

Compact67_Slim I/O Module

----EtherCAT System Manual



Preface

1. Scope of this manual:

This manual applies to the ELCO EtherCAT Compact67_Slim distributed I/O device.

The information in this manual enables you to run the Compact67_Slim module on EtherCAT in a distributed I/O device.

2. Basic knowledge requirements

This manual presumes a general knowledge in the field of automation engineering and describes the components based on the data valid at the time of its release. ELCO reserves the right of including a product information for each new component, and for each component of a later version.

3. Guide

This manual describes the hardware of the EtherCAT Compact67_Slim distributed I/O device.

Covered topics are:

- Installation and wiring
- Commissioning and diagnostics
- Components
- Article numbers
- Technical specifications

4. Technical support:

This manual describes the characteristics and the usage of a Compact67_Slim distributed I/O device.

Please contact your local ELCO representative or dial 400-608-4005 if you have any questions about the products described in this manual.

Additional information about ELCO products is available:

<http://www.elco-holding.com/>

5. Disclaimer of liability:

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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1. Product overview

1.1 Introduction

The distributed I/O devices Compact67_Slim is an EtherCAT I/O device with IP67 protection level.

1.2 Applications

Compact67_Slim distributed I/O device provides a reliable solution for the field bus I/O system which connects controllers and is applied in harsh field environment.

Compact 67_Slim module based on 32mm wide IP67 housing with standardized installation allows a safe and reliable operation in the harsh working environment where water, dust and vibration may occur. These characteristics make them suitable for many applications, such as material conveying system, automatic assembly system and so on.

Other functions include supporting input and output of multiple signals. Embedded high-brightness LED diagnosis helps maintainers to judge I/O, module and network status more easily.

1.3 Features

- Up to IP67 protection level
- Can be used in compact, narrow installation space
- M8 size power supply and network interface
- Independent bus slave station, which can be directly connected with PLC
- LED status display, channel level protection and diagnosis

1.4 Product type list

| No. | Type | Description |
|-----|---------------|---|
| 1 | FEEC-0800P-M8 | 8 PNP Input or Passive Contact Short Circuit Protection and Diagnosis |
| 2 | FEEC-0404P-M8 | 4-Point PNP Input or Passive Contact 4-Point active output Short Circuit Protection and Diagnosis |
| 3 | FEEC-08UP-M8 | 8 PNP input or output, configurable Short Circuit Protection and Diagnosis |

2. Technical characteristics

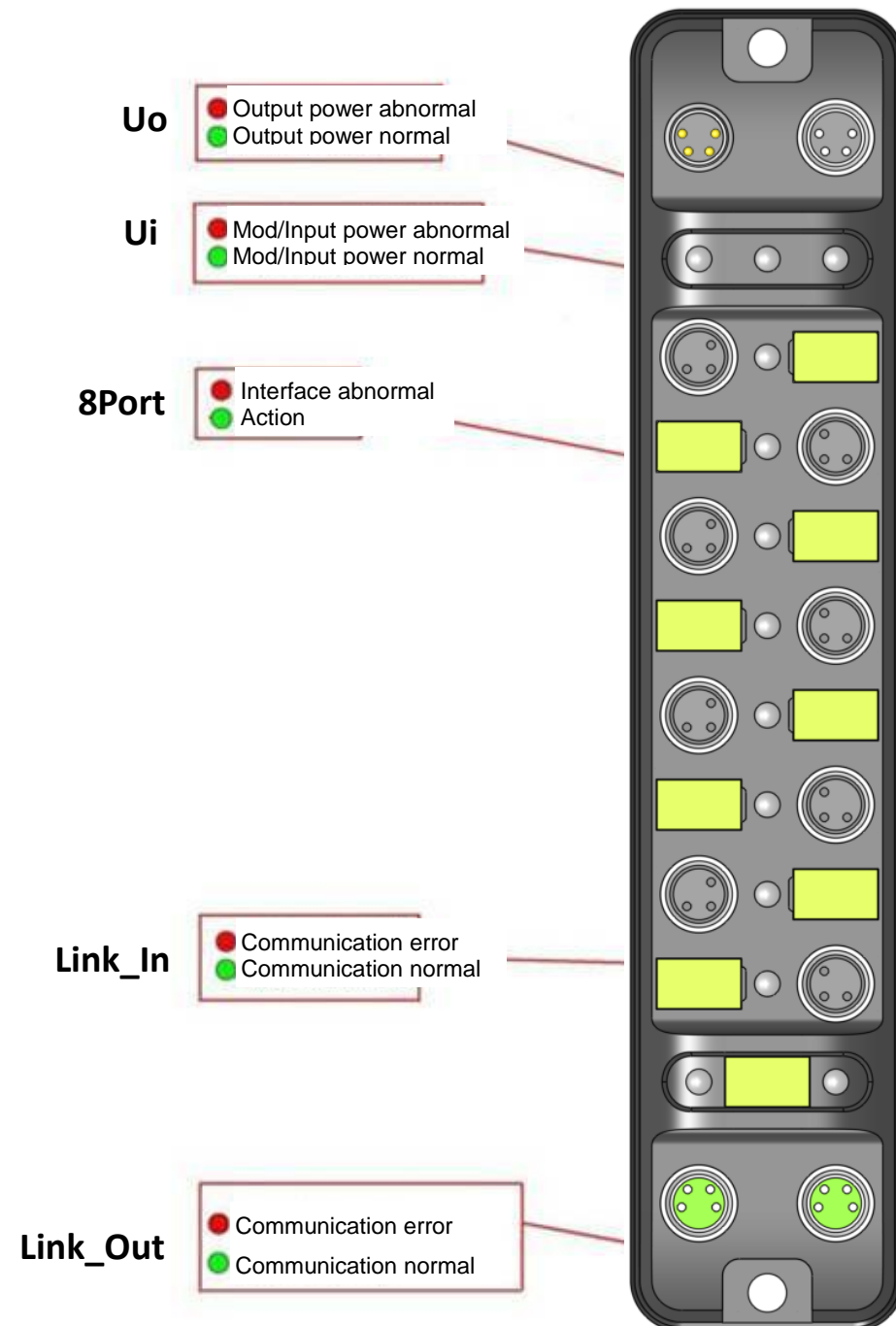
2.1 Hardware parameters

| Item | FEEC-0800P-M8 | FEEC-0404P-M8 | FEEC-08UP-M8 |
|------------------------------|---|----------------------------|--------------|
| Input points | 8 | 4 | Max. 8 |
| Output points | 0 | 4 | Max. 8 |
| EtherCAT Bus-in | 2 x M8 4pin, Female | | |
| EtherCAT Bus-out | 2 x M8 4pin, Female | | |
| I/O signal | 8 x M8 3pin, Female | | |
| Power in | 2 x M8 4pin, Male | | |
| Power out | 2 x M8 4pin, Female | | |
| Mod/Input Voltage | 24VDC (18~30V) | | |
| Output Voltage | 24VDC (18~30V) | | |
| Maximum output current | N/A | Per channel 0.5A, total 4A | |
| Output short circuit current | N/A | Per channel 20mA | |
| Max frequency | N/A | 100Hz | |
| Output Voltage | N/A | Voltage-0.7V | |
| Output type | N/A | PNP | |
| Input signal "0" | Low level: 0~5V | | |
| Input signal "1" | High level: 15~30V | | |
| Input delay | 0.5ms | | |
| Input current | 6.4mA | | |
| Input supply current | Holding current 100mA, Action current 150mA | | |
| Normal input voltage | 24VDC (10~30V) | | |
| Input type | PNP | | |
| Operation temperature | -25℃...70℃ | | |

| | |
|------------------------------|--------------|
| Storage temperature | -40°C...80°C |
| Anti-vibration Class | IE068-2-6 |
| Anti-interference EMC | EN 61000-6-2 |
| Protection class | IP67 |
| Operating life | 100,000 Hour |

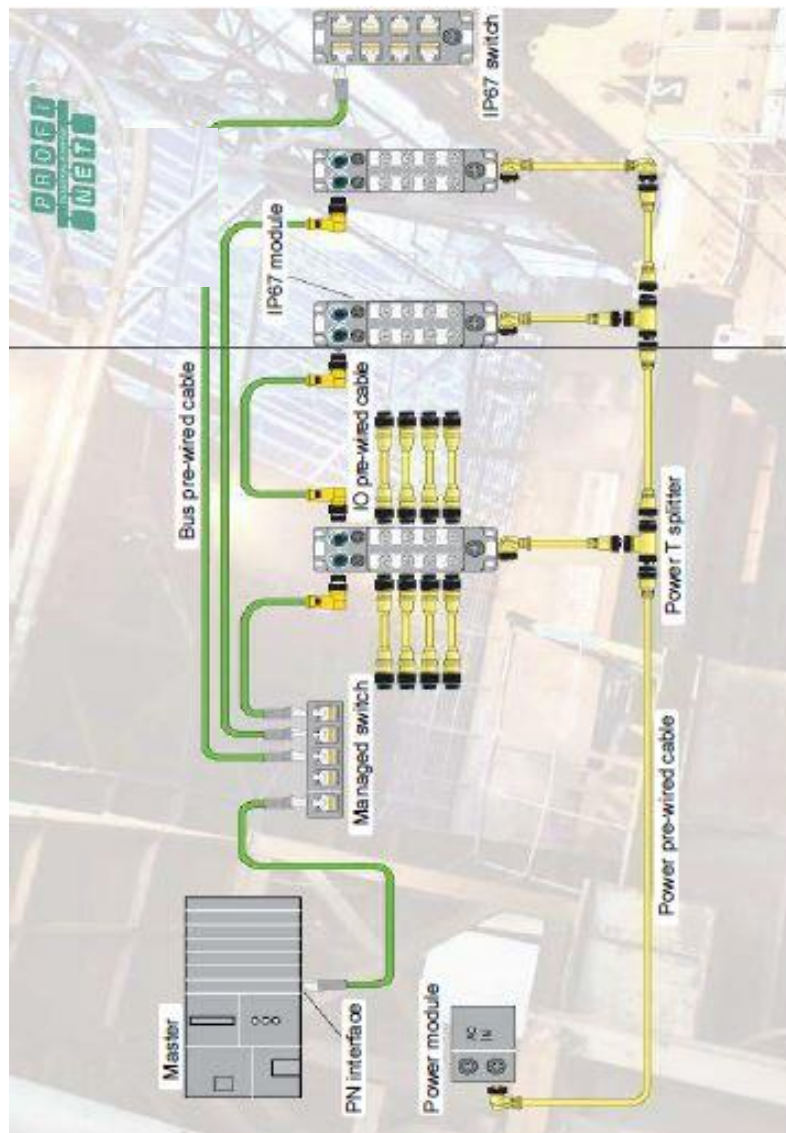
2.2 LED Indication

The operating status of the module can be clearly displayed by the LED indicator.



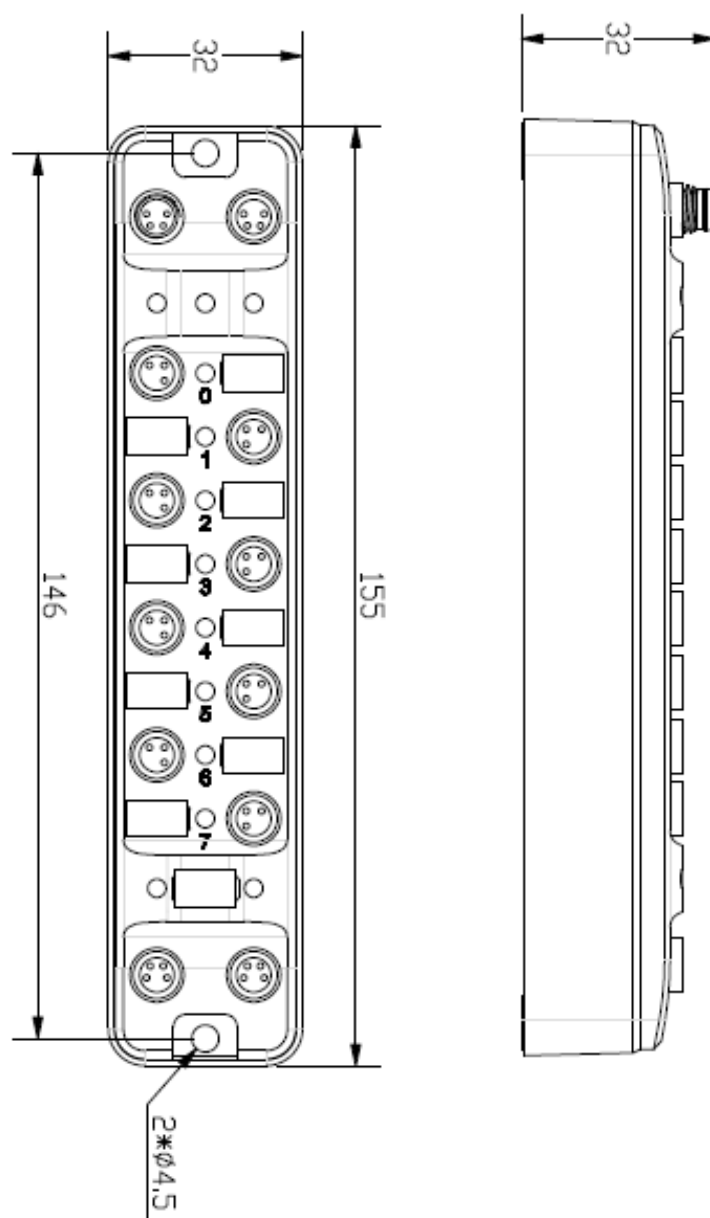
2.3 General system layout

The following figure shows an example of a conventional EtherCAT system module connection, which is powered by 24VDC power supply to three modules. EtherCAT network connects modules through switches or cascades. The further modules can also use more switches to expand the connection distance.



3. Installing

3.1 Mounting dimensions



3.2 Mounting position, mounting dimensions

Compact67_Slim can be mounted in any position because of IP67's high protection level and excellent anti-vibration and anti-interference capability. Compact67_Slim module adopts a uniform shape size. The following table shows the dimensions of the module:

| | Dimensions |
|-----------------|---------------------------|
| Mounting width | 32 mm |
| Mounting height | 155 mm |
| Mounting depth | 32 mm (without connector) |

3.3 Wiring Compact67_Slim

Please connect according to the basic electrical specifications. For personal and equipment safety, we recommend disconnecting the power supply during wiring operation.

3.3.1 Connecting Compact67_Slim to protective earth (PE)

- Always connect the Compact67_Slim to protective earth.
- The module also requires this connection to protective earth in order to discharge any interference currents to ground, and for EMC compatibility.
- Always make sure you have a low-impedance connection to protective earth.

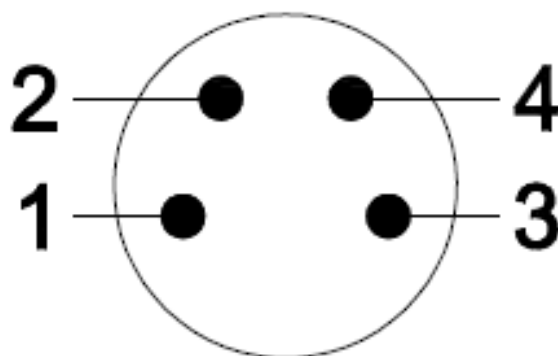
3.3.2 Compact67_Slim power supply

Compact67_Slim modules adopt 24VDC power supply, voltage range 18~30VDC, standard M8-4pin connector.

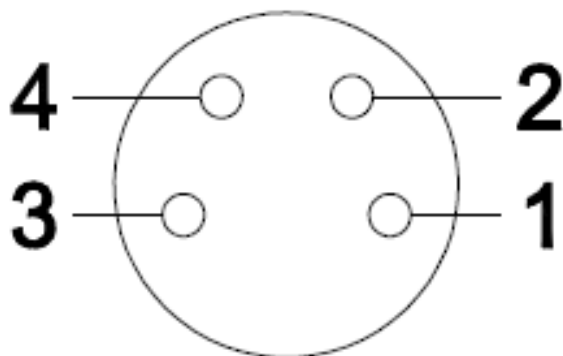
Two parts for power supply: module and input signal power supply U_i (1L+, 1M), output signal power supply (2L+, 2M). Electrical isolation between 1L+ and 2L+, internally connected between common point 1M and 2M.

(FEEC-0404P-M8 complete isolation of common points)

1) Power in connector view (Male)



2) Power out connector view (Female)



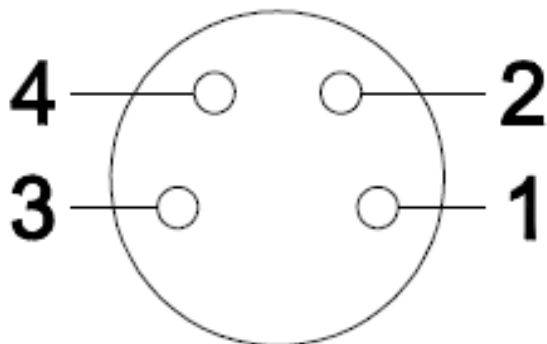
3) Power definition

| Terminal | Function | Power supply |
|----------|-----------------------------|--------------|
| 1 | Module and input signal 1L+ | 24V |
| 2 | Output signal 2L+ | 24V |
| 3 | Module and input signal 1M | 0V |
| 4 | Output signal 2M | 0V |

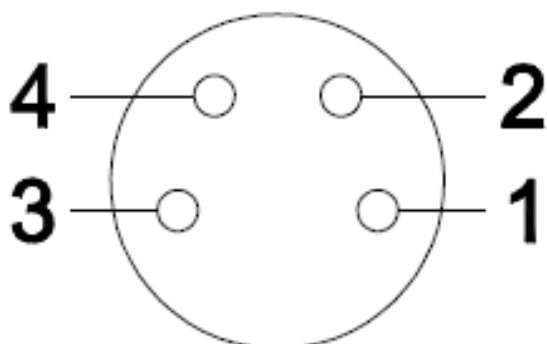
3.3.3 Compact67_Slim BUS connect

Compact67_Slim module, supporting EtherCAT protocol, transmits signals by a shielded cable, M8-4pin connector.

1) BUS-In connector view (Female)



2) BUS-Out connector view (Female)



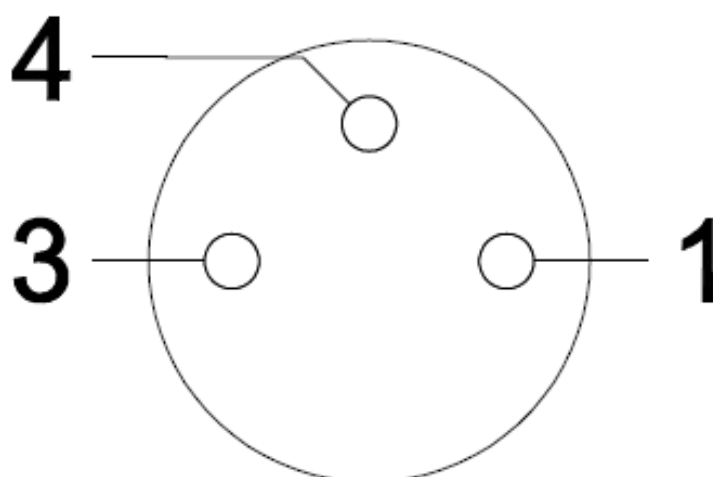
3) Bus definition

| Terminal | Function | Cable color |
|----------|----------------------|-------------|
| 1 | Transmit Data(TD+) | Yellow |
| 2 | Receive Data(RD+) | White |
| 3 | Receive Data(RD-) | Orange |
| 4 | Transmit Data(TD-) | Blue |

3.3.4 Compact67_Slim digital signal connect

I/O signals of Compact67_Slim module are connected by standard M8-3pin connectors, and each port can connect up to one signal (input or output).

1) Signal connector view (Female)

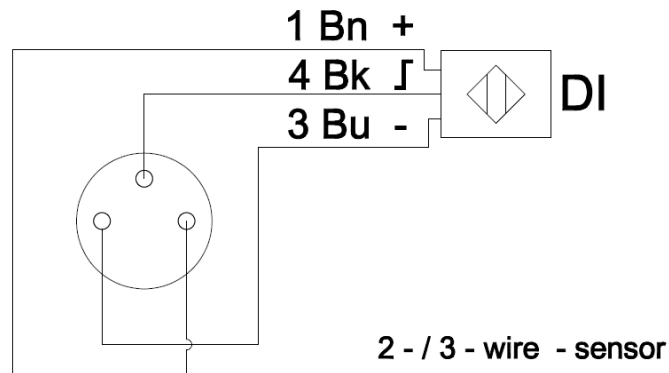


2) Digital signal interface definition

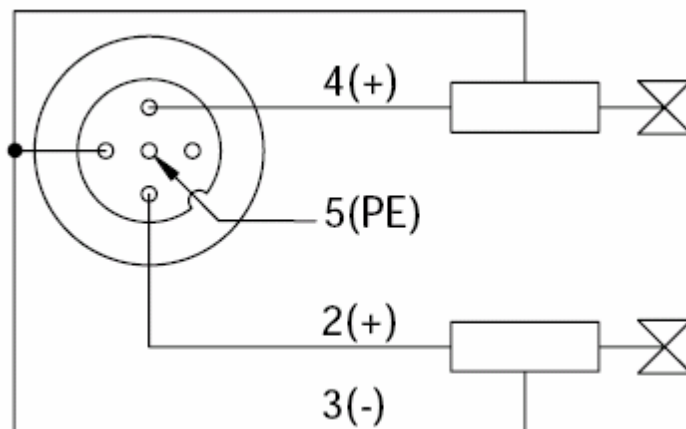
| Terminal | M12 connector | |
|----------|-------------------|------------------------|
| 1 | Power supply 24V+ | |
| 3 | Power supply GND | |
| 4 | Signal in/out A | 1 st signal |

3) Digital signal interface definition

a) Input signal – 1 connector connects 1 digital input, FEEC-0800P-M8, FEEC-0404P-M8, FEEC-08UP-M8 support this connection.



b) Output signal – 1 connector connects 1 digital output, FEEC-0404P-M8, FEEC-08UP-M8 support this connection.



4. Configuration Commissioning

4.1 Installation of configuration files

Configuration of Compact67_Slim distributed I/O device via ESI file (XML format) and the standard EtherCAT IO ESI file for the Compact67_Slim will be integrated into user's system. You can visit the ELCO website to get the latest GSD file or call the hotline to contact technical personnel.

How to integrate the ESI file into the system depends on the user's configuration software:

1. Beckhoff system

Take Beckhoff TwinCAT programming software used in EtherCAT system as an example, add ESI files according to the following steps:

Install TwinCAT, then copy the XML file of Compact67_Slim to the following installation directory, for example:

TwinCAT2-----C:\TwinCAT\Io\EtherCAT\

TwinCAT3-----C:\TwinCAT\3.1\Config\Io\EtherCAT\

2. Omron system

Take Omron Sysmac Studio software used in EtherCAT system as an example, add ESI files according to the following steps:

Install TwinCAT, then copy the XML file of Compact67_Slim to the following installation directory, for example:

C:\OMRON\Sysmac Studio\IODeviceProfiles\EsiFiles\UserEsiFiles

4.2 Signal address assignment

Each signal module with M8 interface has 8 connectors (P0~P7) for signal transmission; each connector has 3 pins (Pin1, Pin3, Pin4).

The following table indicates the matchup between signal status and bytes transmitted of EtherCAT.

1) 8 digital inputs module: FEEC-0800P-M8

| Byte | Bit | Channel | e.g |
|-----------------|-------|-----------|-------|
| Input Byte 0 | Bit 0 | Con0.Pin4 | I 0.0 |
| | Bit 1 | Con1.Pin4 | I 0.1 |
| | Bit 2 | Con2.Pin4 | I 0.2 |
| | Bit 3 | Con3.Pin4 | I 0.3 |
| | Bit 4 | Con4.Pin4 | I 0.4 |
| | Bit 5 | Con5.Pin4 | I 0.5 |
| | Bit 6 | Con6.Pin4 | I 0.6 |
| | Bit 7 | Con7.Pin4 | I 0.7 |

2) 4 digital input & 4 digital output module: FEEC-0404P-M8

| Byte | Bit | Channel | e.g |
|------------------------|-------|-----------|-------|
| Input/Output Byte 0 | Bit 0 | Con0.Pin4 | I 0.0 |
| | Bit 1 | Con1.Pin4 | I 0.1 |
| | Bit 2 | Con2.Pin4 | I 0.2 |
| | Bit 3 | Con3.Pin4 | I 0.3 |
| | Bit 4 | Con4.Pin4 | Q 0.4 |
| | Bit 5 | Con5.Pin4 | Q 0.5 |
| | Bit 6 | Con6.Pin4 | Q 0.6 |
| | Bit 7 | Con7.Pin4 | Q 0.7 |

3) 8 digital input/output configurable module: FEEC-08UP-M8

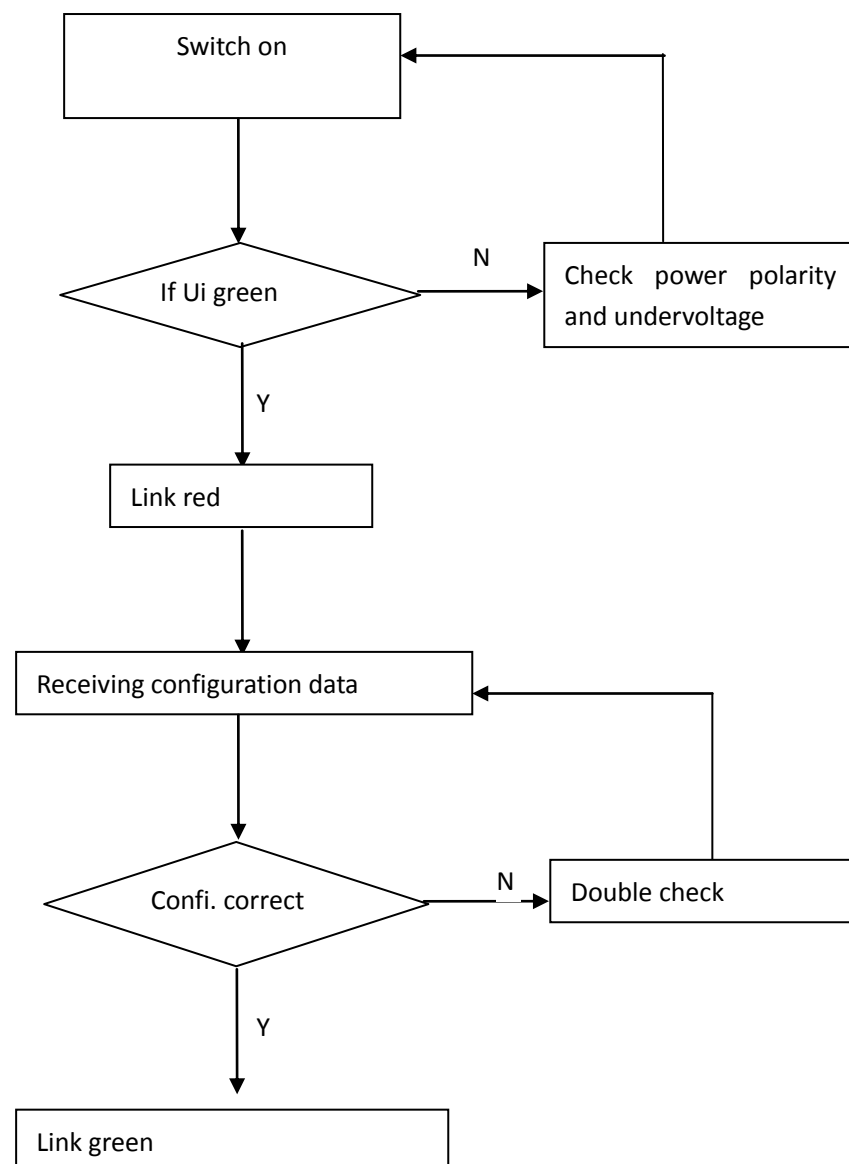
| Byte | Bit | Channel | e.g |
|------------------------|-------|-----------|----------------|
| Input/Output Byte 0 | Bit 0 | Con0.Pin4 | I 0.0 Q 0.0 |
| | Bit 1 | Con1.Pin4 | I 0.1 Q 0.1 |
| | Bit 2 | Con2.Pin4 | I 0.2 Q 0.2 |
| | Bit 3 | Con3.Pin4 | I 0.3 Q 0.3 |
| | Bit 4 | Con4.Pin4 | I 0.4 Q 0.4 |
| | Bit 5 | Con5.Pin4 | I 0.5 Q 0.5 |
| | Bit 6 | Con6.Pin4 | I 0.6 Q 0.6 |
| | Bit 7 | Con7.Pin4 | I 0.7 Q 0.7 |
| | | | |

4.3 Module Startup Process

Check whether the following requirements for the startup of the Compact67_Slim distributed I/O module system are met:

- Compact67_Slim power, bus and signal wired.
- The module address is set by software.
- Compact67_Slim is configured and downloaded into the controller.
- Supply voltage for controller is switched on.

Startup of Compact67_Slim:

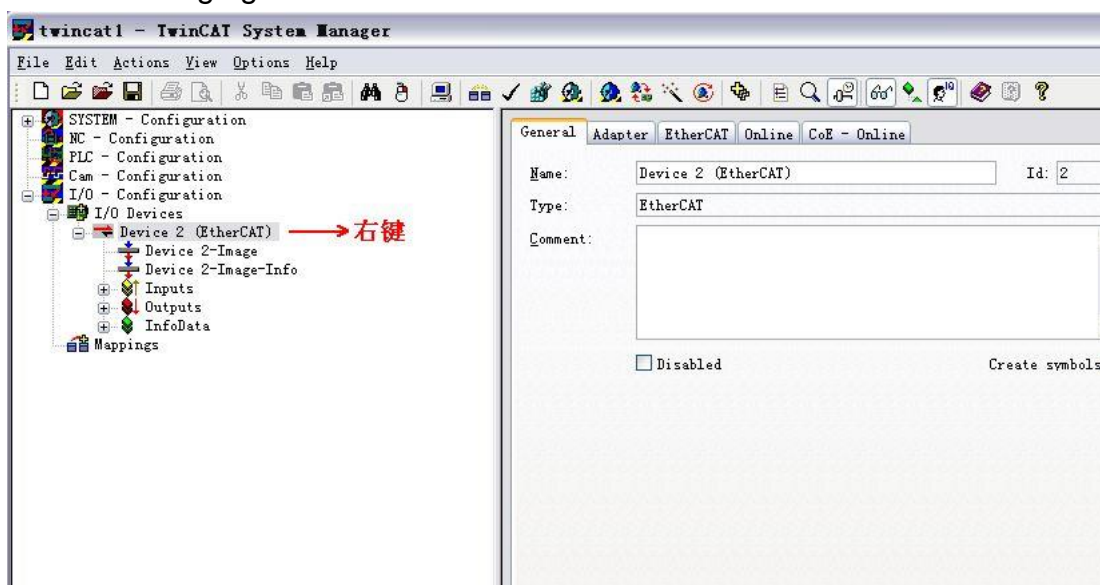


4.4 Module configuration example (Beckhoff)

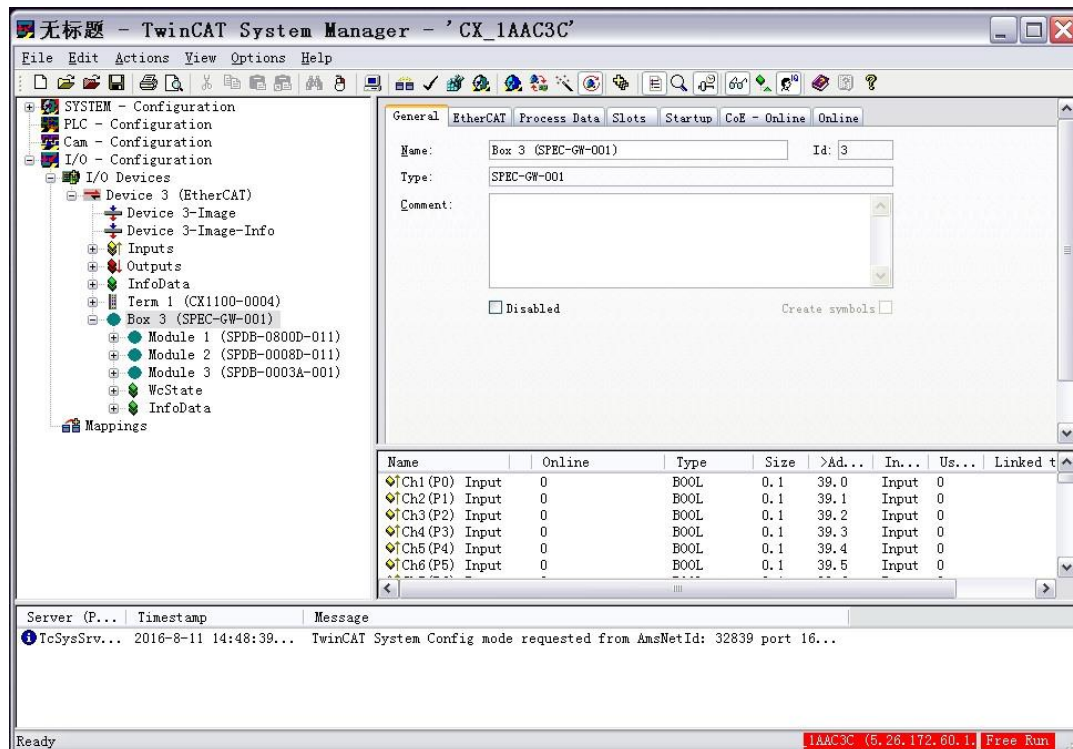
This section, through a case of connection configuration in actual operation process, makes the users fully understand how to use the Compact67_Slim distributed I/O system. In this case, using the ELCO Compact67_Slim as EtherCAT slave station to connect the Beckhoff EtherCAT controller CX1020 under the condition that all power and bus connection have been completed, the device name of Compact67_Slim is assigned as elco67.

The following will show the specific process of software configuration and debugging.

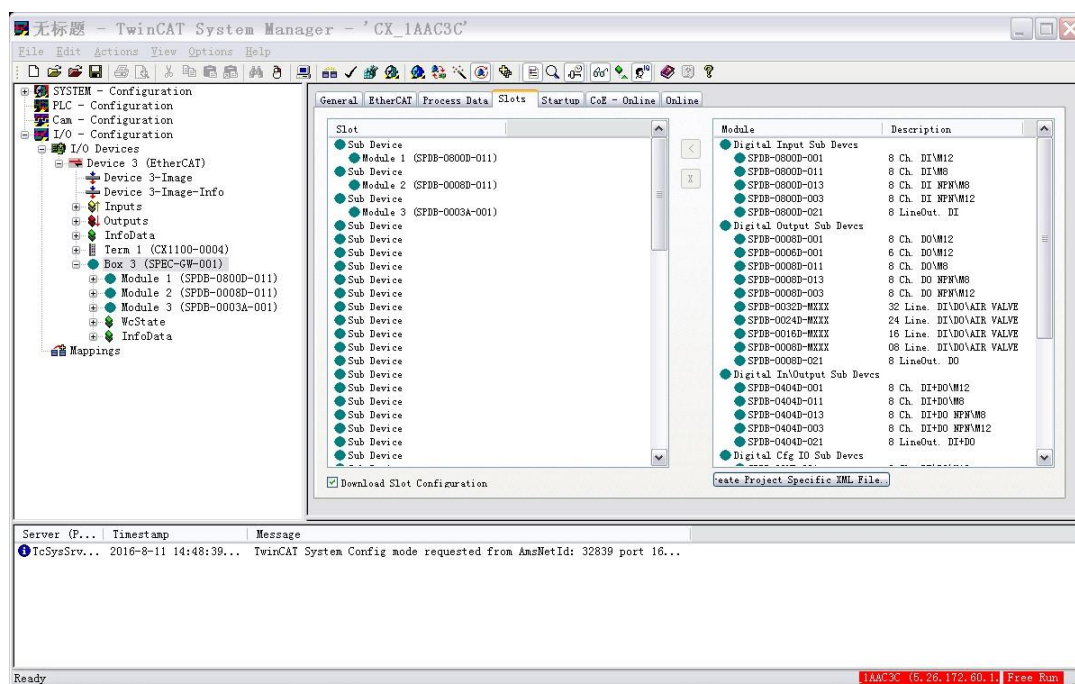
1) Start a new TwinCAT project, and connect to the PLC controller, switch to Config Mode. Then search the slave station: right-click at the arrow marker in the following figure>Scan Boxes...



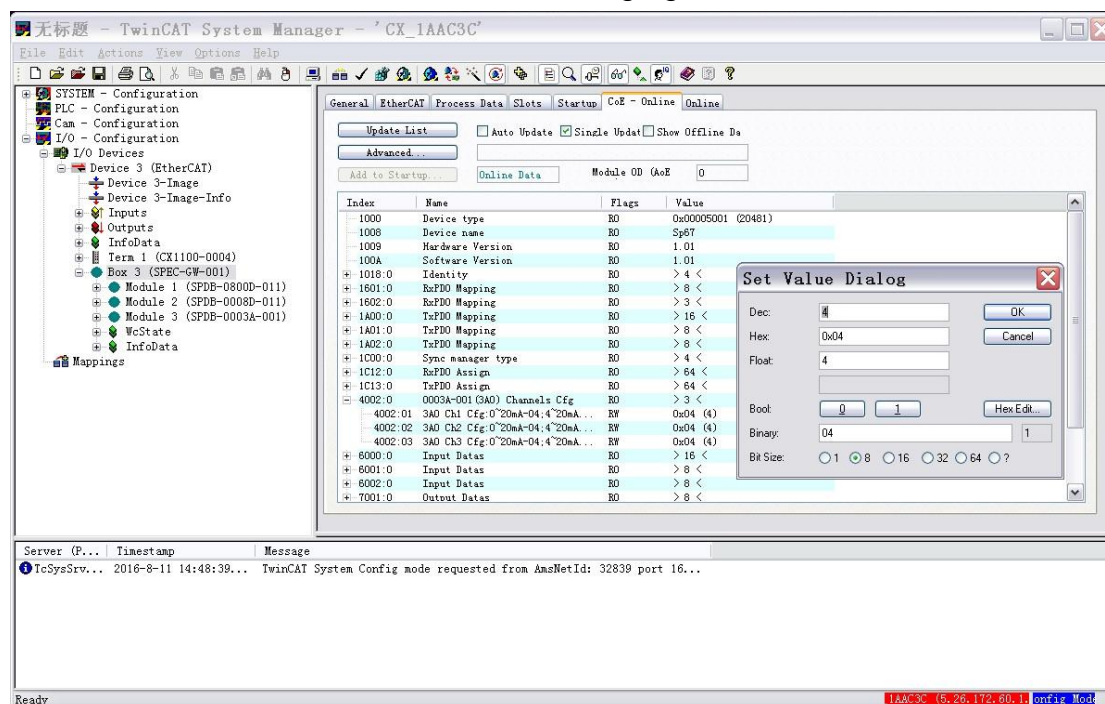
2) If the gateway is connected to PLC properly, the system can automatically search the Compact67_Slim slave station and see the specific module connection. As follows:



3) In order to configure specific modules and send them to PLC to ensure the normal use of subsequent power-ups, it is necessary to check the "Download Slot Configuration" option in the Slots label.



4) For configurable modules like FEEC-08UP-M8, customers can set information such as signal input or output, and customers can modify it in the CoE-Online tab. Please refer to the following figure:



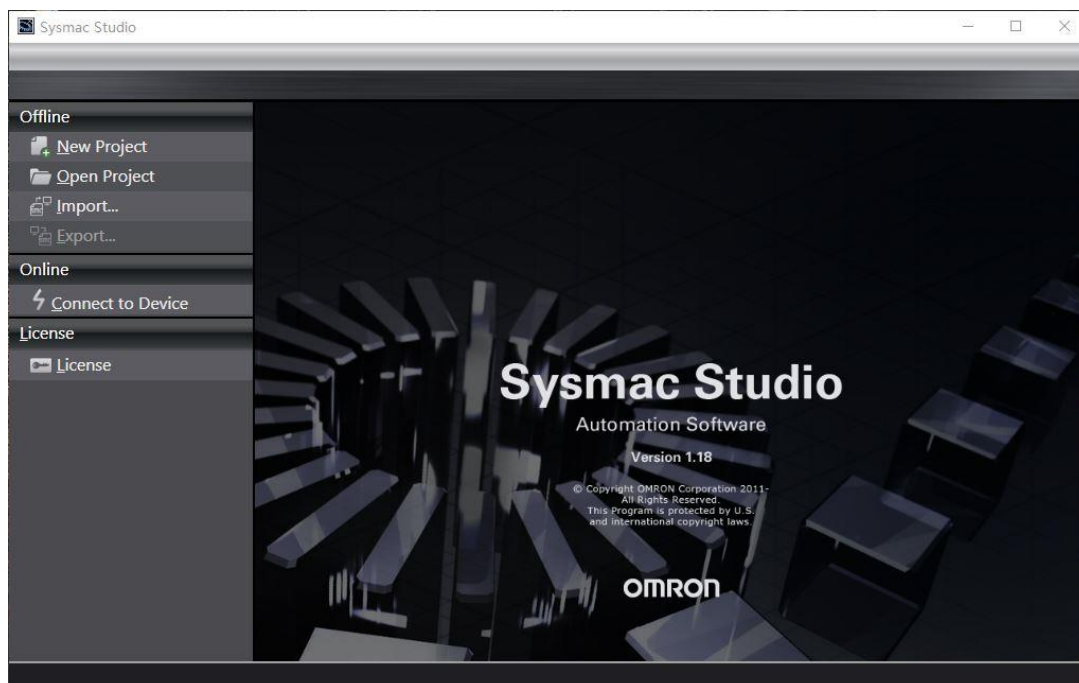
5) After all the settings are completed, click on the "Reload I/O Devices" button and download all the information to the PLC. At this time, the module should be in the connection state and the MOD indicator light should be in the evergreen state.

4.5 Module configuration example (Omron)

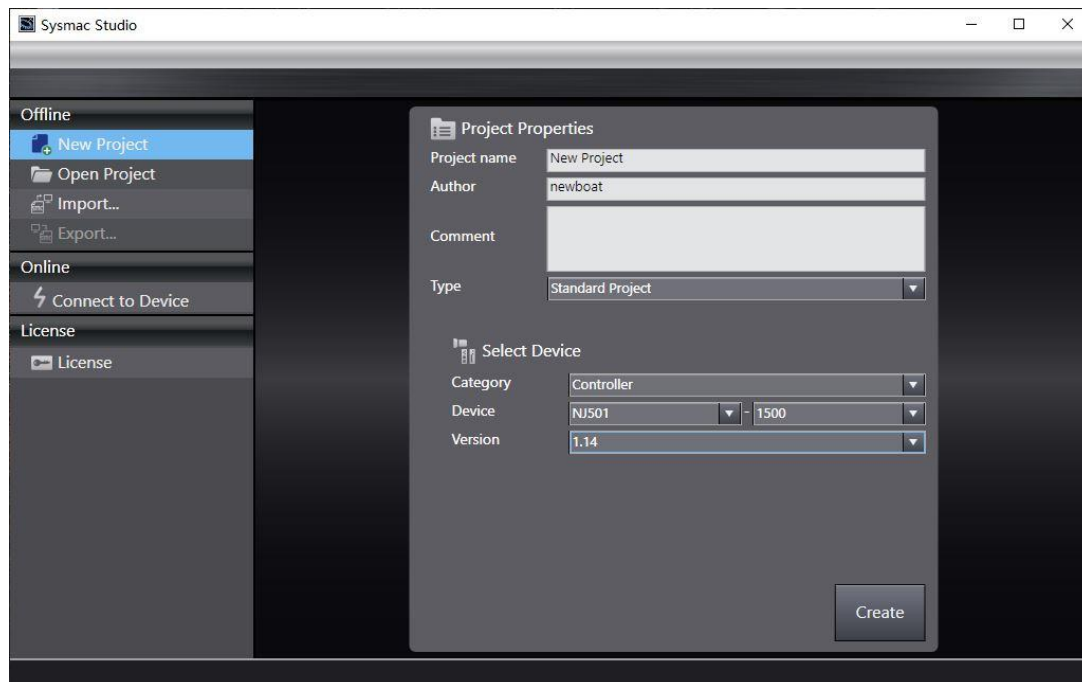
This section, through a case of connection configuration in actual operation process, makes the users fully understand how to use the Compact67_Slim distributed I/O system. In this case, using the ELCO Compact67_Slim as EtherCAT slave station to connect the Omron EtherCAT controller NJ301-1100 under the condition that all power and bus connection have been completed, the device name of Compact67_Slim is assigned as elco67.

The following will show the specific process of software configuration and debugging.

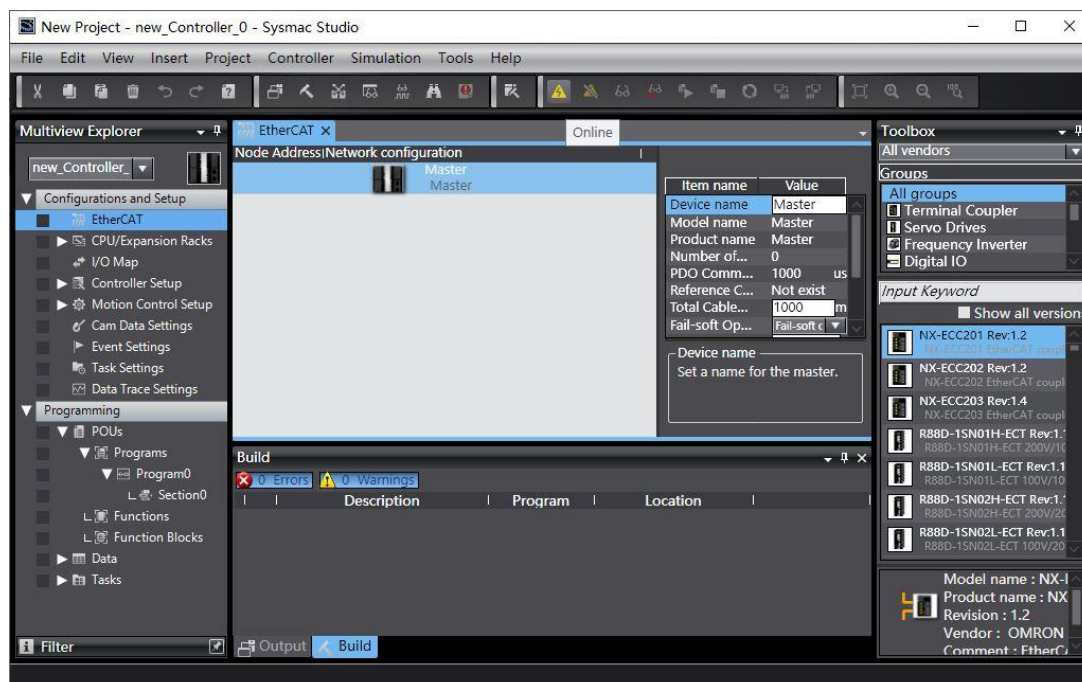
- 1) Open Sysmac Studio, Click 'New Project..'



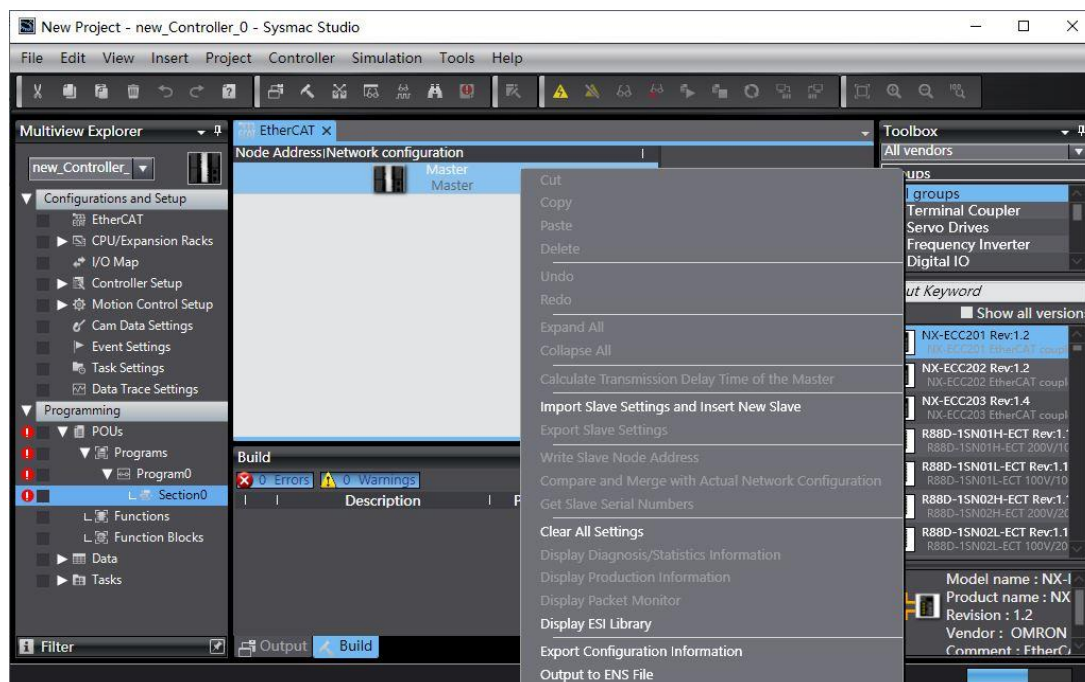
2) Fill in the corresponding information according to the type of PLC and click "Create."



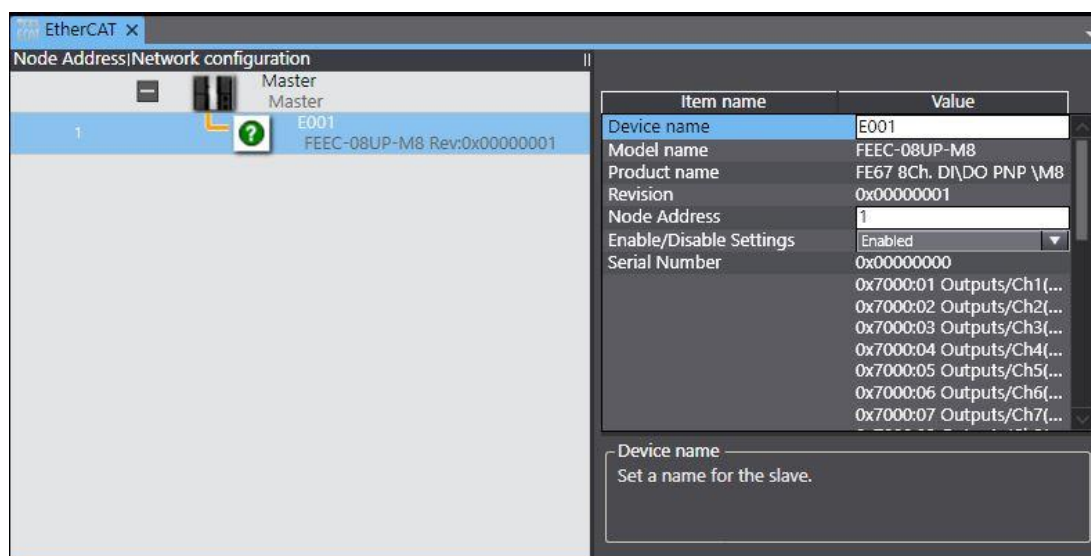
3) Click on the Link icon in the toolbar



4) Select "Ethercat" in the "Configuration and Settings" list on the right, and you can see the corresponding controller icon at B.



5) Right-click on the PLC icon and select the item "Configuration and Merge with Physical Network" to see the following interface. You can see the FEEC module appears at A, then click on B, until the FEEC module icon appears under the PLC in the list on the left.



6) After compiling the PLC program and downloading, all IO information can be seen by selecting the "I/O mapping" label.

| EtherCAT | | Section0 - Program0 | | I/O Map x | | |
|--------------------------------|---------------------------------|---------------------|-----|-----------|----------|----------|
| Position | Port | Description | R/W | Data Type | Variable | Variable |
| EtherCAT Network Configuration | | | | | | |
| Node1 | FEEC-08UP-M8 | | | | | |
| | Outputs_Ch1(P0A) Output_7000D_0 | | W | BOOL | | |
| | Outputs_Ch2(P1A) Output_7000D_0 | | W | BOOL | | |
| | Outputs_Ch3(P2A) Output_7000D_0 | | W | BOOL | | |
| | Outputs_Ch4(P3A) Output_7000D_0 | | W | BOOL | | |
| | Outputs_Ch5(P4A) Output_7000D_0 | | W | BOOL | | |
| | Outputs_Ch6(P5A) Output_7000D_0 | | W | BOOL | | |
| | Outputs_Ch7(P6A) Output_7000D_0 | | W | BOOL | | |
| | Outputs_Ch8(P7A) Output_7000D_0 | | W | BOOL | | |
| | Inputs_Ch1(P0A) Input_6000D_01 | | R | BOOL | | |
| | Inputs_Ch2(P1A) Input_6000D_02 | | R | BOOL | | |
| | Inputs_Ch3(P2A) Input_6000D_03 | | R | BOOL | | |
| | Inputs_Ch4(P3A) Input_6000D_04 | | R | BOOL | | |
| | Inputs_Ch5(P4A) Input_6000D_05 | | R | BOOL | | |
| | Inputs_Ch6(P5A) Input_6000D_06 | | R | BOOL | | |
| | Inputs_Ch7(P6A) Input_6000D_07 | | R | BOOL | | |
| | Inputs_Ch8(P7A) Input_6000D_08 | | R | BOOL | | |
| | Inputs_Ch1(P0A) Input_6000D_09 | | R | BOOL | | |