Set Value Dialog" interface, select "Clear" or "Hold", click "OK" button to complete the setting, as shown in the figure below. Click "OK" button to complete the setting, as shown in the figure below. After the configuration is completed, you need to perform the "Reload" operation for the settings to take effect. If you want to set single channel or group setting, select "Set by 8200", then 8000 will not take effect, and 8200 settings will take effect.

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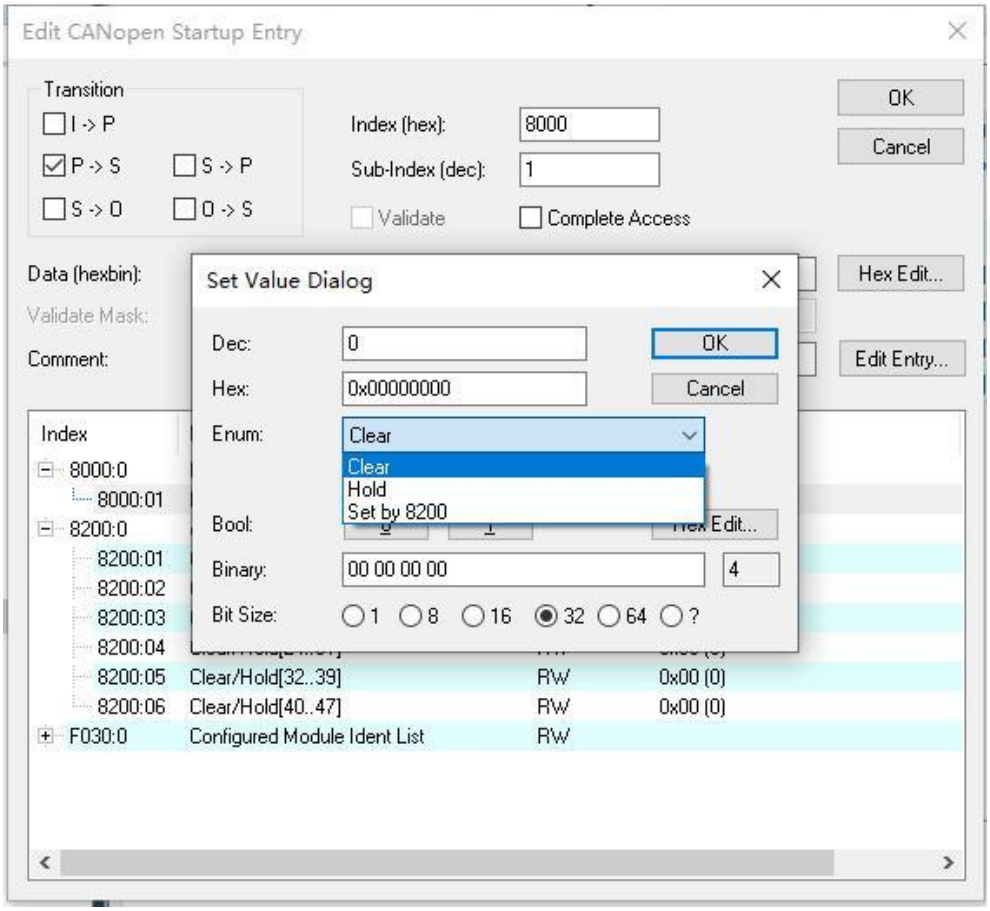

d. When "8000:01 BusFault_Clear/Hold" is set to "Set by 8200", you can set the clear/hold function for single channel or group. For example, to set the clear/hold function of channel 0~7, in the "Edit CANopen Startup Entry" interface, double click "8200:01 Clear/Hold[0...7]", and then click "Set Value Dialog" in the "Set Value Dialog" interface, and then double click "8200:01 Clear/Hold[0...7]" in the "Set Value Dialog" interface. In the "Set Value Dialog" interface, double click "8200:01 Clear/Hold[0..7]", and then enter the value in the input box corresponding to "Dec", a value of 1 for the channel will enable the hold function, and a value of 0 will enable the clear function. If you input 1, only channel [0] will enable the hold function; if you input 255, channel [0...7] will enable the hold function, and so on for the other 5 groups of channels.
When the settings are complete, click the "OK" button to finish the settings, as shown in the following figure. After the configuration is completed, you need to perform the "Reload" operation for the settings to take effect.

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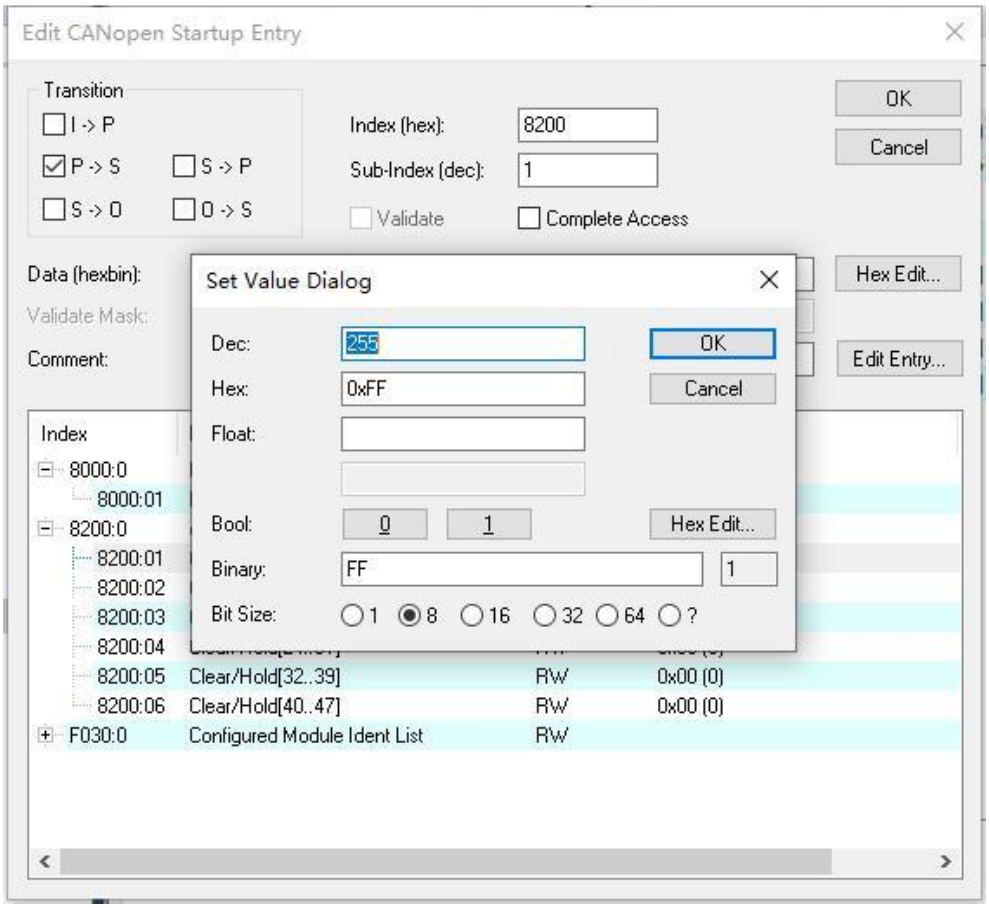

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7.4.2 Application in Sysmac Studio Software Environment

1、 Preparations

- **Hardware Environment**
  - **Valve Terminal Model C2S-EC-24B**
  - **One computer with Sysmac Studio software pre-installed**
  - **One Omron PLC**

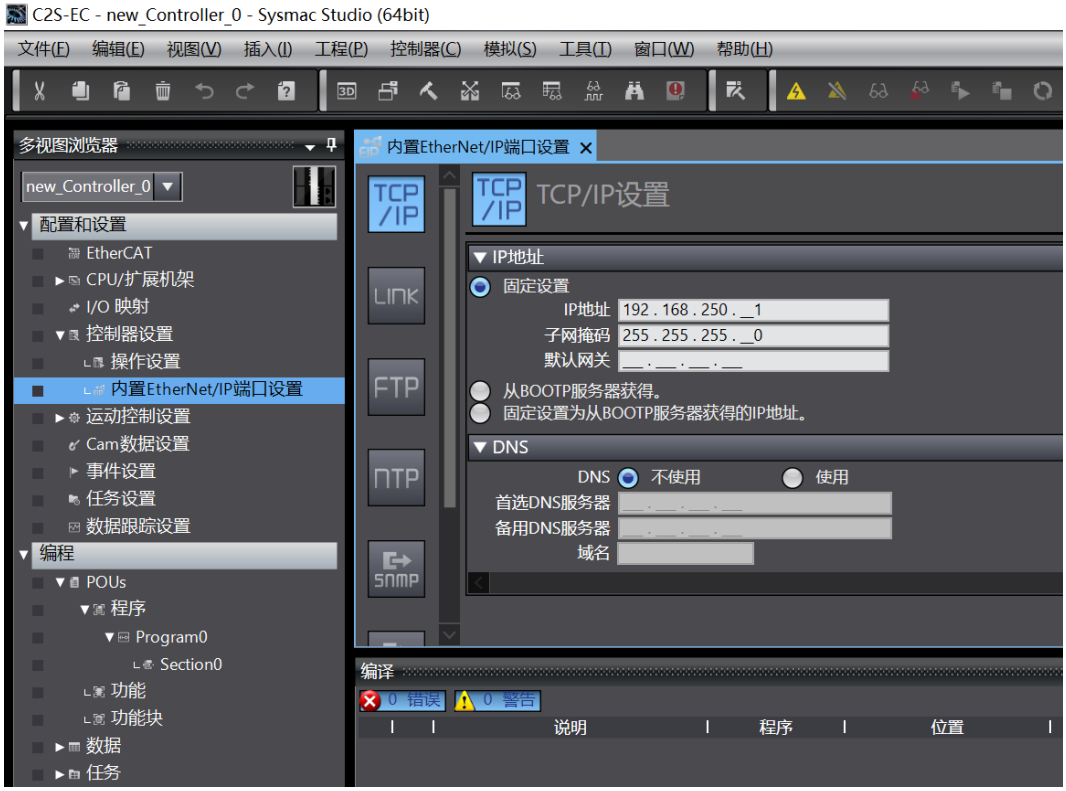
    Model# NJ301-1100 is taken as an example
  - **Shielded cable for valve terminal**
  - **One switching power supply**
  - **Device Configuration Files**

    Configuration file access: https://www.solidotech.com/documents/configfile
- **Hardware configuration and wiring**

  Please follow "5 Installation" and "6 Wiring".

2、 Set IP Address

a. Set the IP address of PC and PLC to make sure they are in the same network segment. If the IP of PLC is unknown, you can check it in "Configuration and Settings -> Controller Settings -> Built-in EtherNet/IP Port Settings" after creating the project, as shown in the figure below:



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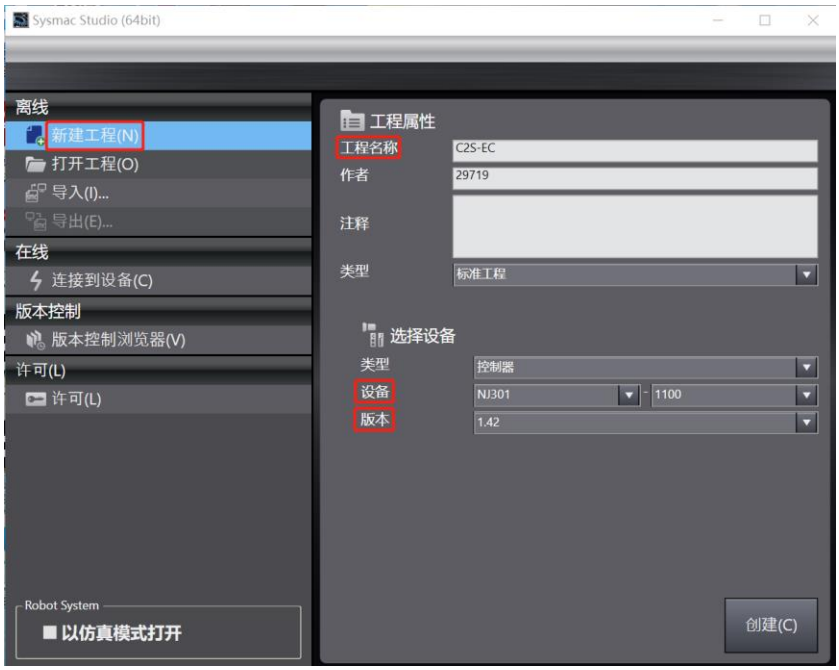
3、 Create A New Project

a. Open the Sysmac Studio software and click the "New Project" button as shown in the figure below:



- Project name: Customized.
- Select device: “Device” selects the corresponding PLC model and “Version” recommends selecting V1.40 and above.

b. When you have finished entering the project properties, click “Create”.

4、 Installation of XML Files

a. Expand "Configuration and Settings" in the left navigation tree, double-click "EtherCAT", right-click "Master Device", and select "Show ESI Library" as shown below. Library", as shown in the figure below:

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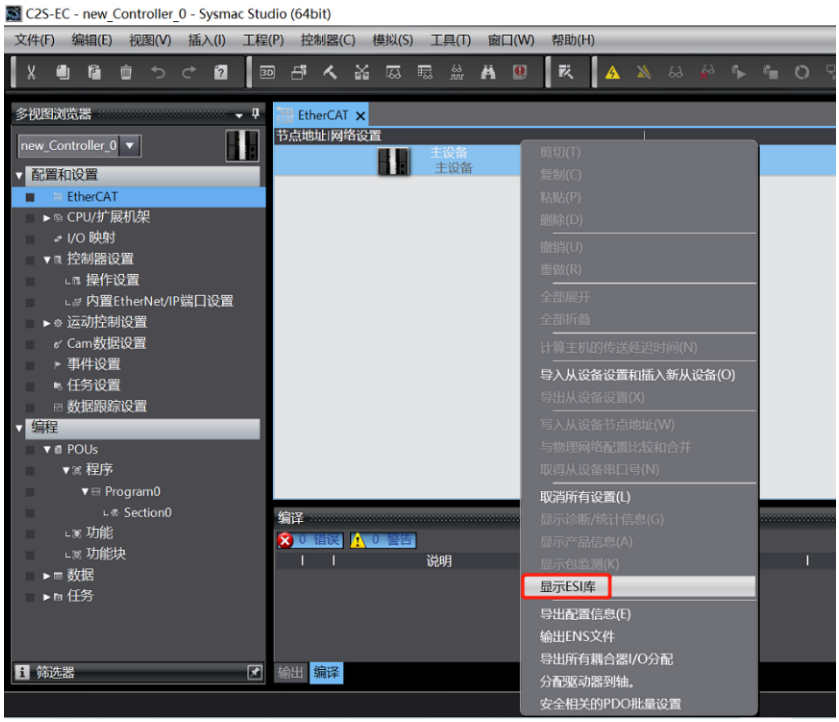
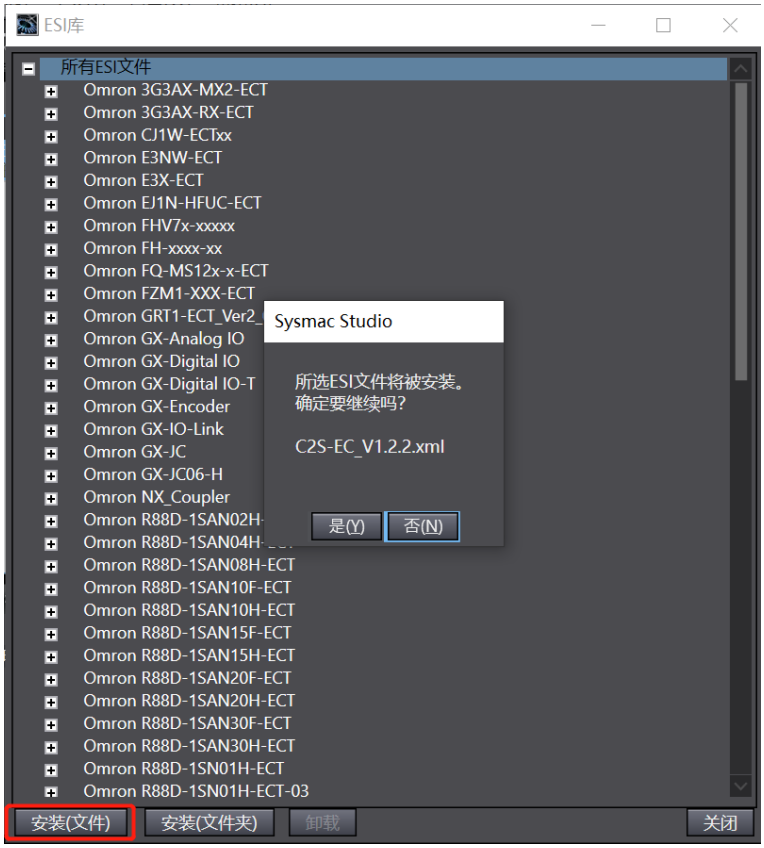


b. In the pop-up "ESI Library" window, click "Install (file)" button, select the XML file path, click the button "Yes" to complete the installation, as shown in the figure below:



5、 Adding Slave Devices

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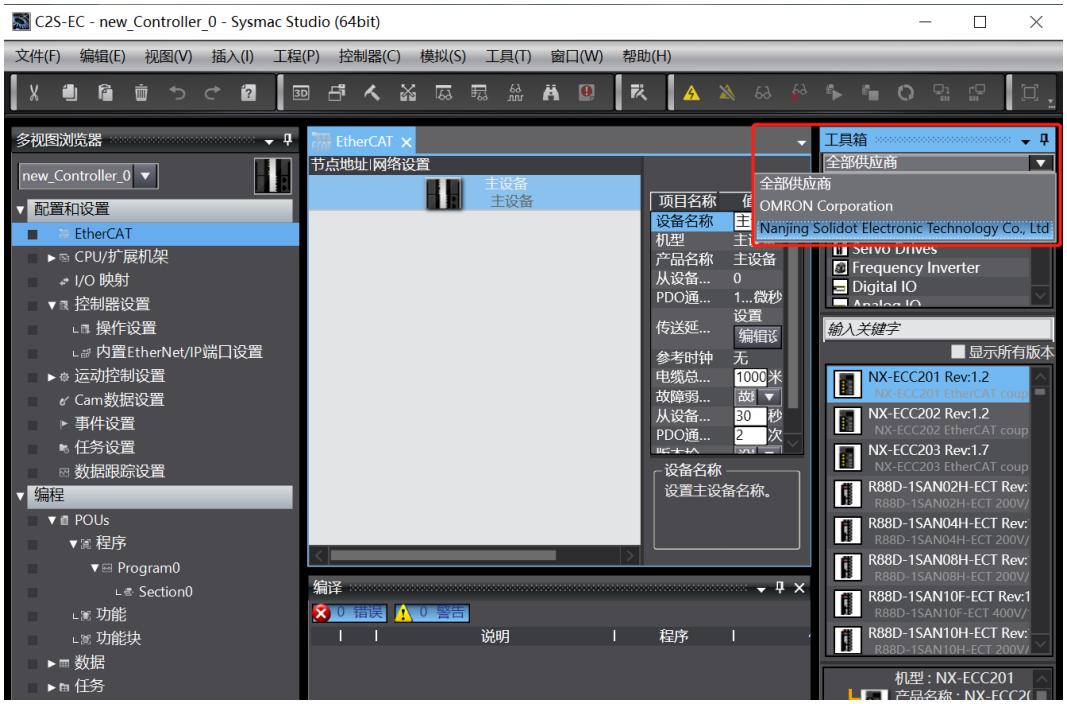
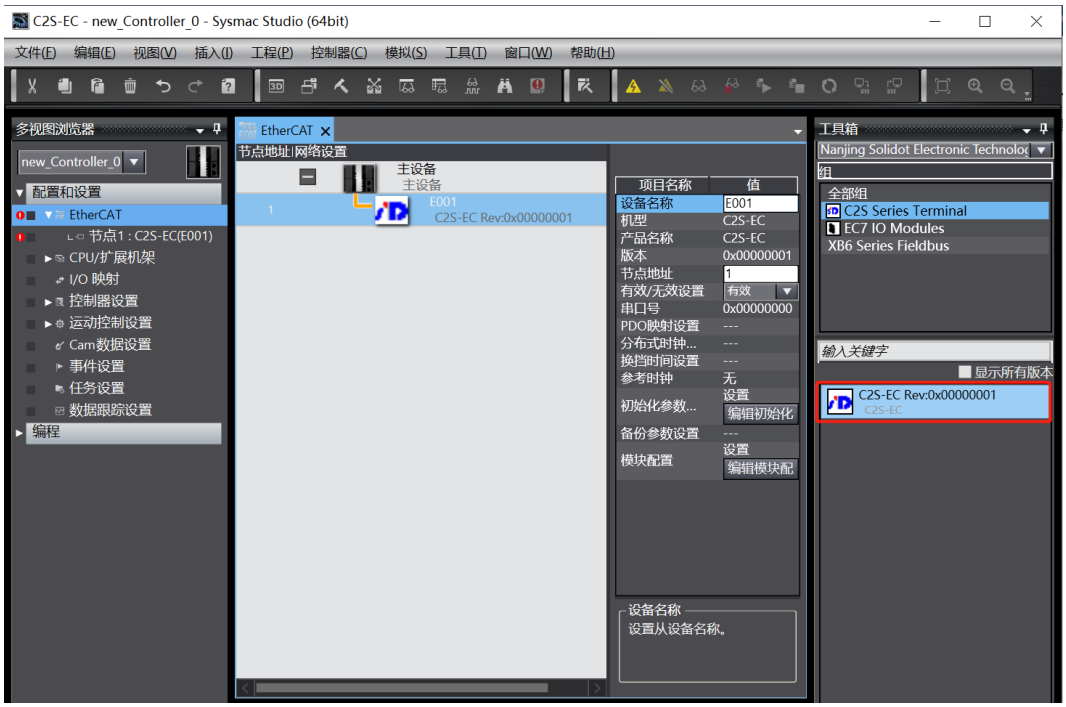
a. In the right side of the "Toolbox" column, click to expand all suppliers, select "Nanjing Solidot Electronic Technology Co.,Ltd"



b. Click "C2S Series Terminal" to select the product series, select the product model at the bottom, and double-click "C2S-EC" to add the slave device, as shown in the figure below:



c. In the EtherCAT main page, click to select "C2S-EC", and then click "Edit Module Configuration" in the right menu, as shown in the figure below:

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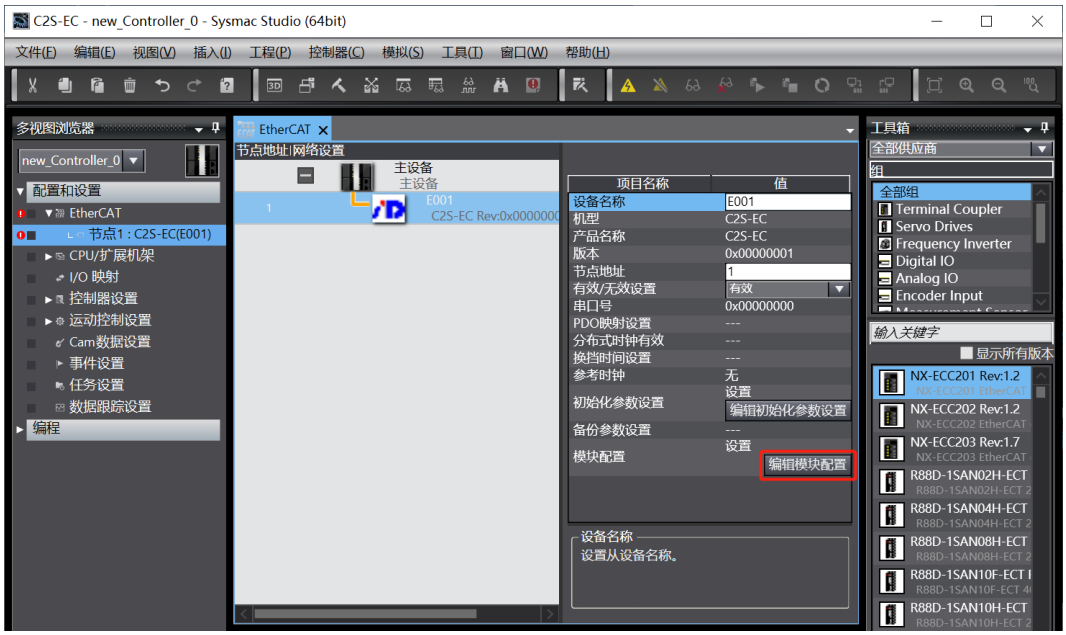

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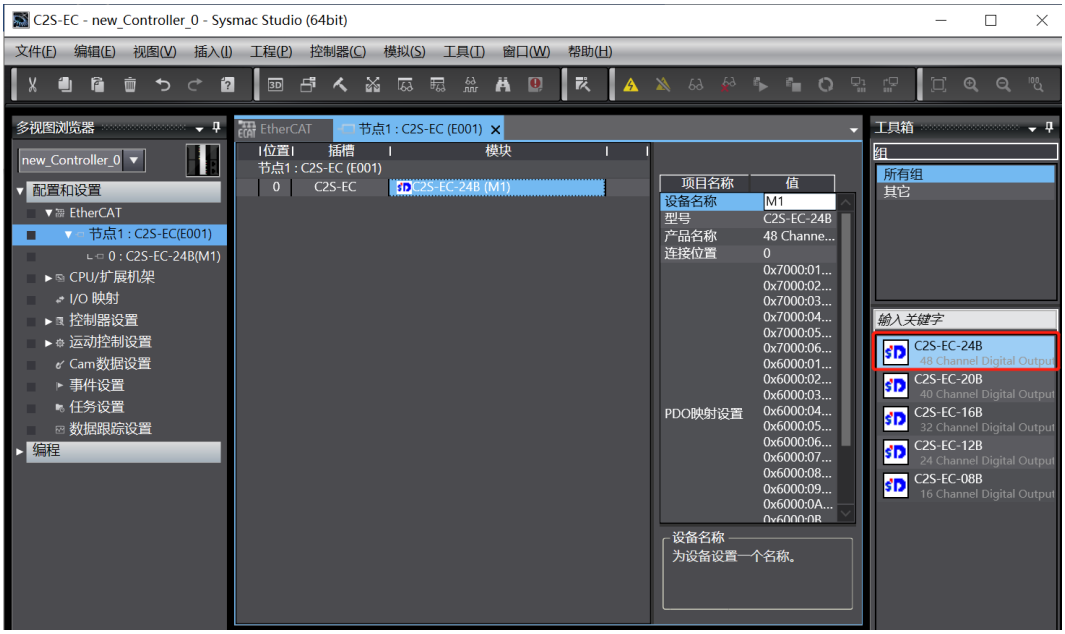
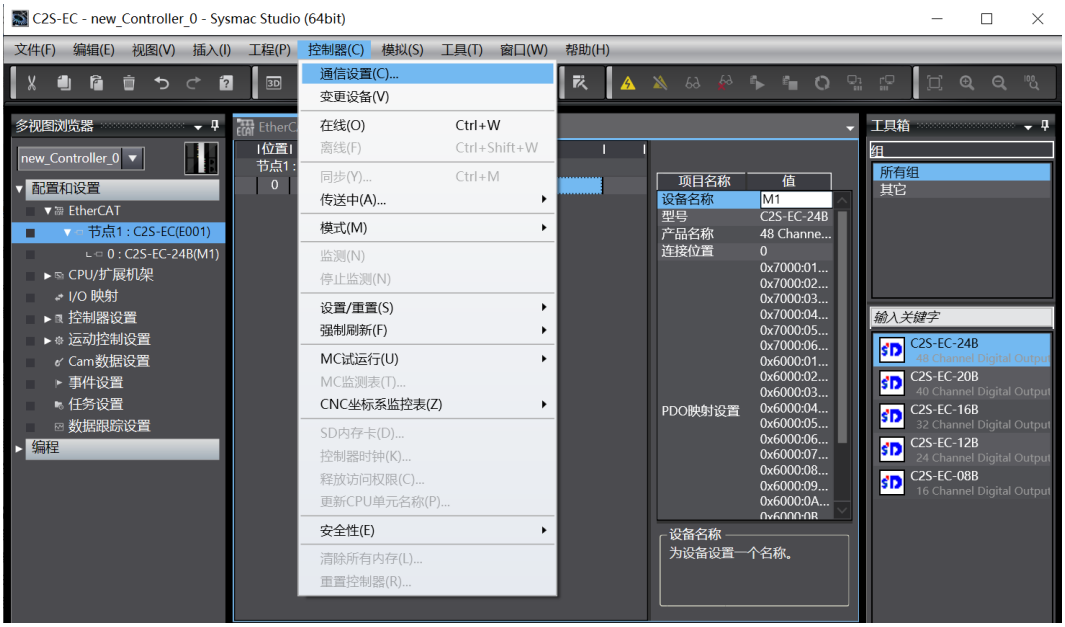
d. In the main page of module configuration, click to check the position of slot 0, and then in the right side of the toolbox, you can see the module model number "C2S-EC-24B", double-click to add the module to the slot, as shown in the following figure. Add all modules one by one according to the actual installation topology.

Note: The order and model number must be consistent with the physical topology!



6、 Communication Settings

a. Click "Controller -> Communication Settings" in the menu bar to bring up the Communication Settings window, as shown in the figure below:



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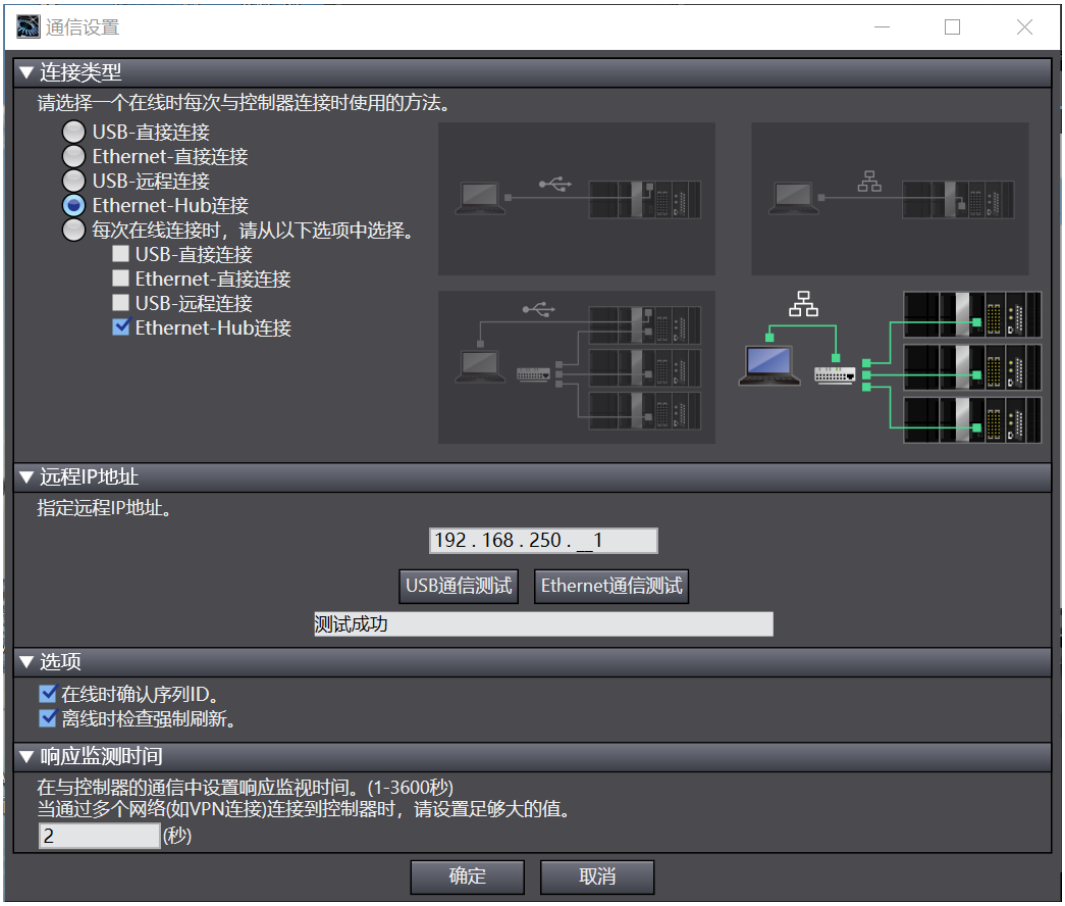
b. In the Communication Settings window, select "Ethernet-Hub Connection" for the connection type, select "Ethernet-Hub Connection" as the method to be used every time the controller is connected online, fill in the IP address of the corresponding PLC for the remote IP address, click "Ethernet Communication Test", if the communication is normal, "Test Success" will be displayed in the box below. IP address, click "Ethernet communication test", if the communication is normal, the following box displays "test success". Determine the communication is normal, click "OK" button, as shown in the figure below:



7、 Setting Node Address

a. Click "Controller -> Online" in the menu bar to turn the controller to online status, as shown in the figure below:

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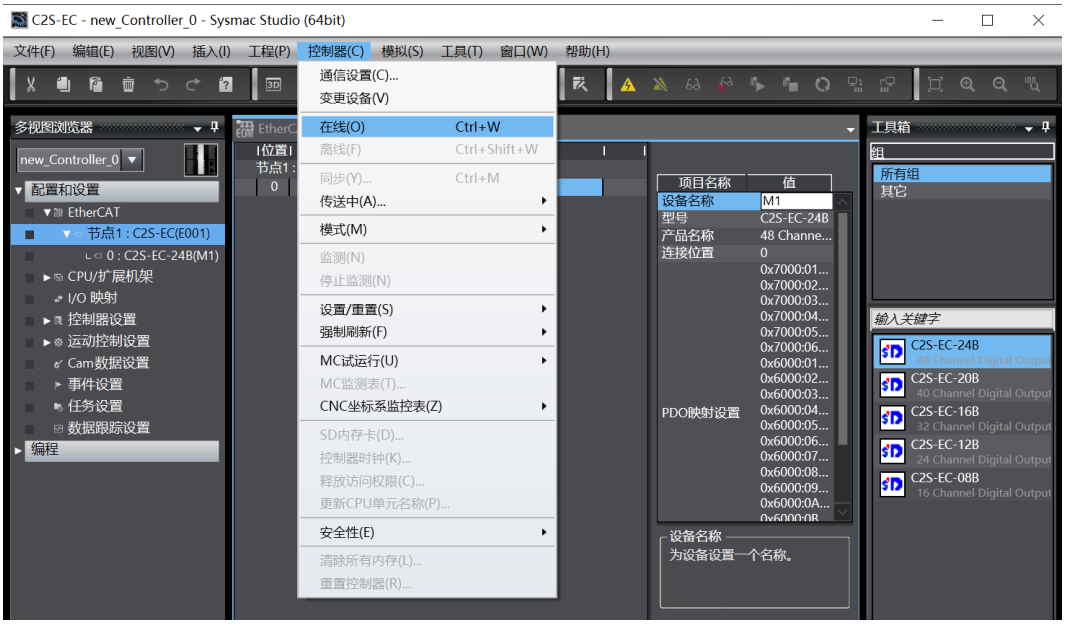
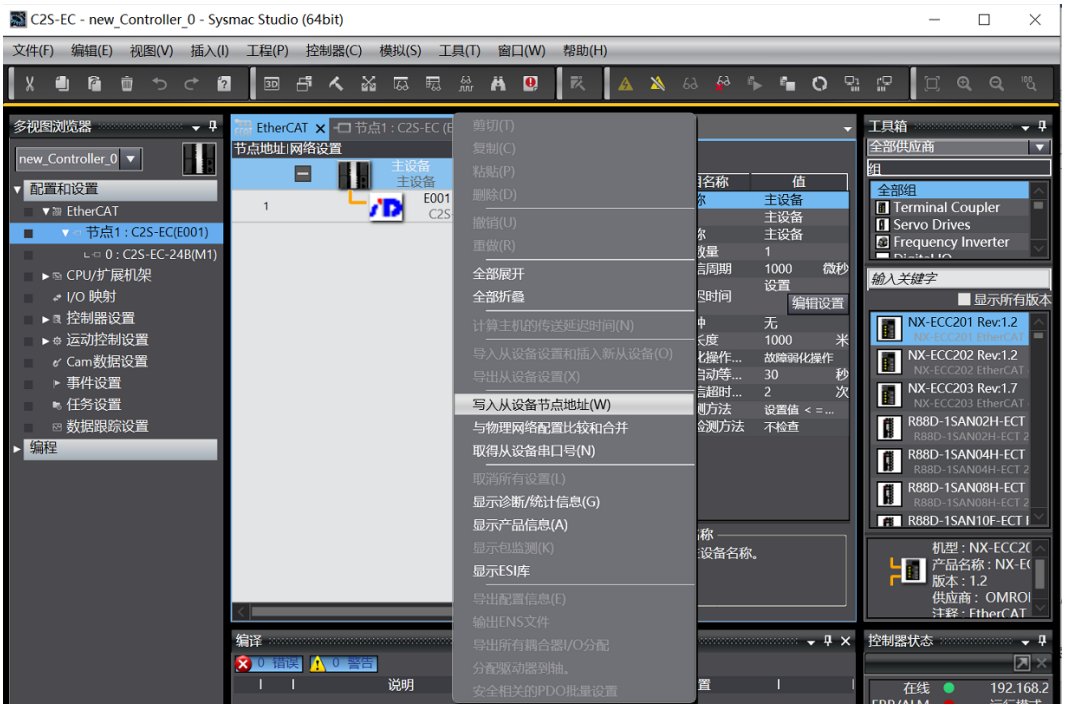


b. Right-click on the master device, click and select "Write Slave Device Node Address" as shown in the figure below:



c. In the Set Node Address window, click the value under Set Value, enter the node address, and click the Write button to change the slave device node address, as shown in the figure below:

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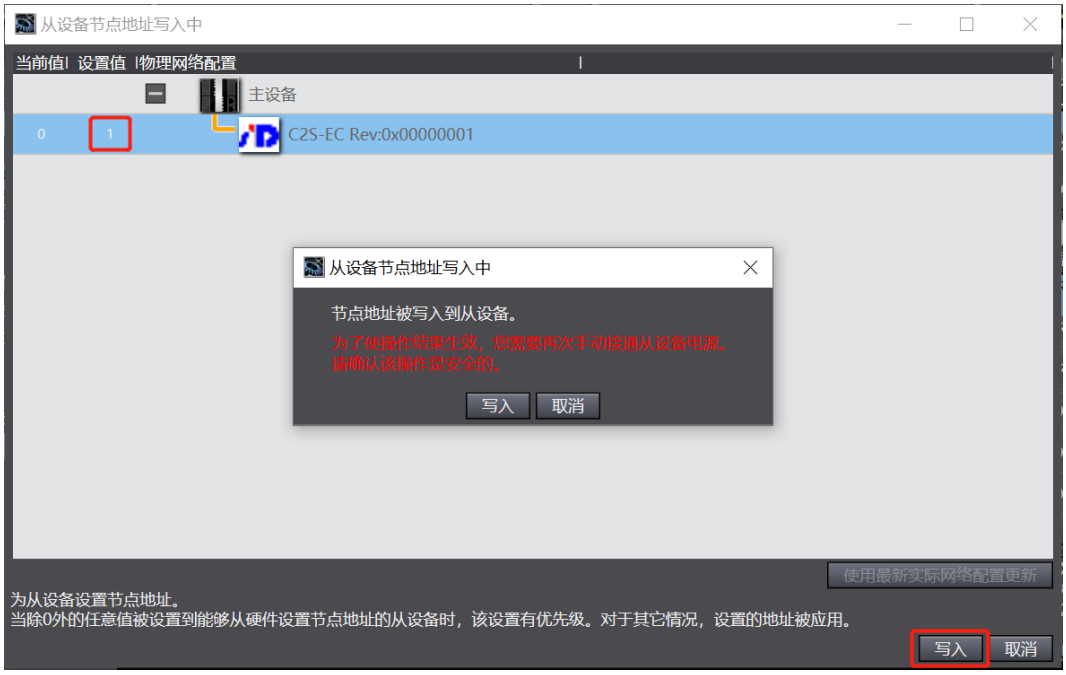

d. Power down and reboot the slave device when prompted after the node address is successfully written.

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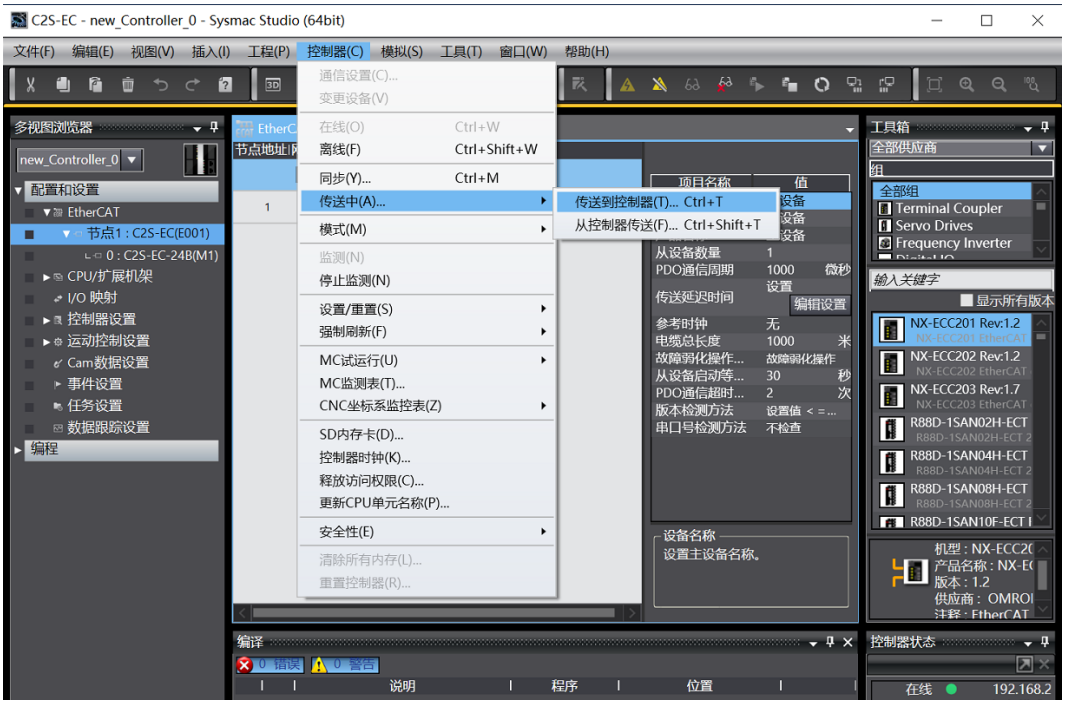
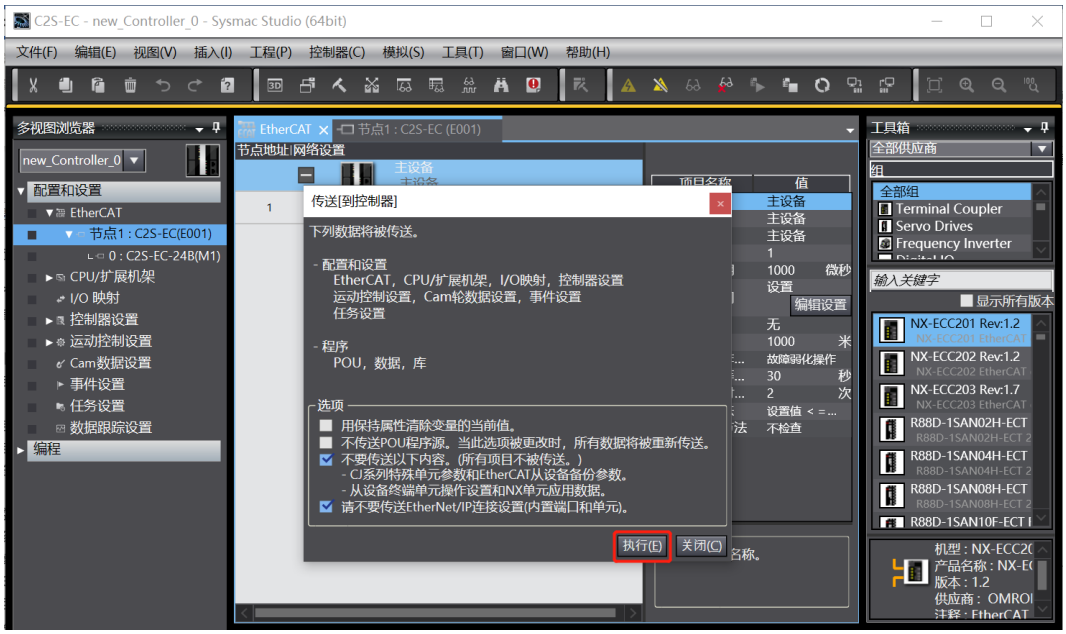
8、 Download Configuration to PLC

a. Click the button "Controller -> Transfer in (A) -> Transfer to Controller (T)" in the menu bar to transfer the configuration to the controller, as shown in the figure below:



b. Pop-up transmission confirmation pop-up window, click the "Execute" button, followed by a pop-up window, click "Yes / OK", as shown in the figure below:



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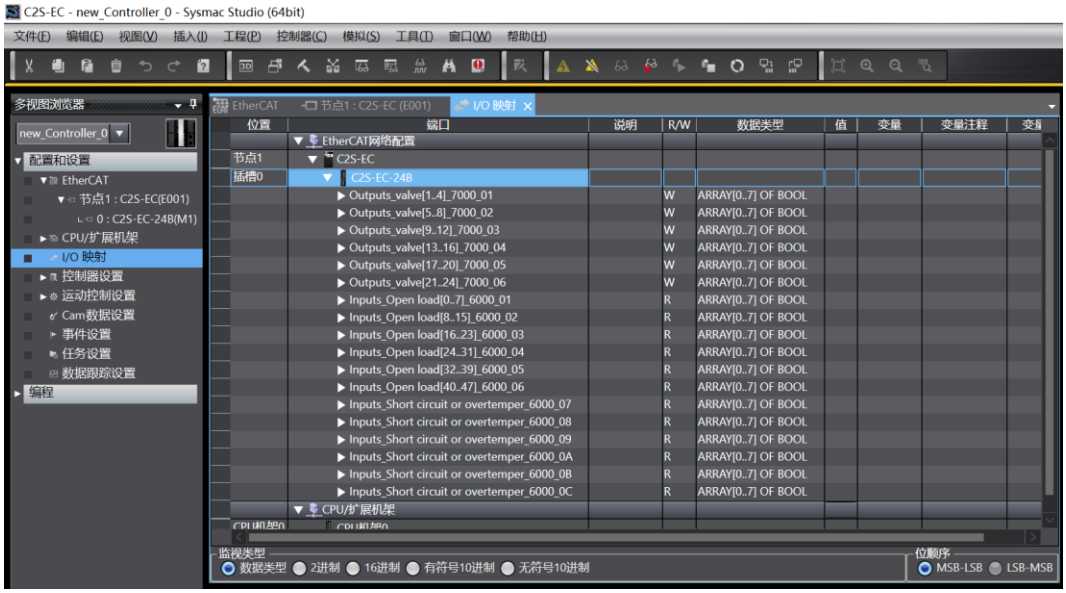
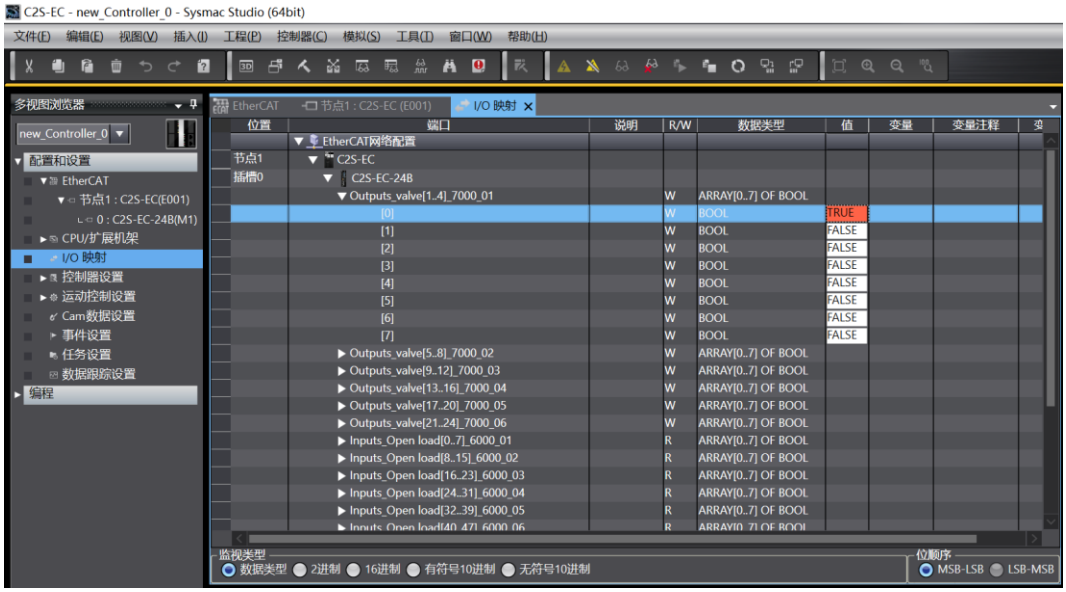
9、 View Valve Terminal Features

a. Double-click "I/O Mapping" in the left navigation tree, you can see the valve terminal series: C2S-EC under the corresponding port in the node 1 of the right main page, and you can see the device name: C2S-EC-24B in the position of slot 0. Click the expand icon in front of the device name to see the diagnostic function and channel output control of the valve island, as shown in the following figure. control, as shown in the figure below:



b.Outputs_valve[1...4]~Outputs_valve[21...24] has a total of 6 groups and 48 channels solenoid valve coils with control function. Select the corresponding channel, you can control the solenoid valve coil through the modification of the channel value. If the value is "TRUE", it means open and if the value is "FALSE", it means close, as shown in the figure below.



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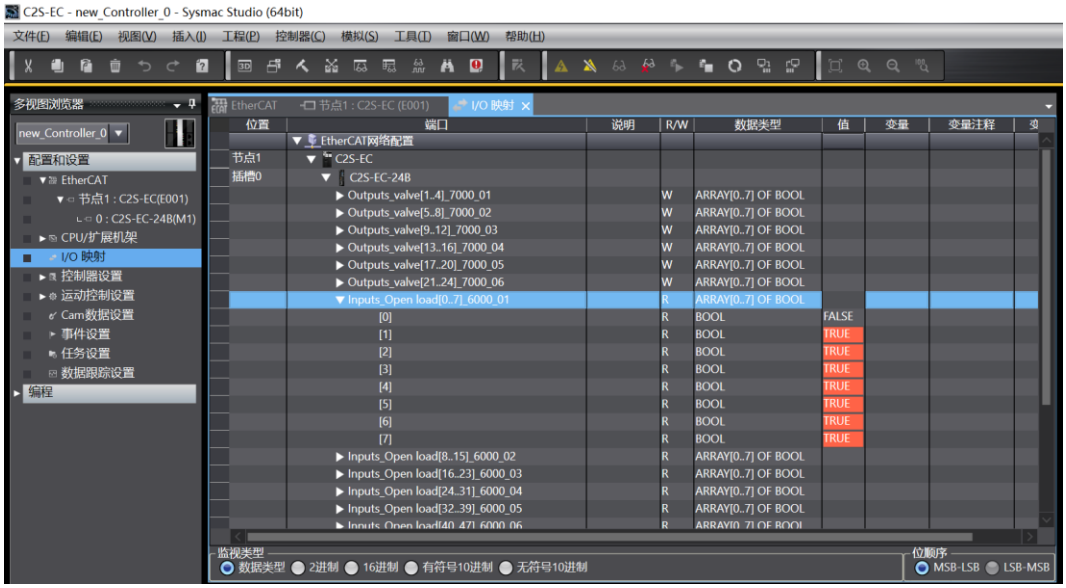
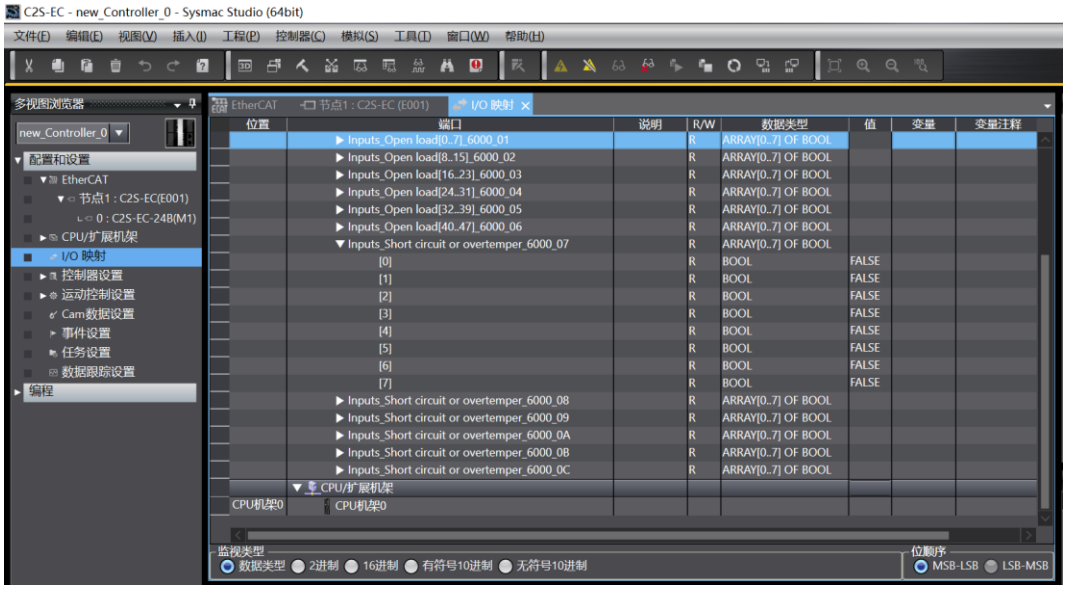
c. Inputs_Open load[0..7]~Inputs_Open load[40..47] has a total of 6 groups and48 channels solenoid valve coils with control function. You can select the corresponding channel to view the diagnostic value (the diagnostic value is valid when solenoid valve coils is off). If the value is "TRUE", it means open circuit. If the value is "FALSE", it means normal status, as shown in the figure below:



d. Inputs_Short circuit or overtemper_6000_07~Inputs_Short circuit or overtemper_6000_0C total of 6 groups, 48 channels solenoid valve short circuit / overtemperature diagnostic function, select the corresponding channel to view the diagnostic value, in the solenoid valve coil output on the premise of the diagnostic value is valid, the value is "TRUE" that valve short circuit / overtemperature, the value is "FALSE" that does not appear / overtemperature, as shown below. Under the premise that the solenoid valve coil output is on, the diagnostic value is valid, the value is "TRUE" that is, the valve has a short circuit/overtemperature, and the value is "FALSE" that is, there is no short circuit/overtemperature, as shown in the figure below:



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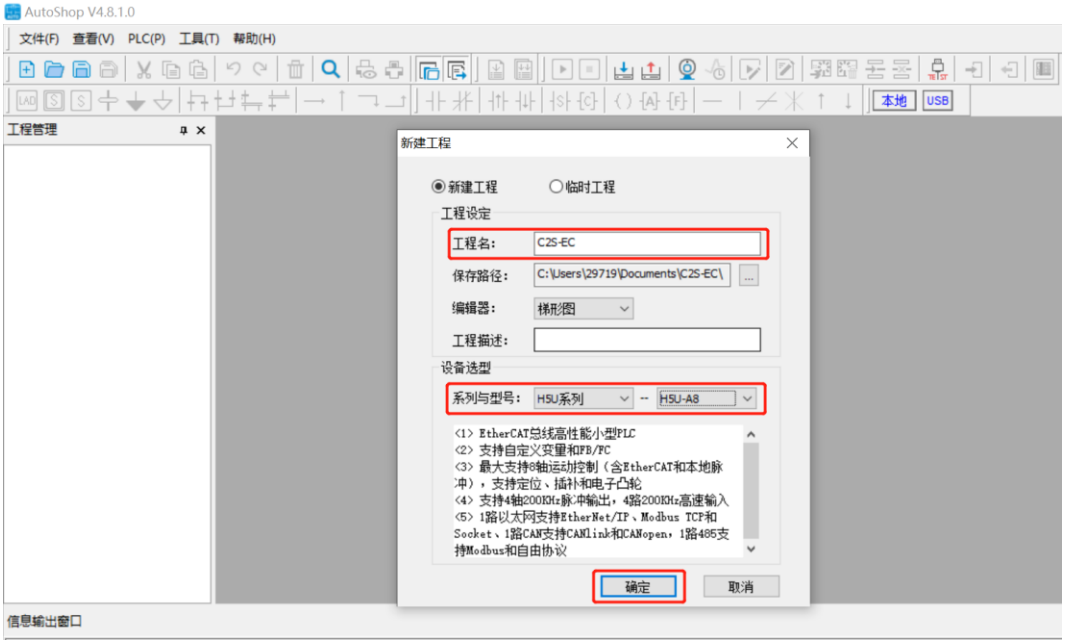
7.4.3 Application in AutoShop V4.8.1.0 Software Environment

1、 Preliminary

- **Hardware Environment**
  - **Valve Terminal Model C2S-EC-12B**
  - **One computer with pre-installed AutoShop V4.8.1.0 software**
    AutoShop V4.8.0.0 or above is required for the host computer software.
  - **One INOVANCE PLC**
    Model# H5U-1614MTD-A8 is taken as an example
  - **Shielded cable for valve terminal**
  - **One switching power supply**
  - **Device Configuration Files**
    Configuration file access: https://www.solidotech.com/documents/configfile
- **Hardware configuration and wiring**
  Please follow "5 Installation" and "6 Wiring".

2、 New Construction

a. Open AutoShop software, click the menu bar "File -> New Project", the new project window will pop up. Enter the custom project name, select the PLC model and series, click "Confirm" to complete the new project, as shown in the figure below:



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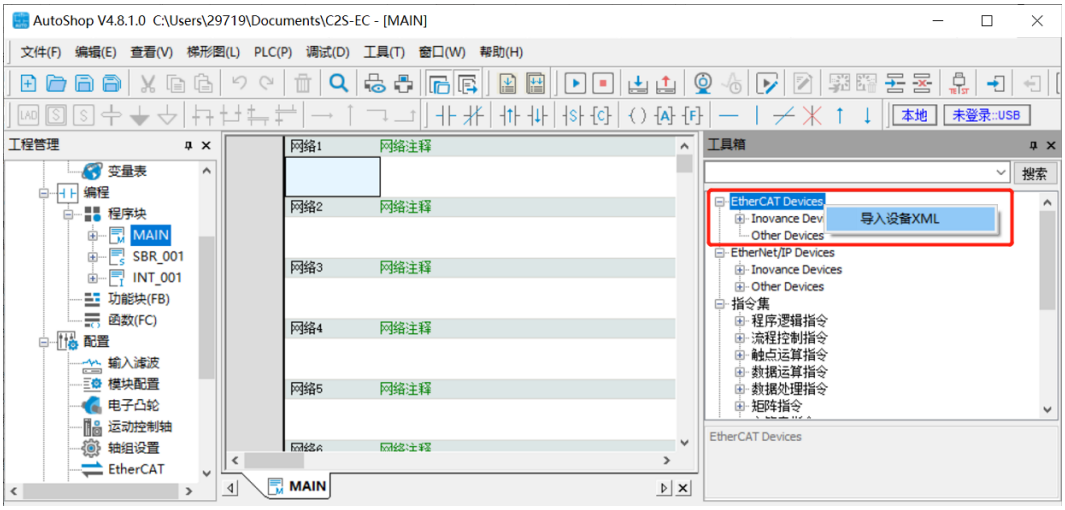
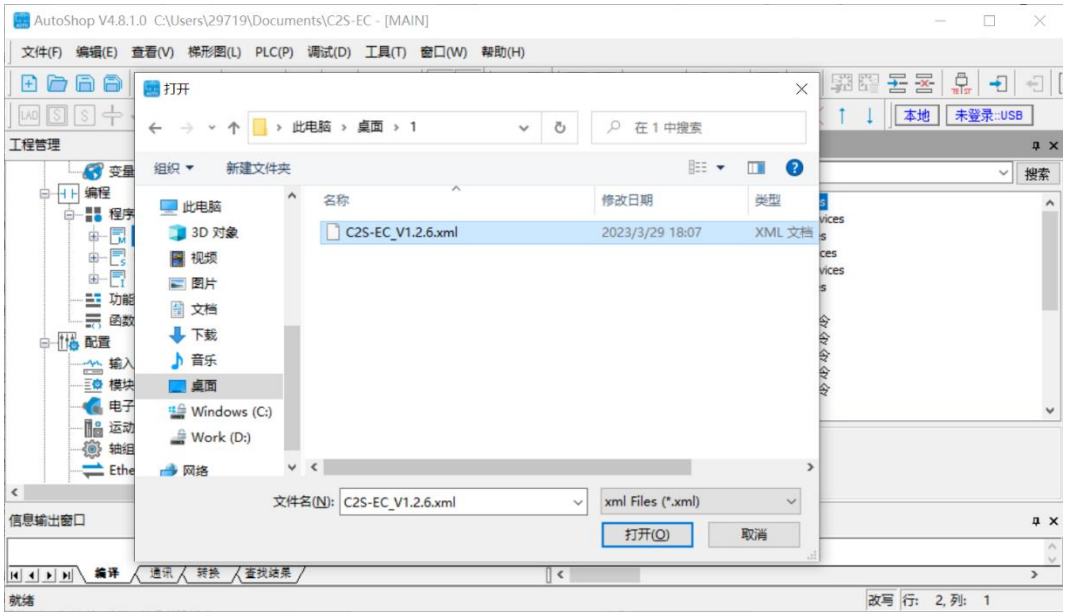
3、 Importing XML Files

a. Right-click on "EtherCAT Devices" in the toolbox on the right side of the interface and select "Import Device XML" as shown in the figure below:



b. Select the corresponding file, click "Open", as shown in the figure below:



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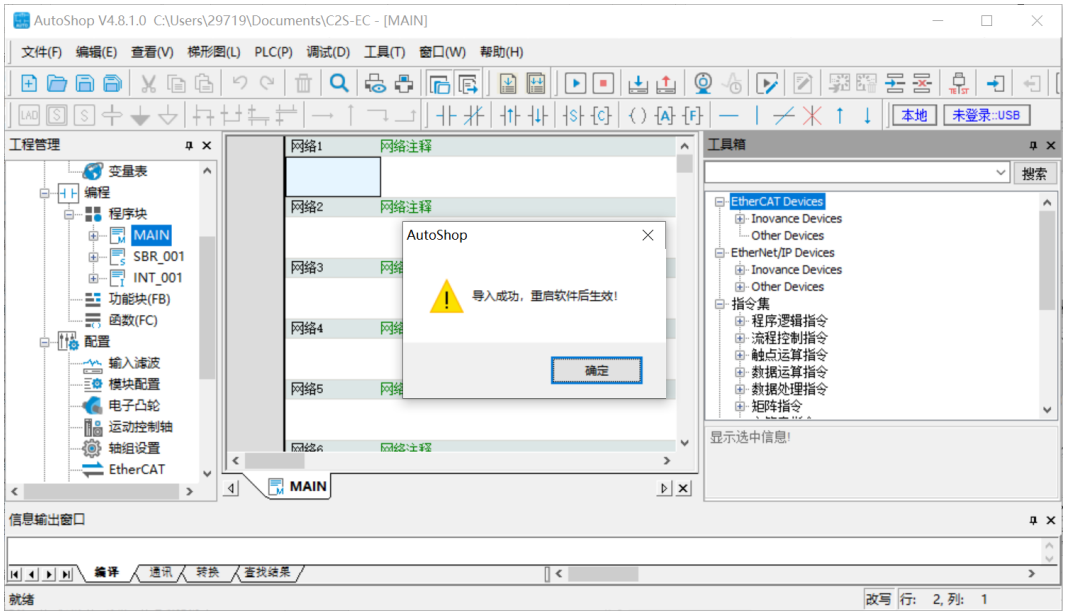
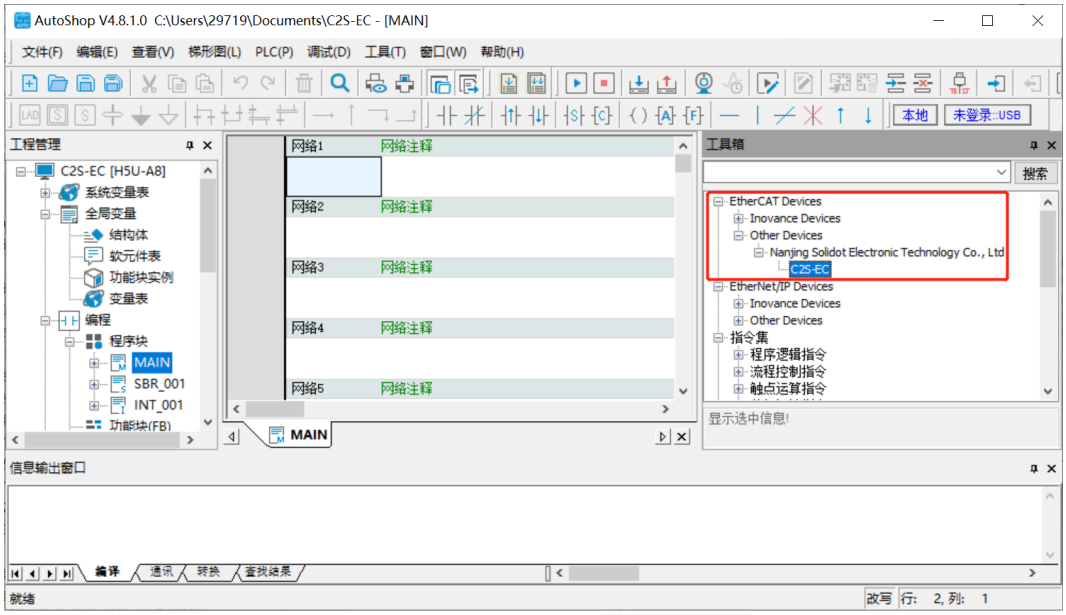
c. After importing, a prompt to restart the software pops up, as shown below. Close the software and then reopen it.



d. Import the previously created project, you can view the imported files in the right toolbox, as shown in the figure below:



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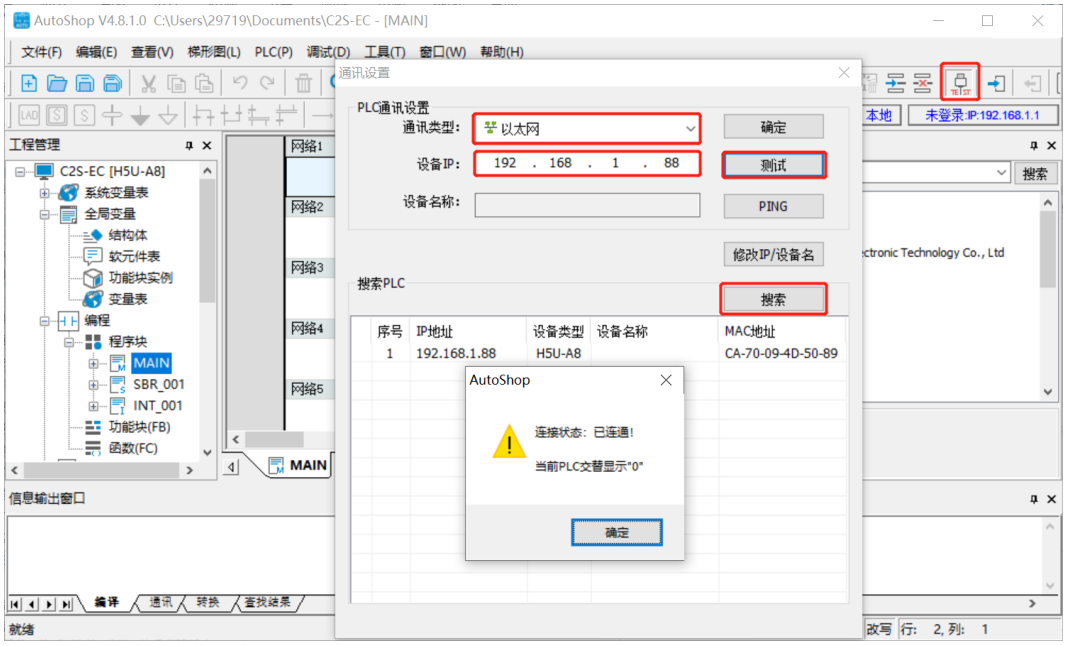
4、 Communications Test

a. Click the toolbar Test Communication Status Tool to pop up the communication setting window.

Select the current connection communication type, click "Search" to search for PLC, after the search is completed, modify the device IP and the IP address of the searched PLC device. Click "Test", the test results show that the connection has been connected, that is, the PLC and computer communication connection is successful. Click "OK", and finally click "OK" on the communication settings window, as shown in the figure below:



b. If the communication test fails, check the IP address of the computer, which needs to be in the same network segment as the IP address of the PLC device. Modify it and test again.

5、 Scanning Device

a. Right-click on "EtherCAT" in the left navigation tree and select "Auto Scan" as shown in the figure below:

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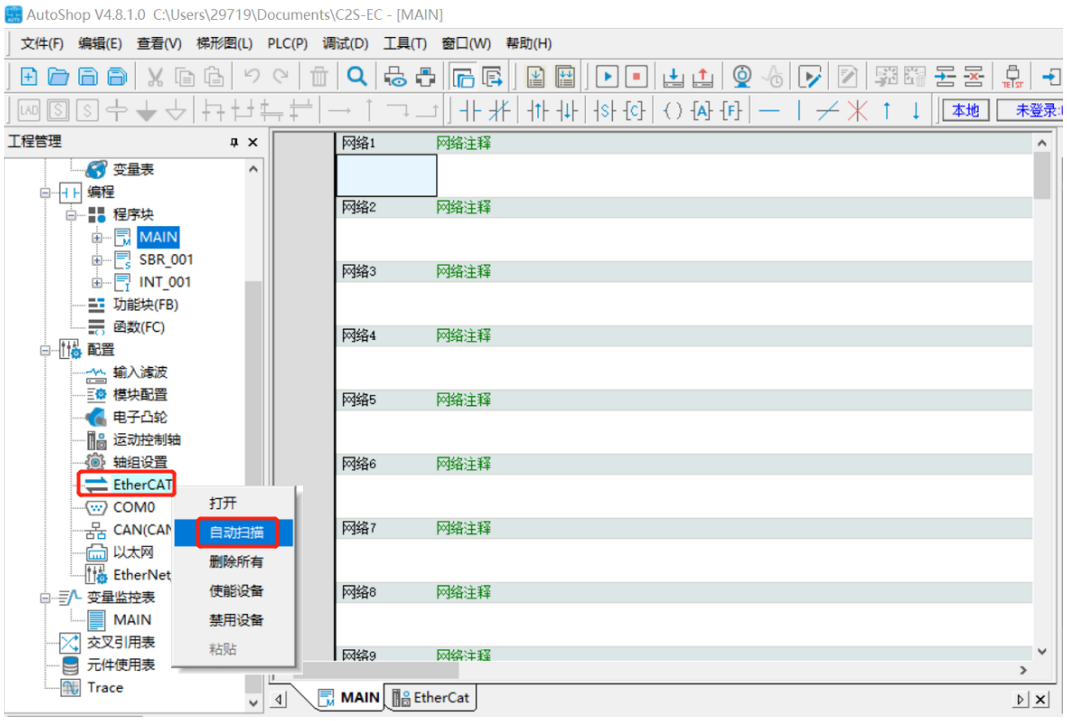
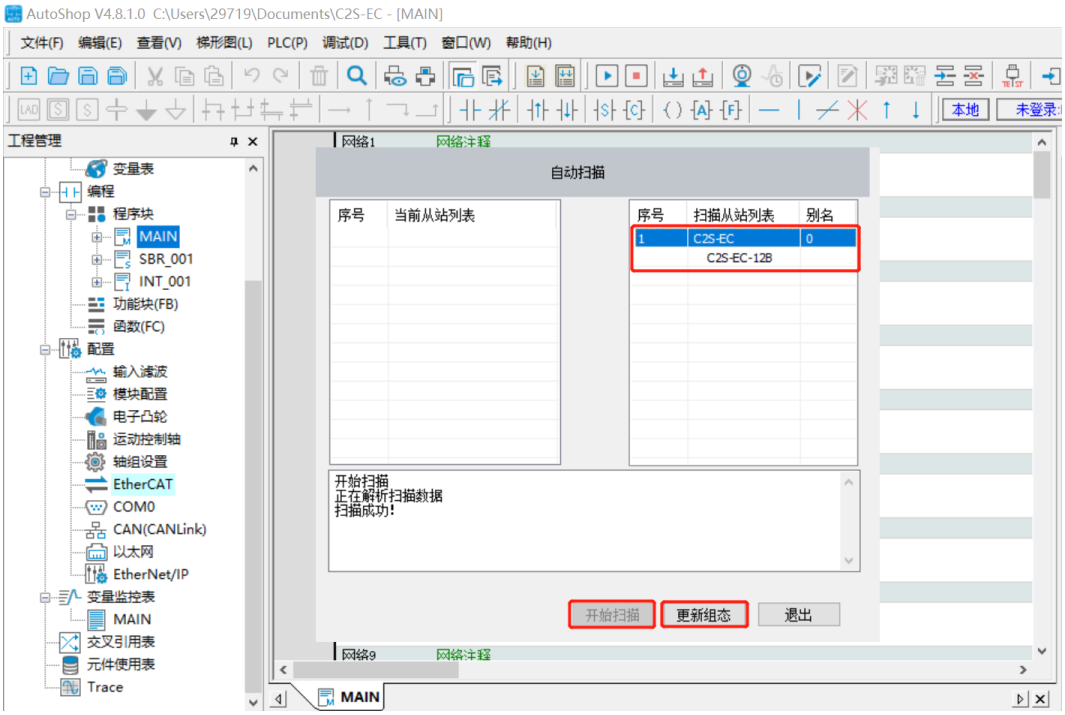


b. The automatic scanning window pops up, click "Start Scanning", after scanning the device, select the device, click "Update Configuration", as shown in the figure below:



c. After the configuration update is completed, the added devices can be seen in the left navigation tree as shown below:

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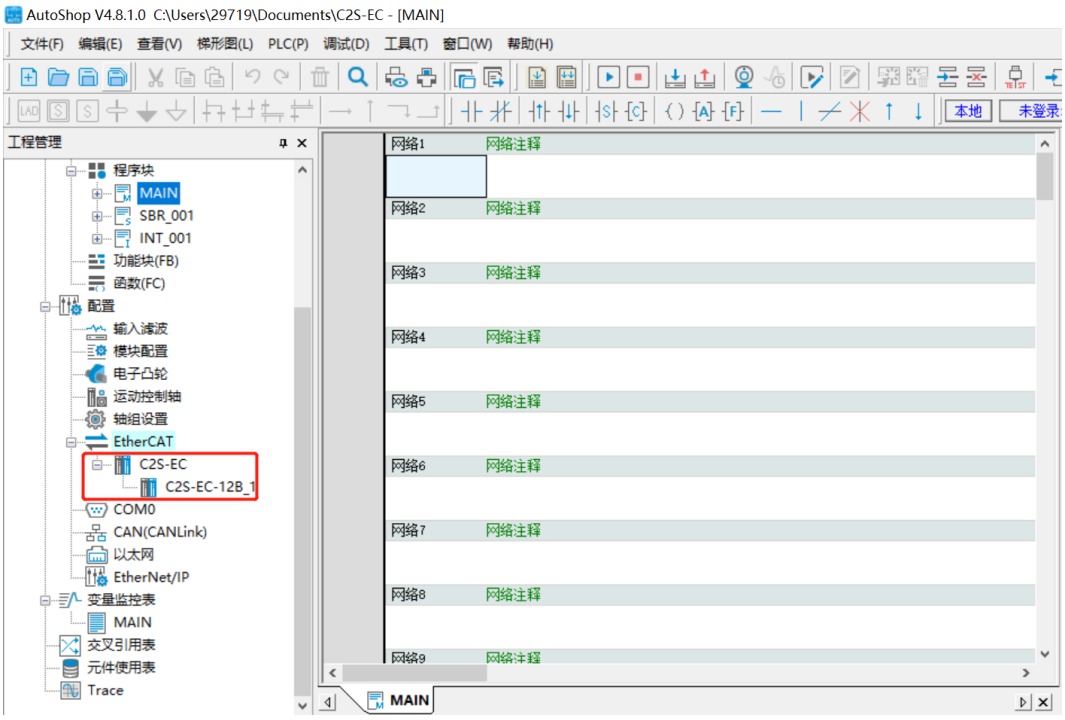

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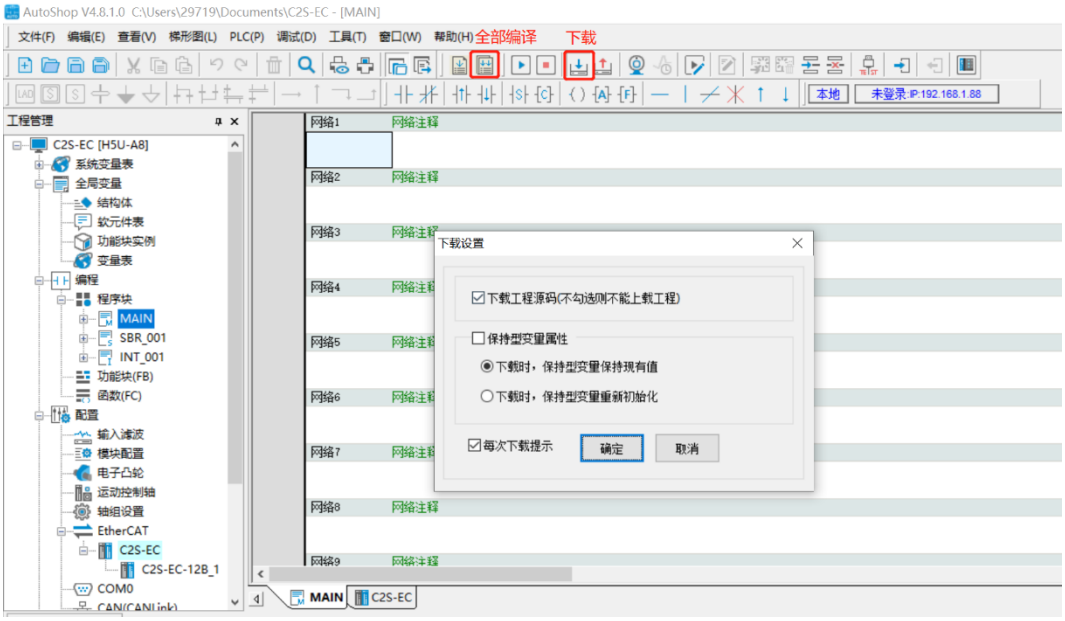
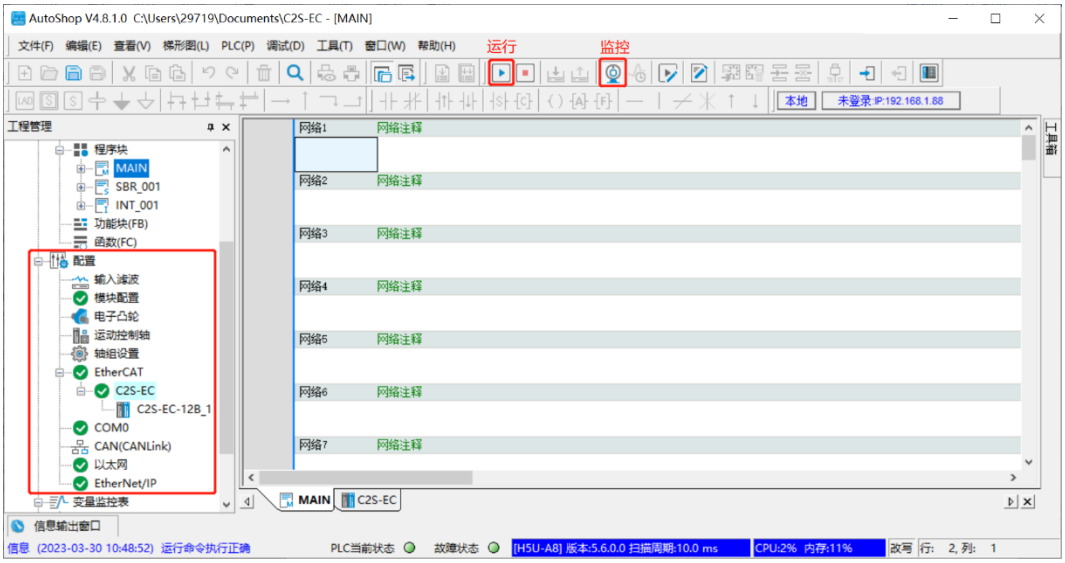
6、 Configuration Download

a. Click the toolbar "Compile All" button, after the completion of compilation, and then click the toolbar "Download" button, pop-up download settings window, click "OK", as shown in the figure below:



b. After the download is completed, click the "Run" button on the toolbar, and then click the "Monitor" button on the toolbar, you can see the successful configuration in the left navigation tree, as shown in the figure below:



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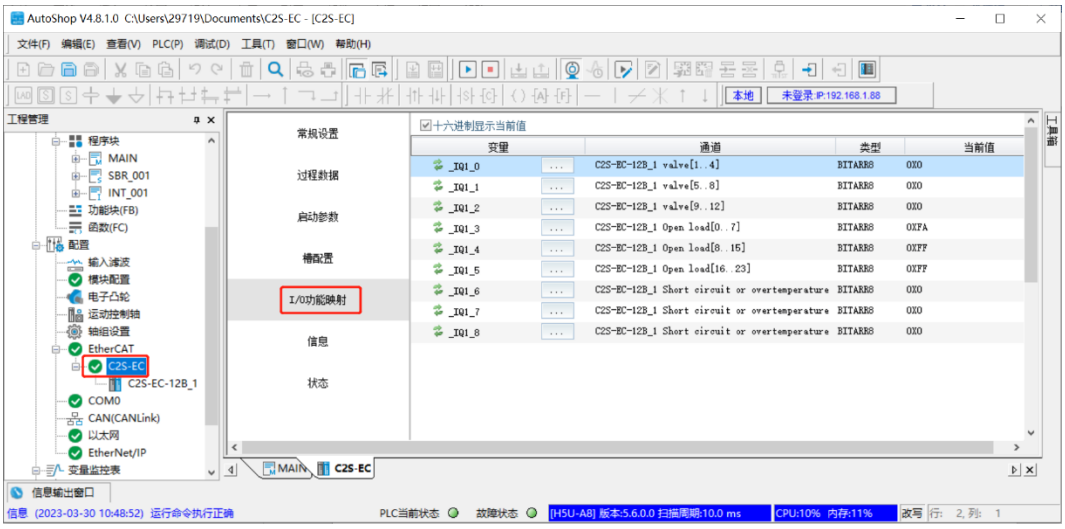
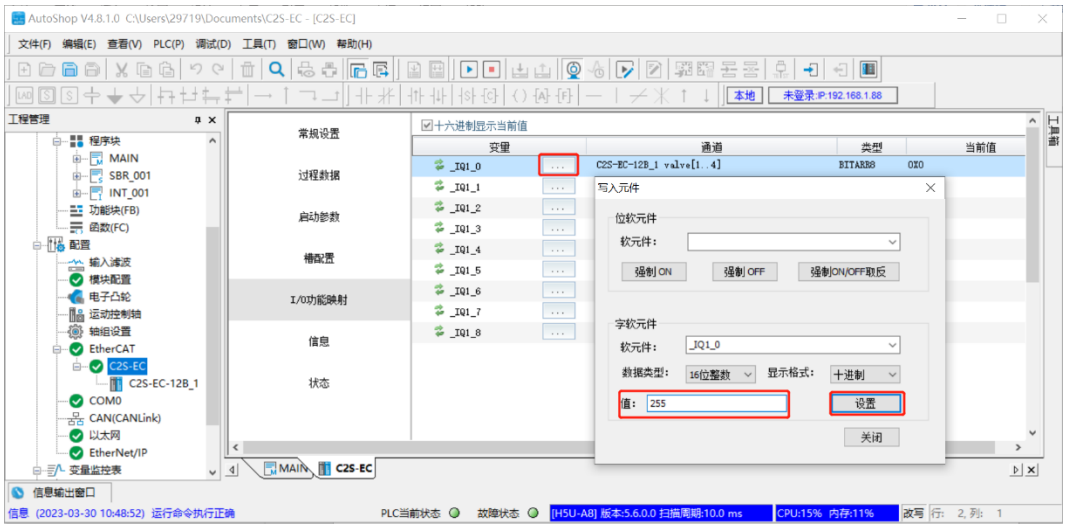
7、 Data Monitoring

a. Double click "C2S-EC" on the left navigation tree to open the C2S-EC page, click "I/O Function Mapping" to view the channel output control, open circuit diagnostics, and short circuit/over temperature diagnostics of the monitoring page of the valve island, as shown in the figure below:



b. Double-click the button to the right of the first group of channels IQ1-0, the pop-up window to write components, enter "255", click "Set" to open the first group of solenoid valve coil channels, as shown in the figure below:



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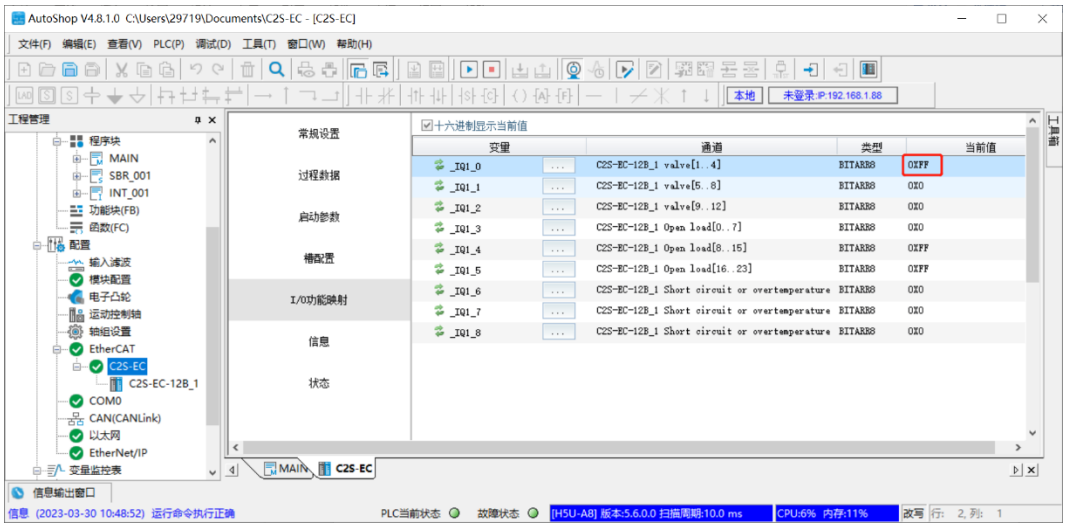
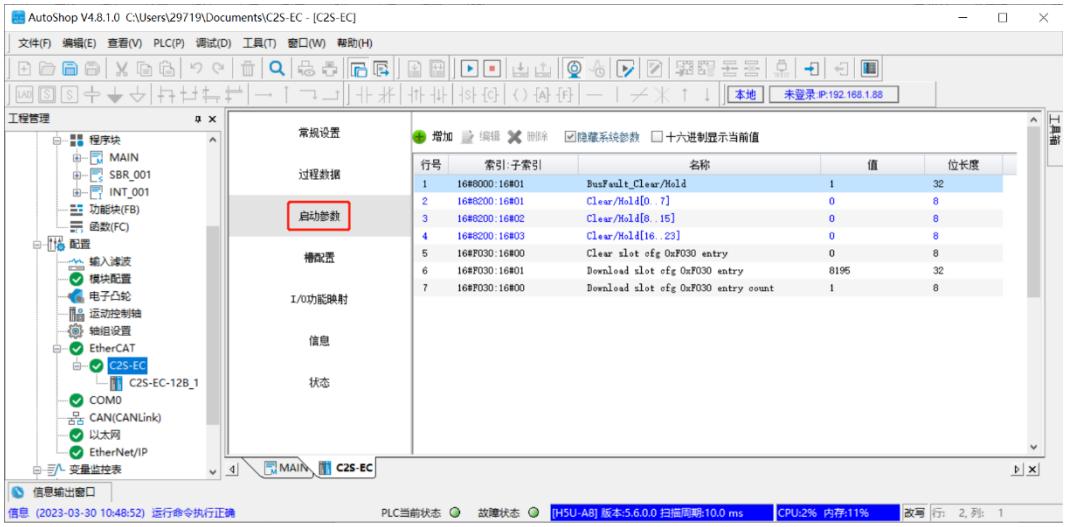
c. When the setup is complete, the first set of solenoid coil channels is open, as shown in the figure below:



8、 Parameter Configuration

a. On the C2S-EC page, click "Startup Parameters" to view the parameters of the device, as shown in the figure below:



Note: C2S-EC series valve island parameter 8000:01 clear/hold parameter needs to be configured by the way of program instruction, the specific steps are shown in the following demonstration. 8200 indexed parameters can be edited in the non-monitoring state, start the parameter page to directly select the corresponding parameter, edit the configuration is complete, click the toolbar "download" button to download the parameters to take effect after the download is complete. After editing and configuring, click the "Download" button on the toolbar to download, and the parameters will take effect after the download is completed.

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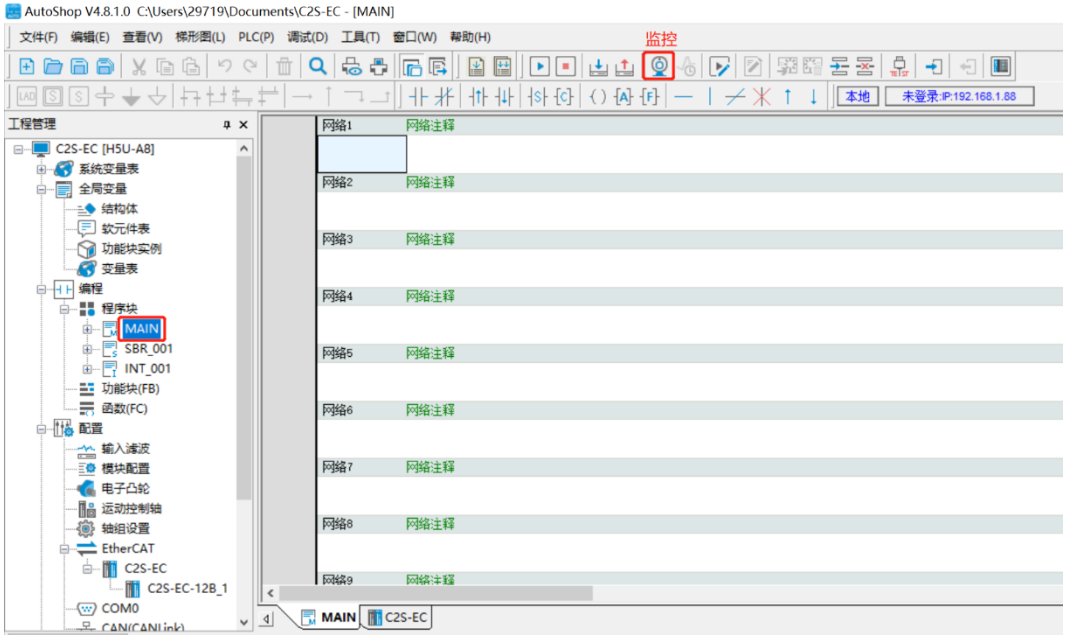
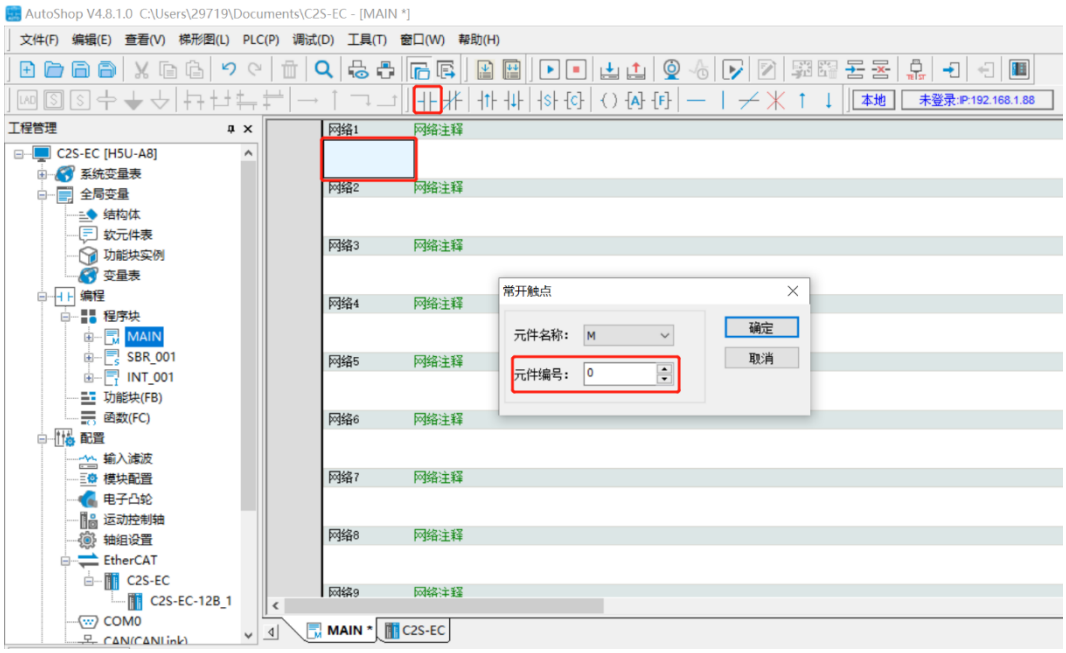
b. Adopt the way of program instruction for parameter configuration, double click MAIN in the left navigation tree to switch to the MAIN page. Click the Monitor button in the toolbar to exit the monitoring state, as shown in the figure below:



c. Click the area below Network 1 on the MAIN page, click the Normally Open Contacts button in the toolbar to bring up the Normally Open Contacts window, select 0 for the number, and click OK, as shown in the figure below:



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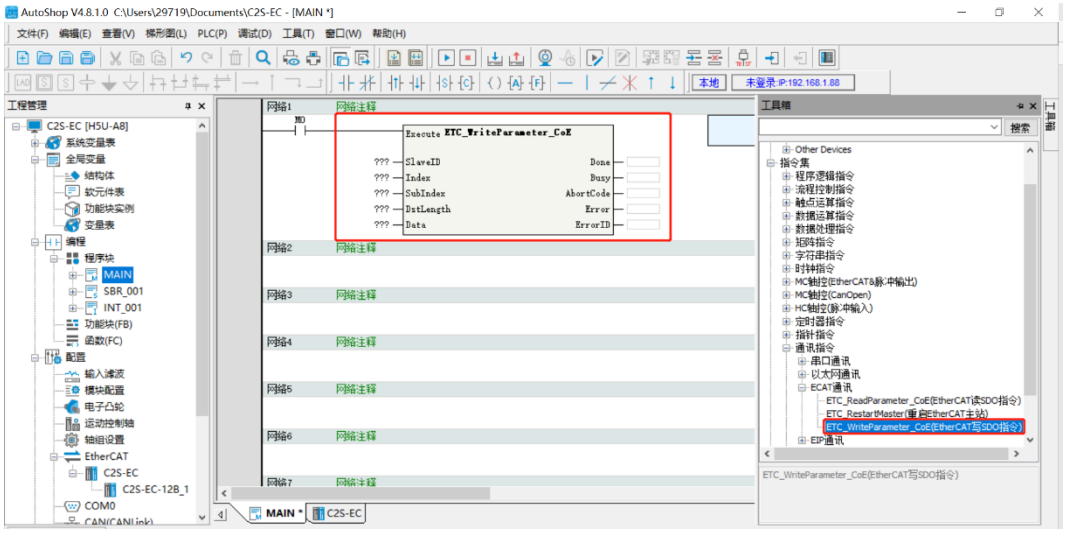
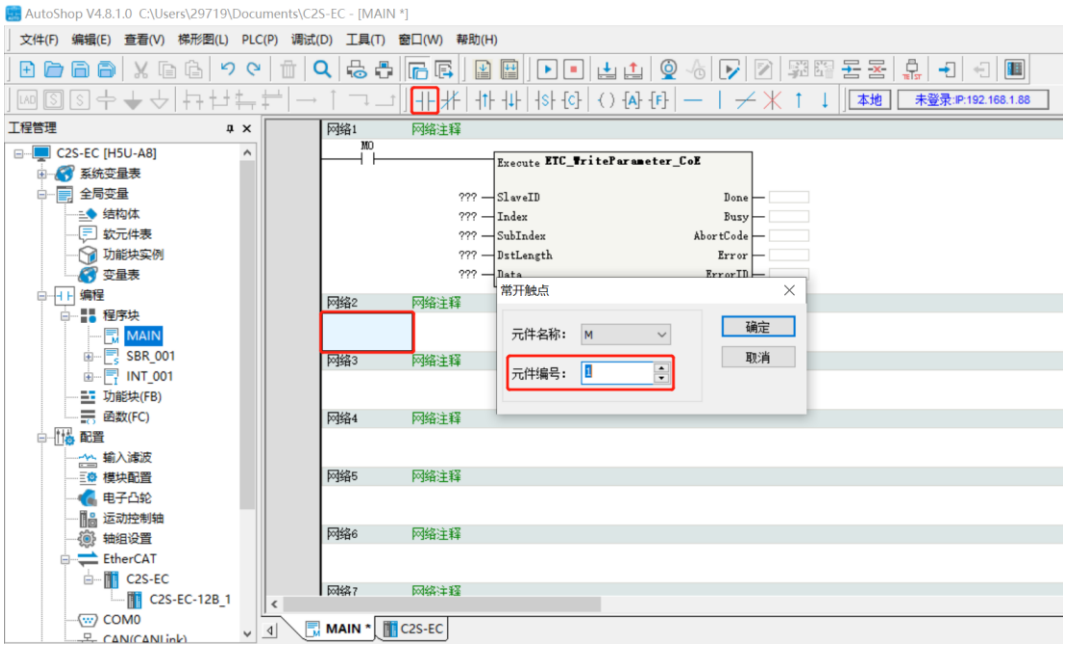
d. Double click "Command Set -> Communication Commands -> ECAT Communication -> EtherCAT Write SDO Command" in the toolbox on the right side to add the write command to the MAIN program, as shown in the figure below:



e. Click the area below the MAIN page network 2, click the toolbar Normally Open Contacts button, pop-up window of the normally open contacts, select the number of 1, click "OK", as shown in the figure below:

Note that the component number cannot be repeated.



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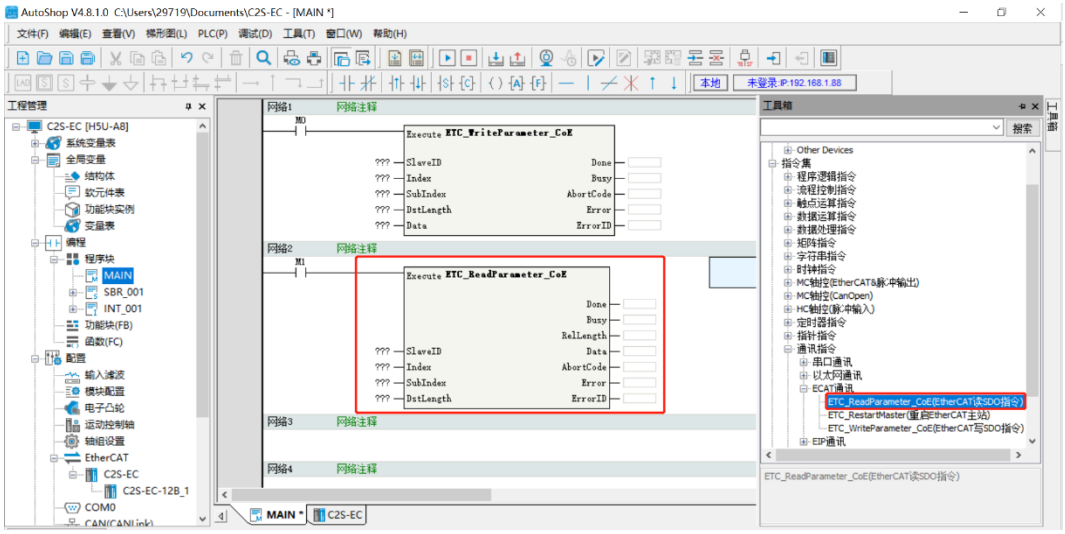
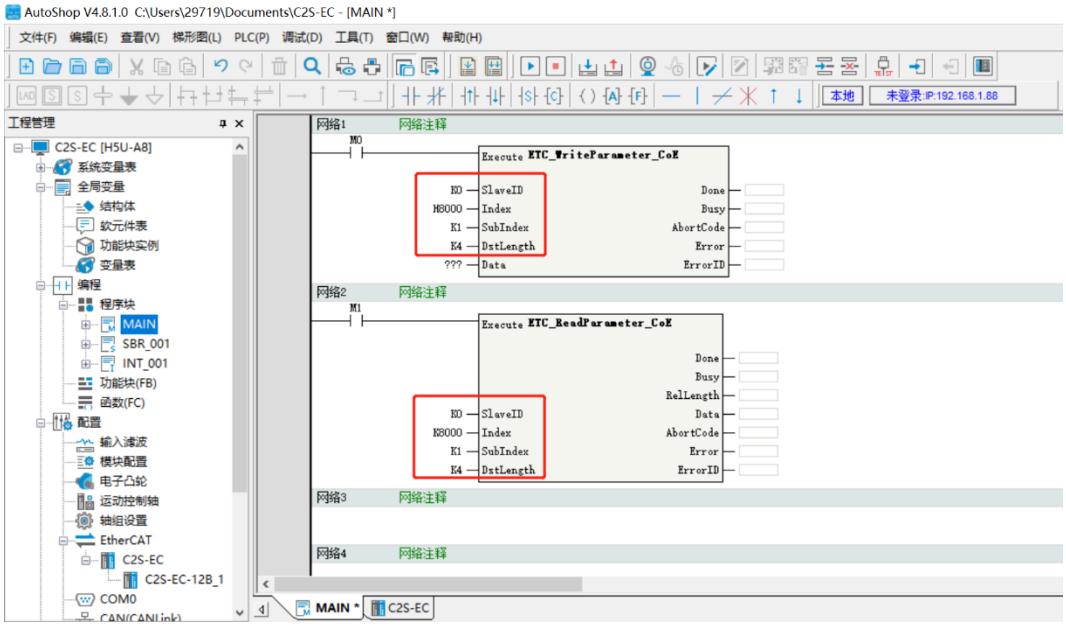
f. Double-click "Command Set -> Communication Commands -> ECAT Communication -> EtherCAT Read SDO Command" in the toolbox on the right to add the read command to the MAIN program, as shown in the figure below:



g. According to the startup parameter in step a, you can know the information of the parameter's Index, SubIndex and DataLength, etc., and fill the information into the write and read instructions. For example, 8000:01 clear/hold parameter, IndexIndex is 8000, SubIndex is 1, BitLength is 32 i.e. 4 bytes, DstLength is 4, write it into the item on the left side of the read/write instruction and SlavECD is written to 0, as shown in the figure below:



- SlavECD: K0
- Index: H8000
- SubIndex: K1
- DstLength: K4

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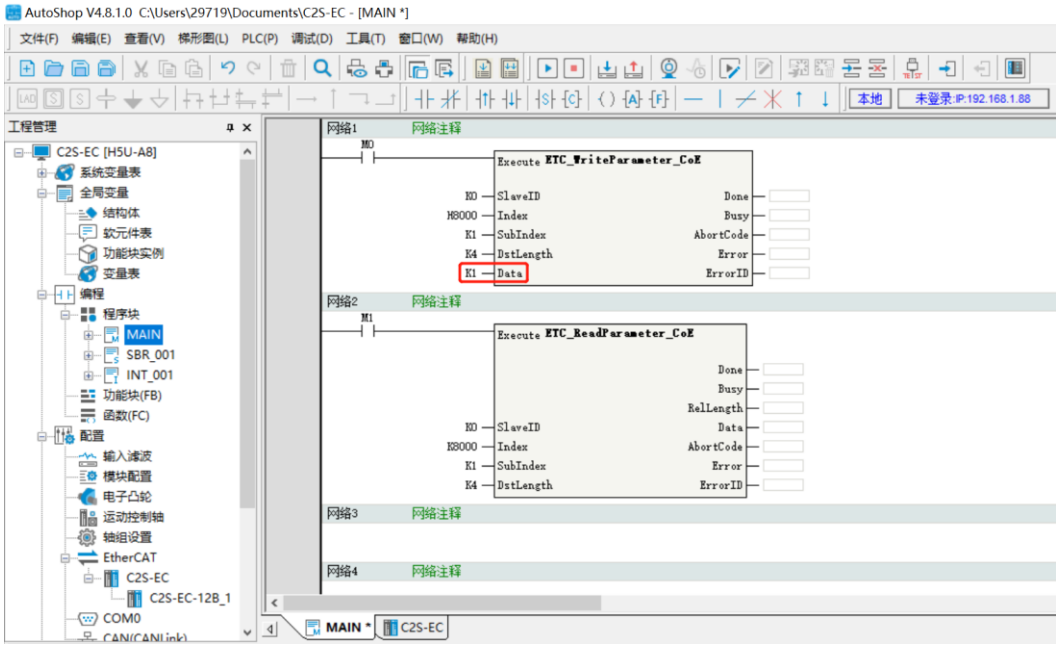
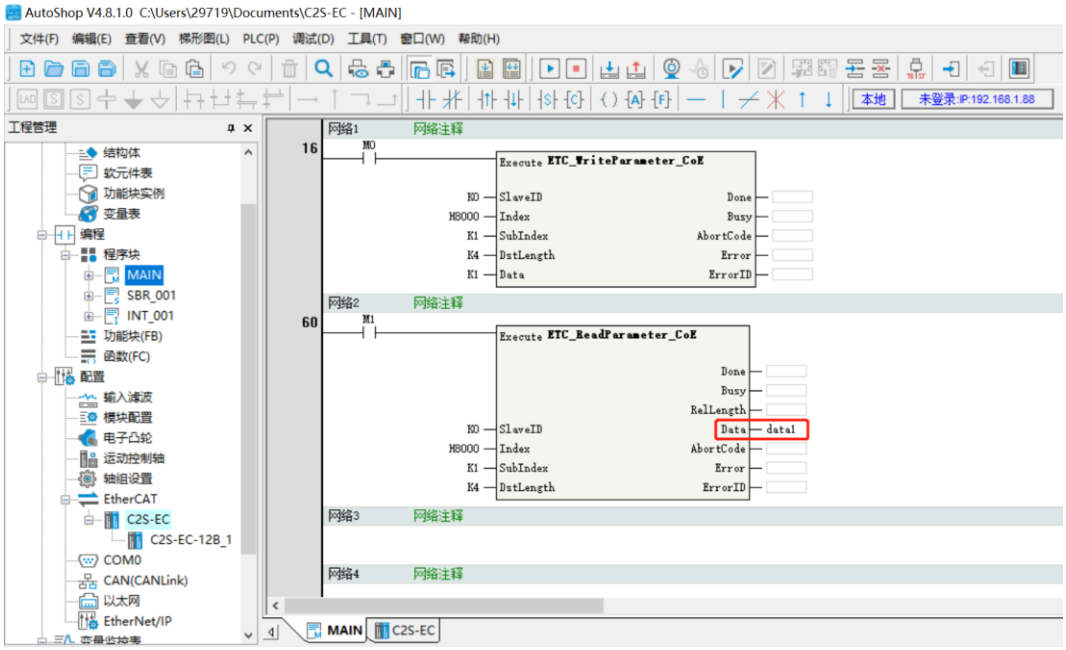
h. The Data in the write instruction corresponds to the value of the 8000:01 Clear/Hold parameter, 0: Clear, 1: Hold, 2: Set by 8200. In this example, the value is set to 1, and Data is written to "K1", as shown in the figure below:



i. Data in the read instruction writes an arbitrary value, such as data1, as shown in the figure below:



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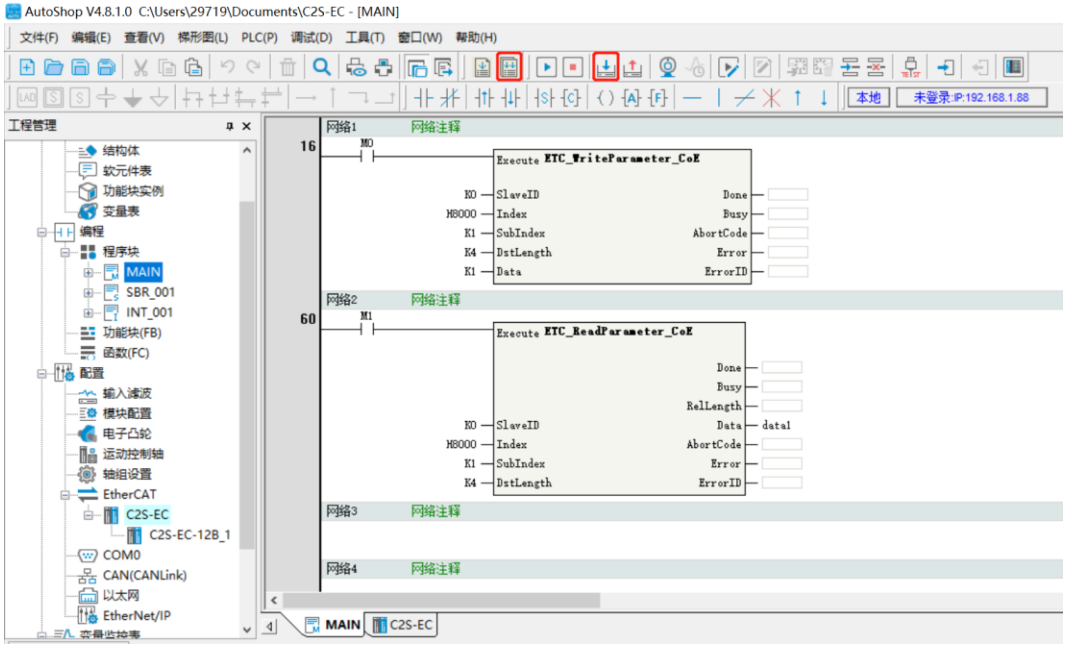
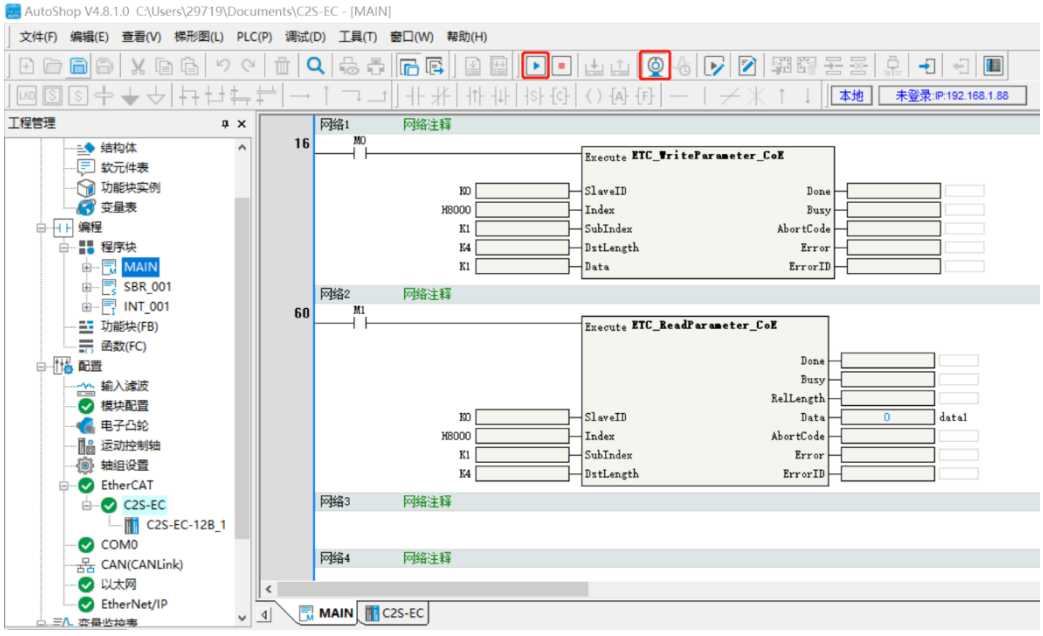
j. Click the toolbar "Compile All" button, after the completion of the compilation, and then click the toolbar "Download" button, the download settings pop-up window, click "OK" to maintain the default settings, as follows Click "OK" to keep the default settings, as shown in the figure below:



k. After the download is complete, click the "Run" button on the toolbar, and then click the "Monitor" button on the toolbar, as shown in the figure below:



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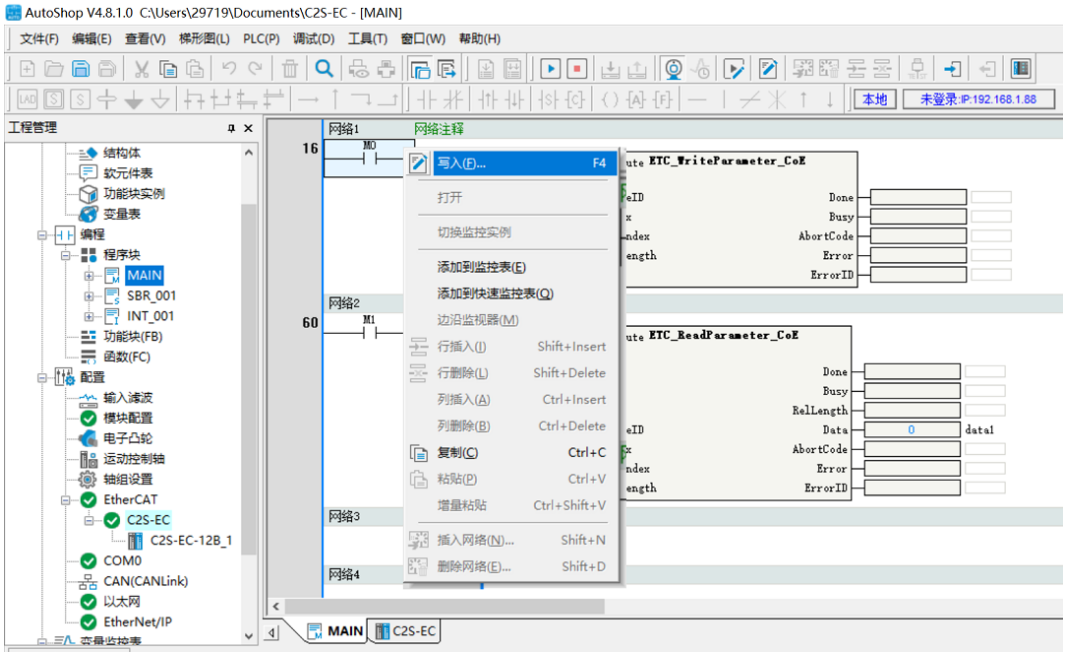
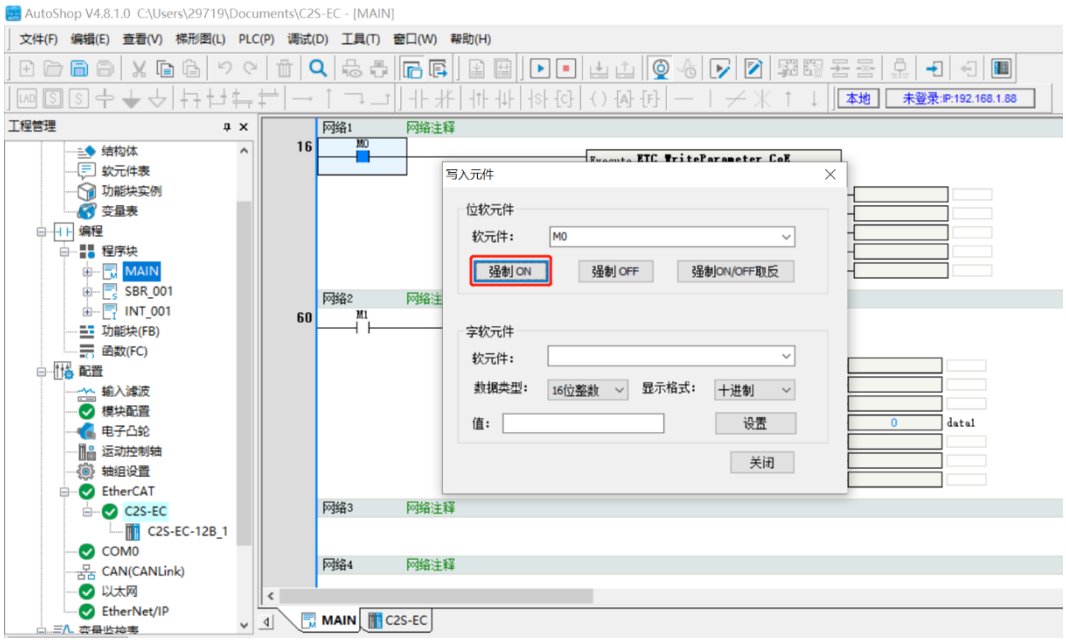
l. Right-click on M0 under Network 1 on the MAIN page of and select "Write". is shown in the figure below:



m. The Write Component window pops up, click "Force ON" to execute the write command, as shown in the figure below:



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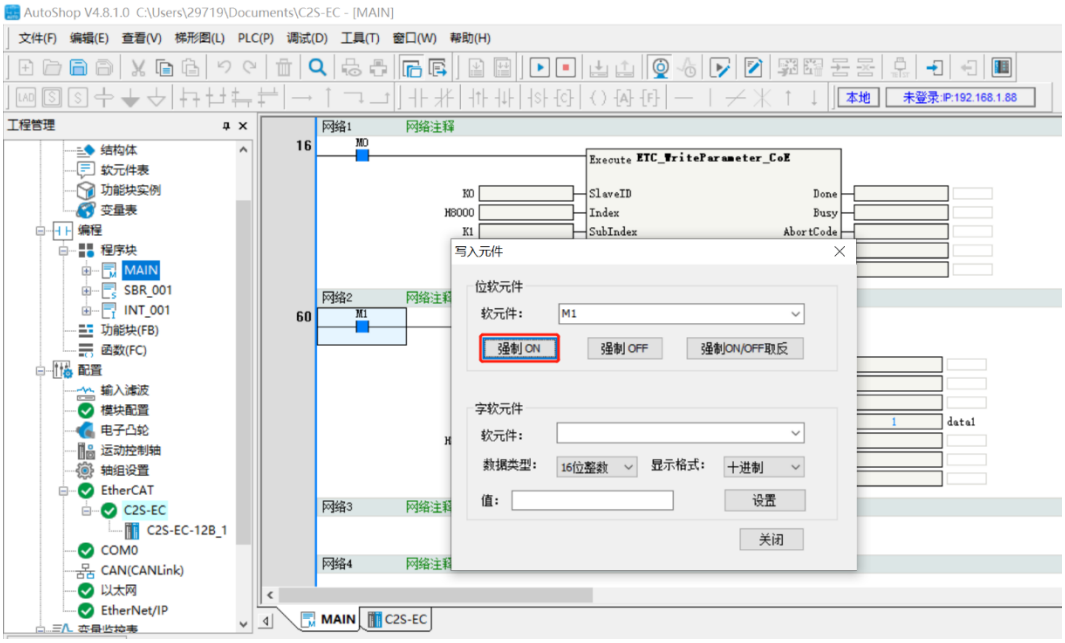
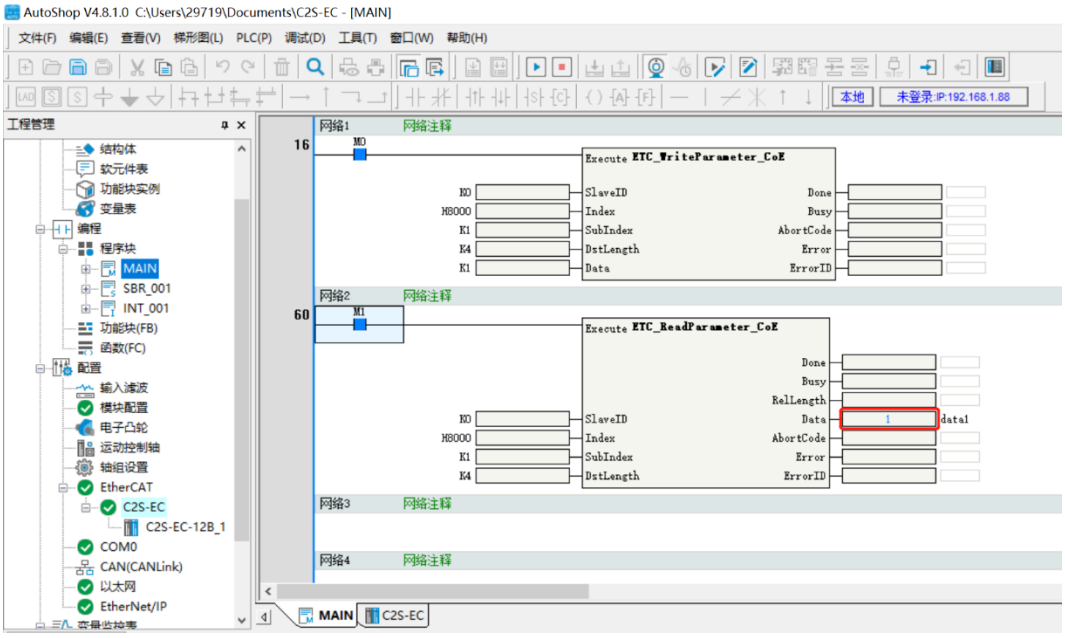
n. Similarly, right-click on M1 under Network 2 on the MAIN page, select "Write" to bring up the Write Component window, and then click "Forced ON" to execute the read command, as shown in the figure below:



o. After the read is completed, you can see that the Data value in the read instruction changes to 1, i.e., the 8000:01 clear/hold parameter is set to 1 hold, as shown in the figure below:



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8 FAQ

8.1 Device Cannot Be Found In The Software

1. Verify that the ESI configuration file is installed correctly.
2. Verify that the ESI profile version is accurate.
3. Whether to restart the software after installing the ESI configuration file.

8.2 Device Cannot Enter OP State

1. Verify that the project is established correctly.
2. Confirm the node station number related settings.
3. Verify that the power supply to the unit is normal.
4. The EtherCAT communication cable is working properly.
5. The IP address of the computer is confirmed.
6. Whether to repower the device after changing the slave device node address.

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