

EX Series Adapter

User Manual

DECOWELL Industrial Intelligence makes reliable partners



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Preface

■ Document Overview

Thank you for purchasing the DECOWELL EX Series slice I/O modules.

The EX Series slice I/O modules are distributed expansion modules developed by DECOWELL. This series consists of adapters, I/O modules, power modules, and end modules. The adapters support multiple communication buses, such as PROFINET, EtherCAT, DeviceNet, Modbus RTU, and PROFIBUS-DP. The I/O modules include digital input modules, digital output modules, analog input modules, analog output modules, and function modules. Users can configure these modules according to specific application requirements.

The EX-1100 is an EtherCAT bus adapter, supporting up to 32 I/O modules per station.

This manual mainly describes the specifications, features, and usage of the module. Please read this manual carefully before use to ensure proper and safe operation of the product.

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Safety Precautions

■ Security Statement

1. Before installing, operating, or maintaining the product, please read and comply with these safety precautions.
2. To ensure personal and equipment safety, follow all safety labels on the product and all safety instructions contained in this manual during installation, operation, and maintenance.
3. The “Note”, “Caution”, “Warning”, and “Danger” statements in this manual do not represent all safety precautions that should be observed; they are supplementary to the overall safety requirements.
4. This product must be used under conditions that meet the specified design requirements. Failure to meet these conditions may result in malfunction. Functional abnormalities or component damage caused by non-compliance are not covered by the product warranty.
5. DECOWELL assumes no legal liability for personal injury, property damage, or other losses caused by improper or unauthorized operation of the product.

■ Security level definition

Note

Indicates additional information or explanations that supplement the operating instructions.

Caution

Indicates a hazardous situation that may result in minor to moderate personal injury or equipment damage if not operated as instructed.

Warning

Indicates a hazardous situation that may result in serious personal injury or death if not operated as instructed.

 Warning — During Control System Design

01. When applying this system, please be sure to design a safety circuit to ensure that the control system can still operate safely when the external power supply fails or the expansion module malfunctions.
02. If the output circuit experiences prolonged overcurrent due to exceeding the rated load current or a load short circuit, the module may smoke or catch fire. External safety devices such as fuses or circuit breakers should be installed.

 Caution — During Control System Design

01. It is essential to install an emergency braking circuit, a protection circuit, an interlock circuit for forward and reverse operation, and upper and lower limit interlock switches to prevent machine damage in the external circuit of the expansion module;
02. To ensure the safe operation of the equipment, please design external protection circuits and safety mechanisms for output signals related to major accidents;
03. When the output units of the expansion module, such as relays and transistors, are damaged, their outputs cannot be controlled to be in the ON or OFF state;

 Caution — During Installation

01. During installation, prevent metal shavings and wire ends from falling into the module's ventilation holes, as this may cause fire, malfunction, or misoperation;
02. After installation, ensure that there are no foreign objects on its ventilation surface, otherwise it may cause poor heat dissipation, resulting in fire, malfunction, or misoperation;
03. During installation, ensure that the module is securely connected to its respective connector and that the module connection hooks are firmly locked. Improper module installation may lead to malfunctions, failures, or detachment.

 Warning — During Installation

01. Only professional maintenance personnel who have received relevant electrical equipment training and possess sufficient electrical knowledge can install this product;

02. When installing or removing modules, all external power supplies to the system must be completely disconnected before proceeding. Failure to disconnect the power supply may result in electric shock, module malfunction, or accidental operation.

03. Do not use the module in the following locations: places with dust, fumes, conductive dust, corrosive gases, or flammable gases; places exposed to high temperatures, condensation, or wind and rain; places subject to vibration or impact. Electric shock, fire, or misoperation may also cause product damage and deterioration.

1. Product Introduction

1.1 Product Naming and Nameplate

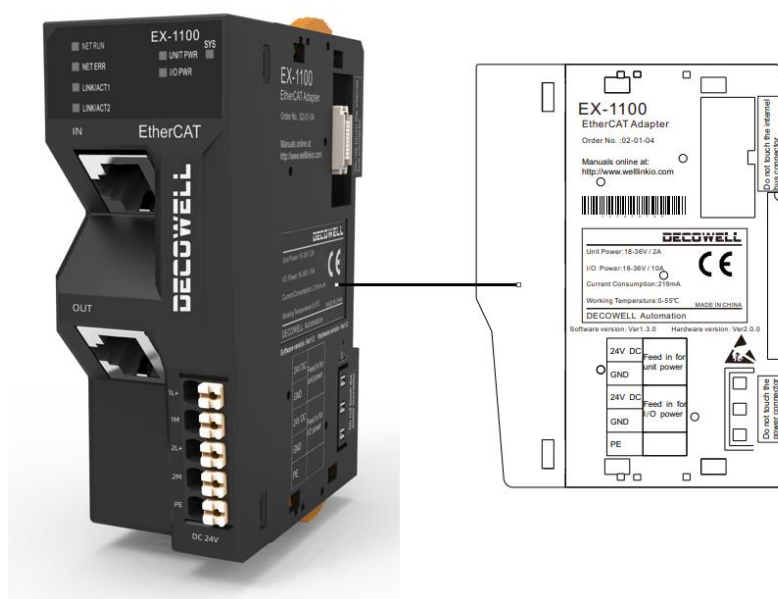
EX-1100

①

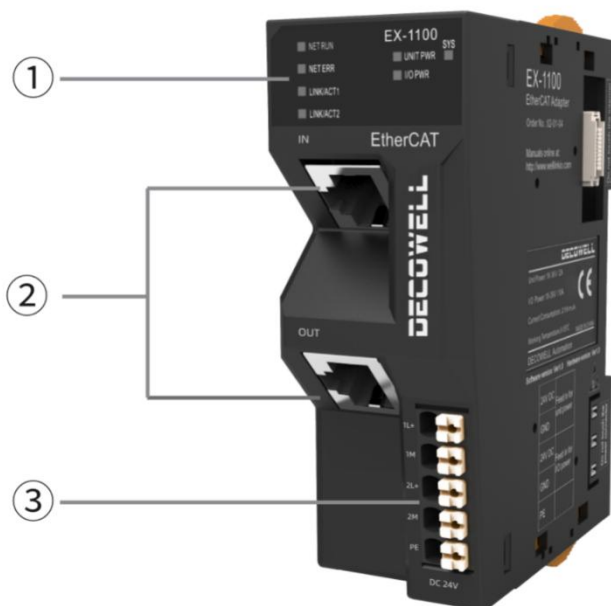
②

No.	Name	Definition
①	EX Series	Card-type I/O
②	Bus Adapter	EtherCAT bus adapter

Note: The laser-etched marking on the right side of the bus adapter indicates the production date, version information, and other details.



1.2 Component Description



Name	Describe	State	Function Definition	Describe
Status Indicator	SYS	System indicator	1Hz Flashing(green)	Communication normal
			5Hz Flashing(green)	IO slave lost
			Flash once (green)	IO module station number allocation failed
			2 blink + 1 off(green)	IO module configuration failed
			OFF	I/O Module Not Running
	UNIT PWR	System power indicator	ON (green)	System power supply normal
			OFF	System power failure or overload
	IO PWR	IO power indicator	ON (green)	IO power supply is normal
			ON (red)	IO power supply not connected or faulty
	NET-RUN	Run Indicator	On (Green)	Communication normal; data transmission normal
			Flashing(Green)	Communication initialized; pre-operational state
			Single Flash (Green)	Safe operational state

			OFF (Green):	Initialization state
	NET-ERR	System fault indicator	ON (red)	Communication Error
			Flash twice (red)	Application Watchdog Timeout
			Flash once (red)	Local Error
			Flashing (red)	Configuration Error
			OFF	No Error
	LINK/ACT1	Network port IN indicator	Flashing (yellow-green)	Receiving data
			OFF	Communication error or data stoppage
	LINK/ACT2	Network port OUT indicator	Flashing (yellow-green)	Receiving data
			OFF	Communication error or data stoppage
Communication Interface	EtherCAT Communication Ports (IN/OUT): The IN port is connected to the upstream controller or the OUT port of a preceding slave; the OUT port is used to connect downstream slave devices.			
Power Port	Adapter Power Input (1L+, 1M) / I/O Module Power Input (2L+, 2M)			

1.3 Technical Specifications

Basic parameters	
Dimensions	90×67×34mm
Storage temperature	0-55℃
Operating temperature	-20~+85℃
Operating humidity	95% non-condensing

Protection Rating	IP20
Wiring specifications	0.2~1.5mm ²
Wiring method	Straight-through spring connector
Power parameters	
System terminal input voltage	24VDC (±25%)
System terminal rated current	Max: 0.6A
I/O port-side power input	24VDC (±25%)
I/O port-side output current	10A (Max)
System-side electrical isolation	AC500V
Power protection	Overcurrent protection, overvoltage protection, reverse connection protection
Software parameters	
Communication Protocol	EtherCAT
Address settings	Assigned by master
Expanding I/O count	32
Maximum input/output data size	Input: 1024 Byte/Output: 1024 Byte
Communication rate	100Mbps
Transmission distance	100m (distance between stations)

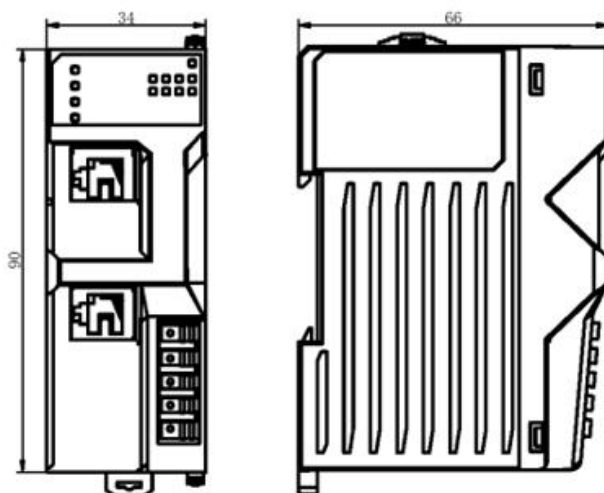
1.4 Environmental Specifications

Environmental parameters	
Operating temperature	0~55℃
Operating humidity	95% non-condensing
atmosphere	≥ 795 hPa (altitude ≤ 2000 m) as per IEC 61131-2
Storage temperature	-20~+85℃
Overvoltage category	I

2. Mechanical installation

2.1 Mounting Dimensions

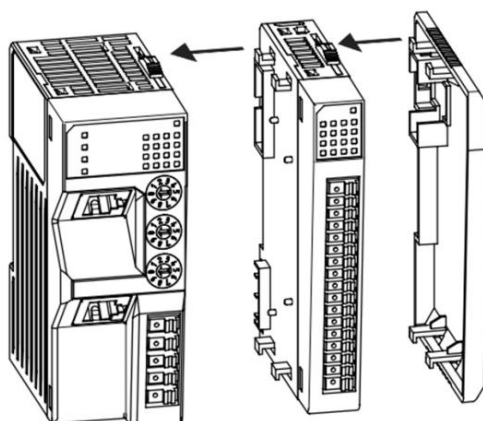
The mounting dimensions are shown in the figure below (unit: mm).



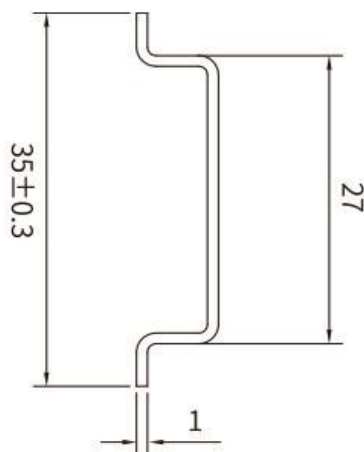
2.2 Installation Method

2.2.1 Inter-module Installation

Modules are assembled using the latches on the top and bottom of each module, as shown in the figure below.



The module is mounted on a DIN rail. The DIN rail must comply with IEC 60715 (35 mm width, 1 mm thickness). Dimensions are shown below.



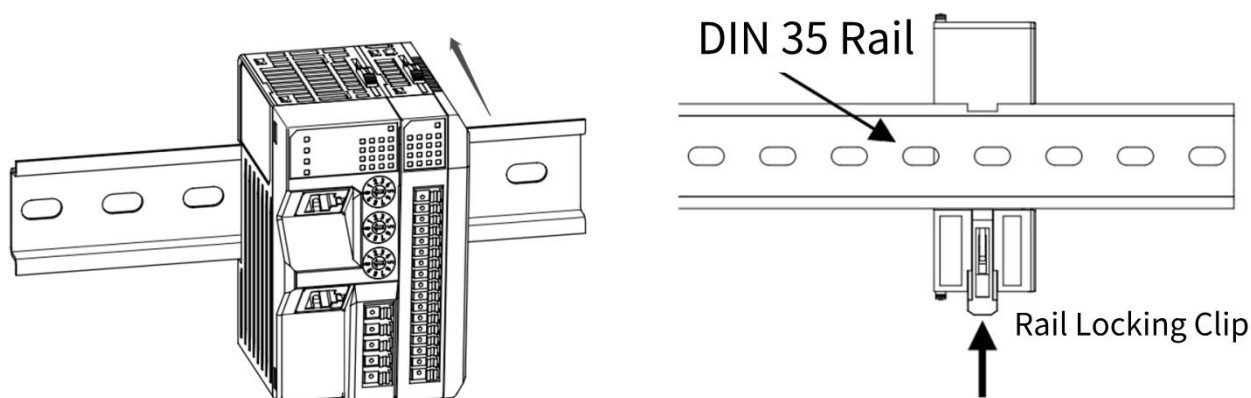
Note: When the module is mounted on a DIN rail other than the recommended DIN 35 rail, the locking clip may not engage properly. Before installing the module, open the lower latch first, then proceed with the installation.

**Caution**

- When this product is installed on DIN rails other than the recommended types (especially DIN rails with a thickness ≤ 1.0 mm), the DIN rail locking latch may fail. This may result in improper mounting and prevent the product from functioning correctly.
-

2.2.2 Mounting on DIN Rail

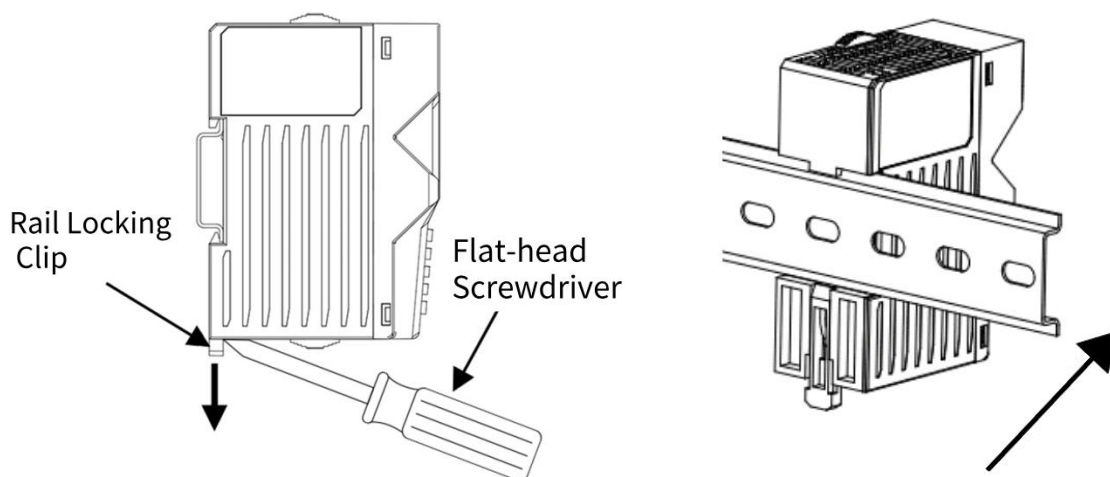
During installation, align the module with the DIN 35 rail and press it in the direction indicated by the arrow, as shown in the figure below.



Note: After installation, press the top of the locking clip upward by hand to ensure the module is securely in place.

Removal:

Use a flat-head screwdriver or a similar tool to pry down the rail locking clip, then pull the module away from the DIN 35 rail.



3. Electrical installation

3.1 Cable Selection

EtherCAT bus communication uses shielded Ethernet cables for network data transmission. Short circuits, incorrect wiring, and poor contact must be avoided. Category 5e or higher shielded twisted-pair cables with molded iron-shell connectors are required. The shielded cable specifications are listed below.

Name	Function Definition
Cable type	Flexible crossover cable, double-shielded (S/FTP), Category 5e or above
Double Shielding	Braided shielding (coverage $\geq 85\%$), aluminum foil shielding (coverage 100%)
Applicable Standards	EIA/TIA 568A, EN50173, ISO/IEC 11801 EIA/TIA bulletin TSB, EIA/TIA SB40-A & TSB36
Conductor Cross-section	AWG26 or larger
Conductor Type	Twisted pair
Number of Pairs	4
Environment	Resistant to industrial oil, acid and alkali corrosion; Operating temperature: $-30^{\circ}\text{C} \sim 60^{\circ}\text{C}$
Notes: 1. The cable length between devices shall not exceed 100 m. Exceeding this length will cause signal attenuation and affect normal communication. 2. If the operating temperature exceeds the normal operating temperature (60°C), please use high-temperature resistant network cables.	

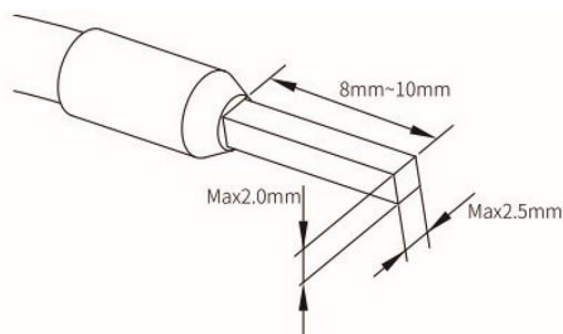
The wire diameter of the lugs in the table below is for reference only. It can be calculated and adjusted according to actual use.

Name	Compatible wire diameter		KST	
Ring Lug	GB/mm ²	American Standard/AWG	Model	Wire crimping pliers
	0.25	24	E0208	KST2000L
	0.5	20	E0510	

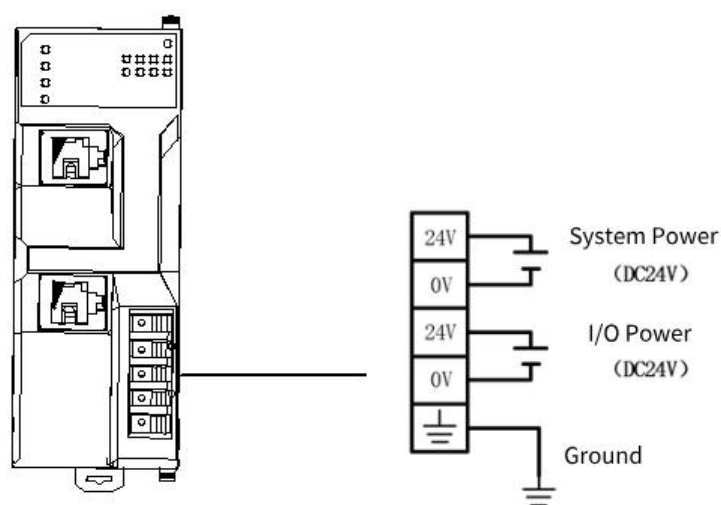
	0.75	18	E7510	
	1.0	18	E1010	
	1.5	16	E1510	

Stripping length: 8-10mm

The shape and size requirements for the crimped terminals are shown in the following figure:



3.2 Terminal wiring

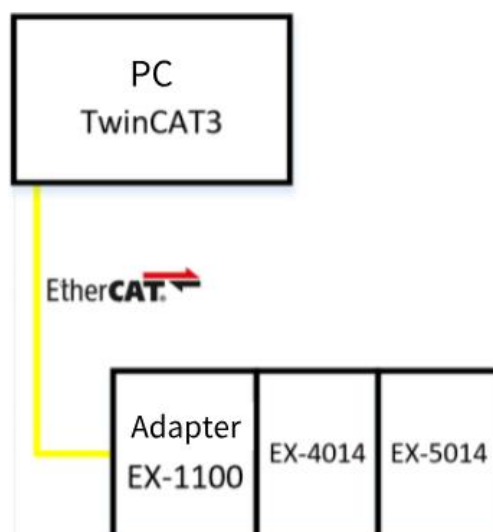


Caution

- **The adapter module grounding terminal must be directly grounded** to prevent interference with I/O module signals.
- **The EX series adapter power supply is divided into system power and I/O power** (both require a 24 V DC supply). To avoid system interference, it is recommended to use the same 24 V DC power supply and connect two separate sets of power lines to the system power and I/O power terminals respectively.

4. Configuration Case (TwinCAT 3)

4.1 Communication Connection Diagram



4.2 Hardware Configuration

Hardware	Quantity	Remarks
Programming PC	1	TwinCAT 3 installed
EX-1100	1	EtherCAT adapter
EX-4014	1	Analog input module
EX-5014	1	Analog output module
Ethernet Cable	Several	

4.3 Installing the XML Description File

Install the XML description file into TwinCAT 3. The default example directory is:
(C:\TwinCAT\3.1\Config\Io\EtherCAT)

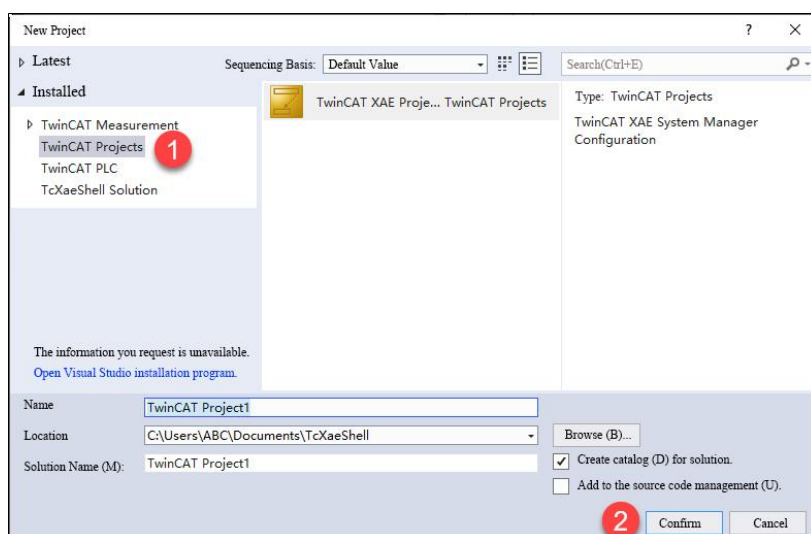
Name	Altering Date	Type	Size
Beckhoff EtherCAT Terminals	2015/2/4 13:57	XML Document	53 KB
Beckhoff FB1XXX	2017/5/24 13:26	XML Document	49 KB
Beckhoff FCxxx	2015/2/4 13:57	XML Document	21 KB
Beckhoff FM3xxx	2018/6/29 16:05	XML Document	367 KB
Beckhoff ILxxx-B110	2015/2/4 13:57	XML Document	8 KB
EX-1100_V1.5.1	2020/9/10 19:15	XML Document	258 KB

4.4 New project and equipment configuration

Open TwinCAT3 software and choose "File" > New > Project from the menu bar. In the window of new Project, select "TwinCAT Projects".

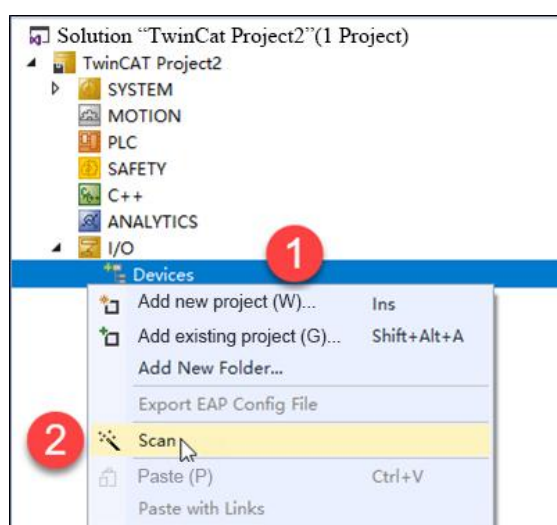


New project

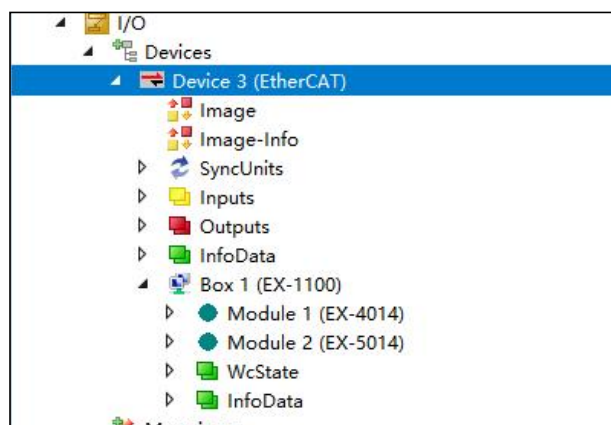


Selecting TwinCAT Project

Scan the IO connected to the programming computer into the project. Click "I/O" > "Devices" > "Scan" in the project tree. The hardware configuration displayed in the Scan .



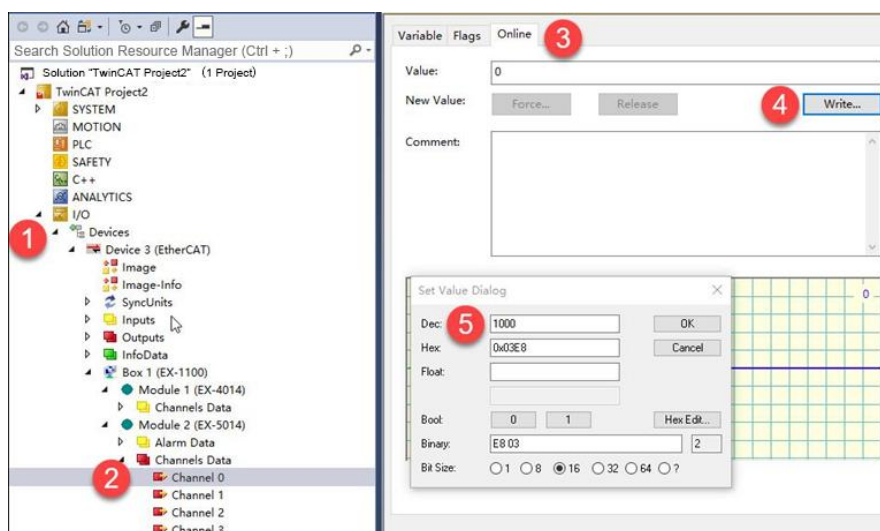
Scanning I/O devices



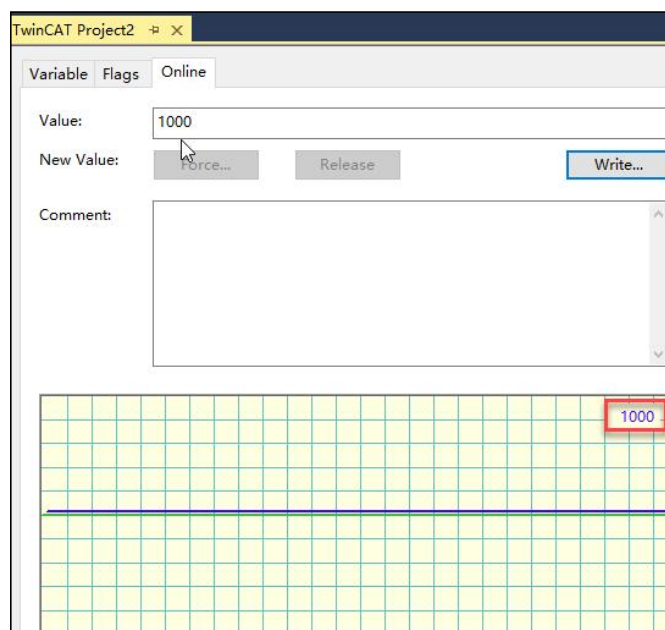
Hardware configuration

IO monitoring and forced output

In the project tree, choose I/O > Devices > Device3 (EtherCAT) > Box1 (EX-1100) > Module2 (EX-5014) > Channels Data. Double-click Channel 0. Choose Online > Write and force the value to 1000.

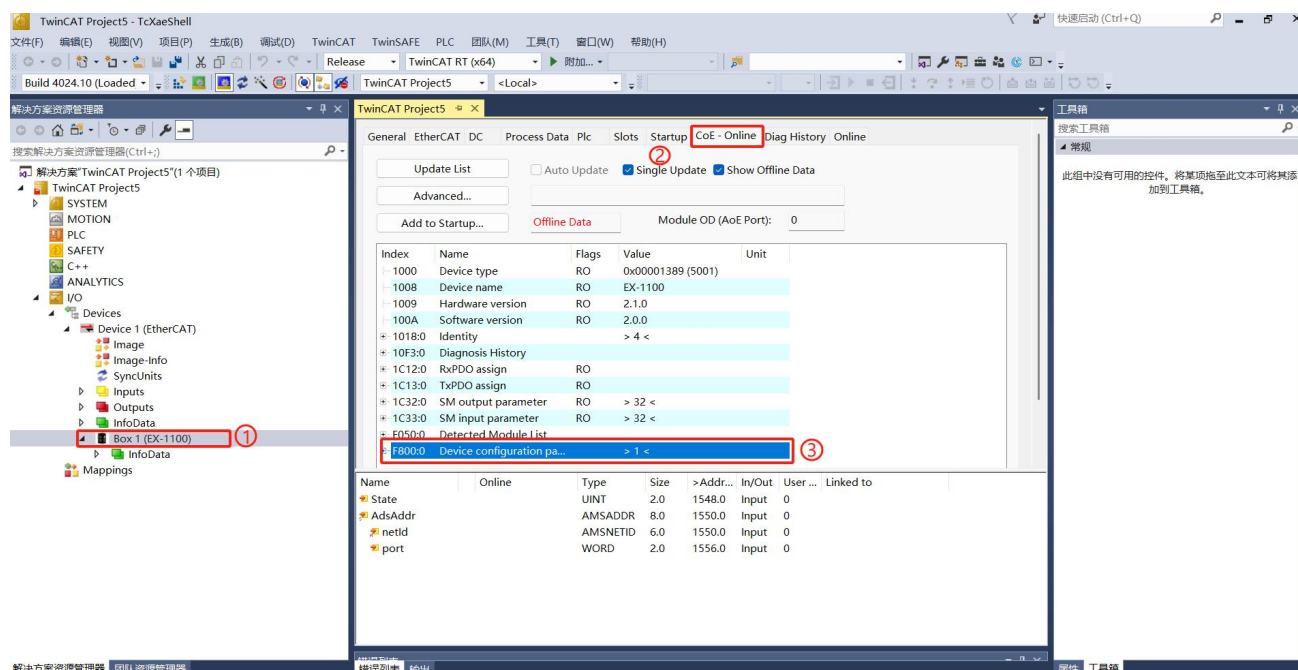


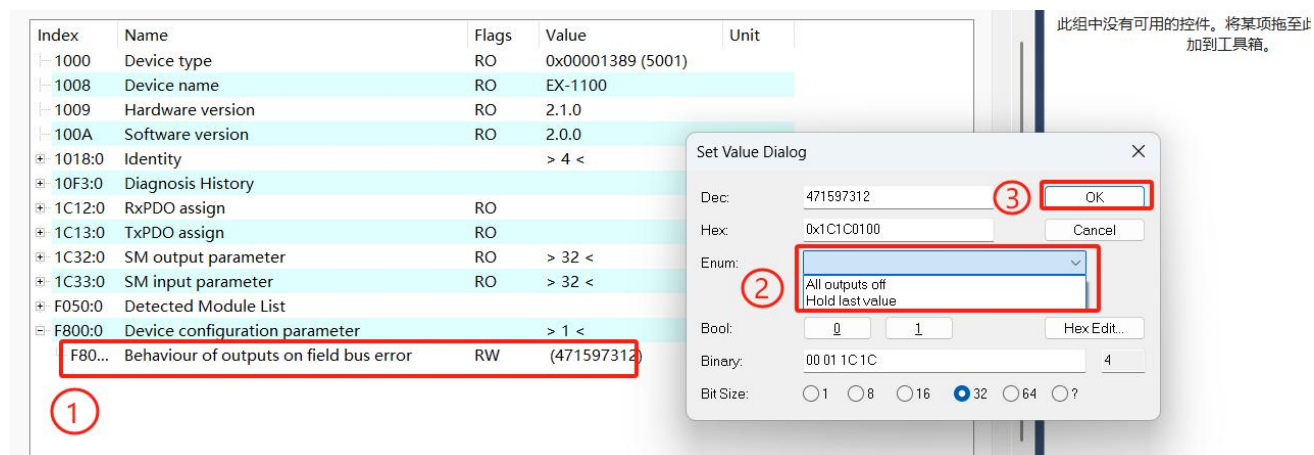
Forcing write values



Monitoring results

4.5 Parameter Configuration Settings





Select the Required Parameter Settings

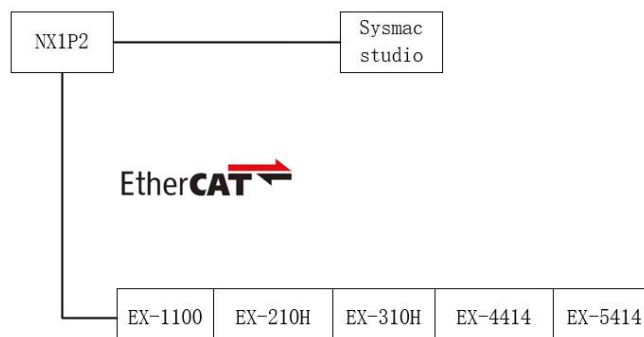
0 — Clear outputs on disconnection (default)

1 — Hold last output value on disconnection

Select the required parameter configuration, then click **OK**. The settings will take effect after downloading.

5. Configuration Case (Sysmac Studio)

5.1 Communication Connection Diagram



5.2 Hardware Configuration

Hardware	Quantity	Remarks
Programming PC	1	Sysmac Studio installed
Controller	1	NJN301-1100
EX-1100	1	EtherCAT adapter
EX-210H	1	Digital input module
EX-310H	1	Digital output module
EX-4414	1	Analog input module
EX-5414	1	Analog output module
Ethernet Cable	Several	

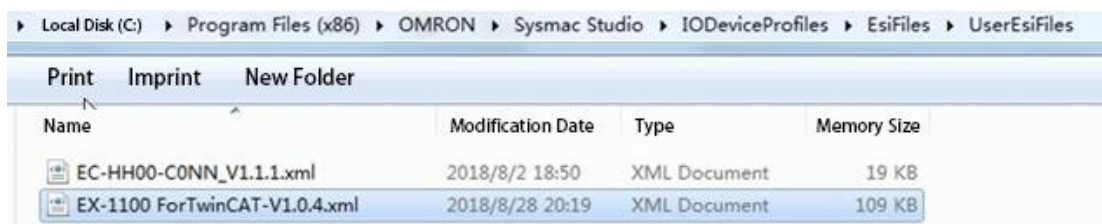
5.3 Install the XML Description File

Install the XML Description File

There are two methods to install the XML description file into Sysmac Studio.

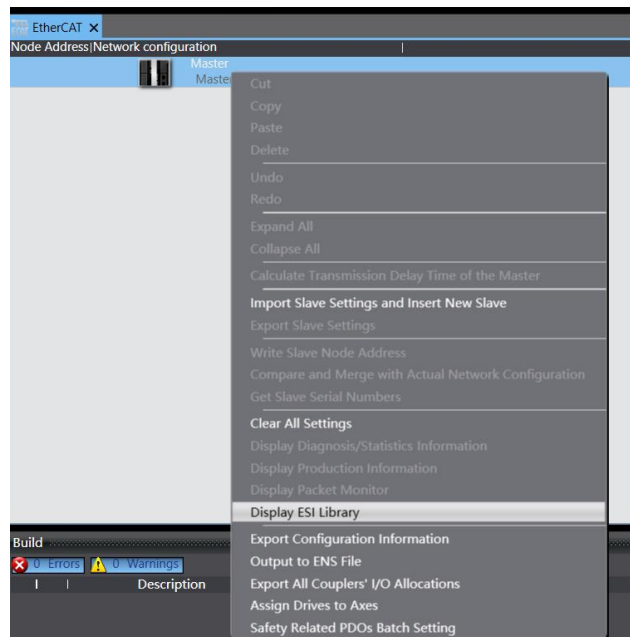
Method 1: As shown in Figure 6-1-2. The default example directory is:

C:\Program Files (x86)\OMRON\SysmacStudio\IODeviceProfiles\EsiFiles\UserEsiFiles

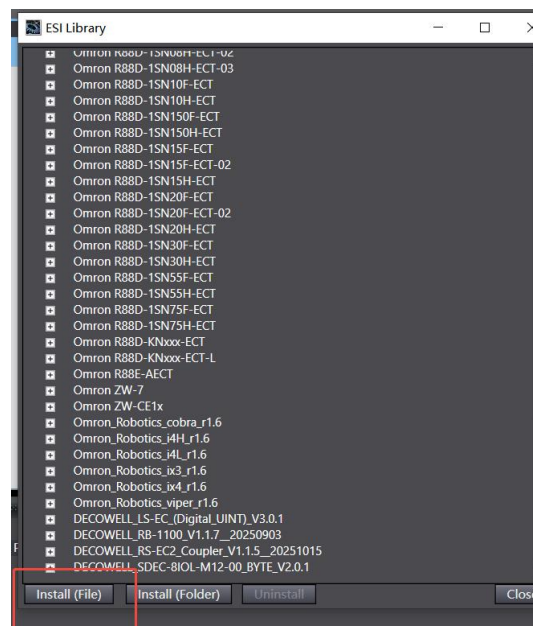


Installing the XML description file

Method 2: Open the ESI Library in Sysmac Studio, click “**Install (File)**”, select the XML file, and confirm. Wait until the installation is complete.

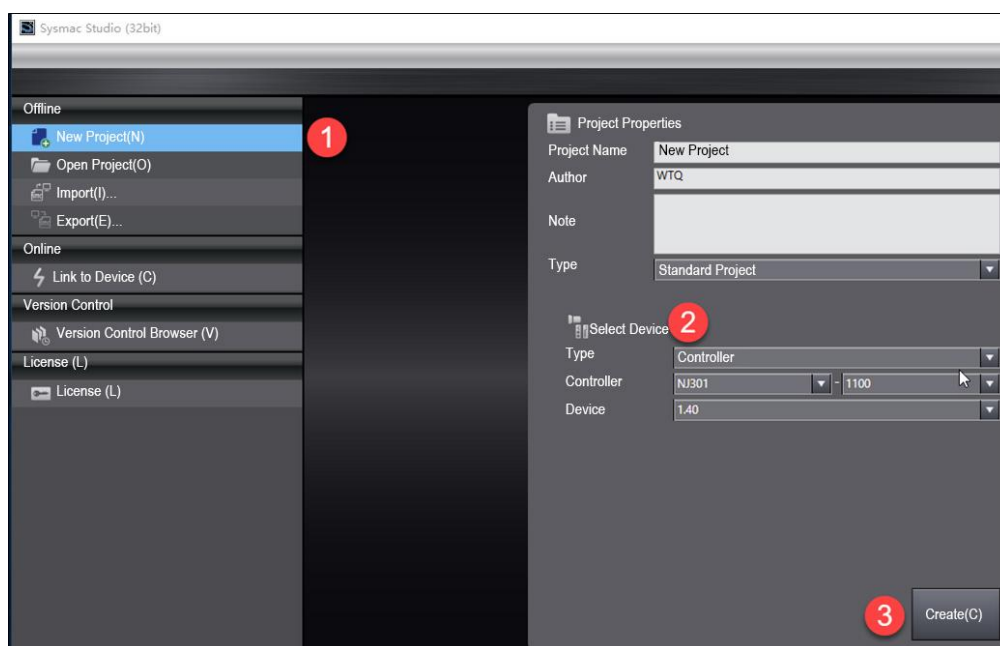


Display ESI Library

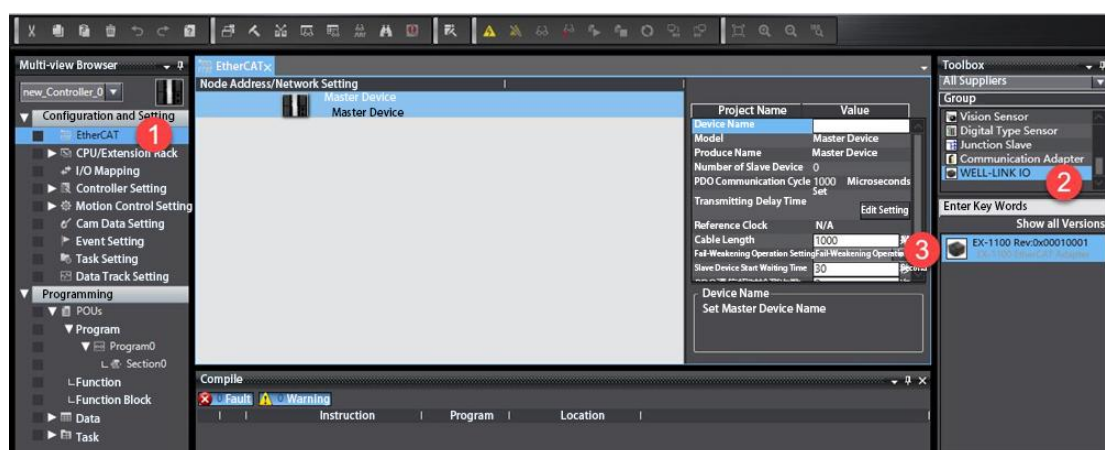


6.4 Configuration of New Projects and Equipment

Open Sysmac Studio, select "New Project" and configure the device model and version number, as shown in the image below.

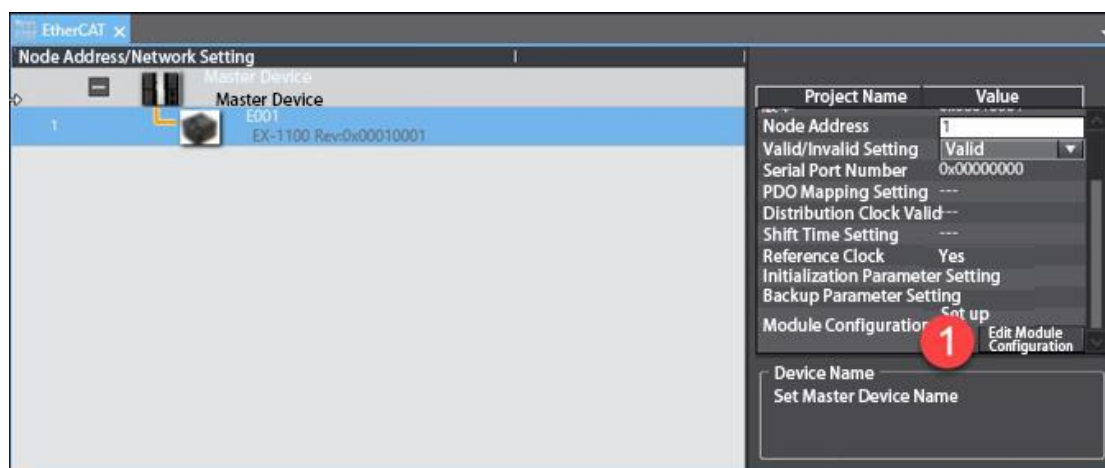


Add the adapter, double-click EtherCAT in the multi-view browser, select Well-Link IO in the toolbox, and select EX-1100 Rev at the bottom of the toolbox.

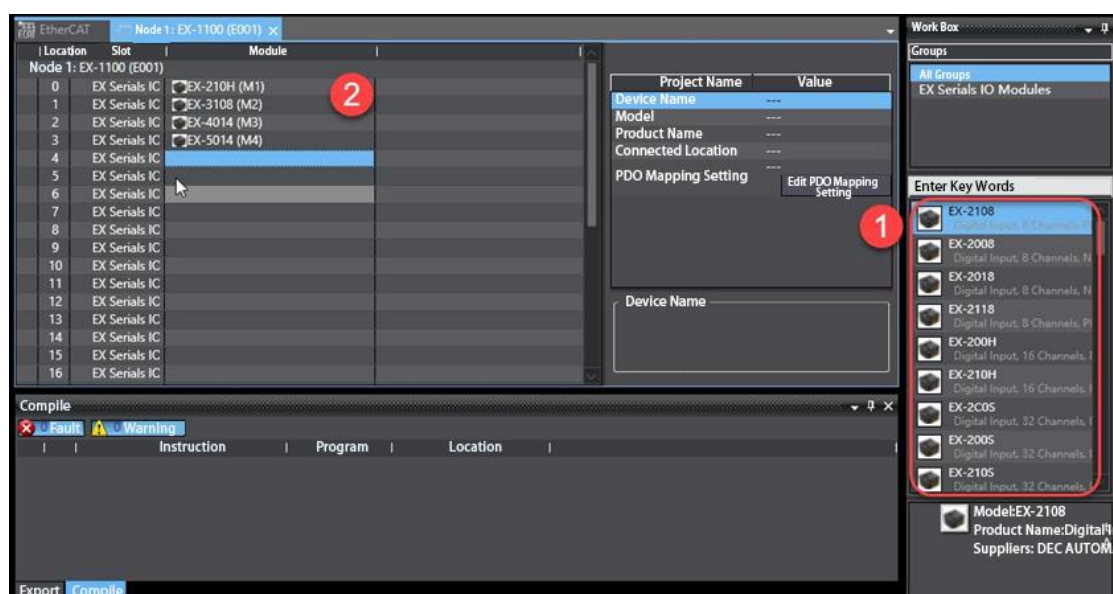


Adding an adapter

In the EtherCAT view, click ex-1100 and choose edit Module Configuration. I/O configuration is performed according to the actual I/O hardware configuration

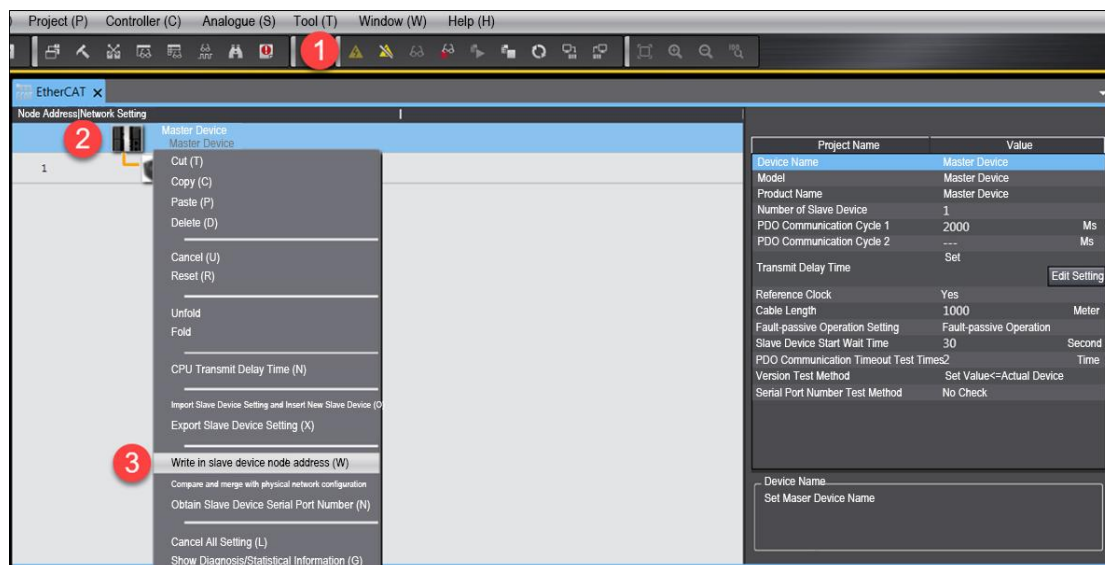


Edit module configuration



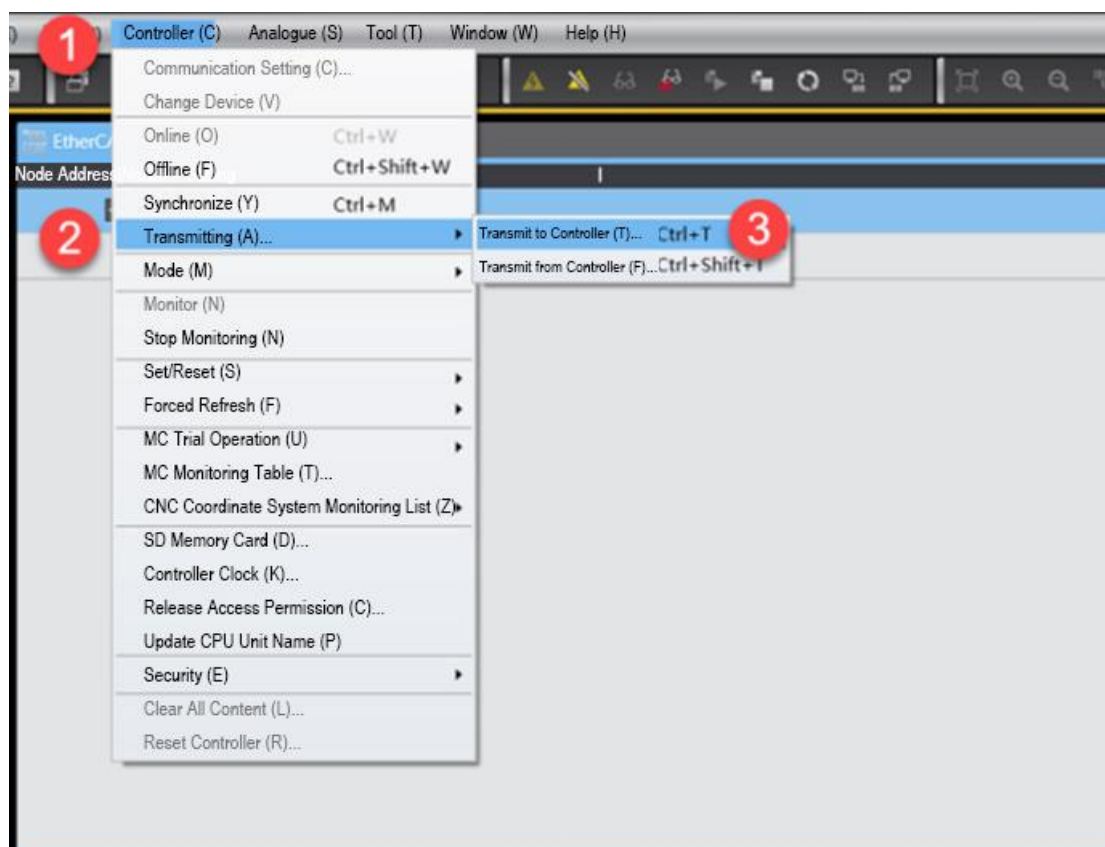
I/O configuration

Note: After writing the node address, the device must be restarted for the new node address to take effect.

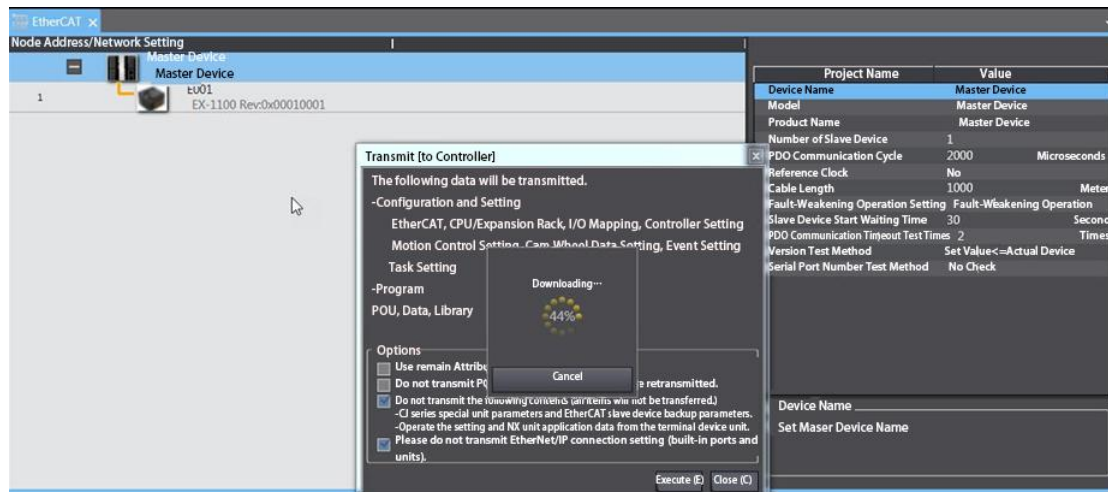


Node address writing

Click the online icon, right-click on the icon of the master device, and select Write slave device node address (well-link EtherCAT slave device default node is 0, so the node number must be set)

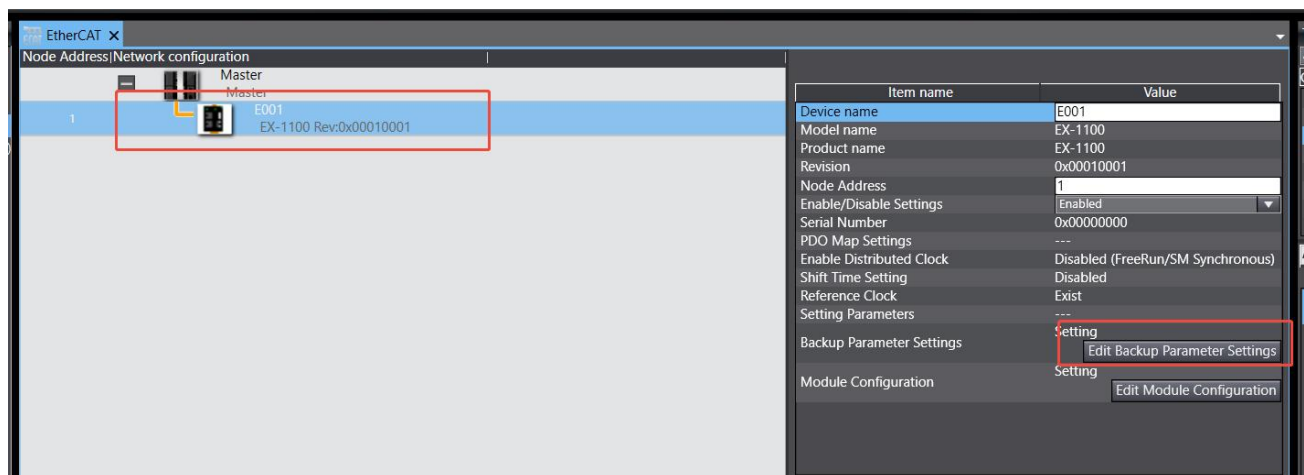


Program download

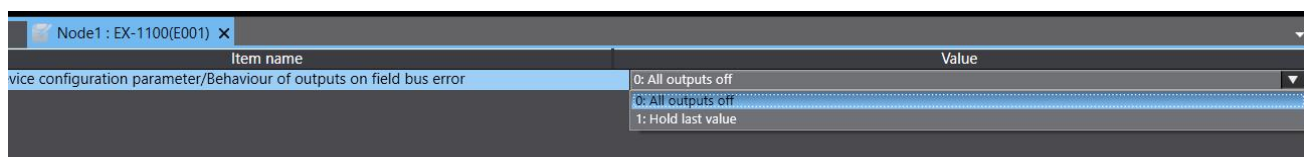


Performing the download

6.5 Parameter Configuration Settings



Parameter Configuration Settings



Select Parameter Settings

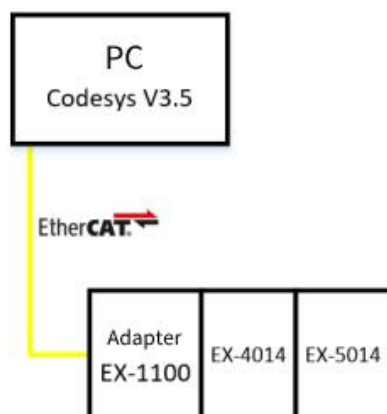
0 — Clear outputs on disconnection (default)

1 — Retain the last output value on disconnection

Select the required parameter configuration, then click **OK**. The settings will take effect after downloading.

6. Configuration Case (CODESYS)

6.1 Communication Connection Diagram

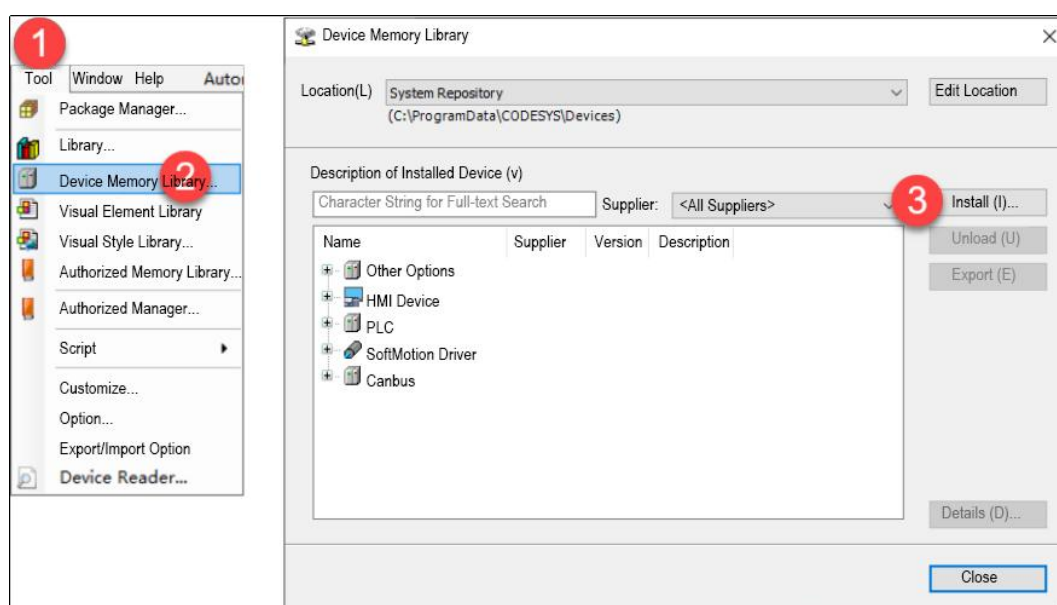


6.2 Hardware Configuration

Hardware	Quantity	Remarks
Programming PC	1	Codesys V3.5 installed
EX-1100	1	EtherCATadapter
EX-4014	1	Analog input module
EX-5014	1	Analog output module
Ethernet Cable	Several	

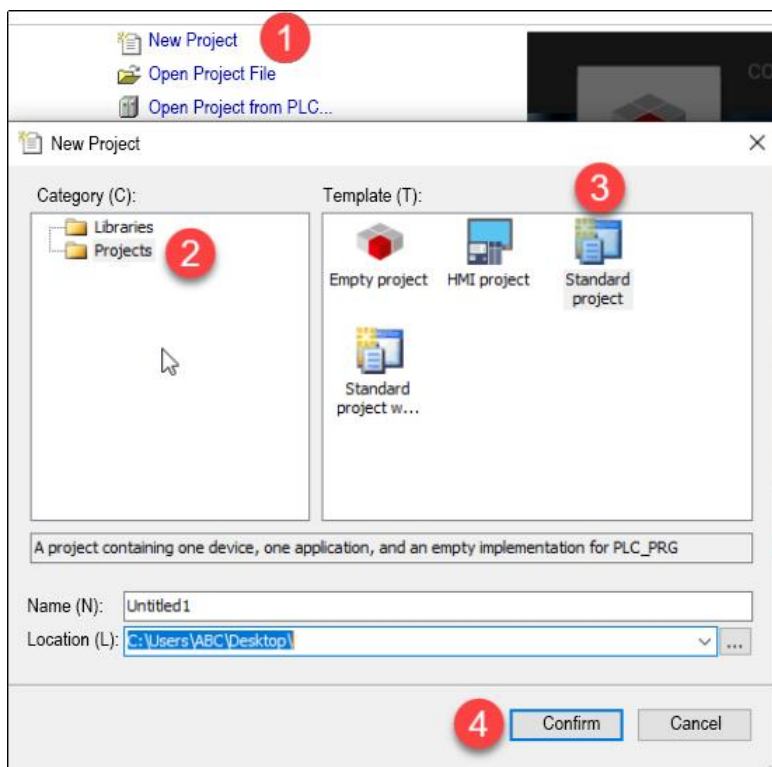
6.3 Install the XML description file

Open CODESYS V3.5 and choose Tools > Device Repository from the menu bar.



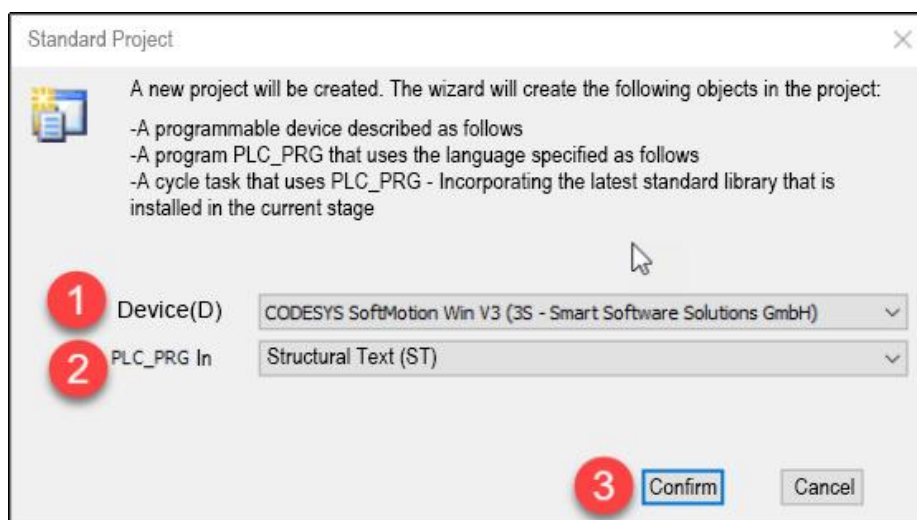
6.4 New project and equipment configuration

Open CODESYS V3.5 software and choose "New Project" > "Project" > "Standard Project",



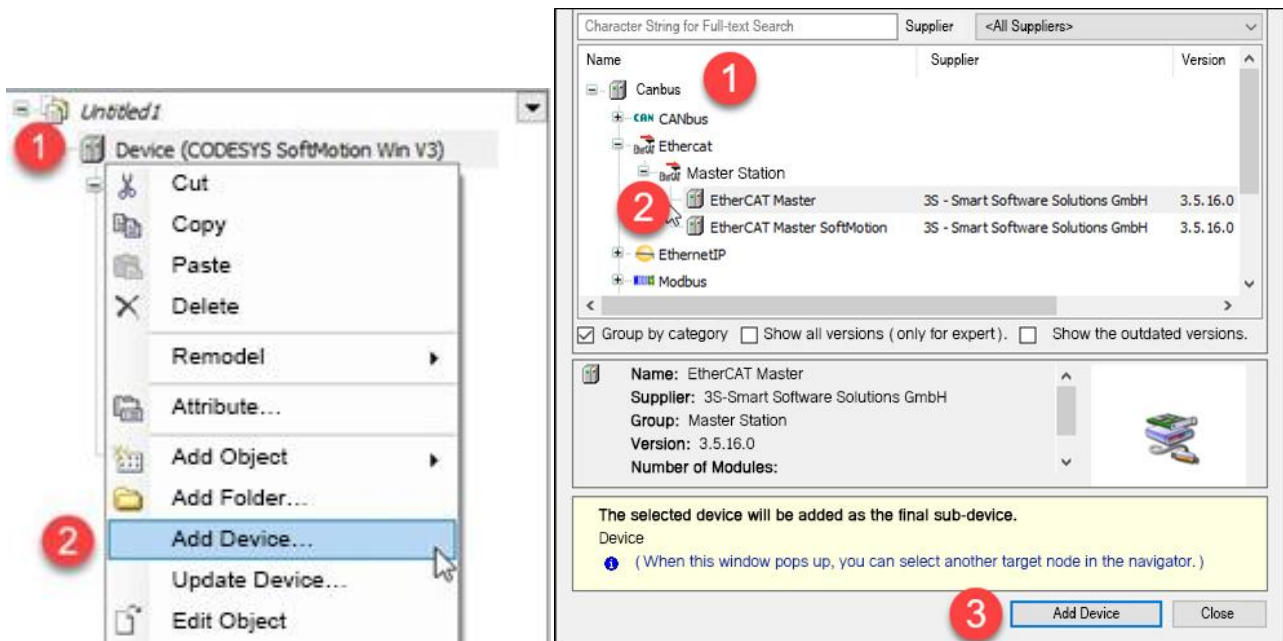
New project

In the standard engineering window, select CODESYS SoftMotion Win V3 for device and Structured Text (ST) for PLC_PRG programming language.



Selecting device and programming language

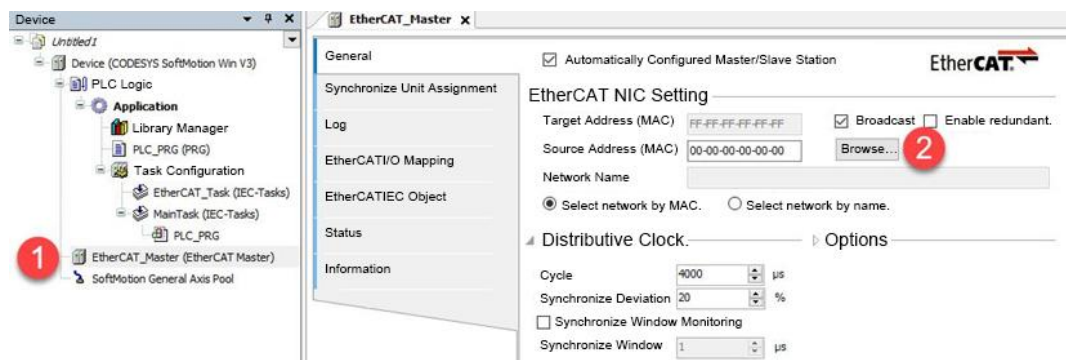
In the Device tree, choose Device (CODESYS SoftMotion Win V3) > Add Device. In the Device adding window, choose FieldBus > EtherCAT > EtherCAT Master.



Adding devices

Selecting the EtherCAT bus

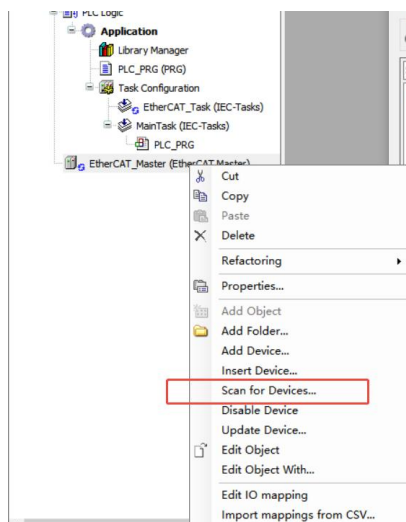
To assign a network port to EtherCAT Master, double-click "EtherCAT_Master" > "EtherCAT NIC Settings" > "Browse" in the device tree.



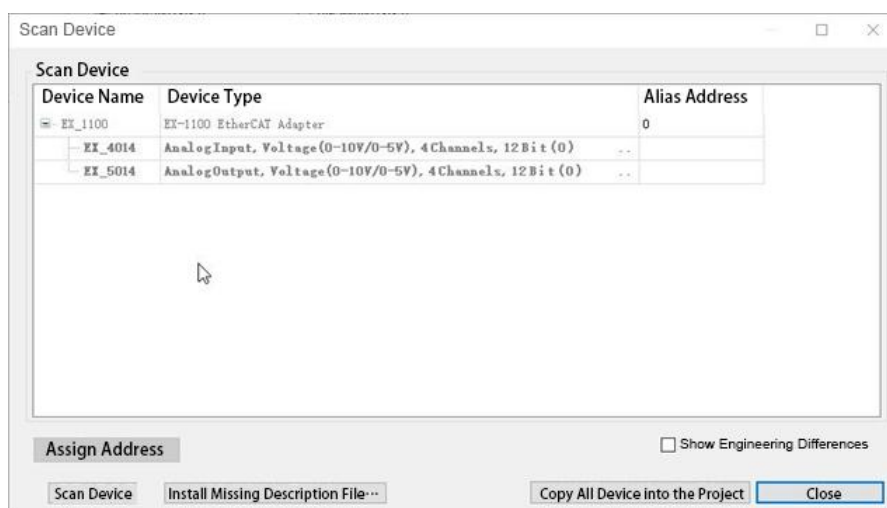
Assigning network ports

Tip: Before assigning network ports, you need to download the project to the controller

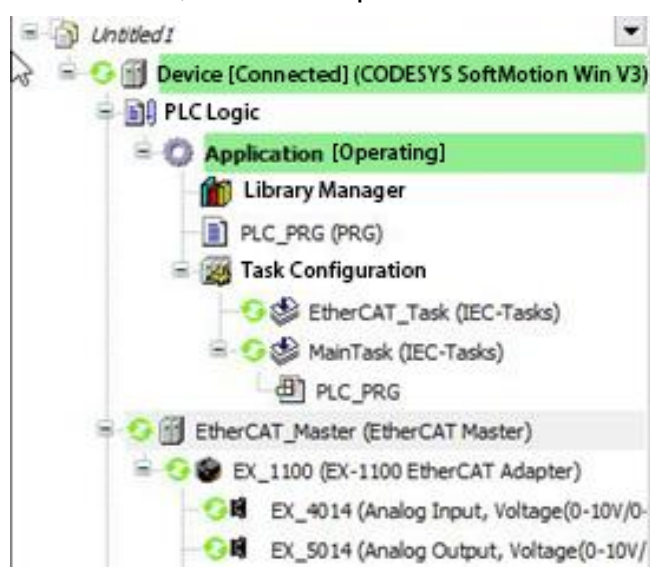
Scan the actual hardware configuration into the project, right click "EtherCAT_Master" > "Scan Device", and you can see the actual hardware configuration in the scanning window.



Scanning equipment

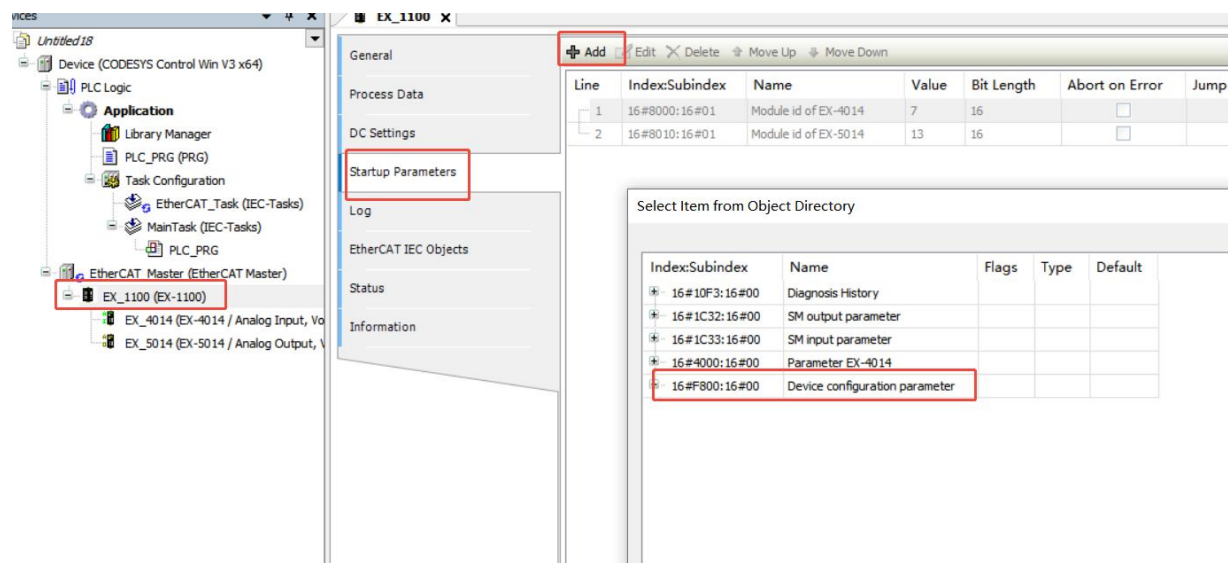


Download the project to the controller, then start operation and monitoring



Monitoring results

6.5 Parameter Configuration Settings



Add Parameter Configuration

0 — Clear outputs on disconnection (default)

1 — Retain the last output value on disconnection

Select the required parameter configuration, then click **OK**. The settings will take effect after downloading.

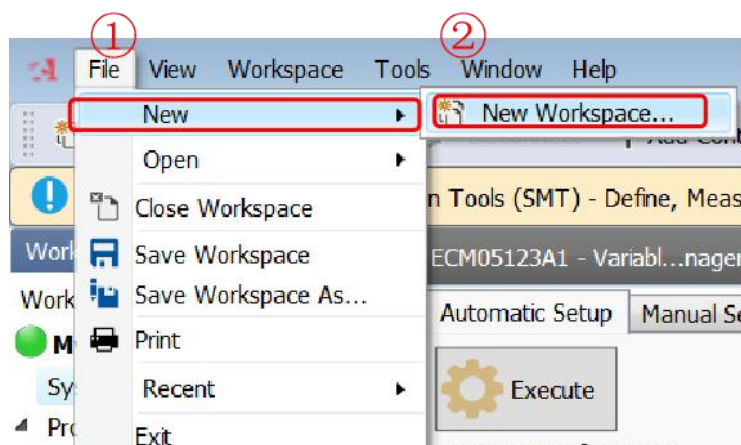
7. Configuration Case (ACS Motion Controller)

7.1 Hardware Configuration

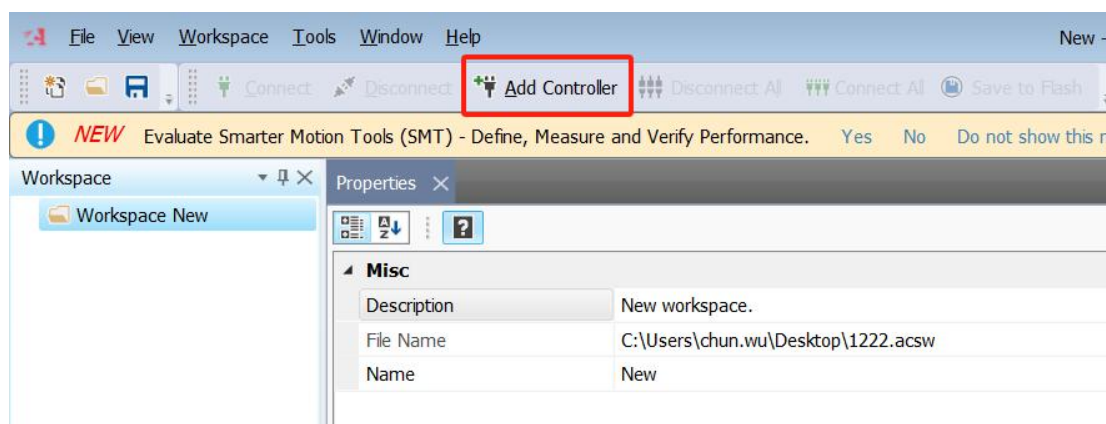
Hardware	Quantity	Remarks
Programming PC	1	SPiiPlus MMI Application Studio
EX-1100	1	EtherCAT adapter
EX-4014	1	Analog input module
EX-5014	1	Analog output module
Ethernet Cable	Several	

7.2 Create a New Project and Configure Parameters

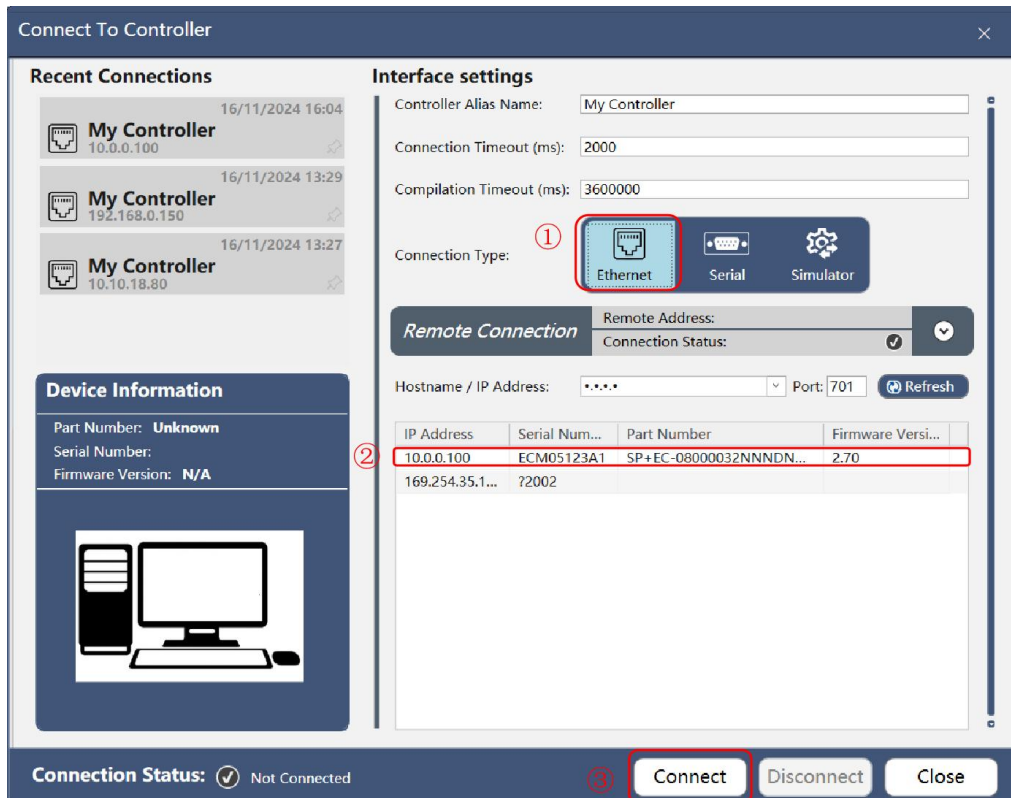
Open the **SPiiPlus MMI Application Studio** software and create a new project, as shown in the figure below.



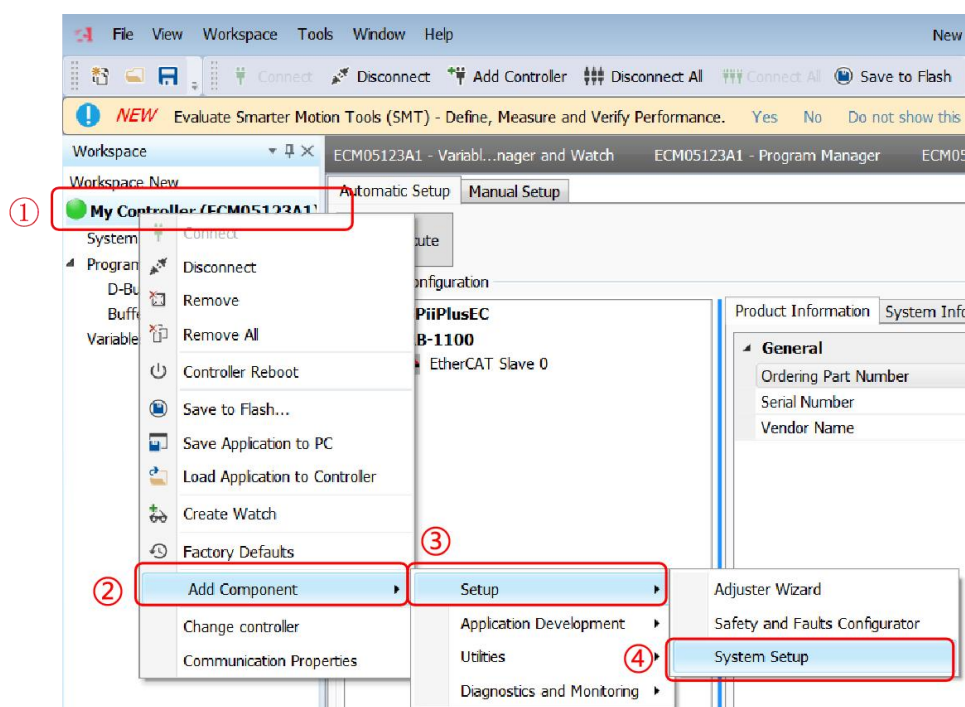
After creating the new project, click **Add Controller** in the navigation bar, as shown in the figure below.



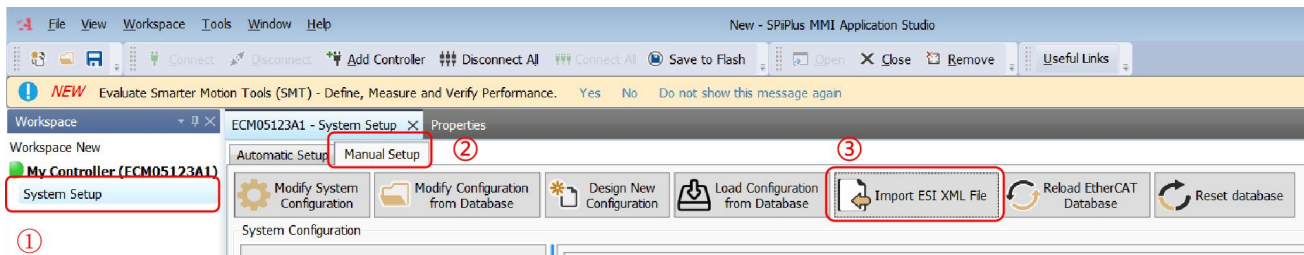
After clicking **Add Controller**, the following interface will appear. Follow the steps to connect to the ACS motion controller. The default IP address of the ACS motion controller is **10.0.0.100**. Ensure that the PC is on the same subnet, as shown in the figure below.



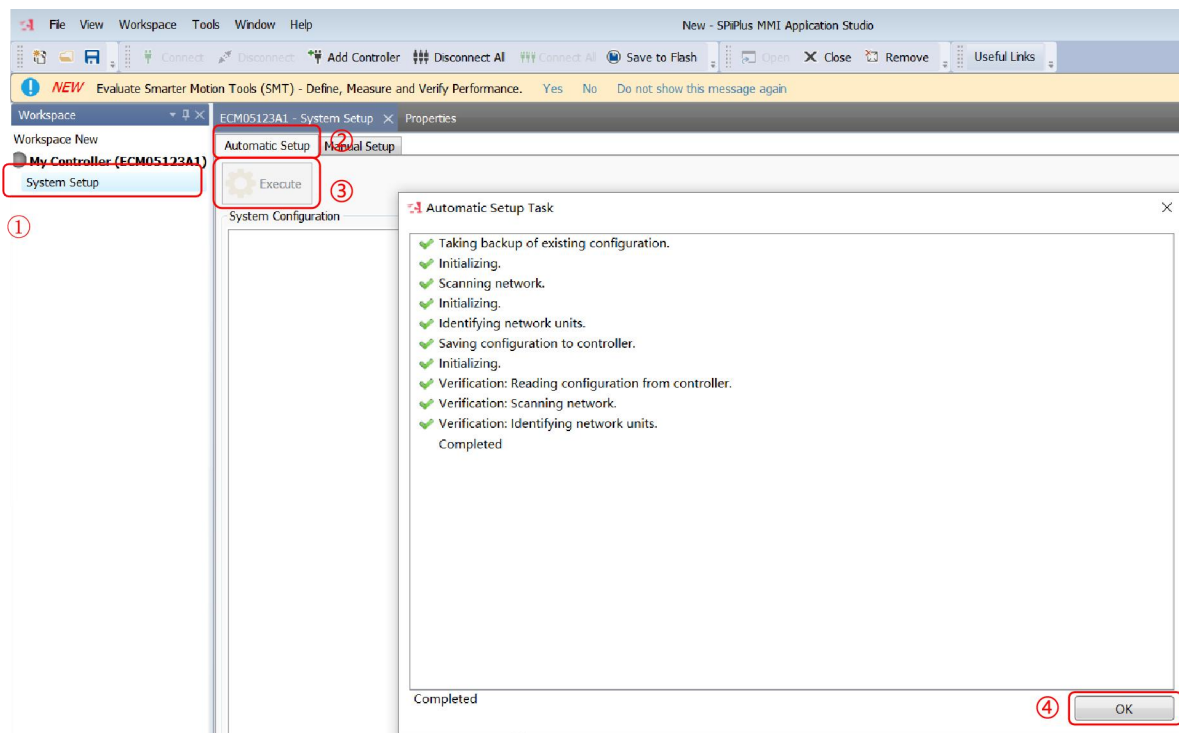
Click **My Controller**, as shown in the figure below.



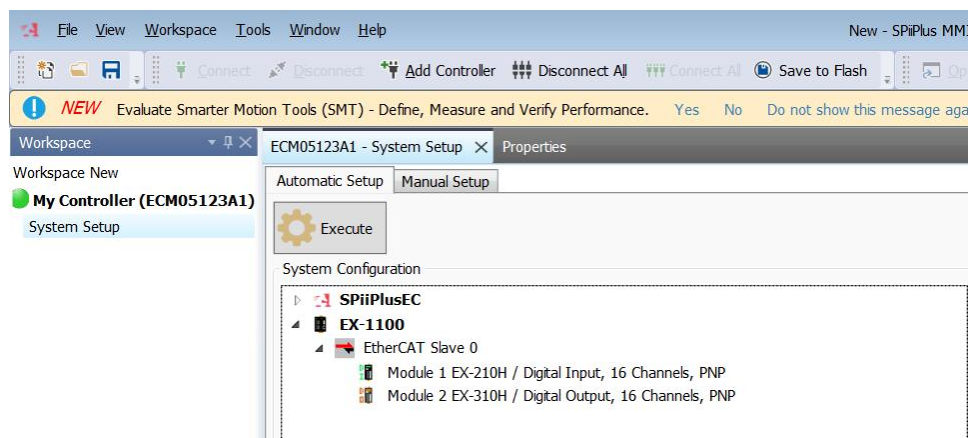
Add the XML configuration file, as shown in the figure below.



Scan for the EX-1100 slave. The controller's scanning process may take some time, as shown in the figure below.



After the scan is successfully completed, the EX-1100 and the I/O modules connected to it will be displayed.



8. Appendix

Model	EX-1100
Adapter Power Consumption	219mA
Latest Hardware Version	V4.0.0
Latest Software Version	V2.1.6
Order Number	02-01-04
Maximum I/O Modules	32 modules per station
Maximum Input Data Size	1024 Byte
Maximum Output Data Size	1024 Byte
Digital I/O Modules Supported	Yes
Analog I/O Modules Supported	Yes
Function Modules Supported	Yes (≤6 片)
Communication Modules Supported	Yes (≤6 片)



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