

# FCEN-8LKM-8A-M Module

----Multi Protocol System Manual



**Preface ..... 5**

- 1. Scope of this manual: ..... 5
- 2. Basic knowledge requirements ..... 5
- 3. Guide: ..... 5
- 4. Technical support: ..... 5
- 5. Disclaimer of liability: ..... 5

**1. Product overview ..... 6**

- 1.1 Introduction ..... 6
- 1.2 Applications ..... 6
- 1.3 Features ..... 6
- 1.4 Type ..... 7

**2. Technical characteristics ..... 8**

- 2.1 IO-Link master ..... 8
- 2.2 IO-Link sensor hub ..... 8
- 2.3 IO-Link cable ..... 8
- 2.4 Hardware ..... 9
- 2.5 LED indicator ..... 10

**3. Installation and wiring ..... 11**

- 3.1 Installation dimensions ..... 11
- 3.2 Installation position and size ..... 12
- 3.3 Wiring guidance ..... 13
  - 3.3.1 Connecting module to protective earth (PE) ..... 13
  - 3.3.2 Module power supply ..... 13
  - 3.3.3 Module Bus connection ..... 15
  - 3.3.4 IO-Link master port cable connection ..... 16
- 3.4 Setting protocols of the module ..... 17

**4. EtherNet/IP ..... 18**

- 4.1 Setting the network parameters ..... 18
  - 4.1.1 Setting IP through DHCP software (Code: 000) ..... 19
  - 4.1.2 Setting IP through Webserver (Code: 001~254) ..... 22
- 4.2 Module address assignment ..... 23
- 4.3 INPUT data address assignment ..... 24
  - 4.3.1 Status feedback of IO-Link master ..... 24
  - 4.3.2 Input signal of IO-Link master ..... 26
  - 4.3.3 Input signal and status feedback of IO-Link slave ..... 26
- 4.4 OUTPUT data address assignment ..... 31
  - 4.4.1 Control function of IO-Link master ..... 31
  - 4.4.2 Output signal of IO-Link master ..... 32
  - 4.4.3 Output signal of IO-Link slave ..... 32
- 4.5 CONFIG data address assignment ..... 34
  - 4.5.1 General settings of IO-Link master ..... 34
  - 4.5.2 Port settings of IO-Link master ..... 36

- 4.5.3 Parameter settings of IO-Link slave .....38
- 4.6 Configuration commissioning (AB PLC) .....42
  - 4.6.1 Installing EDS files .....42
  - 4.6.2 Configuration example in Logix Designer ..... 43
  - 4.6.3 Import Add-On Instruction .....50
- 5. PROFINET ..... 55**
  - 5.1 Setting the network parameters ..... 55
  - 5.2 Module address assignment ..... 57
    - 5.2.1 I/O signal of IO-Link master .....57
    - 5.2.2 Status feedback of IO-Link master ..... 58
    - 5.2.3Control function of IO-Link master ..... 59
  - 5.3 Setting parameters of the module ..... 60
    - 5.3.1 Global diagnostic settings ..... 60
    - 5.3.2Port settings of IO-Link master .....61
    - 5.3.3 Process data layout ..... 62
  - 5.4 Module configuration by Portal (Siemens PLC) ..... 64
- 6.ModbusTCP ..... 72**
  - 6.1 Setting the network parameters ..... 72
  - 6.2 Add modbus slave channel .....72
  - 6.3 Configuration of Analog Module Parameters ..... 73
    - 1) Configuration of Analog Module Parameters ..... 73
    - 2) Use the web to select the IODD file of the analog module for channel configuration. ....73
    - 3) Analog module occupied word length ..... 74
  - 6.4 ModbusTCP slave I/O mapping .....74
  - 6.5 Module address assignment ..... 75
- 7. CC-Link IE Field Basic .....78**
  - 7.1 Setting the network parameters ..... 78
  - 7.2 Module address assignment ..... 81
  - 7.3 RX and RY data address assignment ..... 82
    - 7.3.1 Status feedback of IO-Link master ..... 83
    - 7.3.2Input signal of IO-Link master ..... 84
    - 7.3.3 Control function of IO-Link master ..... 85
    - 7.3.4 Output signal of IO-Link master ..... 85
  - 7.4 RWr and RWw data address assignment ..... 87
  - 7.5 Setting parameters of the module ..... 90
    - 7.5.1 Occupied Station Address Setting ..... 92
    - 7.5.2Each IO-Link Port Size ..... 92
    - 7.5.3 Process Data Layout ..... 93
    - 7.5.4 Port settings of IO-Link master ..... 94
  - 7.6 Module configuration by MELSOFT (Mitsubishi PLC) ..... 96
    - a. Install CSPP configuration file for FCEN-8LKM-8A-M module ..... 96
- 8. Webserver ..... 104**
- 9. Alarm diagnosis ..... 109**

9.1 LED fault indicator .....	109
9.2 EtherNet/IP address assignment .....	110
9.3 PROFINET address assignment .....	112
9.4 CC-Link IE FB address assignment .....	113

## Preface

### 1. Scope of this manual:

This manual applies to the FCEN-8LKM-8A-M module of ELCO.

The information in this manual enables you to run the FCEN-8LKM-8A-M module on Profinet, CC-Link IE FieldBasic, Modbus-TCP and EtherNet/IP as 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 introduces the hardware and usage of the FCEN-8LKM-8A-M module for the Profinet, EtherNet/IP, CC-Link IEFB and Modbus-TCP protocol. Covered topics are:

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

### 4. Technical support:

Please contact your local ELCO representative or call the hotline if you have any questions about the products described in this manual.

Additional information about ELCO products is available:

<https://www.elcoautomation.com/en-us/>

### 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.

## 1. Product overview

### 1.1 Introduction

The FCEN-8LKM-8A-M module supporting IO-Link function is a new type of distributed I/O system. As a multi protocol module, FCEN-8LKM-8A-M allows users to select different protocols (Profinet, EtherNet/IP, CC-Link IEFB and Modbus-TCP) for communication with PLC.

This series of products adopts a fully sealed design structure and can be directly installed in industrial sites, including harsh working environments where liquids, dust, and vibrations may occur.

### 1.2 Applications

IO-Link is an IO communication technology from the controller to the lowest level of automation. Through the IO-Link master, information such as sensors and actuators is transmitted to the controller via the fieldbus network so as to improve work efficiency and reduce production costs.

FCEN-8LKM-8A-M module supporting IO-Link communication, as an IO-Link master, does not require a dedicated communication cable, and can achieve efficient communication with IO-Link device through traditional non-shielded industrial cables. Each IO-Link master can support a maximum of 8 IO-Link interfaces. It meets the requirements of IO-Link v1.1 and supports three transmission rate COM1 (4.8kbps), COM2 (38.4kbps), COM3 (230.4kbps). It can easily connect IO-Link sensors of various brands and other IO-Link devices, as well as sensors and actuators of ordinary switching signals.

### 1.3 Features

- **Up to IP67 protection class**
- **Designed with IO-Link v1.1.3 specification**
- **The IO-Link master supports three communication rates of COM1, 2 and 3**
- **Interface type Class-A or Class-B is optional**
- **Connects various IO-Link standard devices and standard switch signals**
- **LED status display, channel protection and diagnosis**

## 1.4 Type

..

No.	Type	Description
1	FCEN-8LKM-8A-M	Multi protocol IO-Link master module, supporting Profinet, EtherNet/IP, CC-Link IEFB and Modbus-TCP. 8 IO-Link interfaces (8*Class-A) 2 Male+Female, M12 L-Code power supply 2 Female, M12 D-Code field bus interface

## 2. Technical characteristics

### 2.1 IO-Link master

Each FCEN-8LKM-8A-M module occupies an Profinet, EtherNet/IP, CC-Link IEFB and Modbus-TCP address. Depending on the type, up to 8 IO-Link devices can be connected. As an Profinet, EtherNet/IP, CC-Link IEFB and Modbus-TCP slave, the FCEN-8LKM-8A-M module can specify the device name and the corresponding IP address through the configuration software, or it can automatically assign an IP address by the PLC according to the network topology, thereby realizing the communication of the Profinet, EtherNet/IP, CC-Link IEFB and Modbus-TCP network based on the industrial Ethernet structure. The customer can set the IO-Link interface to the communication mode that meets the requirements of IO-Link v1.1.3 or the SIO mode used as standard digital input and output in the programming software as required.

The IO-Link interface supports a total of three transmission rate: COM1 (4.8kbps), COM2 (38.4kbps) and COM3 (230.4kbps). The rate will be adaptive according to the characteristics of the IO-Link device.

### 2.2 IO-Link sensor hub

The Compact67 series IO-Link signal hub can be used as an IO-Link device to connect with the IO-Link master of ELCO or other brands. It conforms to the IO-Link v1.1.3 standard and supports COM2 (38.4 kbps) transmission rate. Each IO-Link interface of the IO-Link master module can be extended with an IO-Link hub to collect input and output signals. That is, an 8-port IO-Link master plus 8 IO-Link hubs which can connect up to 128 digital signals.

IO-Link signal hub has different types to choose from, there are products that support Class-A or Class-B standards, and also include two different signal interface - M12 (A-Code, 2 digital or 1 analog are available) and M8 (3-pin, 1 digital is available).

### 2.3 IO-Link cable

According to the IO-Link protocol, point-to-point transmission is used between the IO-Link master and device. With the ordinary not shielded industrial cables (such as sensor cables), an extended distance of 20 meters can be reached.

According to the IO-Link protocol standard, ordinary 3-core cables can meet transmission requirements, and the 4-core or 5-core cables are used for specific functions. The Compact67 series IO-Link module needs to determine what kind of cable connection to use according to the interface type and IO type of the IO-Link hub.

- 1) Class-A IO-Link interface, because only three pins are defined, the fourth pin (PIN2) can be used as auxiliary power supply, so input IO-Link hub can use 3-core cable, output IO-Link hub requires a 4-core cable.
- 2) Class-B IO-Link interface, because all five pins are defined, when using this IO-Link hub to connect to the IO-Link master, a 5-core cable should be used.

## 2.4 Hardware

---

### ARTICLE PROPERTIES

<b>PRODUCT TYPE</b>	IO-Link Master	<b>PROTOCOL</b>	EtherNet/IP, Profinet, CC-Link IE FB, Modbus-TCP
<b>DESCRIPTION</b>	8 x IO-Link, Class-A	<b>OPERATING MODES</b>	Auto-negotiation, Auto-MDI/MDI-X
		<b>TRANSFER RATE</b>	10/100 Mbps

---

### ELECTRICAL DATA

<b>SUPPLY VOLTAGE</b>	24 V DC (18 ... 30 V DC)	<b>IO-LINK PORTS</b>	8
<b>CURRENT CONSUMPTION</b>	Max. 200 mA	<b>IO-LINK TYPE</b>	8*Class-A
<b>SYSTEM &amp; INPUT SUPPLY</b>	Us, Max. 12 A	<b>IO-LINK VERSION</b>	IO-Link V1.1.3
<b>OUTPUT SUPPLY</b>	Us, Max. 12 A	<b>IO-LINK COMMUNICATION RATES</b>	COM1 (4.8 kbps), COM2 (38.4 kbps), COM3 (230.4 kbps)
<b>ELECTRICAL ISOLATION</b>	Us and Ua: 24 V separated, 0 V connected	<b>INPUT CHANNELS</b>	Max. 16 (8*Pin4 + 8*Pin2)
<b>POWER SUPPLY</b>	2 x M12 L-code 5 pin, Male + Female	<b>INPUT SUPPLY CURRENT</b>	Pin1 & Pin3: 1.6 A per channel
<b>FIELDBUS</b>	2 x M12 D-code 4 pin, Female	<b>INPUT TYPE</b>	PNP sensors, mechanical switches, dry contacts, etc.
<b>SIGNALS</b>	8 x M12 A-code 5 pin, Female	<b>INPUT DELAY</b>	1.6 ms
<b>COMMUNICATION INDICATION</b>	LED indication, Communication message	<b>OUTPUT CHANNELS</b>	Max. 8 (8*Pin2)
<b>VOLTAGE DETECTION</b>	Support, Low voltage alarm	<b>OUTPUT CURRENT</b>	Max. 2 A per channel
<b>SHORT-CIRCUIT &amp; OVERLOAD</b>	Support, LED indication	<b>OUTPUT TYPE</b>	Lamps, solenoidvalve, etc.
		<b>OUTPUT FREQUENCY</b>	Resistive load 100 Hz, Inductive load 5 Hz

---

### GENERAL DATA

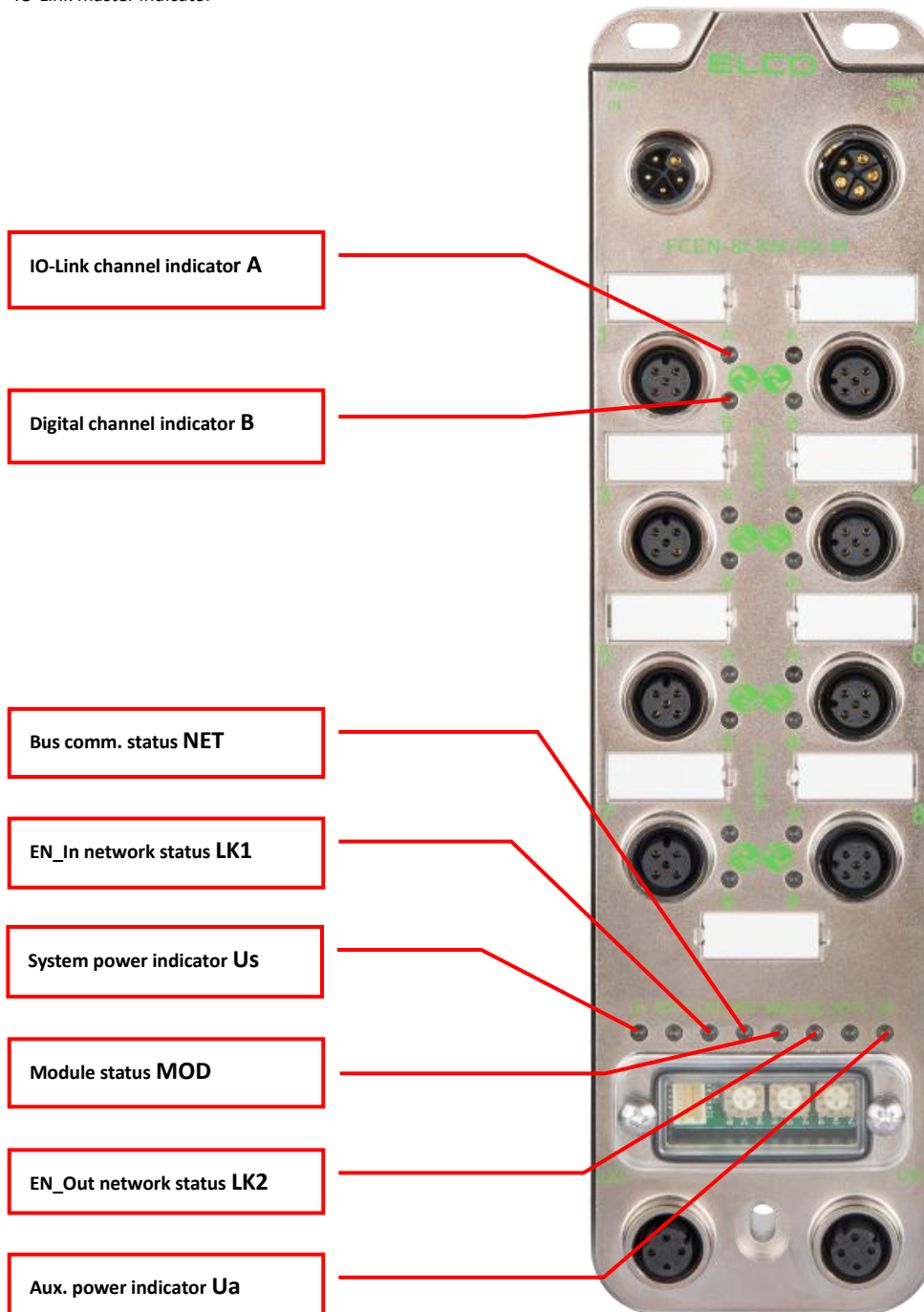
<b>HOUSING MATERIAL</b>	Casting Zinc Alloy	<b>OPERATING TEMPERATURE</b>	-25 ... +70 °C
<b>PROTECTION</b>	IP67	<b>STORAGE TEMPERATURE</b>	-40 ... +85 °C
		<b>DIMENSIONS</b>	60 x 230 x 32.6 mm

---

## 2.5 LED indicator

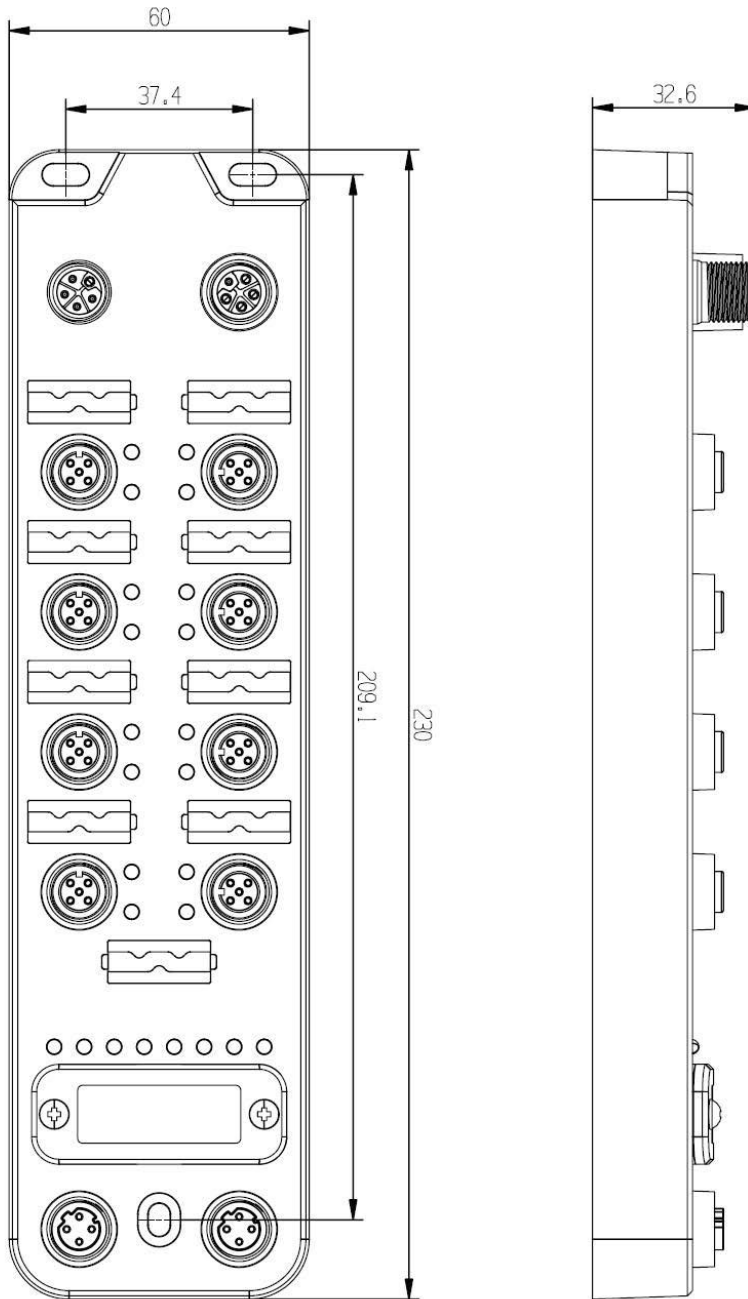
The module's indicator can clearly indicate its operating status. For specific fault indications and solutions, please refer to Section 7.1 "LED Fault Indicator".

IO-Link master indicator



### 3. Installation and wiring

#### 3.1 Installation dimensions



## 3.2 Installation position and size

Thanks to IP67 high protection level and excellent resistance to vibration and interference, FCEN-8LKM-8A-M can be installed in almost any location.

FCEN-8LKM-8A-M uses a compact design to minimize installation space. Its IO-Link master module and IO-Link signal hub use standard dimensions.

The following table shows the module installation dimensions:

	FCEN-8LKM-8A-M
Installation width	60mm
Installation height	230mm
Installation depth	32.6mm

### 3.3 Wiring guidance

Please make sure to cut off power supply when wiring to ensure safety.

#### 3.3.1 Connecting module to protective earth (PE)

- Always connect the module 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.

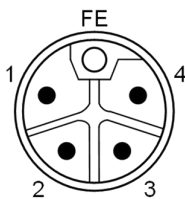
#### 3.3.2 Module power supply

FCEN-8LKM-8A-M module adopts 24VDC power supply, and power IO-Link signal hub by extensible cable, voltage range 18~30VDC, standard M12 L-Code connector.

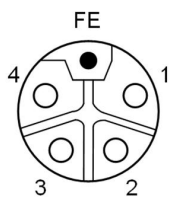
The power supply of IO-Link master is divided into two parts: System and sensor power supply  $U_s$  (+24V, 0V), and auxiliary power supply  $U_a$  (P24, N24).  $U_s$  is used for module chips and input signal power supply, while  $U_a$  is used for output signal power supply.

For FCEN-8LKM-8A-M, the two power supply are partially isolated, electrical isolation between  $U_{s+}$  and  $U_{a+}$ , and internally connected between  $U_{s-}$  and  $U_{a-}$ .

1) Power in connector (Male)



## 2) Power out connector (Female)



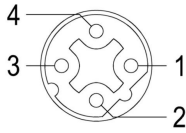
## 3) Power definition

Terminal	Function	Power supply
1	System and input power supply $U_{s+}$	24V
2	Output power supply $U_{a-}$	0V
3	System and input power supply $U_{s-}$	0V
4	Output power supply $U_{a+}$	24V
5	Function earth FE	

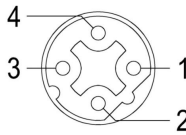
### 3.3.3 Module Bus connection

FCEN-8LKM-8A-M module, supporting Profinet or EtherNet/IP protocol, transmits signals by a shielded cable, M12 D-Code connector.

1) BUS-In (Female)



2) BUS-Out (Female)



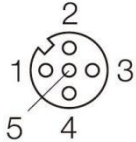
3) Bus definition

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

## 3.3.4 IO-Link master port cable connection

All Compact67 series IO-Link masters are connected through a standard 5-pin M12 connector. Each M12 port can be connected to a maximum of 1 IO-Link signal or 2 switching signals (input or output).

- 1) IO-Link port connector (Female)



- 2) IO-Link port pin definition

Terminal	Class-A
1	Power supply 24V+
2	Signal input/output B
3	Power supply GND
4	IO-Link/input A
5	Function earth FE

- 3) The power supply (Pin1 and Pin3) and signal input power supply come from the system power supply  $U_s$ , and signal output power supply (Pin2) come from the auxiliary power supply  $U_a$ .

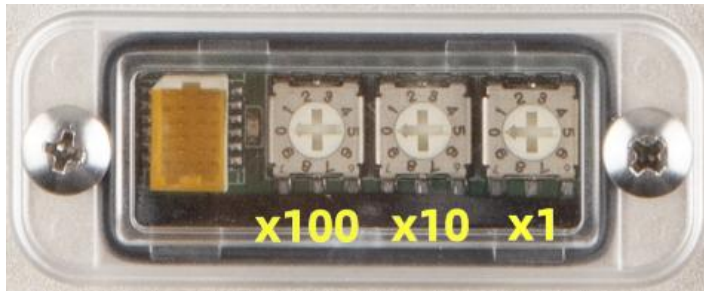
**Note: When the master station of Class-A interface is used to connect LKHA series slaves, the output of Pin2 (i.e. signal B) can be controlled by program to meet the output power supply of LKHA slaves.**

## 3.4 Setting protocols of the module

The multi protocol technology allows you to use the same module in different field bus systems. The FCEN-8LKM-8A-M module supports both Profinet, EtherNet/IP, CC-Link IEFB and Modbus-TCP, users can easily switch them.

The FCEN-8LKM-8A-M module can set the protocol and network parameters (such as IP address, subnet mask, etc.) through its built-in rotary code switch. The module will read the status of the switch and update the corresponding network parameter operation mode when re-powered on.

**Note: Please operate the rotary code switch when the module is powered off, and it will take effect when powered on again.**



The following table describes the protocol selection by the rotary switch settings:

Protocol	x100	x10	x1
EtherNet/IP	0-2	0-9	0-9
Profinet	3	0-9	0-9
CC-LinkIEFB	4-6	0-9	0-9
ModbusTCP	7	0-9	0-9

The factory default setting of the rotary switch is 300, that means it works as a Profinet slave. You can change the protocol to EtherNet/IP by setting the rotary switch to 000~299. You can also change the protocol to CC-Link IEFB by setting the rotary switch to 400~699. If you want to do this, you must turn off the power supply of the module first. After you finish the setting of rotary switch, power on the module again and the module will start the switching process. The LED next to the rotary switch will flash yellow and the indicators of IO-Link port will turn red. The protocol switching will be finished after about 30 seconds. The LED indicator next to the rotary switch and the LED indicators of IO-Link port will turn off. Then you have finish the protocol switching progress after the power recycled.

If you want to change the protocol back to Profinet. You need to repeat the process above with setting rotary switch to 300-399.

## 4. EtherNet/IP

### 4.1 Setting the network parameters

When the FCEN-8LKM-8A-M module powered on, the module will read the rotary switch positions. If the rotary switch position stays 000~299, the module will work in EtherNet/IP protocol.

The module supports the DHCP and BOOTP protocols for receiving the required network parameters such as IP address and sub net mask.

The default IP settings of EtherNet/IP for the module are:

IP address: 192.168.250.xxx

Subnet Mask: 255.255.255.000

You can change the IP address by DHCP (section 4.1.1) or Webserver (section 4.1.2).

The following table describes the operating modes represented by the rotary code switch settings:

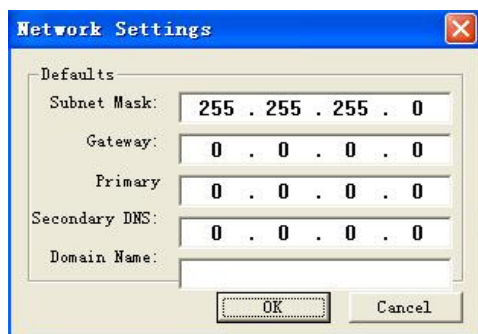
Rotary code switch	Function
000 (EtherNet/IP)	<p>Activate DHCP and BOOTP functions.</p> <p>In this mode, IP addresses can be assigned through specialized software such as Rockwell's built-in BOOTP-DHCP server and other tools. Please refer to the example for explanation.</p>
001~254 (EtherNet/IP)	<p>The last three digits of an IP address.</p> <p>In this mode, network information such as IP addresses can be modified by accessing the Webserver module through a browser. Only the first 9 digits can be set, and the last 3 digits are based on the rotary switch.</p> <p>If the module has already been assigned an IP address through DHCP of 000, it needs to be reset using 999 before the IP address in this mode can take effect.</p>
255~299 (EtherNet/IP)	<p>Illegal address, invalid setting.</p> <p>The original network parameters of the module will not be changed.</p>
300~399	<p>The module runs under the PROFINET protocol and the IP address</p>

(Profinet)	needs to be set through programming software (such as Portal).
400~654 (CC-Link IE FB)	The last three digits of an IP address.  In this mode, network information such as IP addresses can be modified by accessing the Webserver module through a browser. Only the first 9 digits can be set, and the last 3 digits are based on the rotary switch.
700~799 (ModbusTCP)	The last three digits of an IP address.  In this mode, network information such as IP addresses can be modified by accessing the Webserver module through a browser. Only the first 9 digits can be set, and the last 3 digits are based on the rotary switch.
800~899	Reserved multiple protocol switching related functions, please do not select.
999	Module reset.  This mode needs to be maintained for more than 5 seconds after power on, and when the module port indicator lights scroll and flash, it indicates a successful reset.  This operation will clear network parameters such as module IP address and restore to factory settings. Please operate with caution.

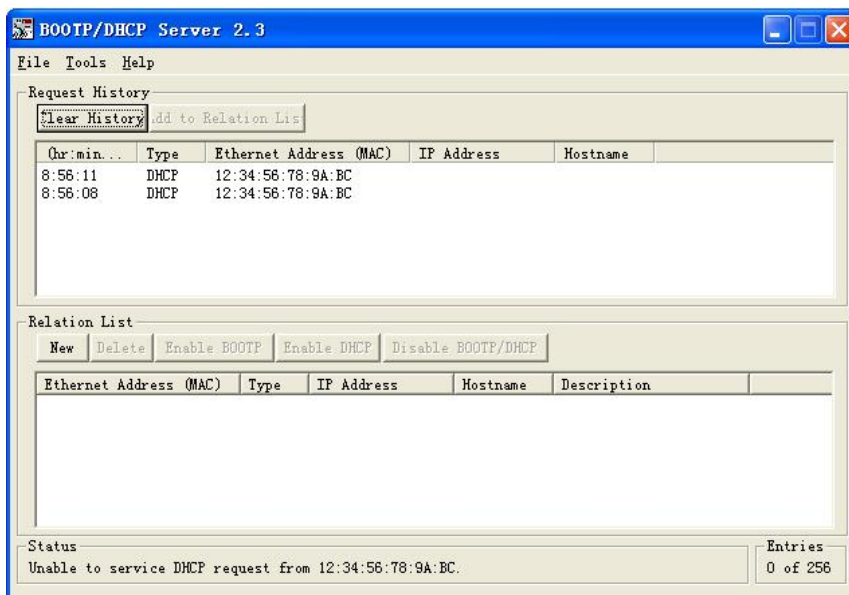
### 4.1.1 Setting IP through DHCP software (Code: 000)

When the rotary code switch is selected as 000, the FCEN-8LKM-8A-M module allocates network parameters such as IP addresses and subnet masks through DHCP software. This section takes the BOOTP-DCHP server tool that comes with Rockwell software as an example to demonstrate how to allocate IP addresses.

First open the BOOP-DHCP server, click on Tools->Network Settings to set the network parameters and fill in the Subnet Mask.

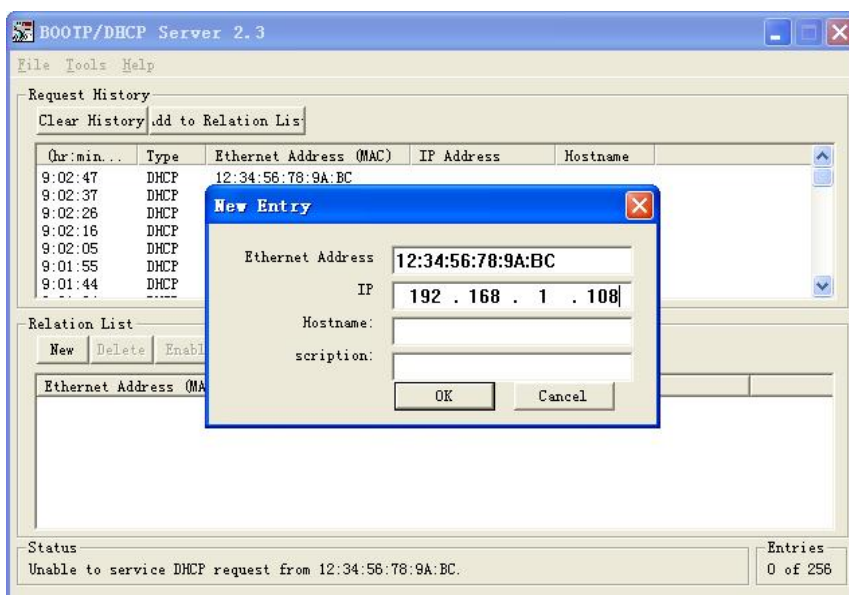


Then the DHCP server will find current gateway that has no IP address assigned on the network, and then click the gateway MAC address that needs to be assigned IP.



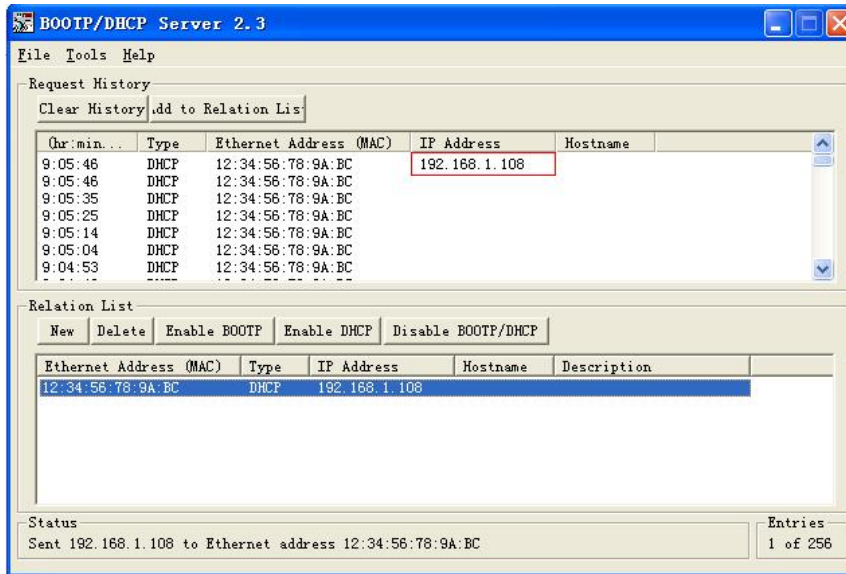
Then click Add to Relation List, or double-click MAC address, in the pop-up window, fill in IP address in IP bar, such as 192.168.1.108.

As follows:

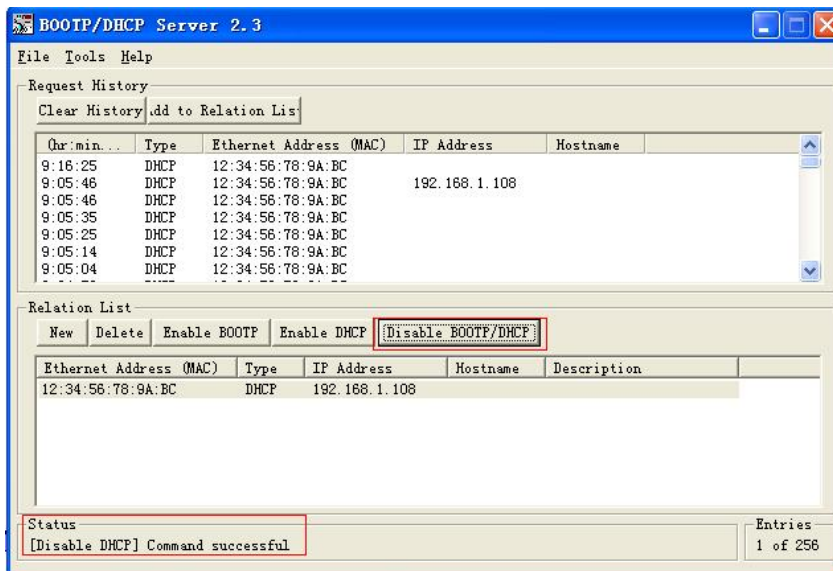


**Note: the assigned IP address needs to be in the same IP segment as the local computer.**

After the assigned IP address appears in the IP Address column in the list, the IP address of the device is assigned successfully. As follows:



After the IP address is assigned, the device can work normally on the network. However, if the device is powered off and restarted, the assigned IP address will be lost. Follow the above steps to process IP address allocation. If the IP address to be distributed is solidified to the gateway and its power-off IP address is not lost, you need to click the Disable BOOTP/DHCP button in the following figure. After the Command Successful appears in the Status column, the IP address is successfully solidified. If you click the Status column and there is no success message, you need to click again until the command succeeds. As follows:



**Note:** If the module has already been assigned an IP address and BOOTP/DHCP is disabled, it will not be able to be automatically searched. There are two ways to reset the IP address.

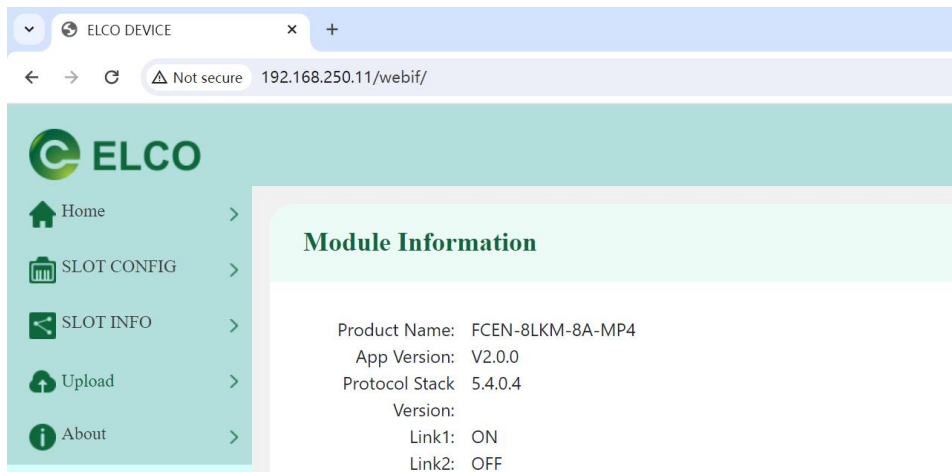
- 1) You need to click the "New" button, manually add the MAC and original IP address of the module, and then click the "Enable DHCP" button. Once successful, you can search for this module. Then close the software and power on the module again to assign a new IP.
- 2) In the event of a power outage, turn the rotary code back to 999 and then power on again for 5 seconds. Wait for the module port indicator light to scroll and flash, then power off again and switch back to 000 to reassign.

## 4.1.2 Setting IP through Webserver (Code: 001~254)

When the rotary code switch is selected from 001 to 254, the FCEN-8LKM-8A-M module accesses the web server through a browser to allocate network parameters such as IP addresses and subnet masks.

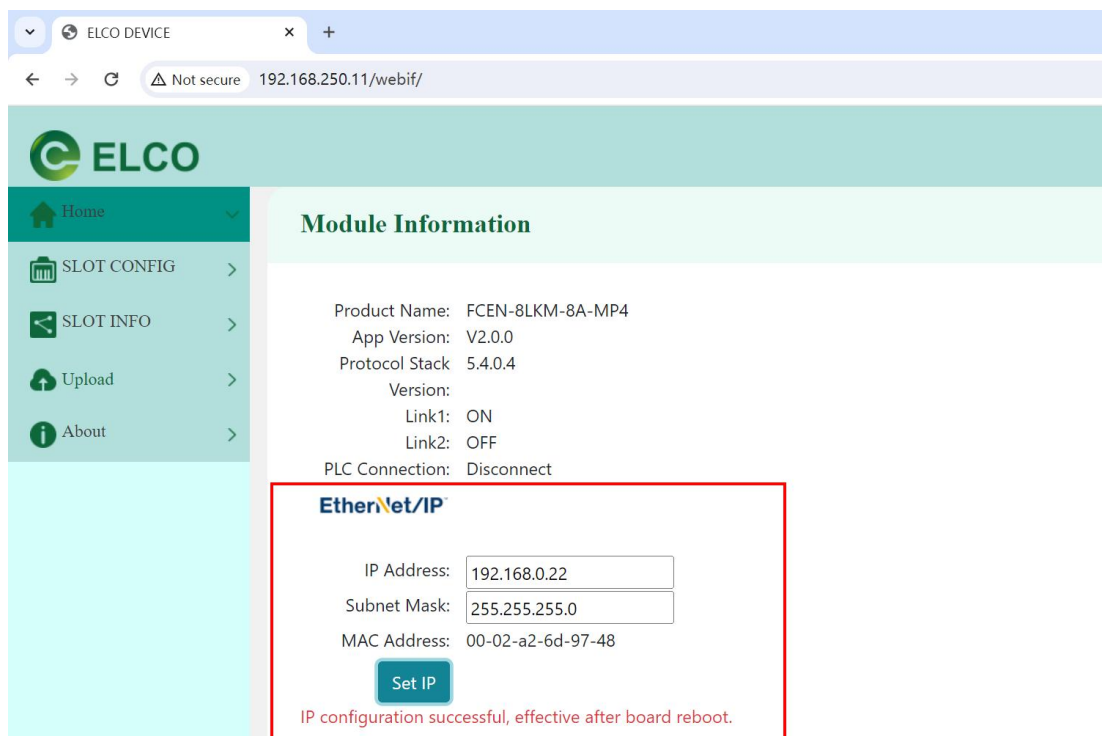
The default value of the module or after resetting through code 999, the default IP address is 192.168.250.xxx (depending on the rotary switch value).

When the computer and module IP addresses are in the same network segment, you can use a browser to enter <http://192.168.250.xxx/webif/> to access the module and modify the first 9 digits of the IP address.



You can see the IP address setting interface on the homepage, modify the values of the IP address and subnet mask, and click the "Set IP" button.

After successful setup, "IP configuration successful" will display under the button, The prompt "effective after board reboot" indicates that the new IP address will take effect after the power reboot.



## 4.2 Module address assignment

This section mainly introduces the signal point arrangement order and address assignment of the FCEN-8LKM-8A-M module, mainly to indicate the clear sequence of signals. Due to the different addressing methods in different PLC systems, this article explains them in Bytes, and systems in Word or DWord units can be arranged in the same order.

The FCEN-8LKM-8A-M module supports multiple connection types such as Exclusive owner, Input only, Listen only, etc. By default, the Exclusive owner type that supports input and output signals is used. The data size and instance encoding are shown in the table below:

Datasize	InstanceID	Length of data
INPUT	171	394 bytes
OUTPUT	160	260 bytes
CONFIG	102	100 bytes

The default connection name is "Control/Status+IOL32+Status", which includes the input and output signals and status indicators of the IO-Link master, as well as 32 bytes of data input and output and IO-Link status information for each IO-Link port. There will be detailed descriptions in subsequent chapters.

## 4.3 INPUT data address assignment

The FCEN-8LKM-8A-M module occupies a total of 394 bytes (Bytes 0-393) of input data. The following table lists the mapping of input data occupied by the IO-Link master and IO-Link slave respectively:

Byte	Input data	Description
0...7	Module status	Indicate the status of IO-Link master and IO-Link port.
8...9	Input signal of Master	Process input data for IO-Link Master SIO mode.
10...57	IO-Link Port 1	Process input data for Port 1.
58...105	IO-Link Port 2	Process input data for Port 2.
106...153	IO-Link Port 3	Process input data for Port 3.
154...201	IO-Link Port 4	Process input data for Port 4.
202...249	IO-Link Port 5	Process input data for Port 5.
250...297	IO-Link Port 6	Process input data for Port 6.
298...345	IO-Link Port 7	Process input data for Port 7.
346...393	IO-Link Port 8	Process input data for Port 8.

### 4.3.1 Status feedback of IO-Link master

This section consists of 8 bytes, used to represent the status and error information related to the IO-Link master.

INPUT	Description
Byte 0	IO-Link Communication Status
Byte 1	IO-Link Device Diagnosis (Short-Circuit & Overload)
Byte 2	IO-Link Port Power Supply Short Circuit (Pin1&Pin3)
Byte 3	Reserved
Byte 4	IO-Link Port Output Overload (Pin4 or Pin2)
Byte 5	Power Supply Diagnosis
Byte 6	IO-Link Device Second Supply Voltage Fault
Byte 7	Reserved

For a detailed description of status feedback, please refer to the following:

#### Byte 0 (IO-Link Communication Status)

When the port is configured in IO-Link mode and has established a connection with the IO-Link device, the corresponding point indicates 1; otherwise, the point indicates 0.

Byte 0	IO-Link Communication Status							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

### Byte 1 (IO-Link Device Diagnosis)

When there is a diagnostic alarm on the IO-Link slave device connected to the port (only supporting short circuit and overload detection of IO-Link slaves), the corresponding point indicates 1, otherwise the point indicates 0.

Byte 1	IO-Link Device Diagnosis							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

### Byte 2 (IO-Link Port Power Supply Short Circuit)

When short circuit occurs between Pin1 and Pin3 of the IO-Link master port, the corresponding point indicates 1, otherwise the point indicates 0.

Byte 2	IO-Link Port Power Supply Short Circuit							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

### Byte 4 (IO-Link Port Output Overload)

When overload occurs between Pin4/Pin2 and Pin3 of the IO-Link master port, the corresponding point indicates 1, otherwise the point indicates 0.

Byte 4	IO-Link Port Output Overload							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

### Byte 5 (Power Supply Diagnosis)

When there is an abnormality in the power supply of the IO-Link master, the corresponding point indication changes to 1, based on the fault status of over voltage, under voltage, and disconnection of the voltage.

Otherwise, the point indication is 0.

Byte 5	Power Supply Diagnosis							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Mean	Ua_H High voltage	Ua_L Low voltage	Us_H High voltage	Us_L Low voltage	Ua_S Short circuit	-	-	-

## Byte 6 (IO-Link Device Second Supply Voltage Fault)

When the IO-Link slave device connected to the port and experiences an auxiliary power loss alarm, the corresponding point indicates 1, otherwise the point indicates 0.

Byte 6	IO-Link Device Second Supply Voltage Fault							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

### 4.3.2 Input signal of IO-Link master

This section consists of 2 bytes, used to represent the status of the IO-Link master port when receiving switch signals.

The default order of port signals is Port base, which means that the mapping addresses are arranged in port order. First, Pin4 of the first port is arranged, then Pin2 of the first port, then Pin4 of the second port, and so on.

Byte 8	Digital input status of port 1~4							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
No.	07	06	05	04	03	02	01	00
Pin	Port4 Pin2	Port4 Pin4	Port3 Pin2	Port3 Pin4	Port2 Pin2	Port2 Pin4	Port1 Pin2	Port1 Pin4
Byte 9	Digital input status of port 5~8							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
No.	15	14	13	12	11	10	09	08
Pin	Port8 Pin2	Port8 Pin4	Port7 Pin2	Port7 Pin4	Port6 Pin2	Port6 Pin4	Port5 Pin2	Port5 Pin4

### 4.3.3 Input signal and status feedback of IO-Link slave

This section consists of 384 bytes, with each IO-Link port occupying 48 bytes.

The front part of the 48 bytes of each port is the input signal of the IO-Link slave, and the back part is the status, encoding, events, etc. of the IO-Link slave.

The following table shows the address assignment for 8 IO-Link ports.

Input	Port	Description
Byte 10...41	Port1	Byte 0~31 of IO-Link input signal data

Byte 42...43	Port1	Byte 0~1 of IO-Link status
Byte 44...45	Port1	Byte 0~1 of Vendor_ID from IO-Link device
Byte 46...48	Port1	Byte 0~2 of Device_ID from IO-Link device
Byte 49...57	Port1	Byte 0~8 of IO-Link event
Byte 58...89	Port2	Byte 0~31 of IO-Link input signal data
Byte 90...91	Port2	Byte 0~1 of IO-Link status
Byte 92...93	Port2	Byte 0~1 of Vendor_ID from IO-Link device
Byte 94...96	Port2	Byte 0~2 of Device_ID from IO-Link device
Byte 97...105	Port2	Byte 0~8 of IO-Link event
Byte 106...137	Port3	Byte 0~31 of IO-Link input signal data
Byte 138...139	Port3	Byte 0~1 of IO-Link status
Byte 140...141	Port3	Byte 0~1 of Vendor_ID from IO-Link device
Byte 142...144	Port3	Byte 0~2 of Device_ID from IO-Link device
Byte 145...153	Port3	Byte 0~8 of IO-Link event
Byte 154...185	Port4	Byte 0~31 of IO-Link input signal data
Byte 186...187	Port4	Byte 0~1 of IO-Link status
Byte 188...189	Port4	Byte 0~1 of Vendor_ID from IO-Link device
Byte 190...192	Port4	Byte 0~2 of Device_ID from IO-Link device
Byte 193...201	Port4	Byte 0~8 of IO-Link event
Byte 202...233	Port5	Byte 0~31 of IO-Link input signal data
Byte 234...235	Port5	Byte 0~1 of IO-Link status
Byte 236...237	Port5	Byte 0~1 of Vendor_ID from IO-Link device
Byte 238...240	Port5	Byte 0~2 of Device_ID from IO-Link device
Byte 241...249	Port5	Byte 0~8 of IO-Link event
Byte 250...281	Port6	Byte 0~31 of IO-Link input signal data
Byte 282...283	Port6	Byte 0~1 of IO-Link status
Byte 284...285	Port6	Byte 0~1 of Vendor_ID from IO-Link device
Byte 286...288	Port6	Byte 0~2 of Device_ID from IO-Link device
Byte 289...297	Port6	Byte 0~8 of IO-Link event
Byte 298...329	Port7	Byte 0~31 of IO-Link input signal data
Byte 330...331	Port7	Byte 0~1 of IO-Link status
Byte 332...333	Port7	Byte 0~1 of Vendor_ID from IO-Link device
Byte 334...336	Port7	Byte 0~2 of Device_ID from IO-Link device
Byte 337...345	Port7	Byte 0~8 of IO-Link event

<b>Byte 346...377</b>	Port8	Byte 0~31 of IO-Link input signal data
<b>Byte 378...379</b>	Port8	Byte 0~1 of IO-Link status
<b>Byte 380...381</b>	Port8	Byte 0~1 of Vendor_ID from IO-Link device
<b>Byte 382...384</b>	Port8	Byte 0~2 of Device_ID from IO-Link device
<b>Byte 385...393</b>	Port8	Byte 0~8 of IO-Link event

Taking Port1 port as an example, describe the meanings represented by Byte10~Byte57 in detail. The data definitions for other IO-Link ports can be calculated according to the above table.

**Byte 10...41** (IO-Link input signal data)

This section is the signal data of the IO-Link slave device, with a total of 32 bytes. According to the IO-Link standard, the maximum data size of a single IO-Link slave is 32 bytes. If the slave data is less than 32 bytes, it is arranged from the lowest byte of the data.

<b>Byte 10...41</b>	IO-Link input signal data
<b>Byte 10</b>	Byte 0 of IO-Link device input signal data
<b>Byte 11</b>	Byte 1 of IO-Link device input signal data
.....	Byte 2~30 of IO-Link device input signal data
<b>Byte 41</b>	Byte 31 of IO-Link device input signal data

**Byte 42...43** (IO-Link status)

This section reflects the status of the IO-Link slave device connected to this IO-Link port. If the status matches the point description, the corresponding point indicates 1; otherwise, the point indicates 0.

DC: Device connected

IOL: Port in IO-Link Mode

VF: Validation failed

SC: IO-Link short-circuit

DF: Data storage validation failed

PDI: Process data invalid

<b>Byte 42</b>	IO-Link Status							
<b>Bit</b>	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
<b>Mean</b>	-	-	-	-	-	-	DC	IOL
<b>Byte 43</b>	IO-Link Error							
<b>Bit</b>	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0

<b>Mean</b>	SC	-	-	-	-	PDI	DF	VF
-------------	----	---	---	---	---	-----	----	----

### Byte 44...45 (Vendor\_ID from IO-Link device)

This section contains the manufacturer's code for the IO-Link slave device, totaling 2 bytes.

<b>Byte 44...45</b>	Vendor_ID from IO-Link device
<b>Byte 44</b>	Vendor_ID (High Byte) of device connected
<b>Byte 45</b>	Vendor_ID (Low Byte) of device connected

### Byte 46...48 (Device\_ID from IO-Link device)

This section contains the device's code for the IO-Link slave device, totaling 3 bytes.

<b>Byte 46...48</b>	Vendor_ID from IO-Link device
<b>Byte 46</b>	Device ID (High Byte) of device connected
<b>Byte 47</b>	Device ID (Mid Byte) of device connected
<b>Byte 48</b>	Device ID (Low Byte) of device connected

### Byte 49...57 (IO-Link Event)

This section is the status of the IO-Link slave device, which can record the last 3 events, with 3 bytes for each event, for a total of 9 bytes.

Mode: 0-Reserved; 1-Singal event; 2-Event outgoing; 3-Event incoming.

Type: 0-Reserved; 1-Message; 2-Warning; 3-Error.

The meaning represented by each byte is as follows:

	Event_1							
<b>Byte 49</b>	IOL EventQualifier1							
<b>Bit</b>	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
<b>Mean</b>	Mode		Type		-			
<b>Byte 50</b>	IOL EventCode1(High Byte)							
<b>Byte 51</b>	IOL EventCode1(Low Byte)							
	Event_2							
<b>Byte 52</b>	IOL EventQualifier2							
<b>Bit</b>	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
<b>Mean</b>	Mode		Type		-			
<b>Byte 53</b>	IOL EventCode2 (High Byte)							

<b>Byte 54</b>	IOL EventCode2 (Low Byte)							
	Event_3							
<b>Byte 55</b>	IOL EventQualifier3							
<b>Bit</b>	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
<b>Mean</b>	Mode		Type		-			
<b>Byte 56</b>	IOL EventCode3 (High Byte)							
<b>Byte 57</b>	IOL EventCode3 (Low Byte)							

## 4.4 OUTPUT data address assignment

The FCEN-8LKM-8A-M module occupies a total of 260 bytes (Bytes 0-259) of output data. The following table lists the mapping of output data occupied by the IO-Link master and IO-Link slave respectively:

Byte	Output data	Description
0...1	Module Control	Control the function (diagnosis or restart) of IO-Link port.
2...3	Output signal of Master	Process output data for IO-Link Master SIO mode.
4...35	IO-Link Port 1	Process output data for Port 1.
36...67	IO-Link Port 2	Process output data for Port 2.
68...99	IO-Link Port 3	Process output data for Port 3.
100...131	IO-Link Port 4	Process output data for Port 4.
132...163	IO-Link Port 5	Process output data for Port 5.
164...195	IO-Link Port 6	Process output data for Port 6.
196...227	IO-Link Port 7	Process output data for Port 7.
278...259	IO-Link Port 8	Process output data for Port 8.

### 4.4.1 Control function of IO-Link master

This section consists of 2 bytes, used to control the IO-Link master to disable port diagnosis or restart output, etc.

OUTPUT	Description
Byte 0	Disable IO-Link Port Diagnosis
Byte 1	Reserved

For a detailed description of control function, please refer to the following:

#### Byte 0 (Disable IO-Link Port Diagnosis)

When the port is configured in IO-Link mode and has established a connection with the IO-Link slave, if you want to disable the diagnosis on this port, set the corresponding point to 1; otherwise, set the point to 0.

Byte 0	Disable IO-Link Port Diagnosis							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0

Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1
------	-------	-------	-------	-------	-------	-------	-------	-------

### Byte 1 (Reserved)

This byte is reserved for related functions and is currently useless.

Byte 1	Reserved							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

## 4.4.2 Output signal of IO-Link master

This section consists of 2 bytes, used to represent the output of the IO-Link master port when controlling switch signals.

The default order of port signals is Port base, which means that the mapping addresses are arranged in port order. First, Pin4 of the first port is arranged, then Pin2 of the first port, then Pin4 of the second port, and so on.

Byte 2	Digital output status of port 1~4							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
No.	07	06	05	04	03	02	01	00
Pin	Port4 Pin2	Port4 Pin4	Port3 Pin2	Port3 Pin4	Port2 Pin2	Port2 Pin4	Port1 Pin2	Port1 Pin4
Byte 3	Digital output status of port 5~8							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
No.	15	14	13	12	11	10	09	08
Pin	Port8 Pin2	Port8 Pin4	Port7 Pin2	Port7 Pin4	Port6 Pin2	Port6 Pin4	Port5 Pin2	Port5 Pin4

## 4.4.3 Output signal of IO-Link slave

This section consists of 256 bytes, with each IO-Link port occupying 32 bytes. The 32 bytes of each port is the output signal of the IO-Link slave.

The following table shows the address assignment for 8 IO-Link ports.

Output	Port	Description
Byte 4...35	Port1	Byte 0~31 of IO-Link output signal data
Byte 36...67	Port2	Byte 0~31 of IO-Link output signal data
Byte 68...99	Port3	Byte 0~31 of IO-Link output signal data

<b>Byte 100...131</b>	Port4	Byte 0~31 of IO-Link output signal data
<b>Byte 132...163</b>	Port5	Byte 0~31 of IO-Link output signal data
<b>Byte 164...195</b>	Port6	Byte 0~31 of IO-Link output signal data
<b>Byte 196...227</b>	Port7	Byte 0~31 of IO-Link output signal data
<b>Byte 228...259</b>	Port8	Byte 0~31 of IO-Link output signal data

Taking Port1 port as an example, describe the meanings represented by Byte4~Byte35 in detail. The data definitions for other IO-Link ports can be calculated according to the above table.

**Byte 4...35** (IO-Link output signal data)

This section is the signal data of the IO-Link slave device, with a total of 32 bytes. According to the IO-Link standard, the maximum data size of a single IO-Link slave is 32 bytes. If the slave data is less than 32 bytes, it is arranged from the lowest byte of the data.

<b>Byte 4...35</b>	IO-Link output signal data
<b>Byte4</b>	Byte 0 of IO-Link device output signal data
<b>Byte 5</b>	Byte 1 of IO-Link device output signal data
.....	Byte 2~30 of IO-Link device output signal data
<b>Byte 35</b>	Byte 31 of IO-Link device output signal data

## 4.5 CONFIG data address assignment

The FCEN-8LKM-8A-M module occupies a total of 100 bytes (Bytes 0-99) of config data. The following table lists the mapping of config data occupied by the IO-Link master:

Byte	Configdata	Description
0...3	Module configuration	General configuration for the overall module.
4...35	Port configuration	Pin type and safe state configuration for ports.
36...43	IO-Link Port 1	Configuration for IO-Link Port 1.
44...51	IO-Link Port 2	Configuration for IO-Link Port 2.
52...59	IO-Link Port 3	Configuration for IO-Link Port 3.
60...67	IO-Link Port 4	Configuration for IO-Link Port 4.
68...75	IO-Link Port 5	Configuration for IO-Link Port 5.
76...83	IO-Link Port 6	Configuration for IO-Link Port 6.
84...91	IO-Link Port 7	Configuration for IO-Link Port 7.
92...99	IO-Link Port 8	Configuration for IO-Link Port 8.

### 4.5.1 General settings of IO-Link master

This section consists of 4 bytes, used to disable the diagnosis of IO-Link master and control the order of signal arrangement.

CONFIG	Description
Byte 0	Disable Global Diagnosis
Byte 1	Disable Us Diagnosis
Byte 2	Disable Ua Diagnosis
Byte 3	Process Data Layout

For a detailed description of general settings, please refer to the following:

#### Byte 0 (Disable Global Diagnosis)

This parameter is used to disable all diagnostics of the IO-Link master. When the point is set to 1, diagnosis is disabled, and when set to 0, diagnosis is enabled.

When this setting is disabled, the uploaded diagnostic information and port indicator lights will no longer prompt any errors, but the status transmitted through the input signal is not affected.

#### Byte 1 (Disable Us Diagnosis)

This parameter is used to disable the system power supply diagnosis of the IO-Link master. When the point is set to 1, diagnosis is disabled,

and when set to 0, diagnosis is enabled.

When this setting is disabled, the uploaded diagnostic information and port indicator lights will no longer prompt any errors, but the status transmitted through the input signal is not affected.

**Byte 2** (Disable Ua Diagnosis)

This parameter is used to disable the output power supply diagnosis of the IO-Link master. When the point is set to 1, diagnosis is disabled, and when set to 0, diagnosis is enabled.

When this setting is disabled, the uploaded diagnostic information and port indicator lights will no longer prompt any errors, but the status transmitted through the input signal is not affected.

**Byte 3** (Process Data Layout)

This parameter is used to set the address mapping order of the IO-Link master switch input and output signals. The default value is 0, which is arranged by port; it can also be set to 1, which is arranged according to the pins.

0-Portbased assignment.

Byte offset	bit	PD_IN	PD_OUT
X	0	Port1 Pin4	Not supported.
	1	Port1 Pin2	Port1 Pin2
	.....	.....	.....
	6	Port4 Pin4	Not supported.
	7	Port4 Pin2	Port4 Pin2
X+1	0	Port5 Pin4	Not supported.
	1	Port5 Pin2	Port5 Pin2
	.....	.....	.....
	6	Port8 Pin4	Not supported.
	7	Port8 Pin2	Port8 Pin2

1-Pin based assignment.

Byte offset	bit	PD_IN	PD_OUT
X	0	Port1 Pin4	No supported.
	1	Port2 Pin4	No supported.
	.....	.....	.....
	6	Port7 Pin4	No supported.
	7	Port8 Pin4	No supported.
X+1	0	Port1 Pin2	Port1 Pin2
	1	Port2 Pin2	Port2 Pin2
	.....	.....	.....
	6	Port7 Pin2	Port7 Pin2

	7	Port8 Pin2	Port8 Pin2
--	---	------------	------------

## 4.5.2 Port settings of IO-Link master

This section consists of 32 bytes, used to set the function of the IO-Link master ports Pin4 and Pin2, and the status of Pin2 output in case of network disconnection or other abnormalities.

CONFIG	Description
Byte 4...19	Pin4 type of Port 1~8
Byte 20...27	Pin2 type of Port 1~8
Byte 28...35	Pin2 safe state of Port 1~8

For a detailed description of port settings, please refer to the following:

### Byte 4...19 (Pin4 type of Port 1~8)

This section is used to set the properties of Pin4 in each port of the IO-Link master, which can control the IO-Link function of the enabled port. Each port occupies 2 bytes of data, which is an INT variable. The default is 0, which means empty; Can be set to 1, means Input mode; Can be configured to 32, means IO-Link mode.

Byte 4...19	Pin4 type of Port 1~8
Byte 4...5	Pin4 type of Port 1(0=empty, 1=DI, 32=IO-Link)
Byte6...7	Pin4 type of Port 2(0=empty, 1=DI, 32=IO-Link)
Byte8...9	Pin4 type of Port 3(0=empty, 1=DI, 32=IO-Link)
Byte10...11	Pin4 type of Port 4(0=empty, 1=DI, 32=IO-Link)
Byte12...13	Pin4 type of Port 5(0=empty, 1=DI, 32=IO-Link)
Byte 14...15	Pin4 type of Port 6(0=empty, 1=DI, 32=IO-Link)
Byte 16...17	Pin4 type of Port 7(0=empty, 1=DI, 32=IO-Link)
Byte18...19	Pin4 type of Port 8(0=empty, 1=DI, 32=IO-Link)

### Byte 20...27 (Pin2 type of Port 1~8)

This section is used to set the properties of Pin2in each port of the IO-Link master, which can be set as switch input or switch output.

Each port occupies 1 bytes of data, which is an SINT variable. The default is 0, which means Input mode; Can be set to 1, means Output mode; Can be configured to 3, means Input/Output Universal.

Byte 20...27	Pin2 type of Port 1~8

<b>Byte 20</b>	Pin2 type of Port 1(0=DI, 1=DO, 3=Universal)
<b>Byte 21</b>	Pin2 type of Port 2(0=DI, 1=DO, 3=Universal)
<b>Byte 22</b>	Pin2 type of Port 3(0=DI, 1=DO, 3=Universal)
<b>Byte 23</b>	Pin2 type of Port 4(0=DI, 1=DO, 3=Universal)
<b>Byte 24</b>	Pin2 type of Port 5(0=DI, 1=DO, 3=Universal)
<b>Byte 25</b>	Pin2 type of Port 6(0=DI, 1=DO, 3=Universal)
<b>Byte 26</b>	Pin2 type of Port 7(0=DI, 1=DO, 3=Universal)
<b>Byte 27</b>	Pin2 type of Port 8(0=DI, 1=DO, 3=Universal)

**Byte 28...35** (Pin2 safe state of Port 1~8)

This section is used to set the safety status of Pin2output in each port of the IO-Link master. When the IO-Link master experiences network disconnection or other abnormalities, the Pin2 output signal will switch to the set value.

Each port occupies 1 bytes of data, which is an SINT variable. The default is 0, which means the output is turned off in case of an exception; Can be set to 1, which means the output is turned on in case of an exception; It can be set to 2, which means the output will maintain the last value in case of an exception.

<b>Byte 28...35</b>	Pin2 safe state of Port 1~8
<b>Byte 28</b>	Pin2 safe state of Port 1 (0=SetTo0, 1=SetTo1, 2=Hold Last)
<b>Byte 29</b>	Pin2 safe state of Port 2 (0=SetTo0, 1=SetTo1, 2=Hold Last)
<b>Byte 30</b>	Pin2 safe state of Port 3 (0=SetTo0, 1=SetTo1, 2=Hold Last)
<b>Byte 31</b>	Pin2 safe state of Port 4 (0=SetTo0, 1=SetTo1, 2=Hold Last)
<b>Byte 32</b>	Pin2 safe state of Port 5 (0=SetTo0, 1=SetTo1, 2=Hold Last)
<b>Byte 33</b>	Pin2 safe state of Port 6 (0=SetTo0, 1=SetTo1, 2=Hold Last)
<b>Byte 34</b>	Pin2 safe state of Port 7 (0=SetTo0, 1=SetTo1, 2=Hold Last)
<b>Byte 35</b>	Pin2 safe state of Port 8 (0=SetTo0, 1=SetTo1, 2=Hold Last)

## 4.5.3 Parameter settings of IO-Link slave

This section consists of 64 bytes, with each IO-Link port occupying 8 bytes. The 8 bytes of each port include IO-Link cycle time setting, ISDU parameter backup setting, IO-Link slave code setting, etc.

The following table shows the address assignment for 8 IO-Link ports.

CONFIG	Port	Description
Byte 36...37	Port1	IO-Link Port Cycle Time
Byte 38	Port1	IO-Link Port Validation and Backup
Byte 39...40	Port1	Byte 0~1 of Vendor_ID to IO-Link device
Byte 41...43	Port1	Byte 0~2 of Device_ID to IO-Link device
Byte 44...45	Port2	IO-Link Port Cycle Time
Byte 46	Port2	IO-Link Port Validation and Backup
Byte 47...48	Port2	Byte 0~1 of Vendor_ID to IO-Link device
Byte 49...51	Port2	Byte 0~2 of Device_ID to IO-Link device
Byte 52...53	Port3	IO-Link Port Cycle Time
Byte 54	Port3	IO-Link Port Validation and Backup
Byte 55...56	Port3	Byte 0~1 of Vendor_ID to IO-Link device
Byte 57...59	Port3	Byte 0~2 of Device_ID to IO-Link device
Byte 60...61	Port4	IO-Link Port Cycle Time
Byte 62	Port4	IO-Link Port Validation and Backup
Byte 63...64	Port4	Byte 0~1 of Vendor_ID to IO-Link device
Byte 65...67	Port4	Byte 0~2 of Device_ID to IO-Link device
Byte 68...69	Port5	IO-Link Port Cycle Time
Byte 70	Port5	IO-Link Port Validation and Backup
Byte 71...72	Port5	Byte 0~1 of Vendor_ID to IO-Link device
Byte 73...75	Port5	Byte 0~2 of Device_ID to IO-Link device
Byte 76...77	Port6	IO-Link Port Cycle Time
Byte 78	Port6	IO-Link Port Validation and Backup
Byte 79...80	Port6	Byte 0~1 of Vendor_ID to IO-Link device
Byte 81...83	Port6	Byte 0~2 of Device_ID to IO-Link device
Byte 84...85	Port7	IO-Link Port Cycle Time
Byte 86	Port7	IO-Link Port Validation and Backup
Byte 87...88	Port7	Byte 0~1 of Vendor_ID to IO-Link device
Byte 89...91	Port7	Byte 0~2 of Device_ID to IO-Link device

Byte 92...93	Port8	IO-Link Port Cycle Time
Byte 94	Port8	IO-Link Port Validation and Backup
Byte 95...96	Port8	Byte 0~1 of Vendor_ID to IO-Link device
Byte 97...99	Port8	Byte 0~2 of Device_ID to IO-Link device

Taking Port1 port as an example, describe the meanings represented by Byte36~Byte43 in detail. The data definitions for other IO-Link ports can be calculated according to the above table.

### Byte 36...37 (IO-Link Port Cycle Time)

This section is used to set the cycle time for IO-Link port communication. According to the IO-Link protocol specification, the cycle time is determined by a combination of multiples and time benchmarks.

Each port occupies 2 bytes of data, which is an INT variable. For ease of use, the following table lists the corresponding setting values for different cycle times. Users can directly enter Value in the INT variable to modify the corresponding Cycle time.

<b>Byte 36...37</b>	IO-Link Port Cycle Time (1.6ms~11.2ms)							
<b>Value (INT)</b>	0	16	32	48	64	68	72	76
<b>Cycle time (ms)</b>	Auto	1.6	3.2	4.8	6.4	8.0	9.6	11.2
	IO-Link Port Cycle Time (12.8ms~24ms)							
<b>Value (INT)</b>	80	84	88	92	96	100	104	108
<b>Cycle time (ms)</b>	12.8	14.4	16.0	17.6	19.2	20.8	22.4	24.0
	IO-Link Port Cycle Time (25.6ms~36.8ms)							
<b>Value (INT)</b>	112	116	120	124	128	129	130	131
<b>Cycle time (ms)</b>	25.6	27.2	28.8	30.4	32.0	33.6	35.2	36.8
	IO-Link Port Cycle Time (38.4ms~49.6ms)							
<b>Value (INT)</b>	132	133	134	135	136	137	138	139
<b>Cycle time (ms)</b>	38.4	40.0	41.6	43.2	44.8	46.4	48.0	49.6
	IO-Link Port Cycle Time (51.2ms~62.4ms)							
<b>Value (INT)</b>	140	141	142	143	144	145	146	147
<b>Cycle time (ms)</b>	51.2	52.8	54.4	56.0	57.6	59.2	60.8	62.4
	IO-Link Port Cycle Time (64ms~75.2ms)							

Value (INT)	148	149	150	151	152	153	154	155
Cycle time (ms)	64.0	65.6	67.2	68.8	70.4	72.0	736	75.2
IO-Link Port Cycle Time (76.8ms~88ms)								
Value (INT)	156	157	158	159	160	161	162	163
Cycle time (ms)	76.8	78.4	80.0	81.6	83.2	84.8	86.4	88.0
IO-Link Port Cycle Time (89.6ms~100.8ms)								
Value (INT)	164	165	166	167	168	169	170	171
Cycle time (ms)	89.6	91.2	92.8	94.4	96.0	97.6	99.2	100.8
IO-Link Port Cycle Time (102.4ms~113.6ms)								
Value (INT)	172	173	174	175	176	177	178	179
Cycle time (ms)	102.4	104.0	105.6	107.2	108.8	110.4	112.0	113.6
IO-Link Port Cycle Time (115.2ms~126.4ms)								
Value (INT)	180	181	182	183	184	185	186	187
Cycle time (ms)	115.2	116.8	118.4	120.0	121.6	123.2	124.8	126.4
IO-Link Port Cycle Time (128ms~132.8ms)								
Value (INT)	188	189	190	191	-	-	-	-
Cycle time (ms)	128.0	129.6	131.2	132.8	-	-	-	-

### Byte 38 (IO-Link Port Validation and Backup)

This section is used to set the verification and parameter storage function of the port. Depending on the type of setting, the port will verify whether the connected IO-Link slave Vendor\_ID and Device\_ID are consistent with the set values, and perform backup and recovery of ISDU parameters according to the settings. The default value is 0, which means no checksum storage is performed.

- 0---No Device check;
- 1---Type compatible Device V1.0;
- 2---Type compatible Device V1.1;
- 3---Type compatible Device V1.1, Backup + Restore;
- 4---Type compatible Device V1.1, Restore

**Byte 39...40** (Vendor\_ID from IO-Link device)

This section contains the manufacturer's code for the IO-Link slave device,  
totaling 2 bytes.

<b>Byte 39...40</b>	Vendor_ID from IO-Link device
<b>Byte 39</b>	Vendor_ID (High Byte) of device connected
<b>Byte 40</b>	Vendor_ID (Low Byte) of device connected

**Byte 41...43** (Device\_ID from IO-Link device)

This section contains the device's code for the IO-Link slave device,  
totaling 3 bytes.

<b>Byte 41...43</b>	Vendor_ID from IO-Link device
<b>Byte 41</b>	Device ID (High Byte) of device connected
<b>Byte 42</b>	Device ID (Mid Byte) of device connected
<b>Byte 43</b>	Device ID (Low Byte) of device connected

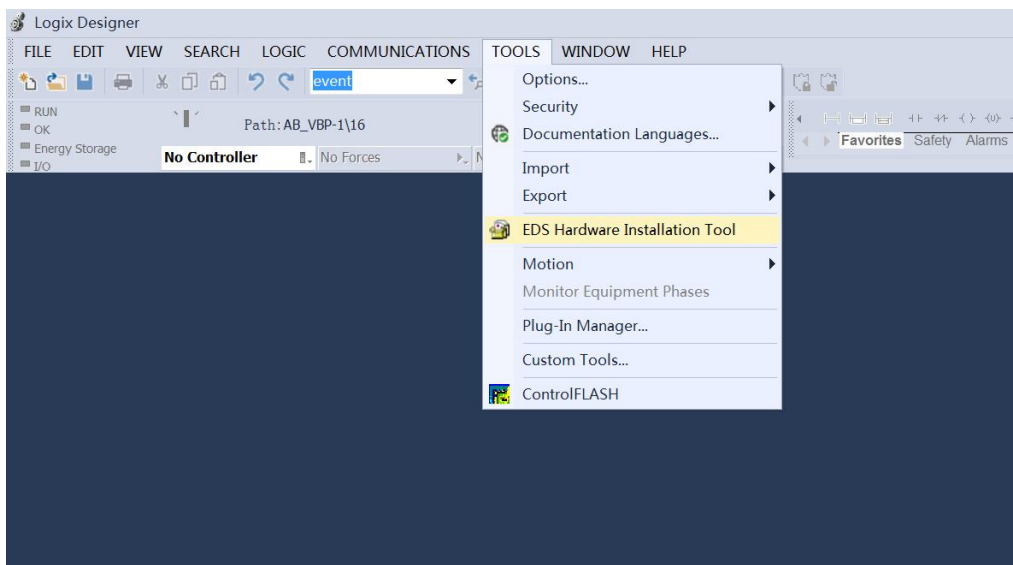
## 4.6 Configuration commissioning (AB PLC)

### 4.6.1 Installing EDS files

Use EDS files to configure the EtherNet/IP protocol IO-Link module, which is used to integrate the EtherNet/IP protocol module as a standard EtherNet/IP slave into your system. You can visit the ELCO company website to obtain the latest EDS files or call the customer service hotline to contact technical personnel.

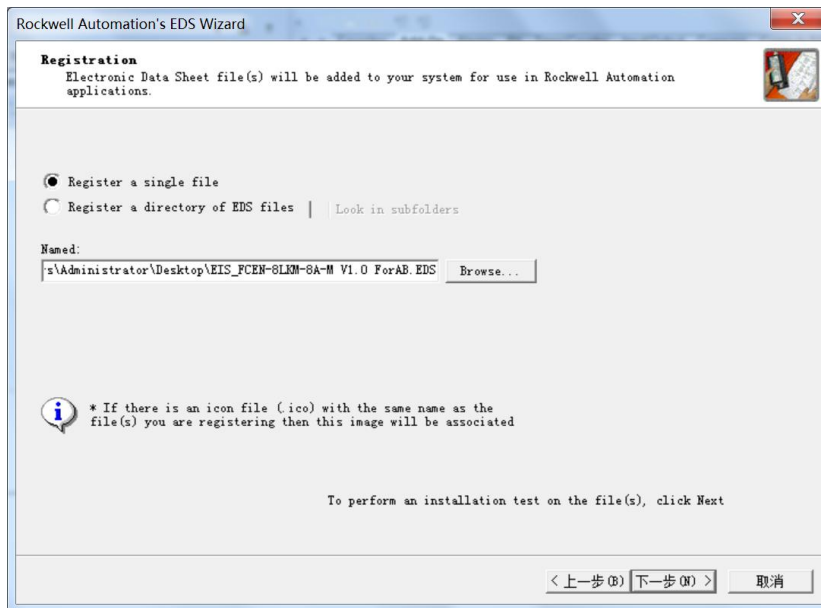
The integration of EDS files into the system depends on the configuration software you are using. Typically, the Rockwell Studio5000 programming software used for the EtherNet/IP protocol integrates EDS files according to the following steps:

- 1) Run "Logix Designer" software and select "TOOLS>EDS Hardware Installation Tool" in the menu bar.

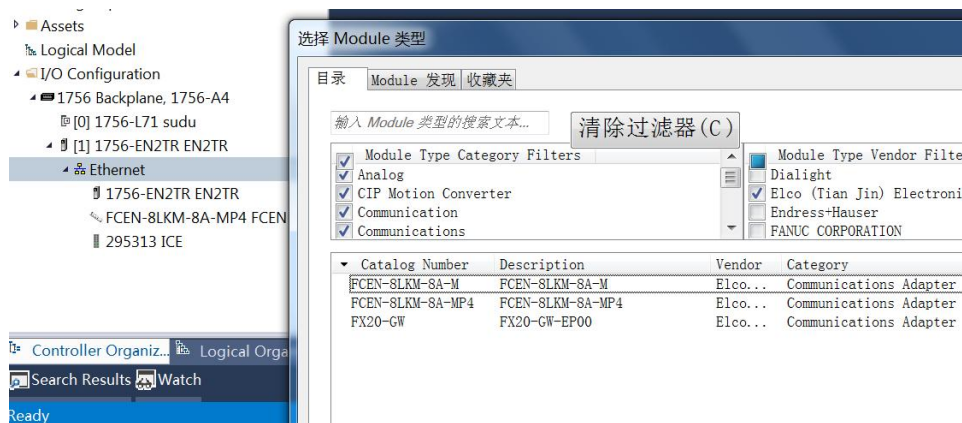


- 2) In the open dialog box, select "Register an EDS file" to proceed to the next step, select the EDS file to be installed, and then click "Next" to proceed with the installation operation.





- 3) The newly installed IO-Link master module can be found when adding network devices and is displayed in the "New Module" interface. By filtering the "Module Type Vendor Filter" and selecting "Elco (Tianjin) Electronic", this module can be found and added in the Catalog.



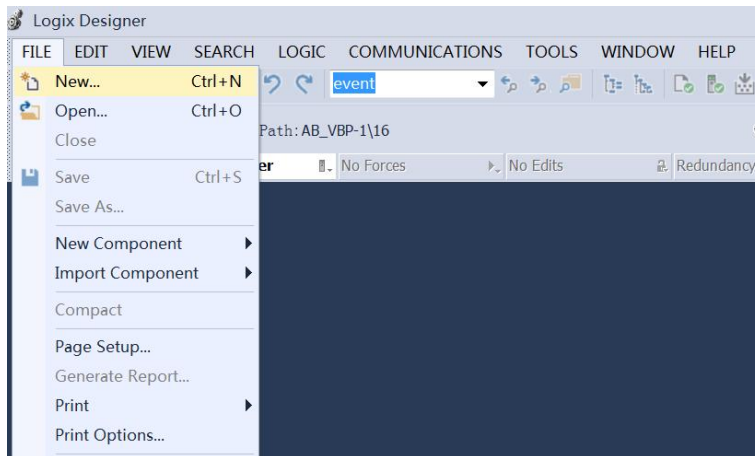
## 4.6.2 Configuration example in Logix Designer

This section provides users with a comprehensive understanding of the actual use of the IO-Link module in the EtherNet/IP protocol through a configuration connection process. This example uses ELCO's FCEN-8LKM-8A-M module as the EtherNet/IP slave to connect Rockwell's 1756-L71 controller and 1756-EN2TR network adapter. By default, all power supply and bus connections have been completed.

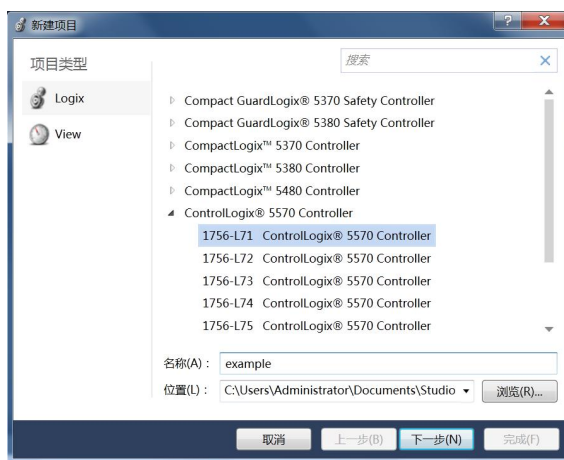
The EtherNet/IP protocol IO-Link system includes one IO-Link master module FCEN-8LKM-8A-M (with IP address 192.168.0.11 set in advance), with expansion ports Port1 and Port6 connected to one IO-Link slave hub LKHA-16UP-M12G, and the remaining expansion ports set to the off state

We show the specific software configuration process in the form of pictures:

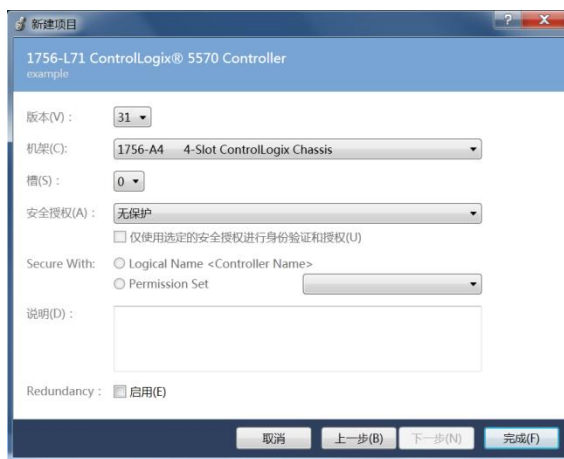
- 1) Create a new Studio5000 project.
  - A) Open the "Logix Designer" software and click "File>New...".



B) In the pop-up interface, select the PLC type to use and click "Next".

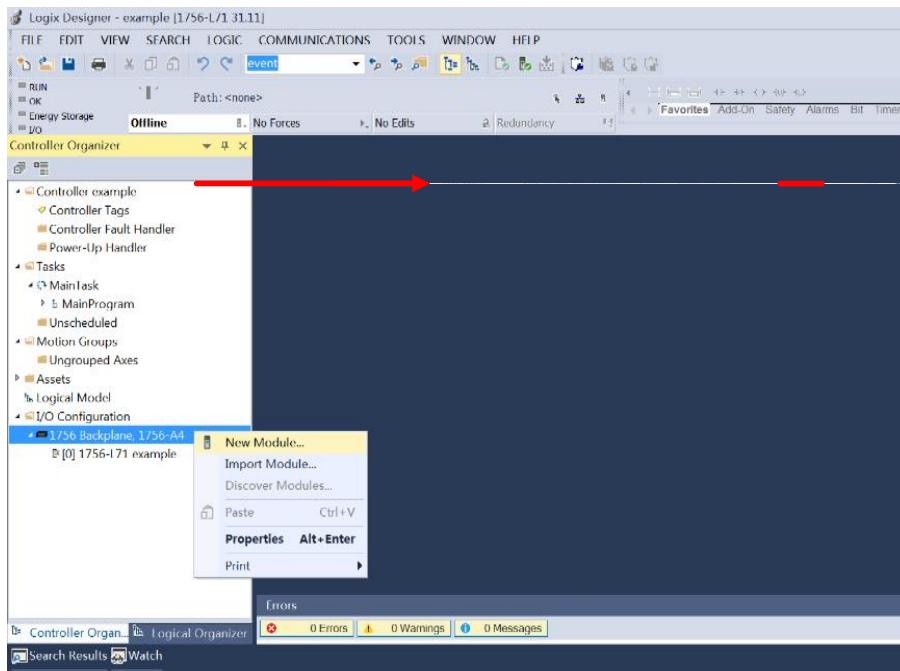


C) Select PLC version, rack, slot number, etc., and click "Finish".

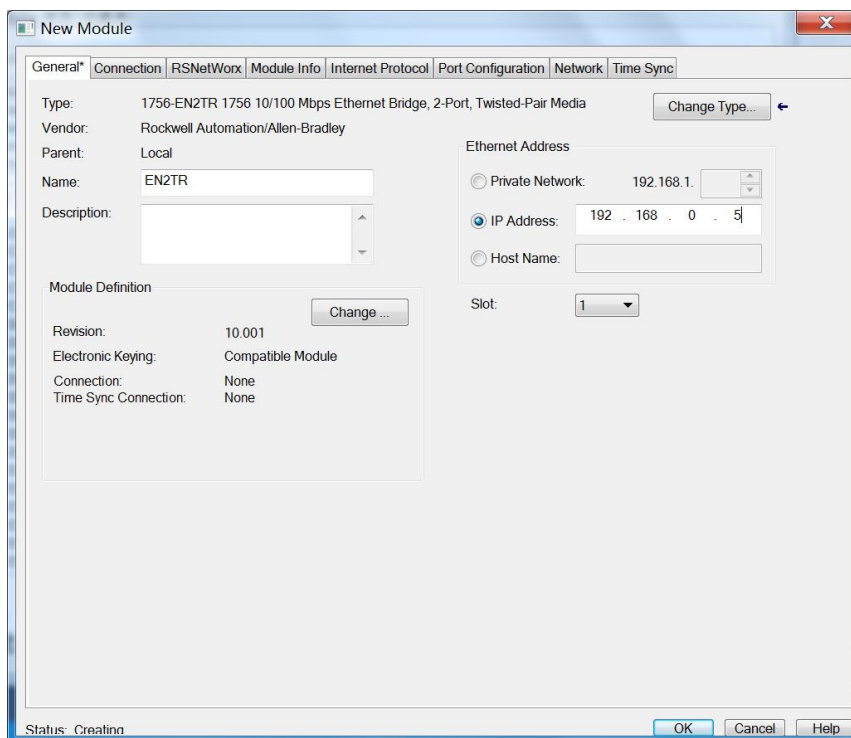


2) Add the 1756-EN2TR network module and set the IP address.

A) In the left Controller Organizer navigation bar, right-click on "1756-A4", select "New Module...", select "1756-EN2TR" in the open interface, and click "Create".

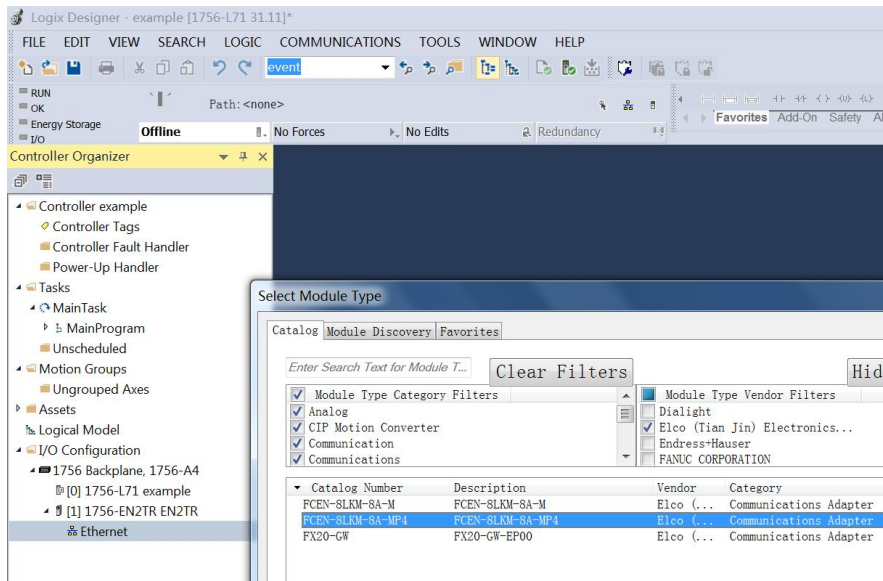


B) In the pop-up interface, fill in the IP address 192.168.0.5 of the module and provide the required name for the module, such as EN2TR. Click "OK" to complete the network adapter configuration.

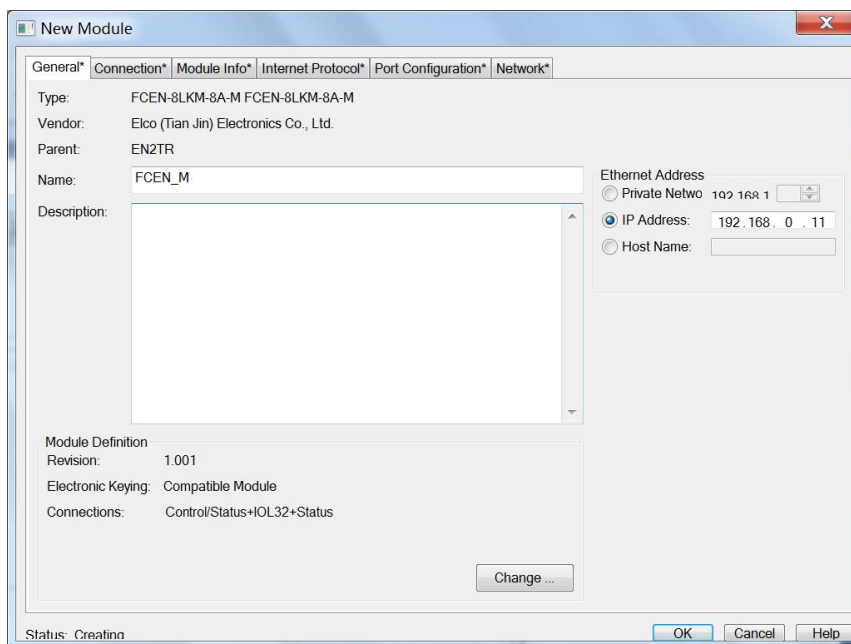


3) Add the FCEN-8LKM-8A-M module and set the IP address.

A) In the left Controller Organizer navigation bar, right-click on Ethernet under 1756-EN2TR, select "New Module...", filter ELCO in the open interface, select module model FCEN-8LKM-8A-M, and click "Create".



B) In the pop-up interface, fill in the IP address 192.168.0.11 of the module and provide the required name for the module, such as FCEN. Click "OK" to complete the configuration of the IO-Link module.



4) After completing the configuration of the hardware module, it is necessary to map the ports and other parameters of the IO-Link module.

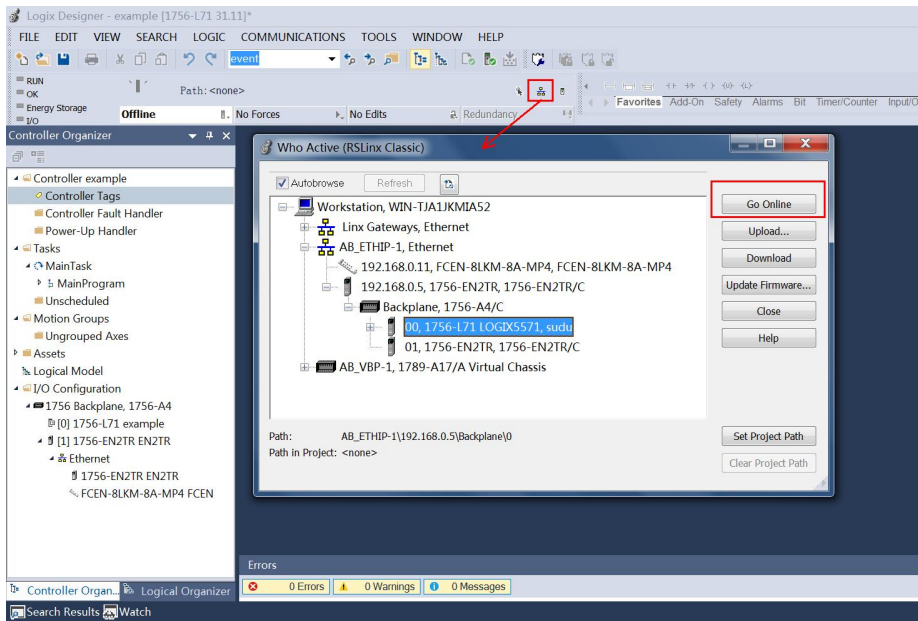
You can refer to Section 4.5 for the allocation of data addresses. Set the Port1 and Port6 ports to IO-Link mode, and set the values of

FCEN\_M:C.Port1\_Pin4\_Type and FCEN\_M:C.Port6\_Pin4\_Type to 32. At the same time, in order to provide output power to the IO-Link slave, set the Pin2\_Type of FCEN\_M: C.Port1~8 to 3.

Name	Value	Force Ma	Style	Data Type
FCEN_M:C	{-}	{-}		_04D0:FCEN_8LK
FCEN_M:C.Disable_Global_Diagnosis	0		Decimal	SINT
FCEN_M:C.Disable_System_Power_Supply_Diagnosis	0		Decimal	SINT
FCEN_M:C.Disable_Auxiliary_Power_Supply_Diagnosis	0		Decimal	SINT
FCEN_M:C.Process_Data_Layout	0		Decimal	SINT
FCEN_M:C.Port1_Pin4_Type	32		Decimal	INT
FCEN_M:C.Port3_Pin4_Type	0		Decimal	INT
FCEN_M:C.Port4_Pin4_Type	0		Decimal	INT
FCEN_M:C.Port5_Pin4_Type	0		Decimal	INT
FCEN_M:C.Port6_Pin4_Type	32		Decimal	INT
FCEN_M:C.Port7_Pin4_Type	0		Decimal	INT
FCEN_M:C.Port1_Pin2_Type	0		Decimal	SINT
FCEN_M:C.Port2_Pin2_Type	3		Decimal	SINT
FCEN_M:C.Port3_Pin2_Type	3		Decimal	SINT
FCEN_M:C.Port4_Pin2_Type	3		Decimal	SINT
FCEN_M:C.Port4_Pin2_Type	3		Decimal	SINT

**Note: If the value of the CONFIG parameter is modified after network connection, the IO-Link module must be powered on or connected back to the network in order for the newly modified parameters to take effect.**

5) Select the already set connection in the RSLinx Classic. In this example, connect through the AB\_ETHIP network and select the "Go Online" button to switch the software to online mode. At the same time, a pop-up interface will pop up and select "Download" to download the program to the PLC.

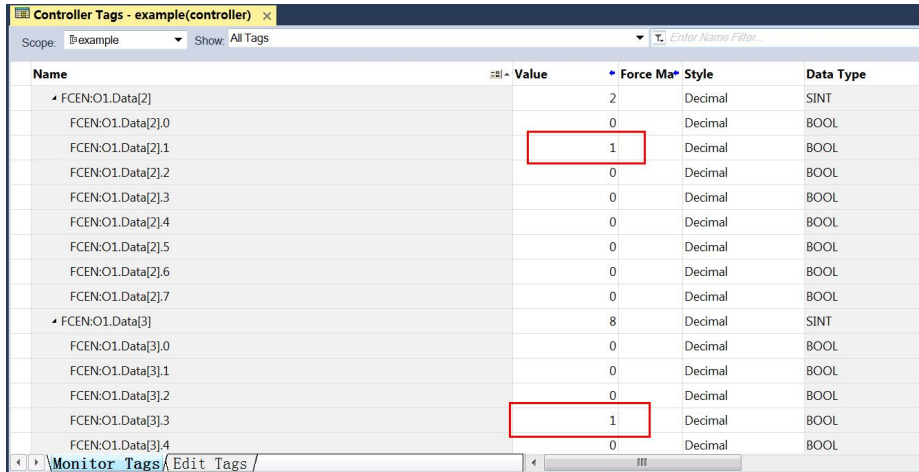


6) After completing the download operation, the NET light of FCEN-8LKM-8A-M module will turn green, indicating that the EtherNet/IP connection between the module and the PLC is successful. The input and output signals of the control module can be read and controlled through the Controller Tags variable table or by programming.

Name	Value	Force Ma*	Style	Data Type	
FCEN_M:C	{...}	{...}		_04D0:FCEN_8LKM_8A_M_E837...	
FCEN_M:I1		{...}	{...}	_04D0:FCEN_8LKM_8A_M_B60A...	
FCEN_M:I1.ConnectionFaulted	0		Decimal	BOOL	
FCEN_M:I1.Data		{...}	{...}	Decimal	SINT[394]
FCEN_M:O1		{...}	{...}	_04D0:FCEN_8LKM_8A_M_9E8B...	
FCEN_M:O1.Data		{...}	{...}	Decimal	SINT[260]
FCEN_M:O1.Data[0]	0		Decimal	SINT	
FCEN_M:O1.Data[1]	0		Decimal	SINT	
FCEN_M:O1.Data[2]	0		Decimal	SINT	
FCEN_M:O1.Data[3]	0		Decimal	SINT	
FCEN_M:O1.Data[4]	0		Decimal	SINT	
FCEN_M:O1.Data[5]	0		Decimal	SINT	
FCEN_M:O1.Data[6]	0		Decimal	SINT	
FCEN_M:O1.Data[7]	0		Decimal	SINT	
FCEN_M:O1.Data[8]	0		Decimal	SINT	
FCEN_M:O1.Data[9]	0		Decimal	SINT	
FCEN_M:O1.Data[10]	0		Decimal	SINT	

7) Due to the absence of an IO-Link slave output auxiliary power supply signal, the Port1 and Port6 indicator lights of LKHA-16UP-M12G are set to IO-Link mode and connected in red. It is necessary to refer to section 4.4 for module OUTPUT data address assignment, and set FCEN\_M:O1.Data[2].1 and FCEN\_M:O1.Data[3].3 to 1. After a successful assignment, the light\_00 remains yellow and light\_01 remains green of Port1;

the light\_10 remains yellow and light\_11 remains green of Port6.



Name	Value	Force Ma*	Style	Data Type
FCEN-O1.Data[2]		2	Decimal	SINT
FCEN-O1.Data[2].0		0	Decimal	BOOL
FCEN-O1.Data[2].1	1		Decimal	BOOL
FCEN-O1.Data[2].2		0	Decimal	BOOL
FCEN-O1.Data[2].3		0	Decimal	BOOL
FCEN-O1.Data[2].4		0	Decimal	BOOL
FCEN-O1.Data[2].5		0	Decimal	BOOL
FCEN-O1.Data[2].6		0	Decimal	BOOL
FCEN-O1.Data[2].7		0	Decimal	BOOL
FCEN-O1.Data[3]		8	Decimal	SINT
FCEN-O1.Data[3].0		0	Decimal	BOOL
FCEN-O1.Data[3].1		0	Decimal	BOOL
FCEN-O1.Data[3].2		0	Decimal	BOOL
FCEN-O1.Data[3].3	1		Decimal	BOOL
FCEN-O1.Data[3].4		0	Decimal	BOOL

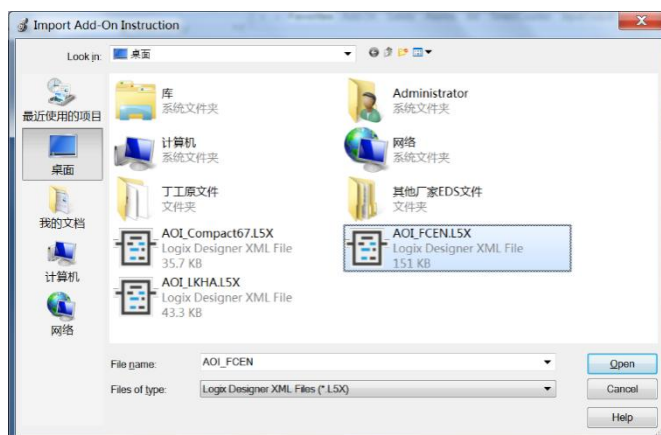
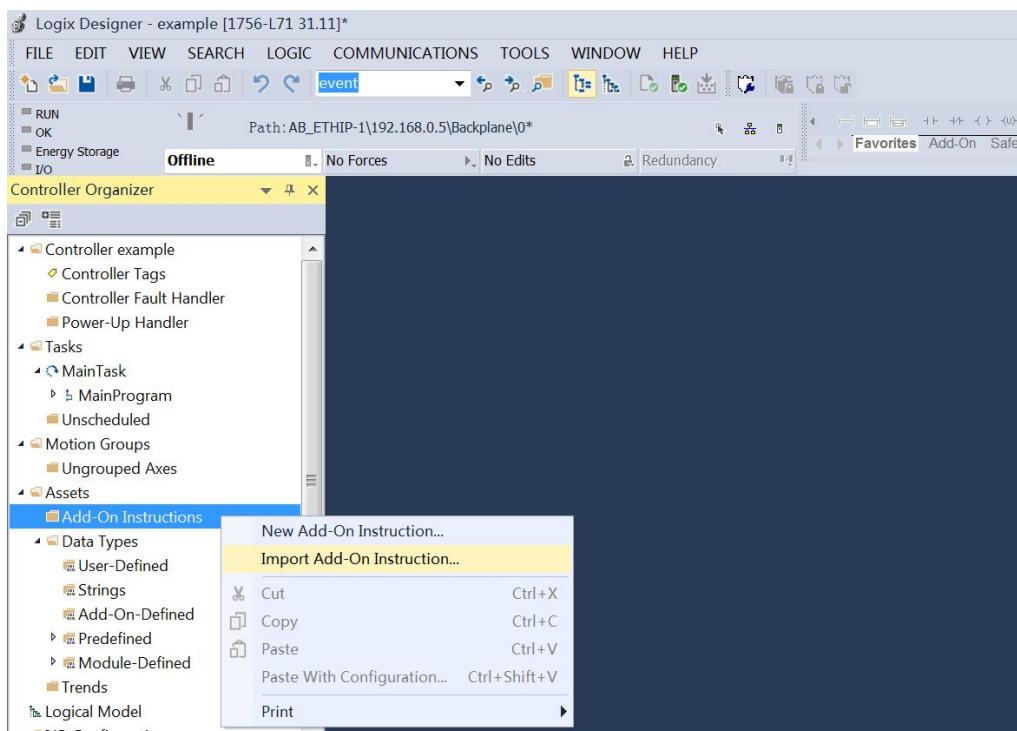
8) All configuration work has been completed and can be used normally.

## 4.6.3 Import Add-On Instruction

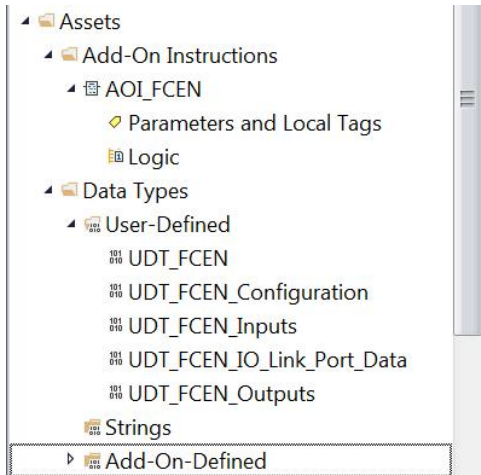
For the convenience of connecting the FCEN-8LKM-8A-M module to AB PLC, ELCO provides an Add-On Instruction specifically designed for Logix Designer software. This program block sorts and annotates the INPUT, OUTPUT, and CONFIG data of the FCEN-8LKM-8A-M module. Users can easily read and control module signals through the AOI program block.

This AOI function block is suitable for RSLogix5000 or Studio5000 software, and the hardware can adapt to various PLCs such as Compact Logix or Control Logix. The usage steps are as follows:

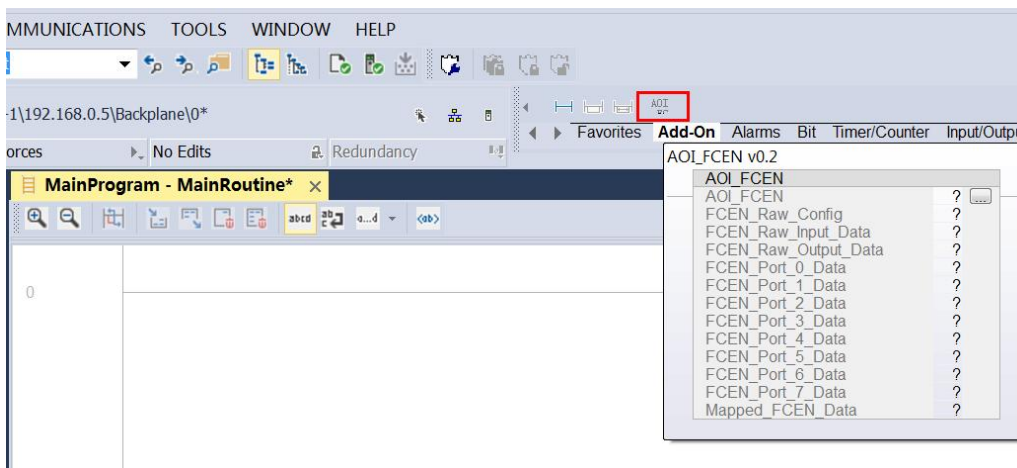
- 1) Right click on the "Add-On Instructions" item in Controller Organizer, select "Import Add On Instructions...", and select the AOI-FCEN dedicated to the ELCO FCEN-8LKM-8A-M module from the pop-up menu L5X file, click the "Open" button to import.



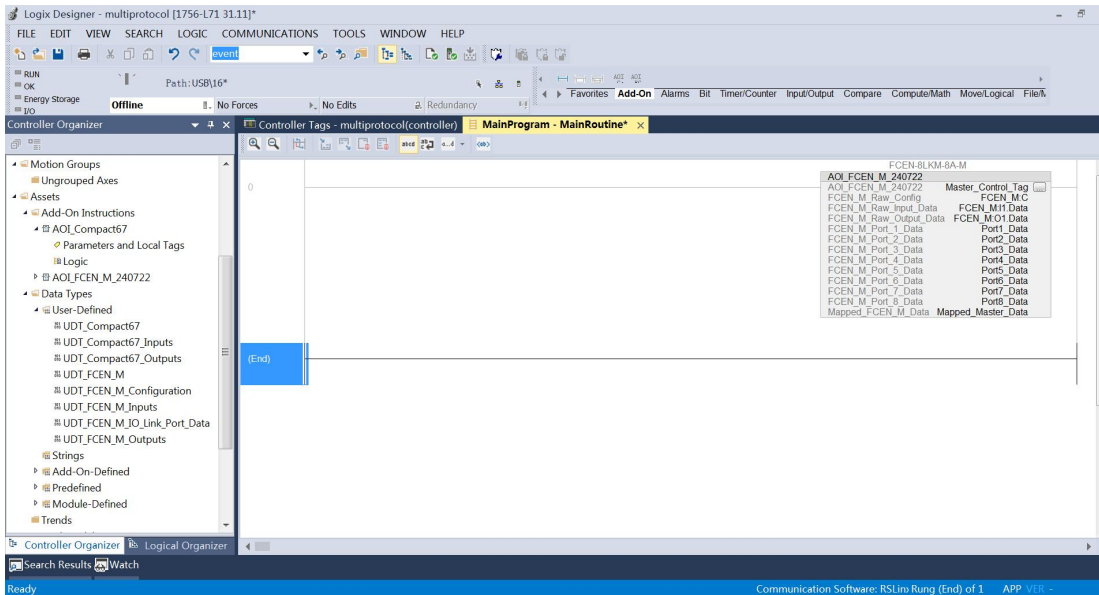
- 2) After successful import, you can see the newly imported function block under the Add-On Instructions category. At the same time, the Data Types involved in the function block will also be imported together, which can be seen under the User-Defined category.



3) You can see the newly imported blocks in the programming interface.



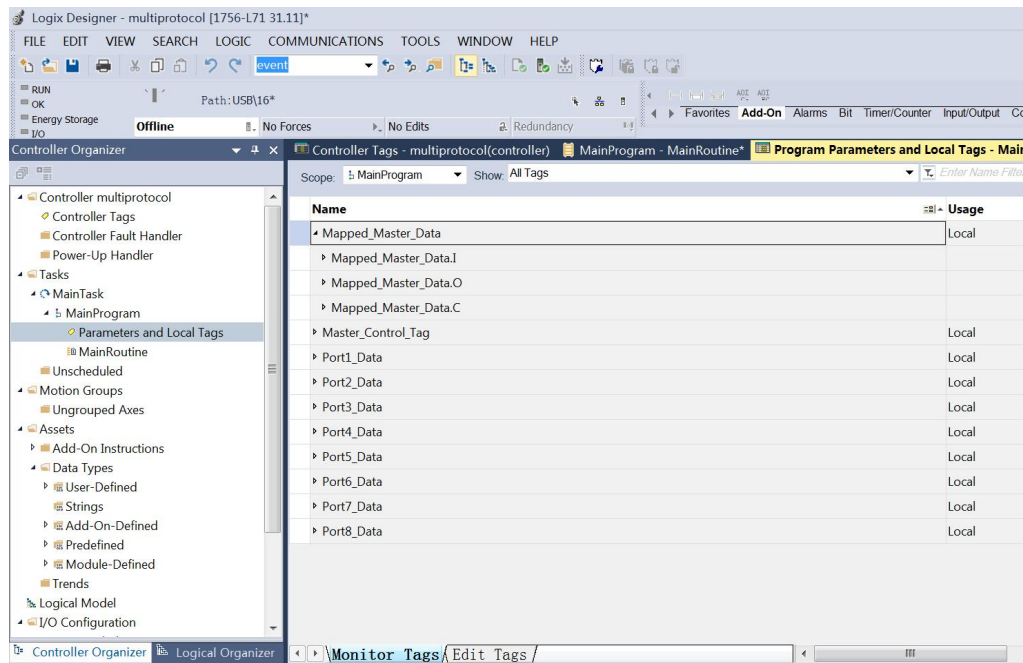
4) Insert the function block into the program by dragging or clicking, and fill in the corresponding variables according to the data type of the Add-On Instruction. Among them, the variables corresponding to the newly inserted FCEN-8LKM-8A-M module need to be selected for FCEN\_Raw\_Config, FCEN\_Raw\_Input\_Data, and FCEN\_Raw\_Output\_Data. Other projects require users to add variables according to the data type themselves.



5) The names and data types of AOI block variables are shown in the table below:

Parameter Name	Description	Data Type	Tag Name (User defined)
AOI_FCEN_M	Unique Control Tag for AOI Module	AOI_FCEN_M	Master_Control_Tag
FCEN_M_Raw_Config	Raw config data from Module Defined Tags	SINT[100]	Module_Name:C
FCEN_M_Raw_Input_Data	Raw input data from Module Defined Tags	SINT[394]	Module_Name:I1.Data
FCEN_M_Raw_Output_Data	Raw output data from Module Defined Tags	SINT[260]	Module_Name:O1.Data
FCEN_M_Port_1_Data	All I/O Data with IO-Link Port 1	UDT_FCEN_M_IO_Link_Port_Data	Port1_Data
FCEN_M_Port_2_Data	All I/O Data with IO-Link Port 2	UDT_FCEN_M_IO_Link_Port_Data	Port2_Data
FCEN_M_Port_3_Data	All I/O Data with IO-Link Port 3	UDT_FCEN_M_IO_Link_Port_Data	Port3_Data
FCEN_M_Port_4_Data	All I/O Data with IO-Link Port 4	UDT_FCEN_M_IO_Link_Port_Data	Port4_Data
FCEN_M_Port_5_Data	All I/O Data with IO-Link Port 5	UDT_FCEN_M_IO_Link_Port_Data	Port5_Data
FCEN_M_Port_6_Data	All I/O Data with IO-Link Port 6	UDT_FCEN_M_IO_Link_Port_Data	Port6_Data
FCEN_M_Port_7_Data	All I/O Data with IO-Link Port 7	UDT_FCEN_M_IO_Link_Port_Data	Port7_Data
FCEN_M_Port_8_Data	All I/O Data with IO-Link Port 8	UDT_FCEN_M_IO_Link_Port_Data	Port8_Data
Mapped_FCEN_M_Data	All Unique data associated with FCEN-8LKM-8A-M	UDT_FCEN_M	Mapped_Master_Data

6) After completing the addition of the AOI block and downloading it to the PLC, the INPUT, OUTPUT and CONFIG variables of the FCEN-8LKM-8A-M module can be read and controlled through the Mapped\_Master\_Data variable. Due to the addition of this instruction, it is necessary to read and write signal points in the “Parameters and Local Tags”. The values in the Controller Tags cannot be directly modified like in steps 6 and 7 of section 4.6.2. At the same time, the signal points of the FCEN-8LKM-8A-M module used in programming also need to directly call the values in the Mapped\_Master\_Data variable.



**Note: If the value of the CONFIG parameter is modified after network connection, the IO-Link module must be powered on or connected back to the network in order for the newly modified parameters to take effect.**

7) The INPUT,OUTPUT and CONFIG variables of the FCEN-8LKM-8A-M module have been classified and described in the AOI\_FCEN program block. For more detailed information, please refer to Chapter 4 “Module Signal Address Assignment”.

Name	Usage	Value	Force Ma	Style	Data Type
Mapped_Master_Data	Local		{...}	{...}	UDT_FCEN
Mapped_Master_Data.I			{...}	{...}	UDT_FCEN_Inputs
Mapped_Master_Data.I.IOL_Connected		0		Decimal	SINT
Mapped_Master_Data.I.IOL_Device_Diag		0		Decimal	SINT
Mapped_Master_Data.I.Short_Circuit		0		Decimal	SINT
Mapped_Master_Data.I.Reserved_1		0		Decimal	SINT
Mapped_Master_Data.I.Overload		0		Decimal	SINT
Mapped_Master_Data.I.Power_Diag		0		Decimal	SINT
Mapped_Master_Data.I.IOL_Device_2nd_Supply		0		Decimal	SINT
Mapped_Master_Data.I.Reserved_2		0		Decimal	SINT
Mapped_Master_Data.I.Input_Data		0		Decimal	INT
Mapped_Master_Data.I.Port_0_IO_Link_Status		0		Decimal	BOOL
Mapped_Master_Data.I.Port_0_Device_Connected		0		Decimal	BOOL
Mapped_Master_Data.I.Port_0_Validation_Failed		0		Decimal	BOOL
Mapped_Master_Data.I.Port_1_IO_Link_Status		0		Decimal	BOOL

Program Parameters and Local Tags - MainProgram x

Scope: MainProgram Show: All Tags Enter Name Filter...

Name	Usage	Value	Force Ma	Style	Data Type
Mapped_Master_Data.I.Port_7_IO_Link_Status		0		Decimal	BOOL
Mapped_Master_Data.I.Port_7_Device_Connected		0		Decimal	BOOL
Mapped_Master_Data.I.Port_7_Validation_Failed		0		Decimal	BOOL
▾ Mapped_Master_Data.O		{...}	{...}		UDT_FCEN_Outputs
▸ Mapped_Master_Data.O.Disable_Diag		0		Decimal	SINT
▸ Mapped_Master_Data.O.Reserved_1		0		Decimal	SINT
▸ Mapped_Master_Data.O.Output_Data		0		Decimal	INT
▾ Mapped_Master_Data.C		{...}	{...}		UDT_FCEN_Configurat
▸ Mapped_Master_Data.C.Disable_Global_Diag		0		Decimal	SINT
▸ Mapped_Master_Data.C.Disable_Us_Diag		0		Decimal	SINT
▸ Mapped_Master_Data.C.Disable_Ua_Diag		0		Decimal	SINT
▸ Mapped_Master_Data.C.PD_Data_Layout		0		Decimal	SINT
▸ Mapped_Master_Data.C.Port_0_Function		0		Decimal	INT
▸ Mapped_Master_Data.C.Port_1_Function		0		Decimal	INT
▸ Mapped_Master_Data.C.Port_2_Function		0		Decimal	INT

Monitor Tags / Edit Tags

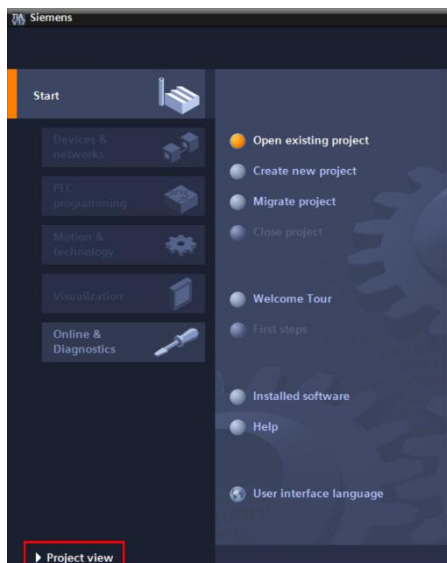
## 5. PROFINET

### 5.1 Setting the network parameters

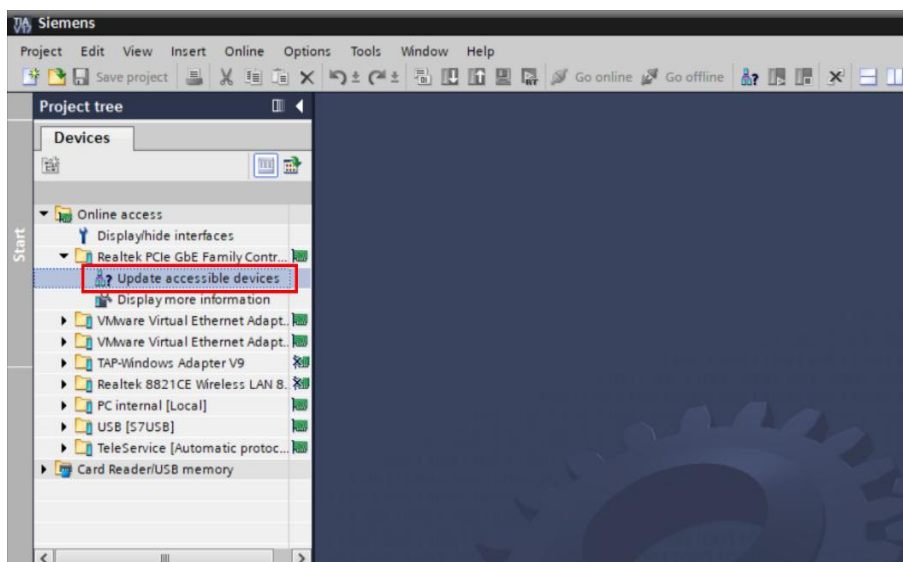
When the FCEN-8LKM-8A-M module powered on, the module will read the rotary switch positions. If the rotary switch position stays 300~399, the module will work in PROFINET protocol.

The factory default IP address is 0.0.0.0 and the default device name is empty. You can set them by the Siemens programming software Portal.

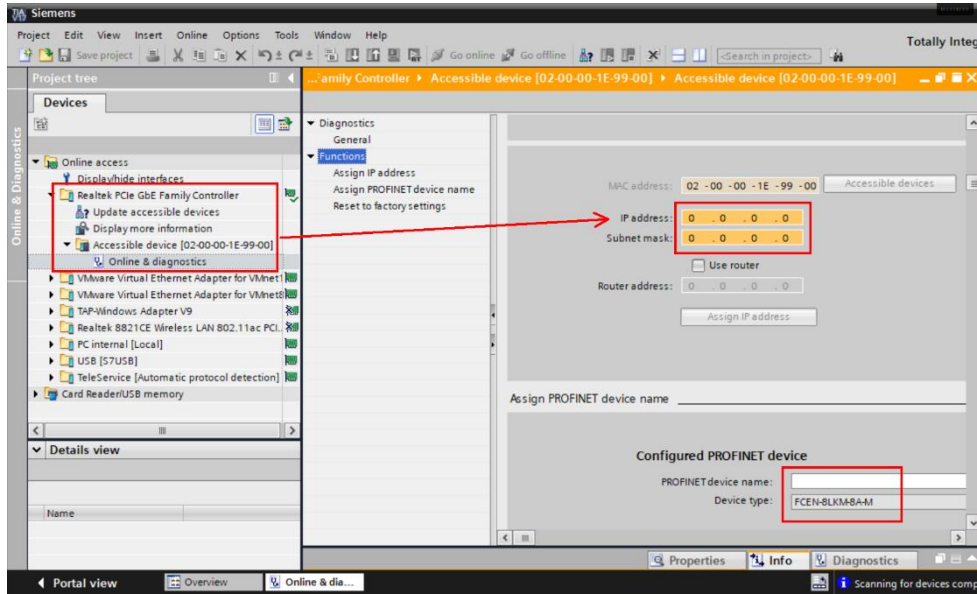
- 1) Run "TIA Portal" software and select "Project view" in the left side.



- 2) In the new window, Click "Online Access" in the "Project Tree" on the left, finding the name of the computer network card. Double-click "Update accessible devices" and then the name and MAC address of the connected IO-Link master module will be scanned.



- 3) Double click the module you scanned, open the "Online & diagnostics" tab. Under the "Functions", you can assign IP address and PROFINET device name to the module.



- 1) The “device name” will be used in the programming steps.
- 2) The “IP address” can be used for accessing the Webserver.

## 5.2 Module address assignment

This section mainly introduces the signal point arrangement order and address assignment of the FCEN-8LKM-8A-M module, mainly to indicate the clear sequence of signals. This picture shows the I/O signal and status of the IO-Link master:

Device overview						
Module	...	Rack	Slot	I address	Q address	Type
io-link-master		0	0			FCEN-8LKM-8A-M
PN-IO		0	0 X1			io-link-master
Digital IN_1		0	IO-Link port 1			Digital IN
Digital IN_2		0	IO-Link port 2			Digital IN
Digital IN_3		0	IO-Link port 3			Digital IN
Digital IN_4		0	IO-Link port 4			Digital IN
Digital IN_5		0	IO-Link port 5			Digital IN
Digital IN_6		0	IO-Link port 6			Digital IN
Digital IN_7		0	IO-Link port 7			Digital IN
Digital IN_8		0	IO-Link port 8			Digital IN
IO-Link Master IO_1		0	IO-Link Master IO	0...1	0...1	IO-Link Master IO
IO-Link Communication Status_1		0	IO-Link Communication Status	2		IO-Link Communi...
IO-Link Device Diagnosis_1		0	IO-Link Device Diagnosis	3		IO-Link Device Dia...
Master Port Error_1		0	Master Port Error	4		Master Port Error
Power Supply Status_1		0	Power Supply Status	5		Power Supply Status
Disable IO-Link Diagnosis_1		0	Disable IO-Link Diagnosis		2	Disable IO-Link Di...

### 5.2.1 I/O signal of IO-Link master

This section consists of 2 bytes, used to represent the status of the IO-Link master port when receiving and controlling switch signals.

The default order of port signals is Port base, which means that the mapping addresses are arranged in port order. First, Pin4 of the first port is arranged, then Pin2 of the first port, then Pin4 of the second port, and so on.

Byte 0	Digital input/output status of port 1~4							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
No.	07	06	05	04	03	02	01	00
Pin	Port4 Pin2	Port4 Pin4	Port3 Pin2	Port3 Pin4	Port2 Pin2	Port2 Pin4	Port1 Pin2	Port1 Pin4
Byte 1	Digital input/output status of port 5~8							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
No.	15	14	13	12	11	10	09	08
Pin	Port8 Pin2	Port8 Pin4	Port7 Pin2	Port7 Pin4	Port6 Pin2	Port6 Pin4	Port5 Pin2	Port5 Pin4

## 5.2.2 Status feedback of IO-Link master

This section consists of 4 bytes, used to represent the status and error information related to the IO-Link master. Users can freely choose to configure any item.

INPUT	Description
Byte 2	IO-Link Communication Status
Byte 3	IO-Link Device Diagnosis (Short-Circuit&Overload)
Byte 4	Master Port Error (Short-Circuit&Overload)
Byte 5	Power Supply Diagnosis

For a detailed description of status feedback, please refer to the following:

### Byte 2 (IO-Link Communication Status)

When the port is configured in IO-Link mode and has established a connection with the IO-Link device, the corresponding point indicates 1; otherwise, the point indicates 0.

Byte 2	IO-Link Communication Status							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

### Byte 3 (IO-Link Device Diagnosis)

When there is a diagnostic alarm on the IO-Link slave device connected to the port (only supporting short circuit and overload detection of IO-Link slaves), the corresponding point indicates 1, otherwise the point indicates 0.

Byte 3	IO-Link Device Diagnosis							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

### Byte 4 (Master Port Error)

When short circuit occurs between Pin1 and Pin3 of the IO-Link master port or overload between Pin2 and Pin3 of the IO-Link master port, the corresponding point indicates 1, otherwise the point indicates 0.

Byte 4	Master Port Error							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

### Byte 5 (Power Supply Diagnosis)

When there is an abnormality in the power supply of the IO-Link master, the corresponding point indication changes to 1, based on the fault status of over voltage, under voltage, and disconnection of the voltage.

Otherwise, the point indication is 0.

Byte 5	Power Supply Diagnosis							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Mean	Ua_H High voltage	Ua_L Low voltage	Us_H High voltage	Us_L Low voltage	Ua_S Short circuit	-	-	-

### 5.2.3 Control function of IO-Link master

This section consists of 1 bytes, used to control the IO-Link master to disable port diagnosis, Users can freely choose to configure the item.

OUTPUT	Description
Byte 2	Disable IO-Link Port Diagnosis

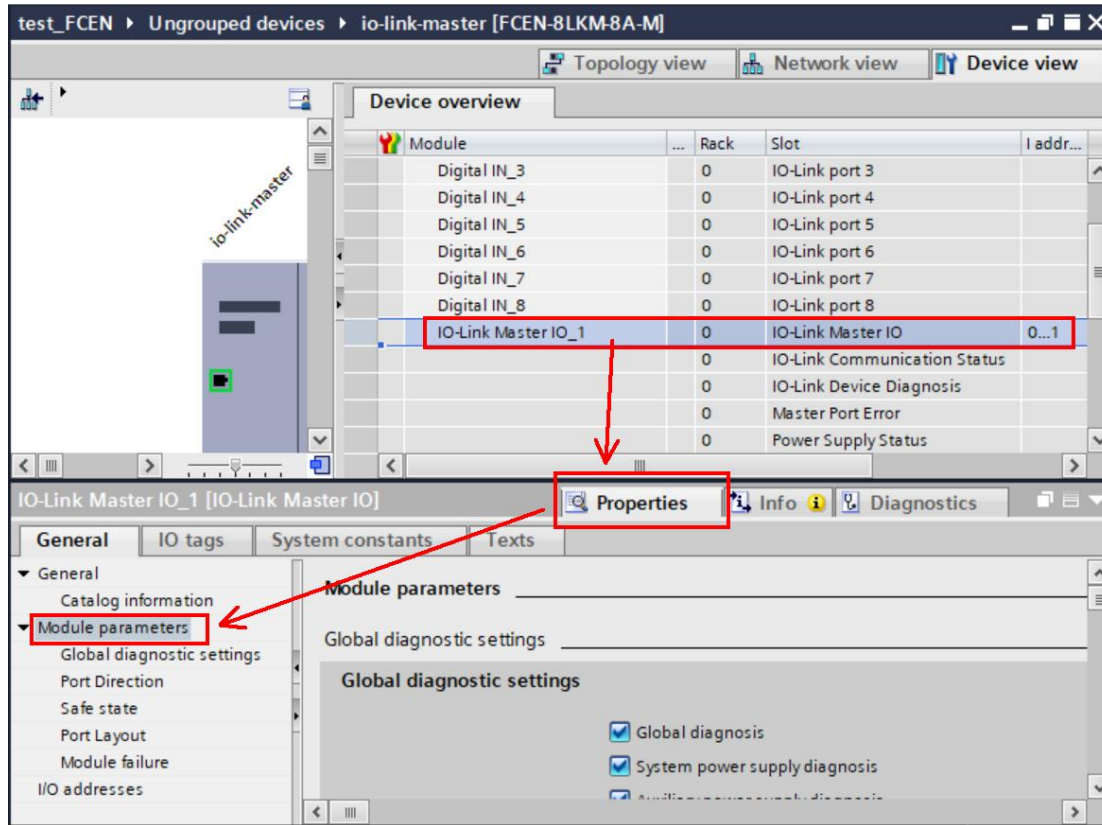
**Byte 2** (Disable IO-Link Port Diagnosis)

When the port is configured in IO-Link mode and has established a connection with the IO-Link slave, if you want to disable the diagnosis on this port, set the corresponding point to 1; otherwise, set the point to 0.

Byte 2	Disable IO-Link Port Diagnosis							
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

## 5.3 Setting parameters of the module

Users can set the parameters of the module in TIA Portal. Enter the "Device View" interface and select "Properties-> General-> Module Parameters" of "IO-LINK Master IO\_1". Users can modify the module parameters as needed.



### 5.3.1 Global diagnostic settings

This section consists of 3 items, used to disable the diagnosis of IO-Link master. For a detailed description of diagnostic settings, please refer to the following:

#### Item\_1 (Global Diagnosis)

This parameter is used to disable all diagnostics of the IO-Link master. When the selection box is checked, diagnosis is enabled, and when the selection box is not checked, diagnosis is disabled.

When this setting is not selected, the uploaded diagnostic information and port indicator lights will no longer prompt any errors, but the status transmitted through the input signal is not affected.

#### Item\_2 (System Power Supply Diagnosis)

This parameter is used to disable the system power supply diagnosis of the IO-Link master. When the selection box is checked, diagnosis is enabled, and when the selection box is not checked, diagnosis is disabled.

When this setting is not selected, the uploaded diagnostic information and port indicator lights will no longer prompt any errors, but the status transmitted through the input signal is not affected.

**Item\_3** (Auxiliary Power Supply Diagnosis)

This parameter is used to disable the output power supply diagnosis of the IO-Link master. When the selection box is checked, diagnosis is enabled, and when the selection box is not checked, diagnosis is disabled.

When this setting is not selected, the uploaded diagnostic information and port indicator lights will no longer prompt any errors, but the status transmitted through the input signal is not affected.

### 5.3.2 Port settings of IO-Link master

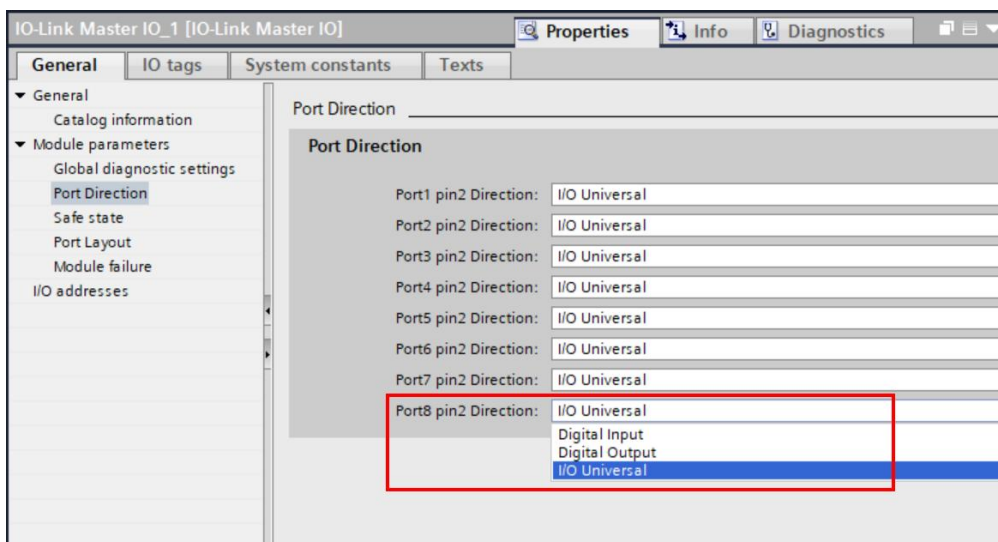
This section used to set the function of the IO-Link master ports Pin4 and Pin2, and the status of Pin2 output in case of network disconnection or other abnormalities.

The Pin4 functions of the IO-Link port are configure as digital input. Users can change it to IO-Link mode by replacing the slots. The Pin2 functions can be set to input or output or universal by selecting. For a detailed description of port settings, please refer to the following:

**Item\_1** (Pin2 type of Port 1~8)

This section is used to set the properties of Pin2in each port of the IO-Link master, which can be set as switch input or switch output or universal.

The default is "I/O Universal", which means the Pin2 can be used as Input or Output by wiring; Can be set to "Input", which means only as Input; Can be set to "Output", which means only as Output.

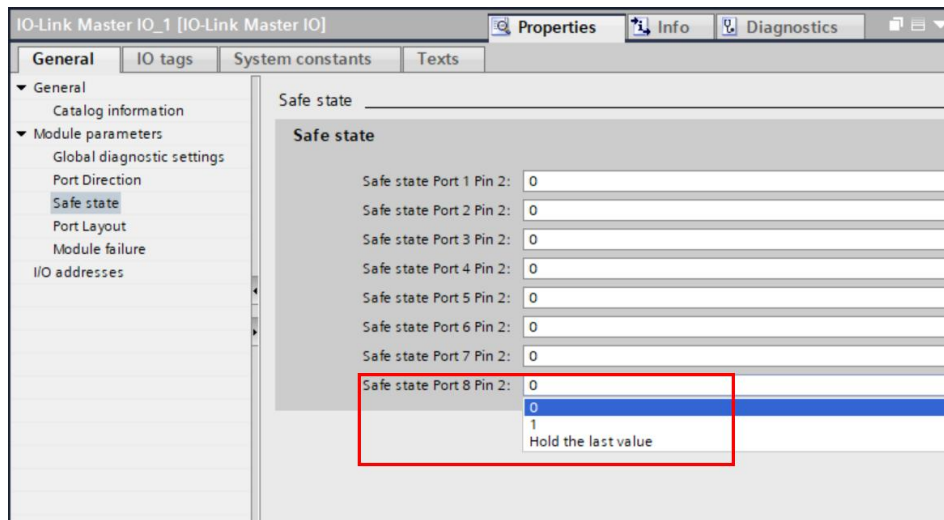


**Item\_2** (Pin2 safe state of Port 1~8)

This section is used to set the safety status of Pin2output in each port of the IO-Link master. When the IO-Link master experiences network disconnection or other abnormalities, the Pin2 output signal will switch to the set value.

The default is "0", which means the output is turned off in case of an exception; Can be set to "1", which means the output is turned on in case

of an exception; Can be set to “Hold the last value”, which means the output will maintain the last value in case of an exception.



### 5.3.3 Process data layout

This parameter is used to set the address mapping order of the IO-Link master switch input and output signals. The default value is “Port base”, which is arranged by port; It can also be set to “Pin base”, which is arranged according to the pins.

#### 0-Portbased assignment.

Byte offset	bit	PD_IN	PD_OUT
X	0	Port1 Pin4	Not supported.
	1	Port1 Pin2	Port1 Pin2
	.....		
	6	Port4 Pin4	
	7	Port4 Pin2	Port4 Pin2
X+1	0	Port5 Pin4	Not supported.
	1	Port5 Pin2	Port5 Pin2
	.....		
	6	Port8 Pin4	Not supported.
	7	Port8 Pin2	Port8 Pin2

#### 1-Pin based assignment.

Byte offset	bit	PD_IN	PD_OUT
X	0	Port1 Pin4	No supported.
	1	Port2 Pin4	No supported.
	.....		
	6	Port7 Pin4	No supported.
	7	Port8 Pin4	No supported.
X+1	0	Port1 Pin2	Port1 Pin2

	1	Port2 Pin2	Port2 Pin2
	.....		
	6	Port7 Pin2	Port7 Pin2
	7	Port8 Pin2	Port8 Pin2

## 5.4 Module configuration by Portal (Siemens PLC)

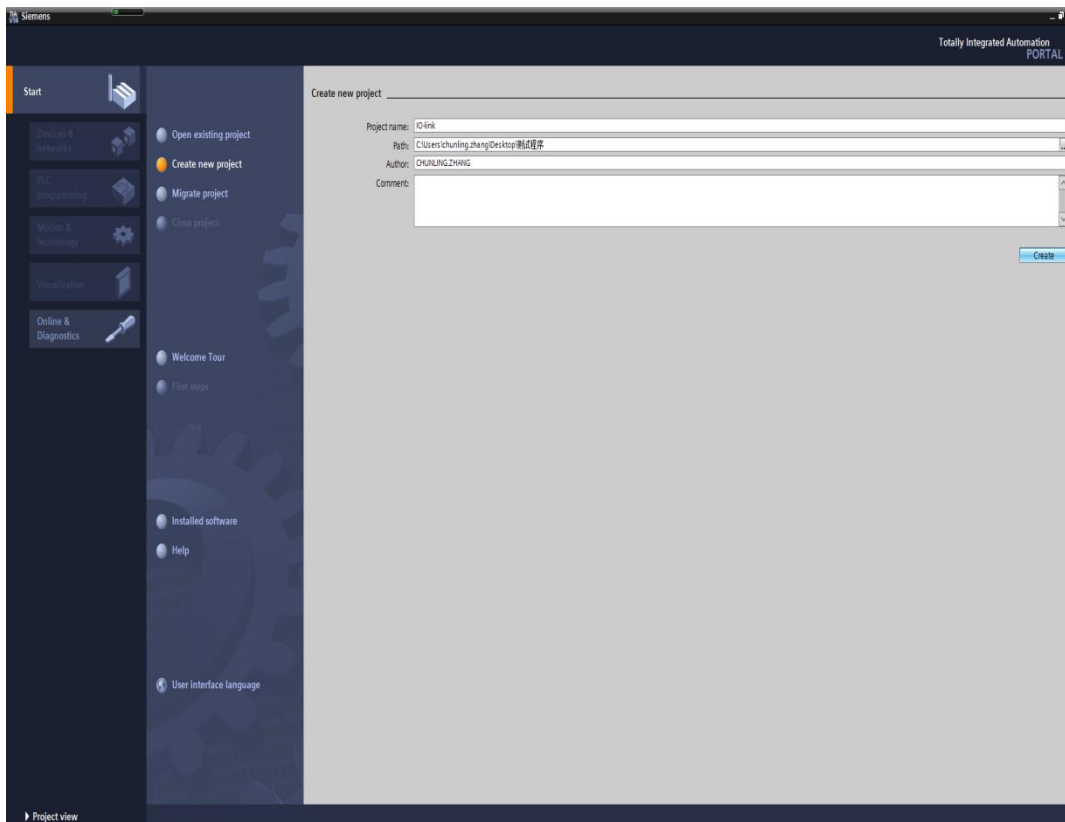
This section, through a case of connection configuration in a current operation process, will let the users fully understand how to use the FCEN-8LKM-8A-M module. In this case, using the FCEN-8LKM-8A-Mas PROFINET slave to connect the Siemens PROFINET controller CPU1511 under the condition that all power and bus connections have been completed, the device name of IO-Link master module is assigned as elco67.

The Profinet protocol IO-Link system includes one IO-Link master module FCEN-8LKM-8A-M, with expansion ports Port1 connected to one IO-Link slave hub LKHA-16UP-M12G, Port6 connected to LKHA-16UP-M12G-AP4, and the remaining expansion ports set to the off state

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

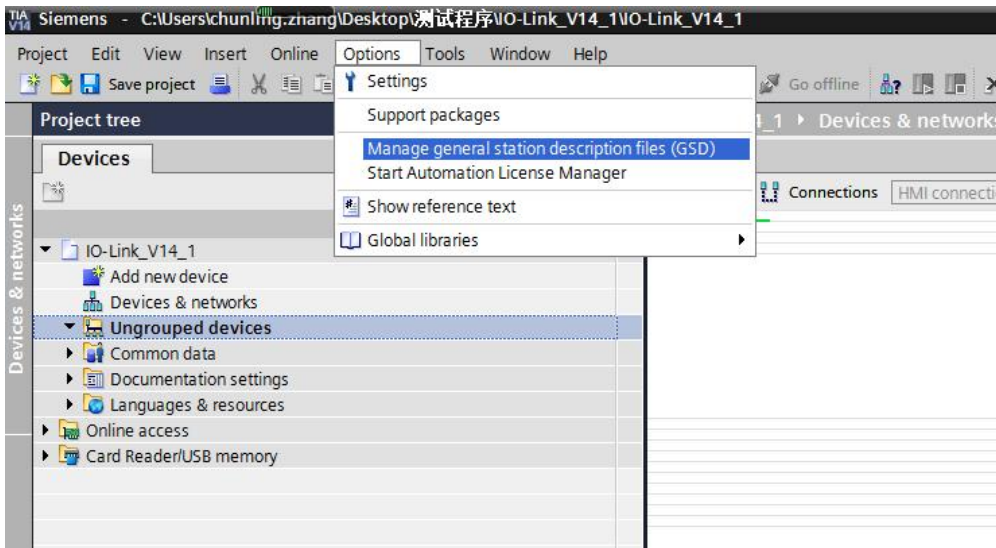
### 1) Create a new Portal project

Open Portal software, click "Create New Project", change "Project Name" to "IO-link", select the save path, and click "Create".

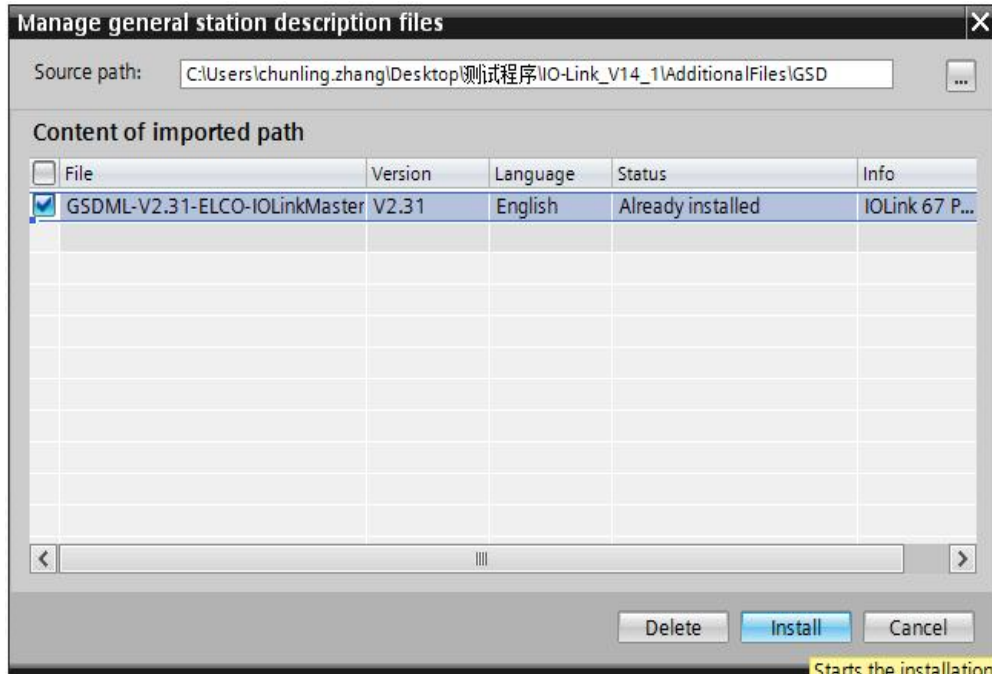


2) Install GSD files for the FCEN-8LKM-8A-M module.

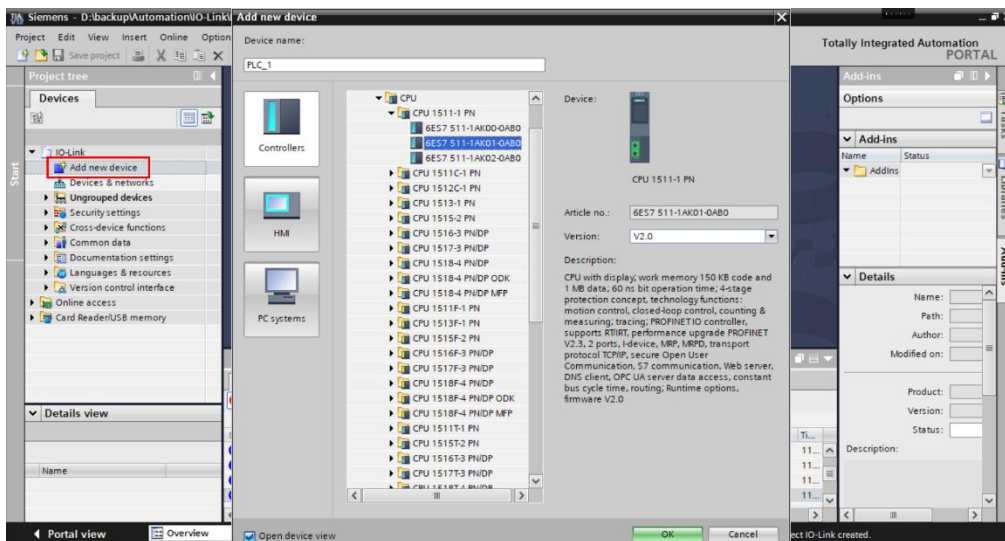
A) Select "Options"->"Manage General Station Description File (GSD)" in the menu bar.



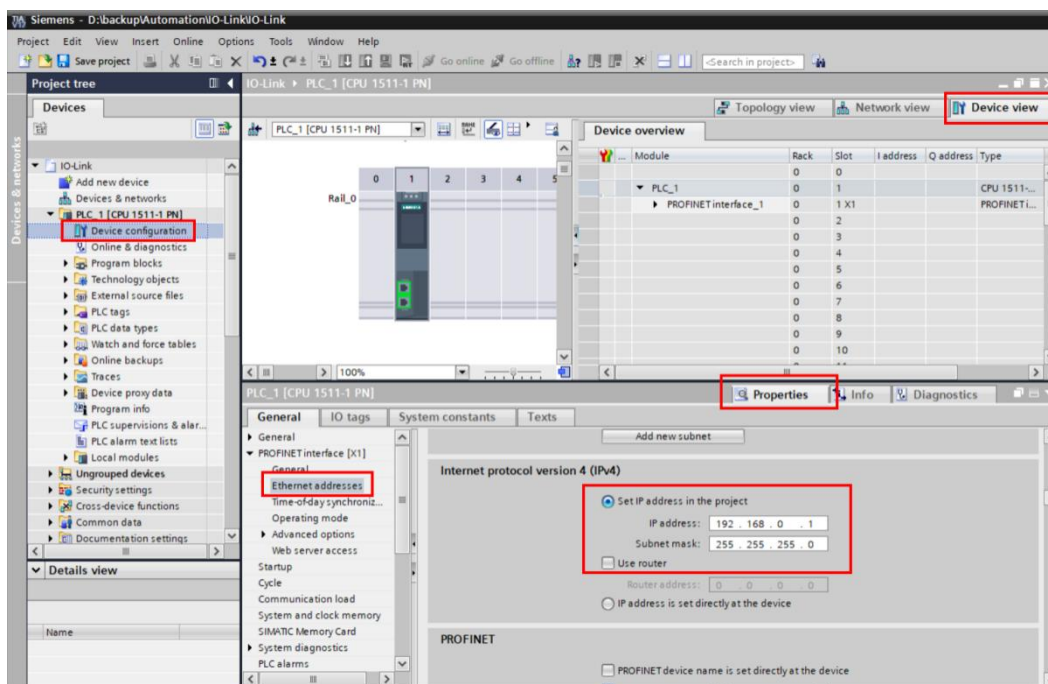
B) Select the version of the GSD file to be imported and click 'Install'.



C) Double-click "Add New Device" on the left and select the PLC model in the "Controller" window.

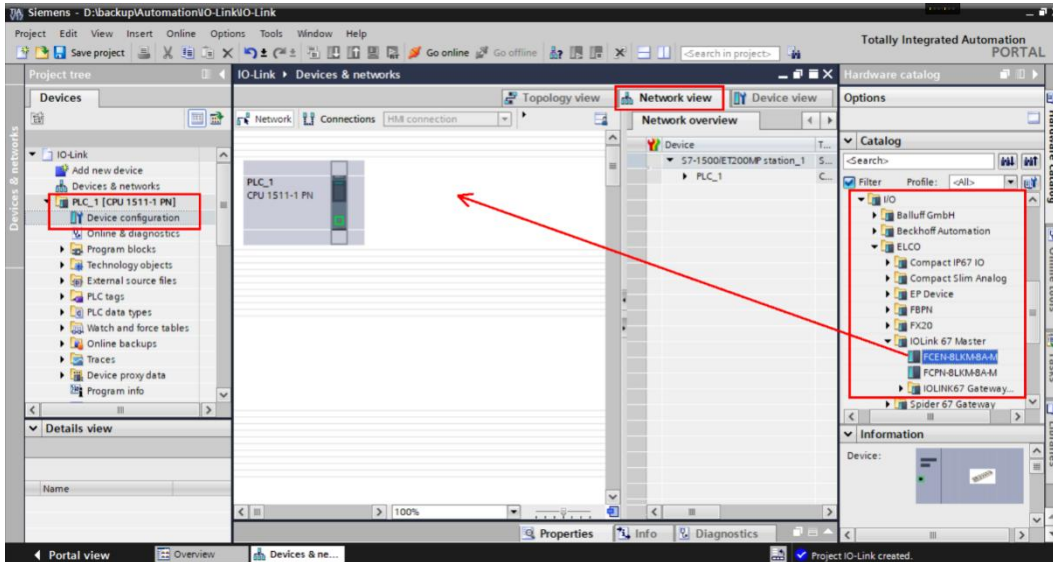


D) Double-click the "Device Configuration" window on the left, and in the "Network View" window, select "Properties" -> "PROFINET Interface [X1]" -> "Ethernet Address" and set the IP address of the PLC.

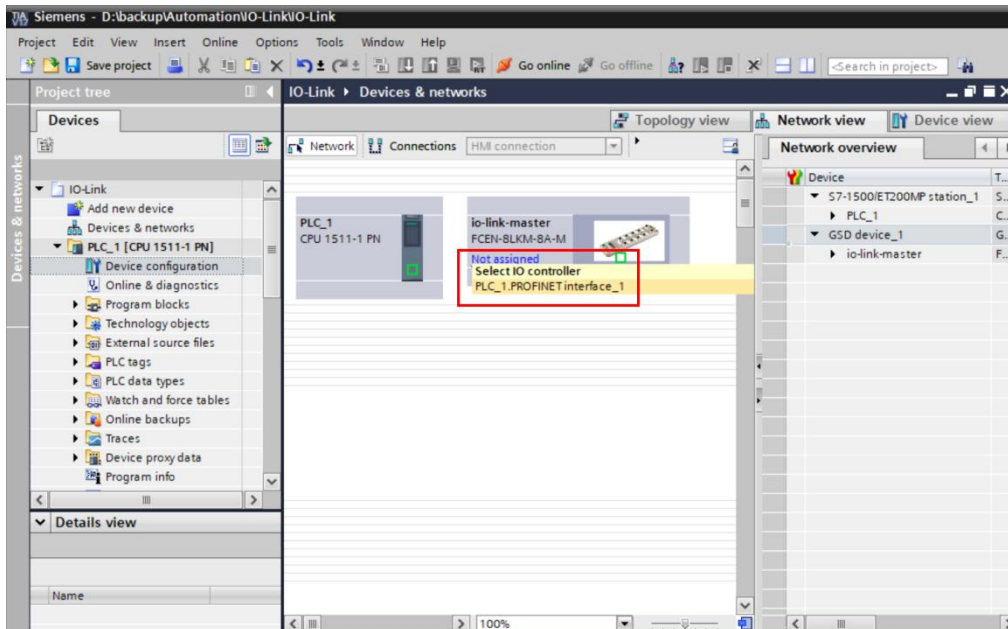


E) Add IO-Link master module and communicate with PLC

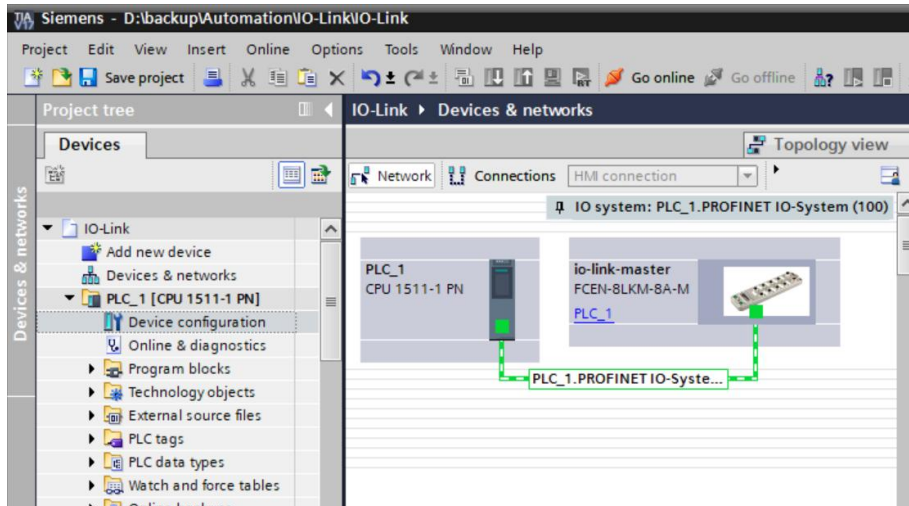
- a) Double-click "Devices & Networks" on the left to enter the "Network View" interface and select FCEN-8LKM-8A-M through "Other Field Devices-> PROFINET IO-> I / O-> ELCO-> IO-Link67 Master" in "Hardware Catalog", double-click or drag to add to the network.



- b) Click the "Not assigned" hyperlink and click to select "PLC\_1.PROFINET Interface\_1"

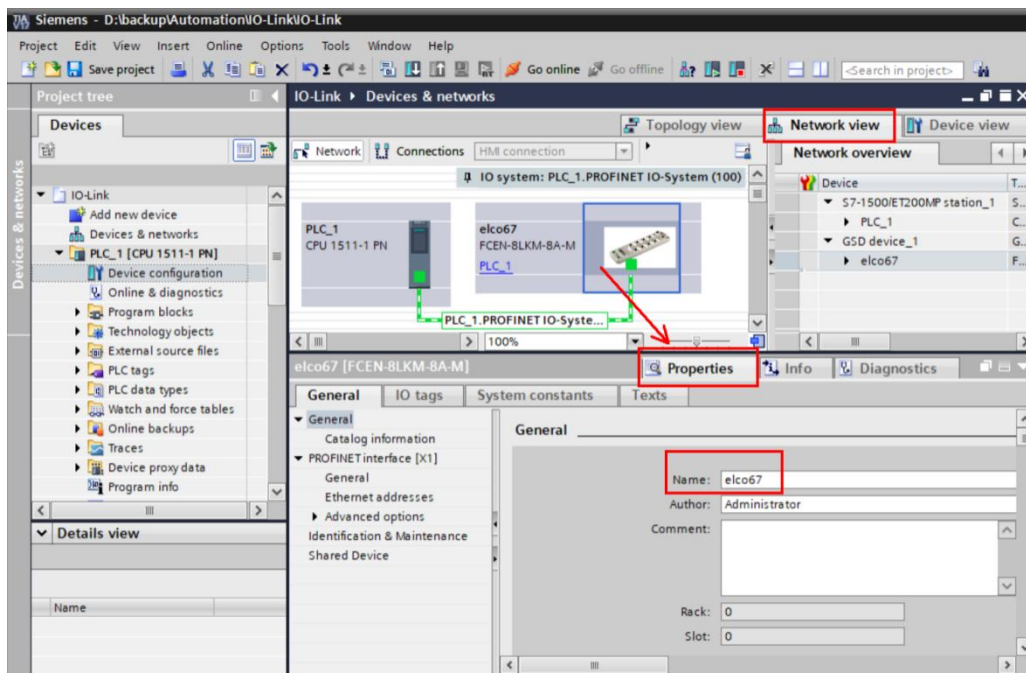


- c) The FCEN-8LKM-8A-M and PLC complete communication connection.

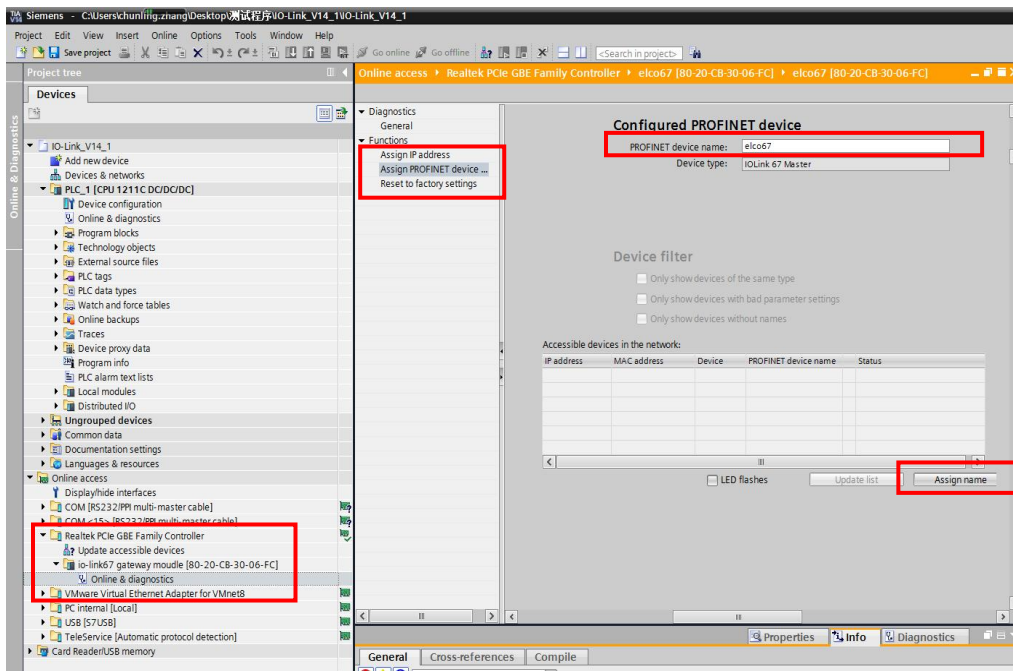


F) Modify IO-Link master module device name and IP address settings

- a) Click the IO-Link master module in the "Network View", select "Properties-> PROFINET Interface-> Ethernet Addresses", set the IO-Link master module device name "elco67" in the window.



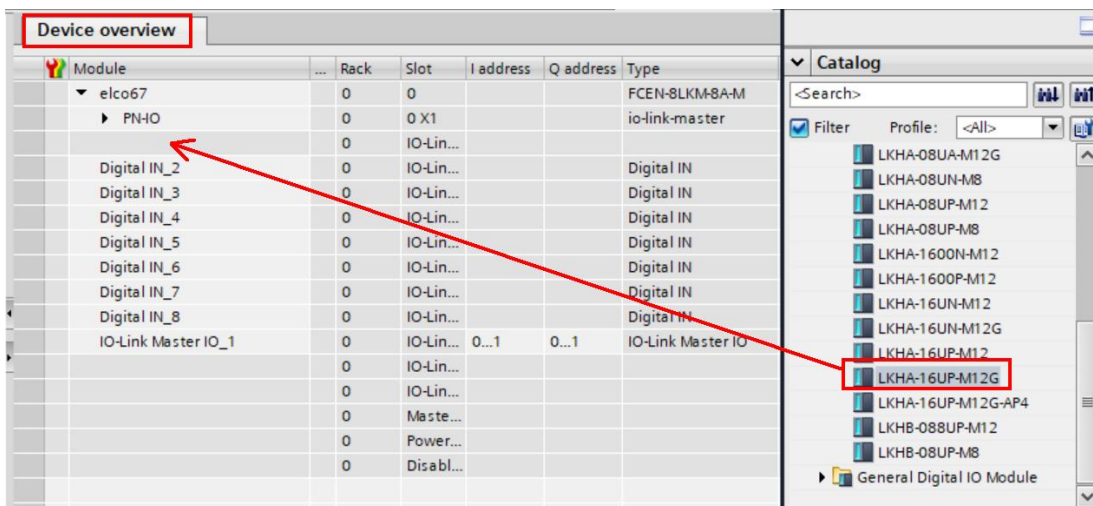
- b) Click "Online Access" in the "Project Tree" on the left, find the name of the upper computer network card, double-click "Update accessible devices", and then the name and MAC address of the connected IO-Link master module will be scanned. Double-click "Online and Diagnostics", modify the device name to elco67 in this interface.



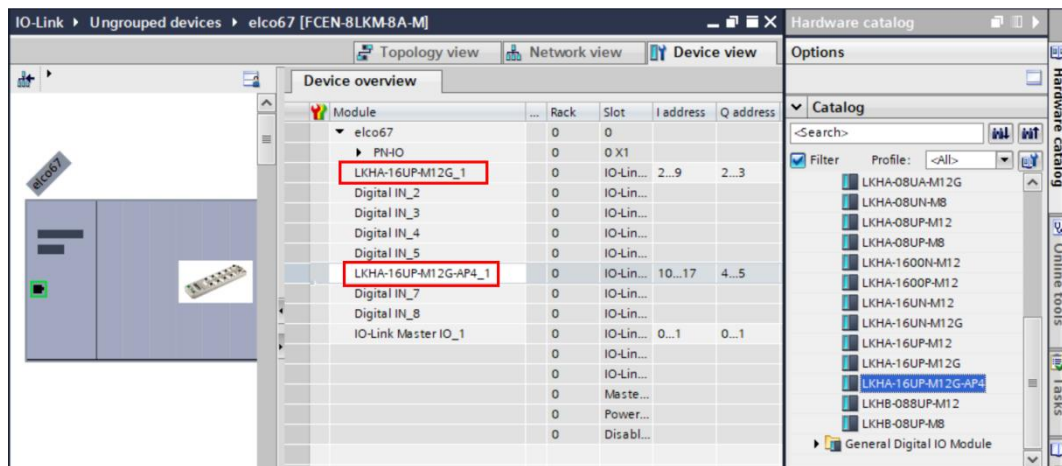
Note: The name of the IO-Link master module must be the same as the device name modified in the previous step.

G) Add the IO-Link sensor hub module to the Device Overview

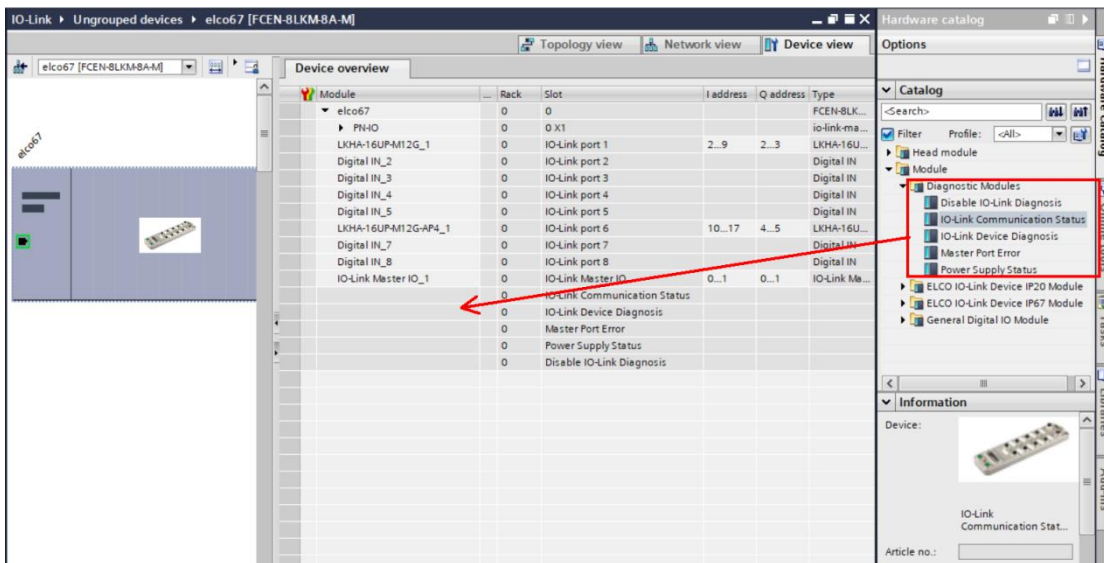
- a) Delete "Digital IN\_1" in the "Device Overview" first.
- b) Select "Module-> ELCO IO-Link Device Module-> LKHA-16UP-M12G" module in the "Hardware Catalog" window and drag it to the slot.



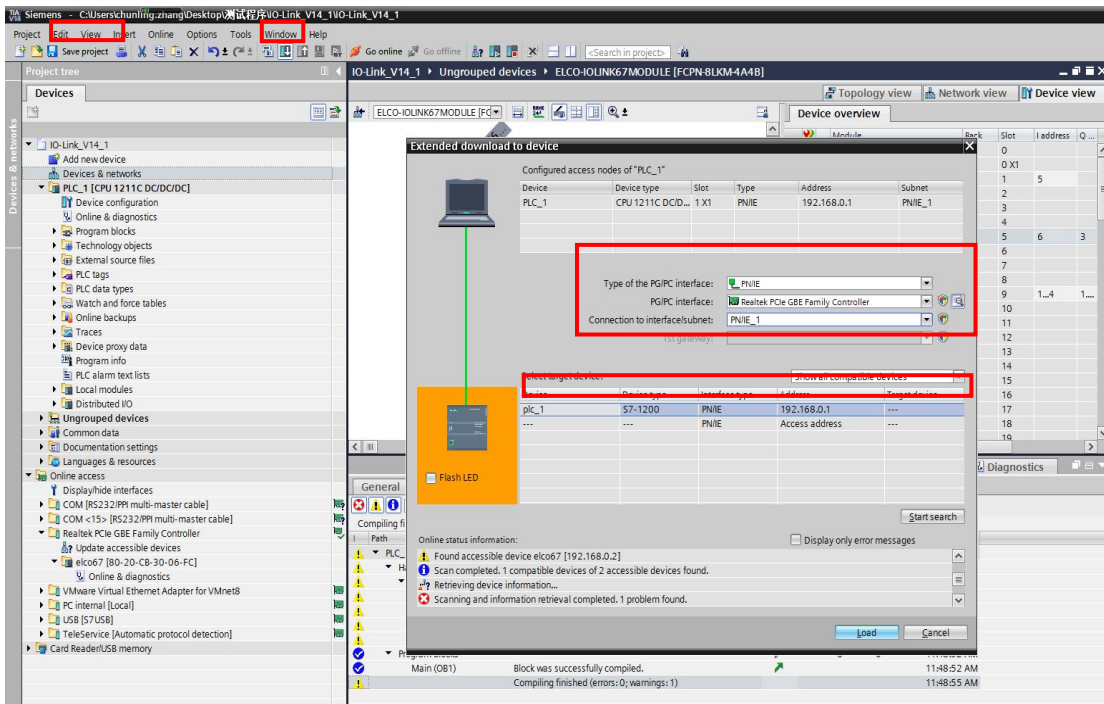
c) Repeat steps a and b to add a "LKHA-16UP-M12G-AP4" IO-Link signal hub module to the Port6 expansion port.



d) Users can add the Diagnostic Modules to the last 5 slots to read the module status and diagnosis in process data. You can double click or drag the diagnostic module to the corresponding slot. Refer to section 5.2.2 for specific descriptions of the status.



- e) After saving and compiling, download the configuration to the PLC.



- f) When the P1 and P6 expansion ports of the IO-Link master module are constantly yellow and BF indicator is green on, the configuration is successful.

## 6.ModbusTCP

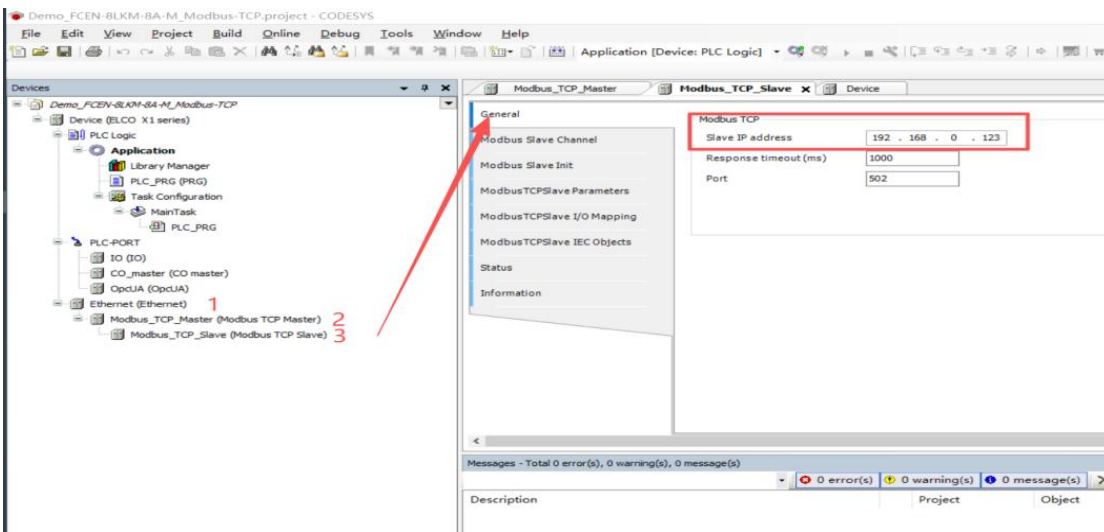
### 6.1 Setting the network parameters

When the FCEN-8LKM-8A-M module powered on, the module will read the rotary

Switch positions.If the rotary switch position stays 700~799, the module will work in Modbus-TCP protocol.

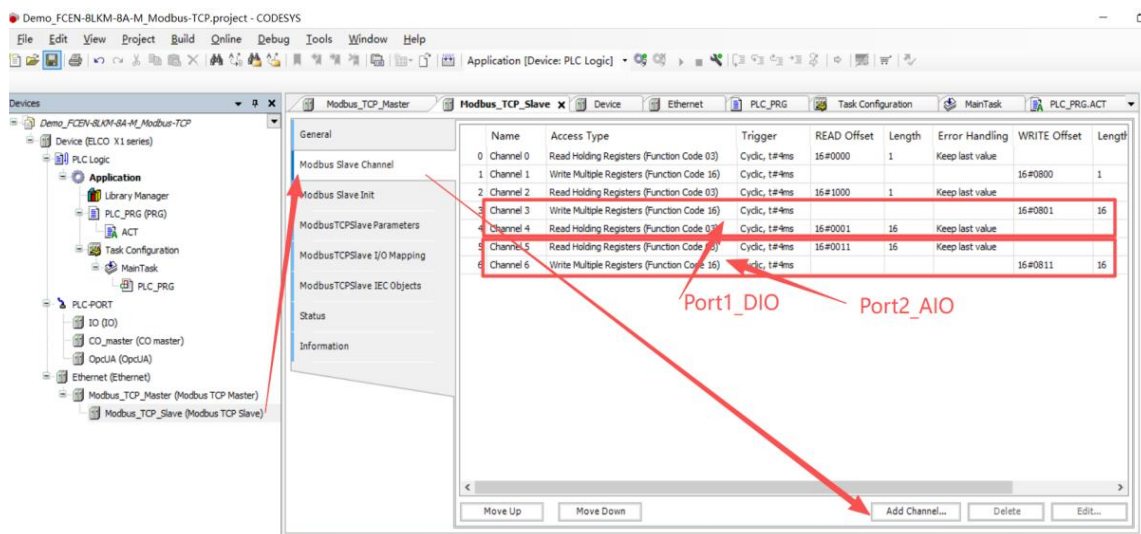
The factory default IP address is 192.168.0.10(rotary switch position stays 700).You can set them by the webserver.eg: HTTP://192.168.0.10/webif/

- 1) Run “codesys” software and insert “Ethernet”in the left side, then insert ModbusTCP\_Master, at the last insert Modbus-TCP\_Slave.
- 2) Enter the IP address of the IO-Link master in the position shown in the figure below in CODESYS.



### 6.2 Add modbus slave channel

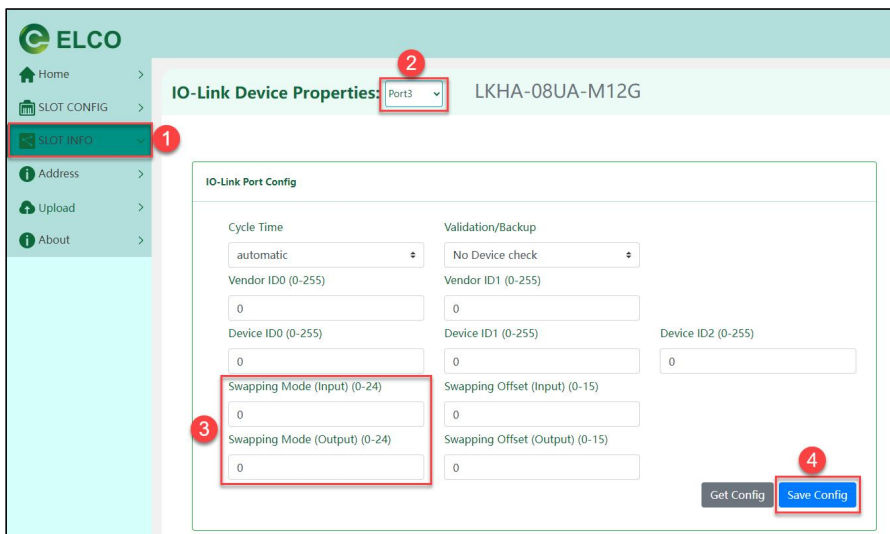
- 1) Click 'Modbus Slave Channel' and 'add channel' button choose which function you want.You can find the addition of READ Offset and WRITE Offset on webserver
- 2) The figure below shows the data reading address of the process data displayed on the webserver.



3) The figure below shows the process data and the data write address displayed on the webserver.

Register	5-digit	Length (WORD)	Content
0x0000	40001	1	IO Signal Input (Mapping 1.1)
0x0001	40002	16	IOL Port1 Input
0x0011	40018	16	IOL Port2 Input
0x0021	40034	16	IOL Port3 Input
0x0031	40050	16	IOL Port4 Input
0x0041	40066	16	IOL Port5 Input
0x0051	40082	16	IOL Port6 Input
0x0061	40098	16	IOL Port7 Input
0x0071	40114	16	IOL Port8 Input

### 6.3 Configuration of Analog Module Parameters



#### 1) Configuration of Analog Module Parameters

1. Select "SLOT INFO" on the web page.
2. Choose the master IO - Link port that is connected to the analog module.
3. Configure the word length for high-low byte flipping required for analog input and output. - For LKHA-08UA-M12G,

If all 8 channels are used as inputs, 10 words need to be configured (the first 8 words are for signals, and the following 2 words are for diagnostic information). - For LKHA-08UA-M12G, if all 8 channels are used as outputs, 8 words need to be configured.

#### 2) Use the web to select the IODD file of the analog module for channel configuration.



After opening the corresponding analog module IODD file, select "Read All" to read all parameters. The parameters of the analog channels can be configured. After modifying the parameters, click the corresponding "Write" button to write the parameters.

### 3) Analog module occupied word length

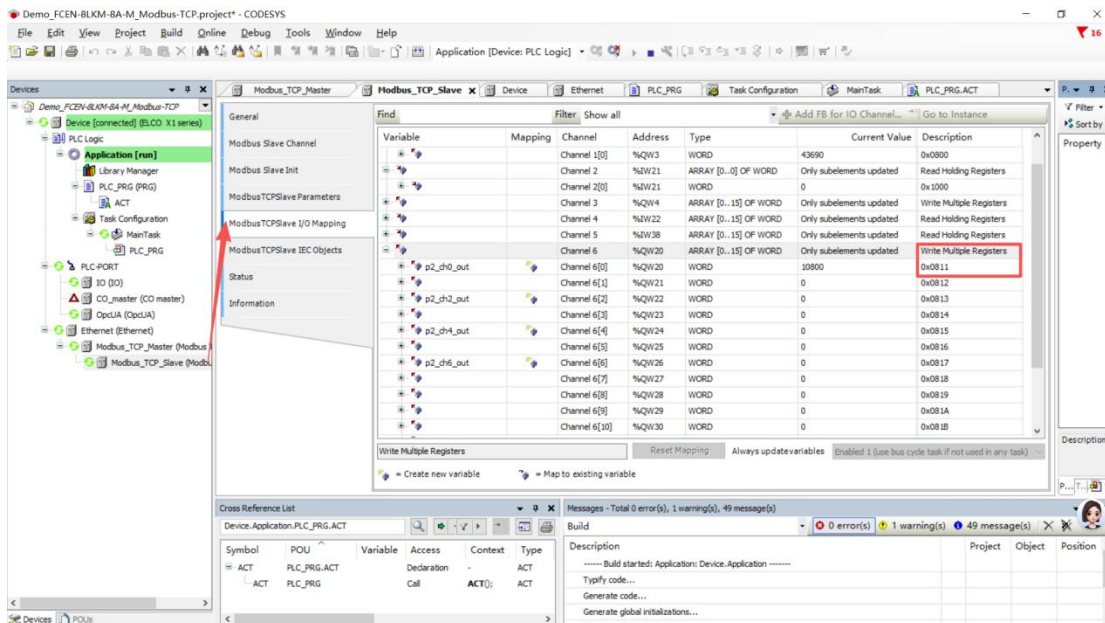
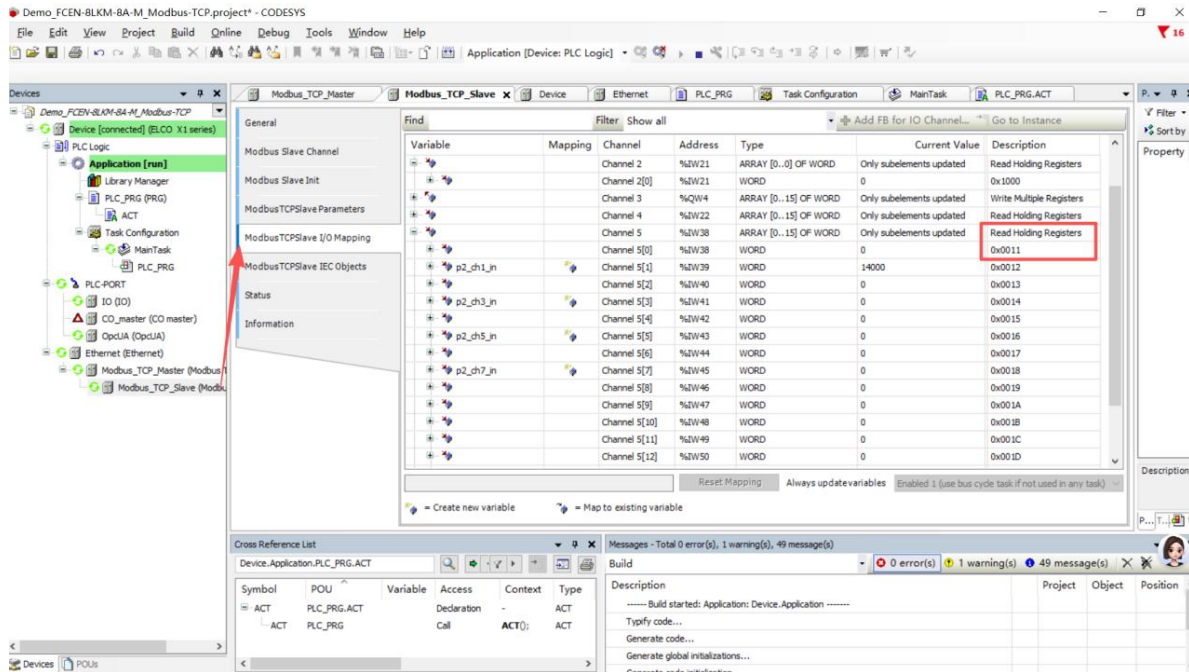
model	Input		Output
	INPUT(word)	Diagnostic (word)	OUTPUT(word)
LKHA-04UA-QC	4	2	4
LKHA-08UA-M12G	8	2	8

LKHA-08UA-M12G			LKHA-04UA-Tx/Qx takes 12 bytes Input and 8 bytes Output.			
Byte	Channel	Eg.	Byte	Byte	Channel	e.g
20 bytes input and 16 bytes output						
Byte 0~15	Input/Output		Input/Output	Byte 0	Channel 1	IW 0
Byte 0&Byte 1	Channel 0	IW 0/QW 0		Byte 1		QW 0
Byte 2&Byte 3	Channel 1	IW 2/QW 2		Byte 2	Channel 2	IW 2
Byte 4&Byte 5	Channel 2	IW 4/QW 4		Byte 3		QW 2
Byte 6&Byte 7	Channel 3	IW 6/QW 6		Byte 4	Channel 3	IW 4
Byte 8&Byte 9	Channel 4	IW 8/QW 8		Byte 5		QW 4
Byte 10&Byte 11	Channel 5	IW 10/QW 10		Byte 6	Channel 4	IW 6
Byte 12&Byte 13	Channel 6	IW 12/QW 12		Byte 7		QW 6
Byte 14&Byte 15	Channel 7	IW 14/QW 14	Diagnose	Byte 8	Signal exceeds the lower limit	IB 8
Diagnose				Byte 9	Signal exceeds the upper limit	IB 9
Byte 16~19				Byte 10	Port short circuit	IB 10
Byte 16	Signal below the lower limit	IB 16		Byte 11	Power supply error	IB 11
Byte 17	Signal exceeds the upper limit	IB 17				
Byte 18	Port signal overload (voltage output only)	IB 18				
Byte 19	short-circuit error	IB 19				

### 6.4 ModbusTCP slave I/O mapping

When you have completed the operation of adding channels, these added addresses will be displayed on the I/O mapping interface. You can add variable tags to these addresses. In the demo program, the IO-Link master PORT2 is connected to the LKHA-16UP-M12 module. Here, the address 0x0011 is selected according to the previous table.

The LKHA-16UP-M12 module has not only input process data but also output process data. Here, we have configured the output process data of this module on port 2. According to the previous table, the address starts from 0x0811.



## 6.5 Module address assignment

This section mainly introduces the signal point arrangement order and address assignment of the FCEN-8LKM-8A-M module. The main purpose is to clarify the address sequence of the signal points.

**1) This table shows the address distribution of reading process data:**

Function code: 01, 02, 03, 04

1, Process data in

Register	5-digit	Length (WORD)	Content		Access
			BIT 8..15	BIT 0..7	
0x0000	40001	1	IO Signal Input (Mapping 1.1)		RO
0x0001	40002	16	IOL Port1 Input		RO
0x0011	40018	16	IOL Port2 Input		
0x0021	40034	16	IOL Port3 Input		
0x0031	40050	16	IOL Port4 Input		
0x0041	40066	16	IOL Port5 Input		
0x0051	40082	16	IOL Port6 Input		
0x0061	40098	16	IOL Port7 Input		
0x0071	40114	16	IOL Port8 Input		

129

1.1, Mapping: IO Signal Input

offset	BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Access
0	Port based																RO
	Port8	Port8	Port7	Port7	Port6	Port6	Port5	Port5	Port4	Port4	Port3	Port3	Port2	Port2	Port1	Port1	
	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	
	Pin based																
	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1	
	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin4	Pin4	Pin4	Pin4	Pin4	Pin4	Pin4	Pin4	

**2) This table shows the address distribution for writing process data:**

Function code: 01, 02, 03, 04, 06, 15, 16

2, Process data out

Register	5-digit	Length (WORD)	Content		Access
			BIT 8..15	BIT 0..7	
0x0800	42049	1	IO Signal Output (Mapping 2.1)		RW
0x0801	42050	16	IOL Port1 Output		RW
0x0811	42066	16	IOL Port2 Output		
0x0821	42082	16	IOL Port3 Output		
0x0831	42098	16	IOL Port4 Output		
0x0841	42114	16	IOL Port5 Output		
0x0851	42130	16	IOL Port6 Output		
0x0861	42146	16	IOL Port7 Output		
0x0871	42162	16	IOL Port8 Output		
0x0881	42178	1	Port1..8 Diagnose Control (Mapping 2.2)		WO

130

2.1, Mapping: IO Signal Output

offset	BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Access
0	Port based																RW
	Port8	-	Port7	-	Port6	-	Port5	-	Port4	-	Port3	-	Port2	-	Port1	-	
	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	
	Pin based																
	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1	-	-	-	-	-	-	-	-	
	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	Pin2	

2.2, Mapping: Port1..8 Diagnose Control

offset	BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Access	
0	-	-	-	-	-	-	-	-	-	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1	WO

BIT=0: Diagnose Enable; BIT=1: Diagnose Disable

### 3) This table shows the address distribution of the diagnostic data:

Function code: 03, 04

#### 3. Diagnostic data

Register	5-digit	Length (WORD)	Content		Access
			BIT 8..15	BIT 0..7	
0x1000	44097	1	<b>Master Power Status</b> BIT0: Reserved BIT1: Reserved BIT2: Reserved BIT3: Uaux Error BIT4: Usys Undervoltage BIT5: Usys Overvoltage BIT6: Uaux Undervoltage BIT7: Uaux Overvoltage		RO
0x1001	44098	12	Port1 IO-Link Status (Mapping 3.1)		RO
0x100D	44110	12	Port2 IO-Link Status		
0x1019	44122	12	Port3 IO-Link Status		
0x1025	44134	12	Port4 IO-Link Status		
0x1031	44146	12	Port5 IO-Link Status		
0x103D	44158	12	Port6 IO-Link Status		
0x1049	44170	12	Port7 IO-Link Status		
0x1055	44182	12	Port8 IO-Link Status		
0x1061	44194	1	Parameter Error (Mapping 3.2)		RO

98

#### 3.1. Mapping: Port1..8 IO-Link Status

offset	BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Access
0	<b>PortX IO-Link Status</b> BIT0: Pin1 Power Short BIT1: Reserved BIT2: Pin2 Overload BIT3: IO-Link Device Other Error BIT4: Communication Lost BIT5: IO-Link Device Validation Error BIT6: Device Error or Warning BIT7: Secondary Supply Voltage Fault																RO
1	SC	-				PDI	DF	VF	-						DC	IOL	RO
	<b>IOL PortX Error</b> VF: Validation failed DF: Data storage validation failed PDI: Process data invalid SC: IO-Link short-circuit								<b>IOL PortX Status</b> IOL: Port in IO-Link mode DC : Device connected								RO
2	IOL PortX Vendor ID 0								IOL PortX Vendor ID 1								RO
3	IOL PortX Device ID 0								IOL PortX Device ID 1								
4	-								IOL PortX Device ID 2								
5	-								Mode	Type	-						RO
	<b>IOL PortX EventQualifier1</b> Mode: 0: Reserved; 1: Single event; 2: Event outgoing; 3: Event incoming Type: 0: Reserved; 1: Message; 2: Warning; 3: Error																RO
6	IOL PortX EventCode1																RO
7	IOL PortX EventQualifier2																RO
8	IOL PortX EventCode2																RO
9	IOL PortX EventQualifier3																RO
10	IOL PortX EventCode3																RO
11	Reserved																RO

#### 3.2. Parameter Error

offset	BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Access
0	BIT8: Process Data Layout BIT9: Watchdog actual time BIT10: Reserved BIT11: Reserved BIT12: Reserved BIT13: Swapping Offset + Mode BIT14: Data Length BIT15: Register Address								BIT0: PortX Pin4 Type BIT1: IOL PortX Cycle Time BIT2: IOL PortX Validation/Backup BIT3: Swapping Mode BIT4: Swapping Offset BIT5: Reserved BIT6: PortX Pin2 Type BIT7: PortX Pin2 Safe State								RO

## 7. CC-Link IE Field Basic

### 7.1 Setting the network parameters

When the FCEN-8LKM-8A-M module powered on, the module will read the rotary switch positions. If the rotary switch position stays 400~699, the module will work in CC-Link IE Field Basic protocol.

The module supports the DHCP and BOOTP protocols for receiving the required network parameters such as IP address and subnet mask.

The default IP settings of CC-Link IE Field Basic for the module are:

IP address: 192.168.3.xxx

Subnet Mask: 255.255.255.000

You can change the IP address by setting the rotary code switch or the web server.

The following table describes the operating modes represented by the rotary code switch settings:

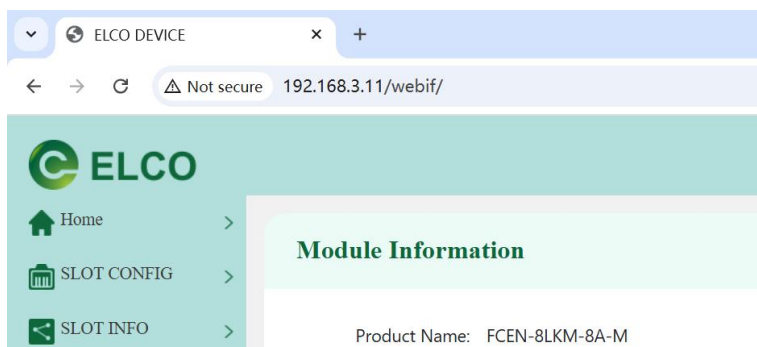
Rotary code switch	Function
000~299 (EtherNet/IP)	This module runs under the EtherNet/IP protocol. Please refer to the previous section for setting the IP address.
300~399 (Profinet)	This module runs under the PROFINET protocol. Please refer to the previous section for setting the IP address.
401~654 (CC-Link IE FB)	Subtract 400 from the value to obtain the last three digits of the IP address. (i.e. 1-254)  In this mode, the Webserver module can be accessed through a browser to modify network information such as IP addresses. Only the first 9 digits can be set, and the last 3 digits are subject to the rotation code.  Do not set the address to 400, otherwise the IP address may not be successfully set.
655~699 (CC-Link IE FB)	Illegal address, invalid setting.  The original network parameters of the module will not be changed.
700~998	Reserved multiple protocol switching related functions, please do not select.

999	<p>Module reset.</p> <p>This mode needs to be maintained for more than 5 seconds after power on, and when the module port indicator lights scroll and flash, it indicates a successful reset.</p> <p>This operation will clear network parameters such as module IP address and restore to factory settings. Please operate with caution.</p>
-----	---

When the rotary code switch is selected as 401~654, subtracting 400 from this value will result in the last 3 bits of the module IP address being 1~254.

Meanwhile, the FCEN-16UP-M12-M module can access the Webserver through a browser to allocate network parameters such as IP addresses and subnet masks.

The default value of the module or after resetting through code 999, the default IP address is 192.168.3.xxx (depending on the rotary switch value minus 400). When the computer and module IP addresses are in the same network segment, you can use a browser to enter <http://192.168.3.xxx/webif/> to access the module and modify the first 9 digits of the IP address.



You can see the IP address setting interface on the homepage, modify the values of the IP address and subnet mask, and click the "Set IP" button.

After successful setup, "IP configuration successful" will display under the button, The prompt "effective after board reboot" indicates that the new IP address will take effect after the power reboot.



The screenshot shows a web browser window with the address bar displaying "192.168.3.11/webif/". The page features the ELCO logo and a navigation menu on the left with items: Home, SLOT CONFIG, SLOT INFO, Upload, and About. The main content area is titled "Module Information" and lists the following details:

- Product Name: FCEN-8LKM-8A-M
- App Version: V1.0.1
- Protocol Stack: 5.1.0.4
- Version:
- Link1: ON
- Link2: ON
- PLC Connection: Connect

Below this information, there is a "CC-Link IE Field Basic" logo and a configuration section enclosed in a red box. This section contains three input fields:

- IP Address: 192.168.20.11
- Subnet Mask: 255.255.255.0
- MAC Address: 02-00-00-1e-99-00

A "Set IP" button is located below the input fields. At the bottom of the red box, a message reads: "IP configuration successful, effective after board reboot."

## 7.2 Module address assignment

This section mainly introduces the signal point arrangement order and address allocation of the FCEN-8LKM-8A-M module, which is used to clarify the signal arrangement order. The signal points and status information of the IO-Link master occupy the RX and RY areas, while the input and output signal data of the IO-Link slave device occupy the RWr and RWw areas.

Due to the fixed data length of the IO-Link master, it is necessary to determine the number of station addresses allocated by the IO-Link master in the CC-Link IE FB network based on the data size of the configured IO-Link slave devices. According to the definition of CC-Link IE FB network, each site contains 64 bits RX and RY, as well as 32 Words RWr and RWw.

When the data length of a single IO-Link slave device connected to a port is 1-16 bytes, the IO-Link master needs to occupy “2 Occupied Stations” (default setting); When the data length of a single IO-Link slave device connected to a port is 17-24 bytes, the IO-Link master needs to occupy “3 Occupied Stations”; When the data length of a single IO-Link slave device connected to a port is 25-32 bytes, the IO-Link master needs to occupy “4 Occupied Stations”. These figures show the occupancy information of software components in the FCEN module:

Link Side			
Device Name	Points	Start	End
RX	128	00000	0007F
RY	128	00000	0007F
RWr	64	00000	0003F
RWw	64	00000	0003F

2 Occupied Stations:

Link Side			
Device Name	Points	Start	End
RX	192	00000	000BF
RY	192	00000	000BF
RWr	96	00000	0005F
RWw	96	00000	0005F

3 Occupied Stations:

Link Side			
Device Name	Points	Start	End
RX	256	00000	000FF
RY	256	00000	000FF
RWr	128	00000	0007F
RWw	128	00000	0007F

4 Occupied Stations:

## 7.3 RX and RY data address assignment

The FCEN-8LKM-8A-M module occupies different lengths of RX and RY data depending on the number of allocated station addresses. But the actual effective number of RX and RY is the same (80 bits of RX and 32 bits of RY), with the rest being idle data.

The following table lists the data mapping of IO-Link master status information and signals occupancy, where each RX or RY represents a bit:

RX	Input data	Description
<b>RX 00...3F</b>	Module status	Indicate the status of IO-Link master and IO-Link port.
<b>RX 40...4F</b>	Input signal of Master	Process input data for IO-Link Master SIO mode.
<b>RX 50...7F</b> (2 Stations) <b>RX 50...BF</b> (3 Stations) <b>RX 50...FF</b> (4 Stations)	Reserved	Reserved
RX	Output data	Description
<b>RY 00...0F</b>	Module Control	Control the function (diagnosis or restart) of IO-Link port.
<b>RY 10...1F</b>	Output signal of Master	Process output data for IO-Link Master SIO mode.
<b>RY 20...7F</b> (2 Stations) <b>RY 20...BF</b> (3 Stations) <b>RY 20...FF</b> (4 Stations)	Reserved	Reserved

## 7.3.1 Status feedback of IO-Link master

This section consists of 8 bytes, used to represent the status and error information related to the IO-Link master.

INPUT	Description
RX 00...07	IO-Link Communication Status
RX 08...0F	IO-Link Device Diagnosis (Short-Circuit&Overload)
RX 10...17	IO-Link Port Power Supply Short Circuit (Pin1&Pin3)
RX 18...1F	Reserved
RX 20...27	IO-Link Port Output Overload (Pin4 or Pin2)
RX 28...2F	Power Supply Diagnosis
RX 30...37	IO-Link Device Second Supply Voltage Fault
RX 38...3F	Reserved

For a detailed description of status feedback, please refer to the following:

### RX 00...07 (IO-Link Communication Status)

When the port is configured in IO-Link mode and has established a connection with the IO-Link device, the corresponding point indicates 1; otherwise, the point indicates 0.

RX 00...07	IO-Link Communication Status							
Bit	RX07	RX06	RX05	RX04	RX03	RX02	RX01	RX00
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

### RX 08...0F (IO-Link Device Diagnosis)

When there is a diagnostic alarm on the IO-Link slave device connected to the port (only supporting short circuit and overload detection of IO-Link slaves), the corresponding point indicates 1, otherwise the point indicates 0.

RX 08...0F	IO-Link Device Diagnosis							
Bit	RX0F	RX0E	RX0D	RX0C	RX0B	RX0A	RX09	RX08
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

### RX 10...17 (IO-Link Port Power Supply Short Circuit)

When short circuit occurs between Pin1 and Pin3 of the IO-Link master port, the corresponding point indicates 1, otherwise the point indicates 0.

RX 10...17	IO-Link Port Power Supply Short Circuit							
Bit	RX17	RX16	RX15	RX14	RX13	RX12	RX11	RX10
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

## RX 20...27 (IO-Link Port Output Overload)

When overload occurs between Pin4/Pin2 and Pin3 of the IO-Link master port, the corresponding point indicates 1, otherwise the point indicates 0.

RX 20...27	IO-Link Port Output Overload							
Bit	RX27	RX26	RX25	RX24	RX23	RX22	RX21	RX20
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

## RX 28...2F (Power Supply Diagnosis)

When there is an abnormality in the power supply of the IO-Link master, the corresponding point indication changes to 1, based on the fault status of over voltage, under voltage, and disconnection of the voltage.

Otherwise, the point indication is 0.

RX 28...2F	Power Supply Diagnosis							
Bit	RX2F	RX2E	RX2D	RX2C	RX2B	RX2A	RX29	RX28
Mean	Ua_H High voltage	Ua_L Low voltage	Us_H High voltage	Us_L Low voltage	Ua_S Short circuit	-	-	-

## RX 30...37 (IO-Link Device Second Supply Voltage Fault)

When the IO-Link slave device connected to the port and experiences an auxiliary power loss alarm, the corresponding point indicates 1, otherwise the point indicates 0.

RX 30...37	IO-Link Device Second Supply Voltage Fault							
Bit	RX37	RX36	RX35	RX34	RX33	RX32	RX31	RX30
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

## 7.3.2 Input signal of IO-Link master

This section consists of 2 bytes, used to represent the status of the IO-Link master port when receiving switch signals.

The default order of port signals is Port base, which means that the mapping addresses are arranged in port order. First, Pin4 of the first port is arranged, then Pin2 of the first port, then Pin4 of the second port, and so on.

RX 40...47	Digital input status of port 1~4							
Bit	RX47	RX46	RX45	RX44	RX43	RX42	RX41	RX40
No.	07	06	05	04	03	02	01	00
Pin	Port4 Pin2	Port4 Pin4	Port3 Pin2	Port3 Pin4	Port2 Pin2	Port2 Pin4	Port1 Pin2	Port1 Pin4

RX 48...4F	Digital input status of port 5~8							
Bit	RX4F	RX4E	RX4D	RX4C	RX4B	RX4A	RX49	RX48
No.	15	14	13	12	11	10	09	08
Pin	Port8 Pin2	Port8 Pin4	Port7 Pin2	Port7 Pin4	Port6 Pin2	Port6 Pin4	Port5 Pin2	Port5 Pin4

### 7.3.3 Control function of IO-Link master

This section consists of 2 bytes, used to control the IO-Link master to disable port diagnosis or restart output, etc.

OUTPUT	Description
RY 00...07	Disable IO-Link Port Diagnosis
RY 08...0F	Reserved

For a detailed description of control function, please refer to the following:

#### Byte 0 (Disable IO-Link Port Diagnosis)

When the port is configured in IO-Link mode and has established a connection with the IO-Link slave, if you want to disable the diagnosis on this port, set the corresponding point to 1; otherwise, set the point to 0.

RY 00...07	Disable IO-Link Port Diagnosis							
Bit	RY07	RY06	RY05	RY04	RY03	RY02	RY01	RY00
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

#### Byte 1 (Reserved)

This byte is reserved for related functions and is currently useless.

RY 08...0F	Restart output after short-circuit							
Bit	RY0F	RY0E	RY0D	RY0C	RY0B	RY0A	RY09	RY08
Port	Port8	Port7	Port6	Port5	Port4	Port3	Port2	Port1

### 7.3.4 Output signal of IO-Link master

This section consists of 2 bytes, used to represent the output of the IO-Link master port when controlling switch signals.

The default order of port signals is Port base, which means that the mapping addresses are arranged in port order. First, Pin4 of the first port is arranged, then Pin2 of the first port, then Pin4 of the second port, and so on.

<b>RY 10...17</b>		Digital output status of port 1~4						
<b>Bit</b>	RY17	RY16	RY15	RY14	RY13	RY12	RY11	RY10
<b>No.</b>	07	06	05	04	03	02	01	00
<b>Pin</b>	Port4	Port4	Port3	Port3	Port2	Port2	Port1	Port1
	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4
<b>RY 18...1F</b>		Digital output status of port 5~8						
<b>Bit</b>	RY1F	RY1E	RY1D	RY1C	RY1B	RY1A	RY19	RY18
<b>No.</b>	15	14	13	12	11	10	09	08
<b>Pin</b>	Port8	Port8	Port7	Port7	Port6	Port6	Port5	Port5
	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4

## 7.4 RWr and RWw data address assignment

The FCEN-8LKM-8A-M module occupies different lengths of RWr and RWw data depending on the number of Occupied Stations. Meanwhile, according to the different data size settings for each port (Each port size), the assignment of IO-Link slave address mapping is also different.

When Station\_Config is Station2 (2x Occupied Station), 'Each Port Size' can be set to 1-16 bytes.

When Station\_Config is Station3 (3x Occupied Station), 'Each Port Size' can be set to 17-24 bytes.

When Station\_Config is Station4 (4x Occupied Station), 'Each Port Size' can be set to 25-32 bytes.

**Note: The setting value of 'Each Port Size' depends on the IO-Link slave with the largest number of bytes connected to each IO-Link port. For example, when there are multiple types of IO-Link slave devices such as 2-byte, 4-byte, 8-byte, etc., 'Each Port Size' should be filled with '8'.**

Parameter Processing of Slave Station

Target Module Information: FCEN-8LKM-8A-M  
Station No.: 1

Method selection: Parameter read (Read parameter from target module.)

Parameter Information

Checked parameters are the targets of selected processes.

Select All    Cancel All Selections

Name	Initial Value	Unit	Read Value	Unit	Write Value	Unit	Setting Range	Description
<b>Module Information</b>								
<input checked="" type="checkbox"/> Module Information								Module Information
Vendor code	0x2319							Vendor code of the device
Device model	FCEN-8LKM-8A-M							Device Model of the device
Product ID	0x00320239							Product ID of the device
Hardware Version	V1.0.7							Hardware version of the device
Device type ID	0x0239							Device type ID
<b>Config</b>								
<input checked="" type="checkbox"/> Station_Config	Station2							Station_Config
<input checked="" type="checkbox"/> Each Port Size	2						1 to 32	Each Port Size
<input checked="" type="checkbox"/> Process Data Layout	PortBase							Pinbase or Portbase Config
<b>Pin_Config</b>								
<input checked="" type="checkbox"/> Port1_Config	Digital IN							Configure Port1 Mode
<input checked="" type="checkbox"/> Port2_Config	Digital IN							Configure Port2 Mode

Clear All "Read Value"    Clear All "Write Value"

The following table lists the data mapping of IO-Link slave devices for each port through several typical configurations, and other settings can be calculated based on this. Each RWr and RWw represents a word (Word):

- 1) Set '2 Occupied Station', with 2 bytes 'Each Port Size' (default configuration).

	Input/Output data	Description
<b>RWr 00</b> <b>RWw 00</b>	IO-Link Port 1	Process input data for Port 1.
<b>RWr 01</b> <b>RWw 01</b>	IO-Link Port 2	Process input data for Port 2.

<b>RWr 02</b> <b>RWw 02</b>	IO-Link Port 3	Process input data for Port 3.
<b>RWr 03</b> <b>RWw 03</b>	IO-Link Port 4	Process input data for Port 4.
<b>RWr 04</b> <b>RWw 04</b>	IO-Link Port 5	Process input data for Port 5.
<b>RWr 05</b> <b>RWw 05</b>	IO-Link Port 6	Process input data for Port 6.
<b>RWr 06</b> <b>RWw 06</b>	IO-Link Port 7	Process input data for Port 7.
<b>RWr 07</b> <b>RWw 07</b>	IO-Link Port 8	Process input data for Port 8.
<b>RWr 08...3F</b> <b>RWw 08...3F</b>	Reserved	Reserved

2) Set '2 Occupied Station', with 4 bytes 'Each Port Size'.

	<b>Input/Output data</b>	<b>Description</b>
<b>RWr 00...01</b> <b>RWw 00...01</b>	IO-Link Port 1	Process input data for Port 1.
<b>RWr 02...03</b> <b>RWw 02...03</b>	IO-Link Port 2	Process input data for Port 2.
<b>RWr 04...05</b> <b>RWw 04...05</b>	IO-Link Port 3	Process input data for Port 3.
<b>RWr 06...07</b> <b>RWw 06...07</b>	IO-Link Port 4	Process input data for Port 4.
<b>RWr 08...09</b> <b>RWw 08...09</b>	IO-Link Port 5	Process input data for Port 5.
<b>RWr 0A...0B</b> <b>RWw 0A...0B</b>	IO-Link Port 6	Process input data for Port 6.
<b>RWr 0C...0D</b> <b>RWw 0C...0D</b>	IO-Link Port 7	Process input data for Port 7.
<b>RWr 0E...0F</b> <b>RWw 0E...0F</b>	IO-Link Port 8	Process input data for Port 8.

RWr 10...3F RWw 10...3F	Reserved	Reserved
----------------------------	----------	----------

3) Set '2 Occupied Station', with 16 bytes 'Each Port Size'.

	Input/Output data	Description
RWr 00...07 RWw 00...07	IO-Link Port 1	Process input data for Port 1.
RWr 08...0F RWw 08...0F	IO-Link Port 2	Process input data for Port 2.
RWr 10...17 RWw 10...17	IO-Link Port 3	Process input data for Port 3.
RWr 18...1F RWw 18...1F	IO-Link Port 4	Process input data for Port 4.
RWr 20...27 RWw 20...27	IO-Link Port 5	Process input data for Port 5.
RWr 28...2F RWw 28...2F	IO-Link Port 6	Process input data for Port 6.
RWr 30...37 RWw 30...37	IO-Link Port 7	Process input data for Port 7.
RWr 38...3F RWw 38...3F	IO-Link Port 8	Process input data for Port 8.

4) Set '3Occupied Station', with 24 bytes 'Each Port Size'.

	Input/Output data	Description
RWr 00...0B RWw 00...0B	IO-Link Port 1	Process input data for Port 1.
RWr 0C...17 RWw 0C...17	IO-Link Port 2	Process input data for Port 2.
RWr 18...23 RWw 18...23	IO-Link Port 3	Process input data for Port 3.
RWr 24...2F RWw 24...2F	IO-Link Port 4	Process input data for Port 4.

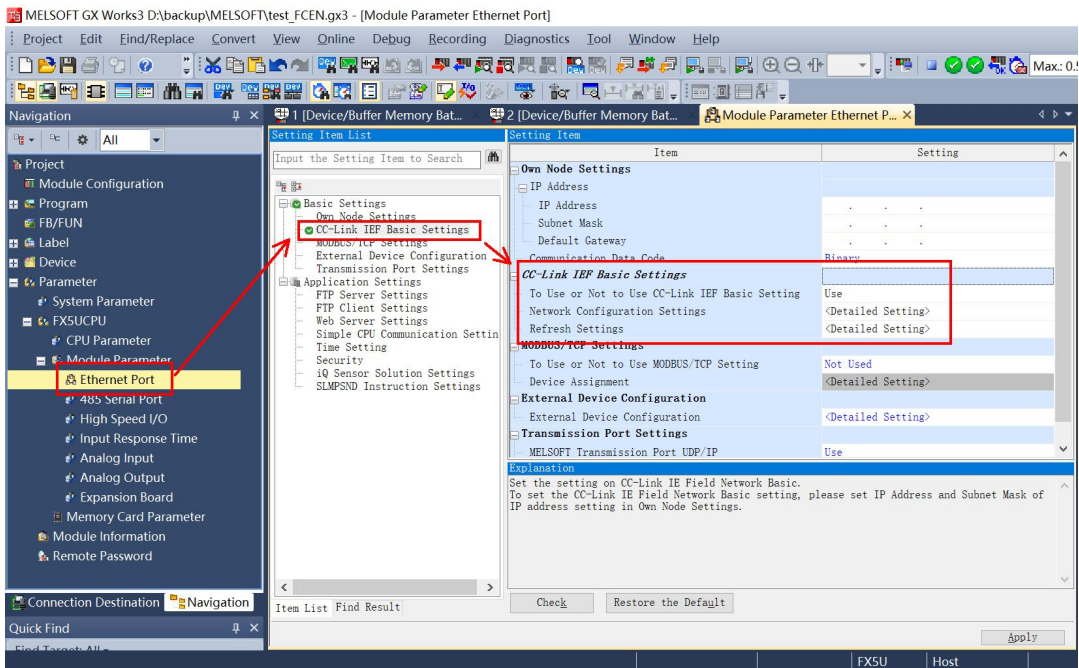
<b>RWr 30...3B</b> <b>RWw 30...3B</b>	IO-Link Port 5	Process input data for Port 5.
<b>RWr 3C...47</b> <b>RWw 3C...47</b>	IO-Link Port 6	Process input data for Port 6.
<b>RWr 48...53</b> <b>RWw 48...53</b>	IO-Link Port 7	Process input data for Port 7.
<b>RWr 54...5F</b> <b>RWw 54...5F</b>	IO-Link Port 8	Process input data for Port 8.

5) Set '4Occupied Station', with 32 bytes 'Each Port Size'. (Maximum)

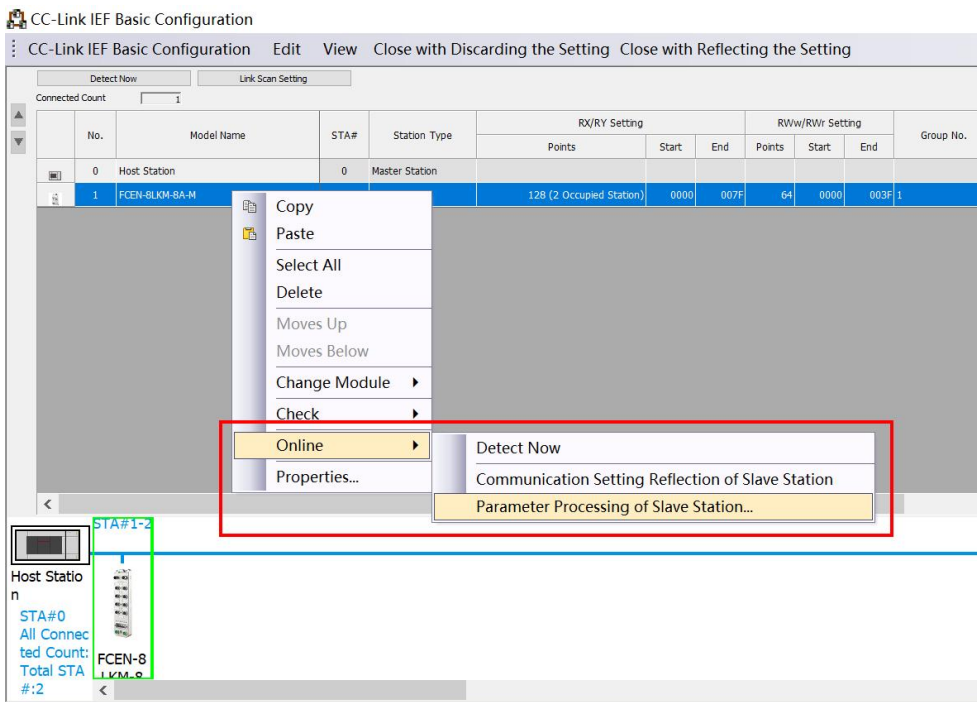
	<b>Input/Output data</b>	<b>Description</b>
<b>RWr 00...0F</b> <b>RWw 00...0F</b>	IO-Link Port 1	Process input data for Port 1.
<b>RWr 10...1F</b> <b>RWw 10...1F</b>	IO-Link Port 2	Process input data for Port 2.
<b>RWr 20...2F</b> <b>RWw 20...2F</b>	IO-Link Port 3	Process input data for Port 3.
<b>RWr 30...3F</b> <b>RWw 30...3F</b>	IO-Link Port 4	Process input data for Port 4.
<b>RWr 40...4F</b> <b>RWw 40...4F</b>	IO-Link Port 5	Process input data for Port 5.
<b>RWr 50...5F</b> <b>RWw 50...5F</b>	IO-Link Port 6	Process input data for Port 6.
<b>RWr 60...6F</b> <b>RWw 60...6F</b>	IO-Link Port 7	Process input data for Port 7.
<b>RWr 70...7F</b> <b>RWw 70...7F</b>	IO-Link Port 8	Process input data for Port 8.

## 7.5 Setting parameters of the module

Users can set module parameters in GX Works3. Enter the "Ethernet Port" interface, select "Network Configuration Settings" from "CC-Link IEF Basic Settings", and in the newly opened window, users can modify module parameters as needed.



Right click on the module and select "Parameter Processing of Slave Station.." to open the settings interface.



In the newly opened window, you can see the parameter settings of the

### Parameter Processing of Slave Station

Target Module Information: FCEN-8LKM-8A-M  
Station No.: 1

Method selection: Parameter read Read parameter from target module.

Parameter Information  
Checked parameters are the targets of selected processes.

Select All Cancel All Selections

	Name	Initial Value	Unit	Read Value	Unit	Write Value	Unit	Setting Range	Description
<b>Config</b>									
<input checked="" type="checkbox"/>	Station_Config	Station2							Station_Config
<input checked="" type="checkbox"/>	Each Port Size	2						1 to 32	Each Port Size
<input checked="" type="checkbox"/>	Process Data Layout	PortBase							Pinbase or Portbase Config
<b>Pin4_Config</b>									
<input checked="" type="checkbox"/>	Port1_Config	Digital IN							Configure Port1 Mode
<input checked="" type="checkbox"/>	Port2_Config	Digital IN							Configure Port2 Mode
<input checked="" type="checkbox"/>	Port3_Config	Digital IN							Configure Port3 Mode
<input checked="" type="checkbox"/>	Port4_Config	Digital IN							Configure Port4 Mode
<input checked="" type="checkbox"/>	Port5_Config	Digital IN							Configure Port5 Mode
<input checked="" type="checkbox"/>	Port6_Config	Digital IN							Configure Port6 Mode
<input checked="" type="checkbox"/>	Port7_Config	Digital IN							Configure Port7 Mode
<input checked="" type="checkbox"/>	Port8_Config	Digital IN							Configure Port8 Mode
<b>Pin2_Config</b>									

Clear All "Read Value" Clear All "Write Value"

module.

## 7.5.1 Occupied Station Address Setting

This parameter Station\_Config is used to set the station address multiplier of CC-Link IE FB occupied by the FCEN-8LKM-8A-M module. The default value is 'Station2', which is '2 Occupied Station'; It can also be set to 'Station3', which is '3 Occupied Station'; It can also be set to 'Station4', which is '4 Occupied Station'.

This setting depends on the data length of a single IO-Link slave connected to the IO-Link port. When the data length of a single IO-Link slave device connected to a port is 1-16 bytes, the IO-Link master needs to occupy '2 Occupied Station' (default setting); When the data length of a single IO-Link slave device connected to a port is 17-24 bytes, the IO-Link master needs to occupy '3 Occupied Station'; When the data length of a single IO-Link slave device connected to a port is 25-32 bytes, the IO-Link master needs to occupy '4 Occupied Station'.

## 7.5.2 Each IO-Link Port Size

This parameter 'Each Port Size' is used to set the byte length occupied by each IO-Link port of the FCEN-8LKM-8A-M module. The default value is '2', which means that each IO-Link slave device receives 2 bytes of INPUT and OUTPUT data; It can also be set to any value between '1-32', that is, each IO-Link slave device Input and OUTPUT data from 1-32 bytes.

## 7.5.3 Process Data Layout

This parameter is used to set the address mapping order of the I/O module switch input and output signals. The default value is 0, which is arranged by port; It can also be set to 1, which is arranged according to the pins.

### 0-Port based assignment.

Byte offset	bit	PD_IN	PD_OUT
X	0	Port1 Pin4	Port1 Pin4
	1	Port1 Pin2	Port1 Pin2
	.....	.....	.....
	6	Port4 Pin4	Port4 Pin4
	7	Port4 Pin2	Port4 Pin2
X+1	0	Port5 Pin4	Port5 Pin4
	1	Port5 Pin2	Port5 Pin2
	.....	.....	.....
	6	Port8 Pin4	Port8 Pin4
	7	Port8 Pin2	Port8 Pin2

### 1-Pin based assignment.

Byte offset	bit	PD_IN	PD_OUT
X	0	Port1 Pin4	Port1 Pin4
	1	Port2 Pin4	Port2 Pin4
	.....	.....	.....
	6	Port7 Pin4	Port7 Pin4
	7	Port8 Pin4	Port8 Pin4
X+1	0	Port1 Pin2	Port1 Pin2
	1	Port2 Pin2	Port2 Pin2
	.....	.....	.....
	6	Port7 Pin2	Port7 Pin2
	7	Port8 Pin2	Port8 Pin2

## 7.5.4 Port settings of IO-Link master

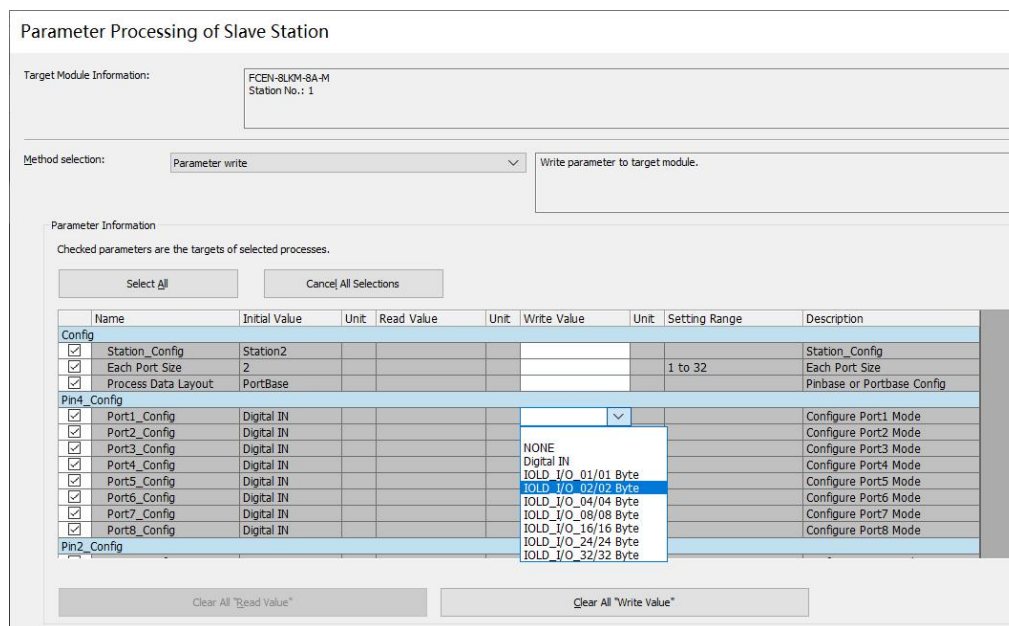
This section used to set the function of the IO-Link master ports Pin4 and Pin2, and the status of Pin2 output in case of network disconnection or other abnormalities.

For a detailed description of port settings, please refer to the following:

### Item\_1 (Pin4 type of Port 1~8)

This section is used to set the properties of Pin4in each port of the IO-Link master, which can be set as switch input or IO-Link mode.

The default is “Digital IN”, which means the Pin4 can be used as Input by wiring; Can be set to “IOL\_I/O\_0x/0x Byte”, which means as IO-Link mode. Can connect IO-Link devices, where '0x/0x Byte' means the byte length of the IO-Link device.



### Item\_2 (Pin2 type of Port 1~8)

This section is used to set the properties of Pin2in each port of the IO-Link master, which can be set as switch input or switch output or universal.

The default is “I/O Universal”, which means the Pin2 can be used as Input or Output by wiring; Can be set to “Digital Input”, which means only as Input; Can be set to “Digital Output”, which means only as Output.

### Item\_3 (Pin2 safe state of Port 1~8)

This section is used to set the safety status of Pin2output in each port of the IO-Link master. When the IO-Link master experiences network disconnection or other abnormalities, the Pin2 output signal will switch to the set value.

The default is “Clear”, which means the output is turned off in case of an exception; Can be set to “Out\_Set”, which means the output is turned on in case of an exception; Can be set to “Hold the last value”, which means the output will maintain the last value in case of an exception.

**Parameter Processing of Slave Station**

Target Module Information: FCEN-8LKM-8A-M  
Station No.: 1

Method selection: Parameter write Write parameter to target module.

Parameter Information  
Checked parameters are the targets of selected processes.

Select All Cancel All Selections

Name	Initial Value	Unit	Read Value	Unit	Write Value	Unit	Setting Range	Description
<b>Pin2_Config</b>								
<input checked="" type="checkbox"/> Port1_Config								Configure Port1 Mode
Direction	I/O Universal							IO Direction config
Status	Clear							Offline Status
<input checked="" type="checkbox"/> Port2_Config								Configure Port2 Mode
Direction	I/O Universal				Digital Input			IO Direction config
Status	Clear				Digital Output			Offline Status
Status	Clear				I/O Universal			Offline Status
<input checked="" type="checkbox"/> Port3_Config								Configure Port3 Mode
Direction	I/O Universal							IO Direction config
Status	Clear							Offline Status
<input checked="" type="checkbox"/> Port4_Config								Configure Port4 Mode
Direction	I/O Universal							IO Direction config
Status	Clear							Offline Status
<input checked="" type="checkbox"/> Port5_Config								Configure Port5 Mode

Clear All "Read Value" Clear All "Write Value"

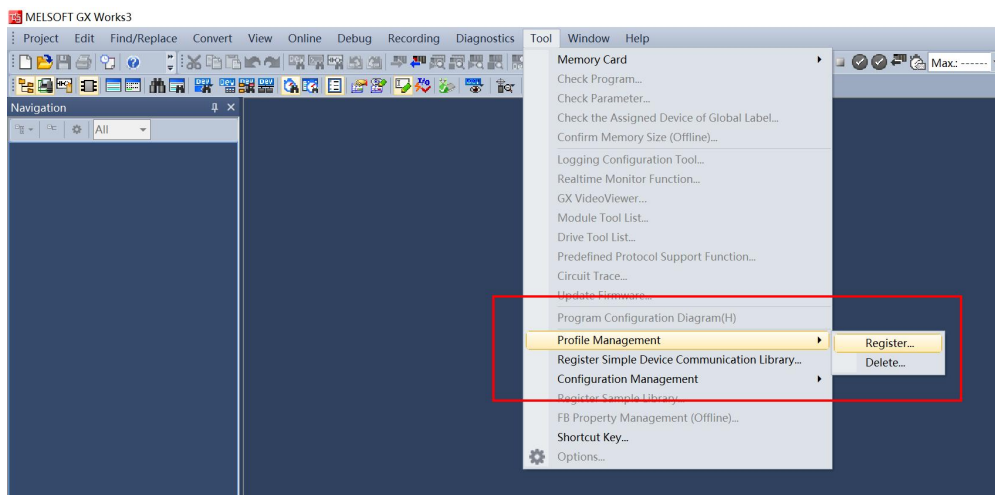
## 7.6 Module configuration by MELSOFT (Mitsubishi PLC)

This section provides users with a comprehensive understanding of how to use the FCEN-8LKM-8A-M module through a practical operation process of configuring connections. With all power and bus connections completed, use FCEN-8LKM-8A-M as the CC-Link IE Field Basic slave to connect the Mitsubishi controller FX5U, where the IP address of the I/O module is specified as 192.168.3.11. This IO-Link system includes one IO-Link Master FCCB-8LKM-8A-M, with the expansion port P1 connected to one IO-Link hub LKHA-1600P-M12, and the expansion port P5 connected to one IO-Link hub LKHA-16UP-M12.

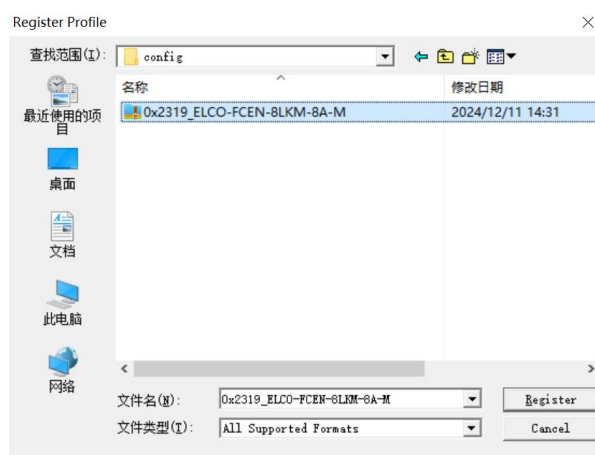
The following will show the specific process of software configuration and debugging.

### a. Install CSPP configuration file for FCEN-8LKM-8A-M module

A) Select "Tool" -> "Profile Management" -> "Register..." in the menu bar, and click to open a new window.

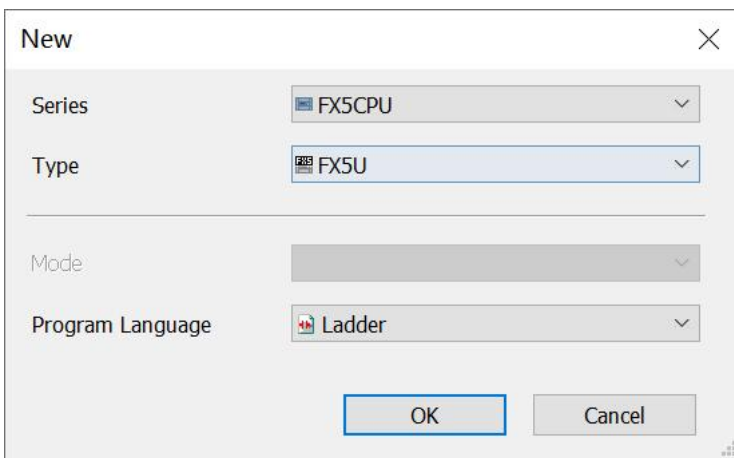
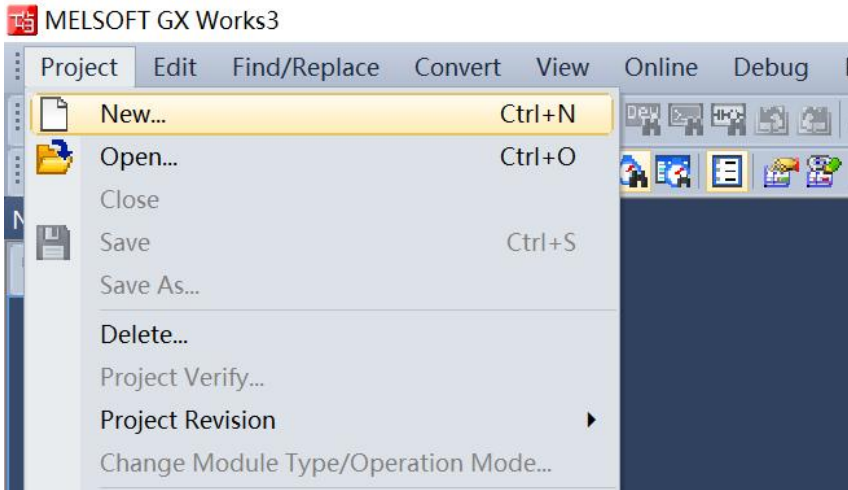


B) Select the version of the CSPP file to import and click "Register".

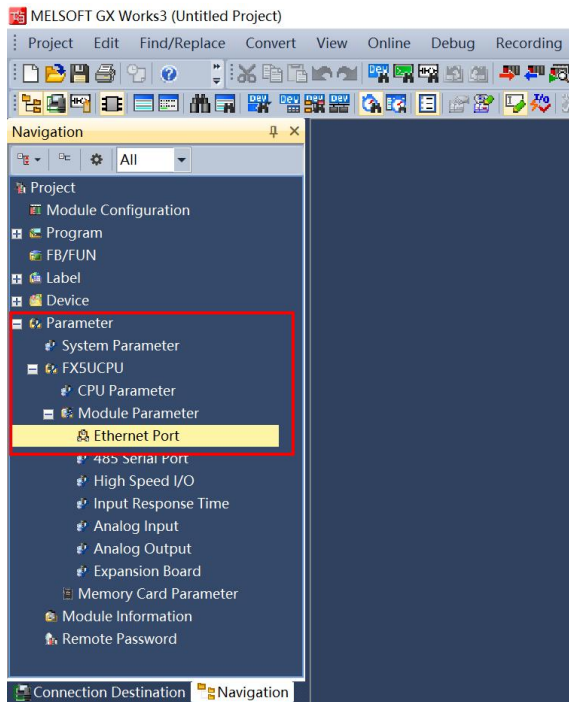


### b. Create a new GX Works3 project

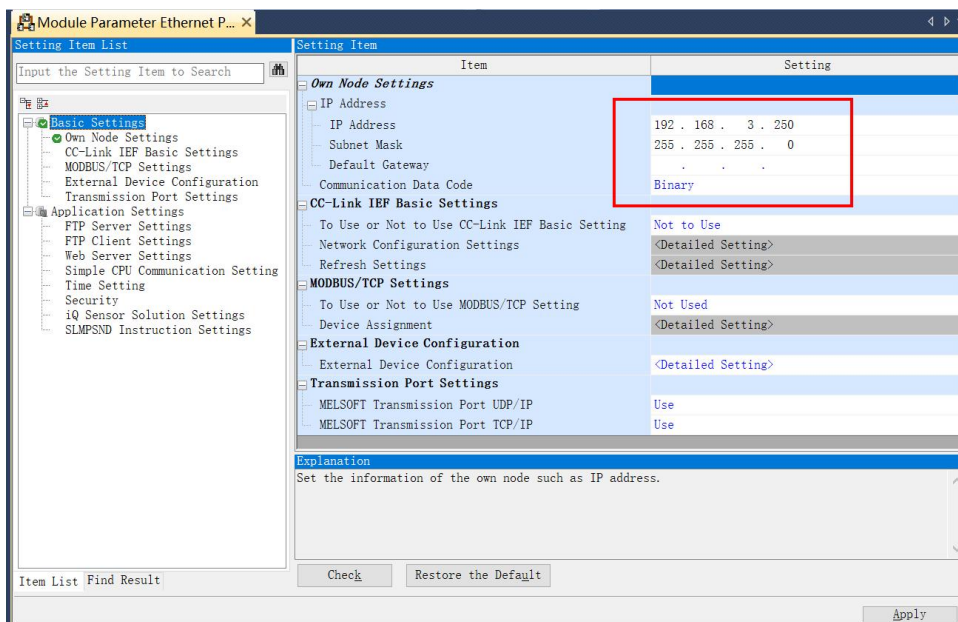
Open the MELSOFT software, click "Project>New...", select the PLC series "FX5CPU" and model "FX5U" in the pop-up dialog box, choose the programming language according to your habits, and then click "OK" to create the project.



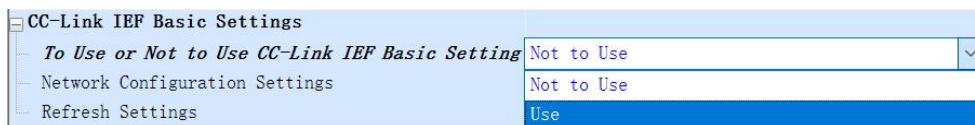
- c. After entering the interface, select the "Navigation" project tree on the left side, and then choose "Parameter>Module Parameter>Ethernet Port" to enter the network settings interface.



- d. In the newly opened window, set the IP address of the PLC to "192.168.3.250" and the subnet mask to "255.255.255.0". Users can also set according to their own needs, please note that the PLC and module need to be on the same IP network segment.



- e. Enable CC Link IE Field Basic network settings, click on the "To Use or Not to use CIB Setting" option, and select "Use" to enable network settings.

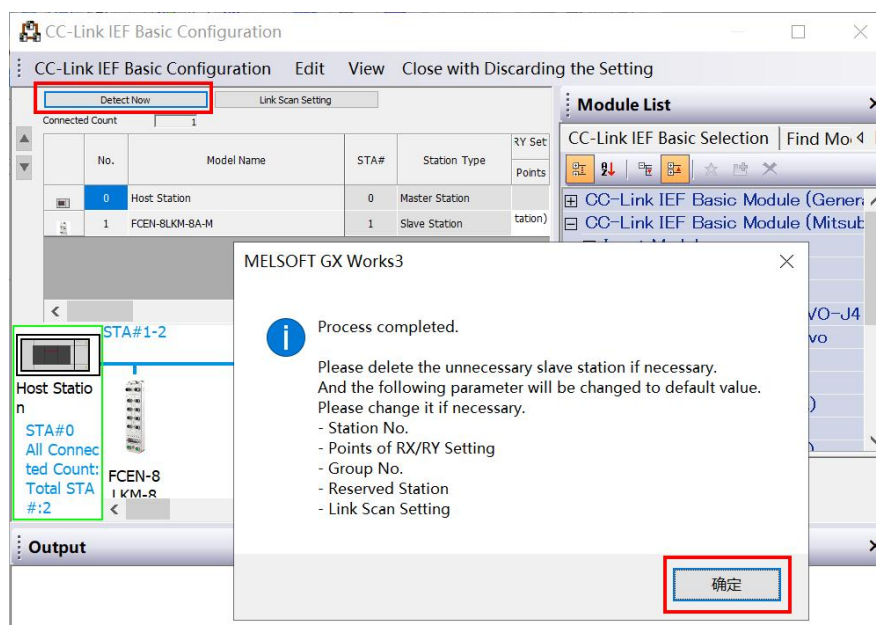


- f. Perform CC Link IE Field Basic network configuration settings.

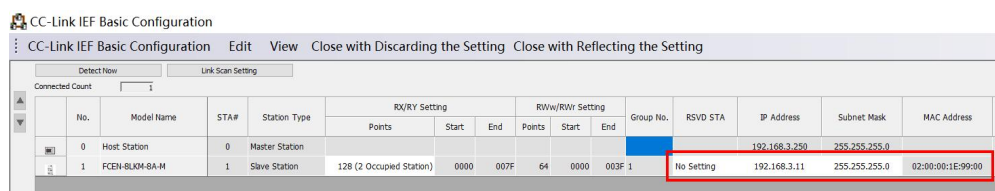
A) Click the button on the right side of "Network Configuration Settings" or double-click the text to open the "Detailed Setting" option.



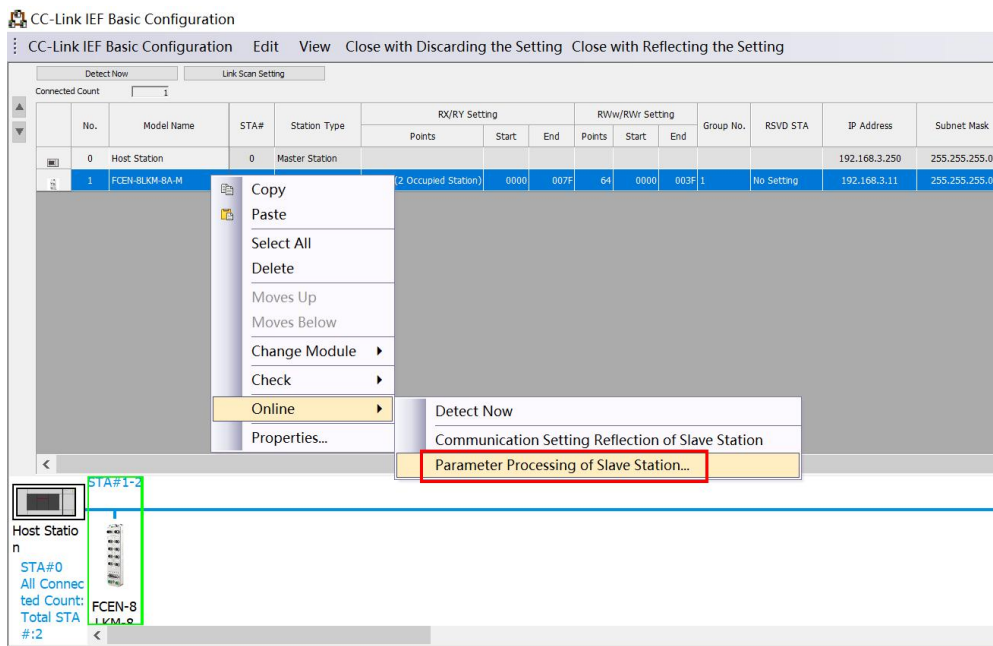
B) In the newly opened "CC-Link IE FB Configuration" window, click the "Detect Now" button to automatically scan the FCEN module connected to the PLC, as shown in the figure.



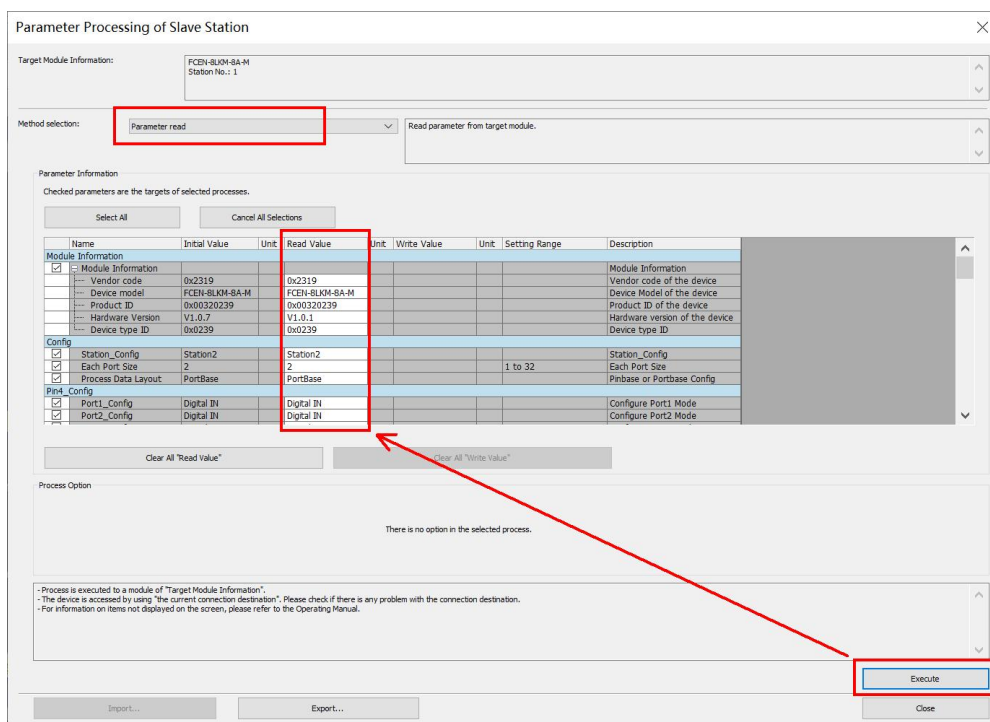
C) Here you can see the IP address and other network information of FCEN-8LKM-8A-M. Please confirm the correspondence between the IP address and the module MAC address.



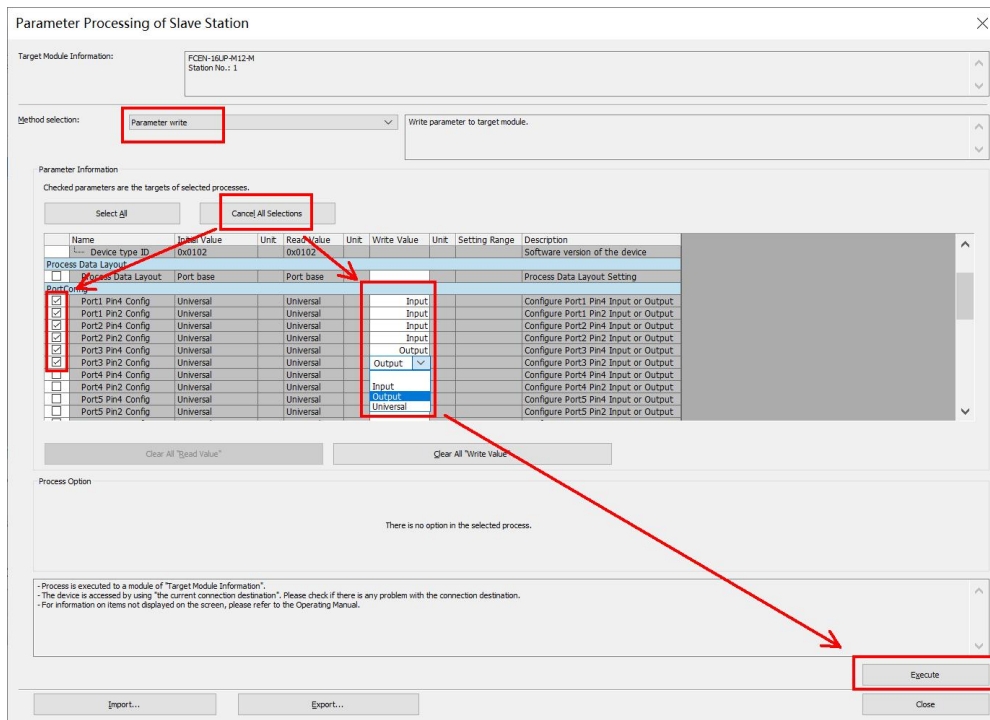
D) Right click on the FCEN-8LKM-8A-M module and select "Parameter Processing of Slave Station..." under the "Online" option to enter the module parameter settings page.



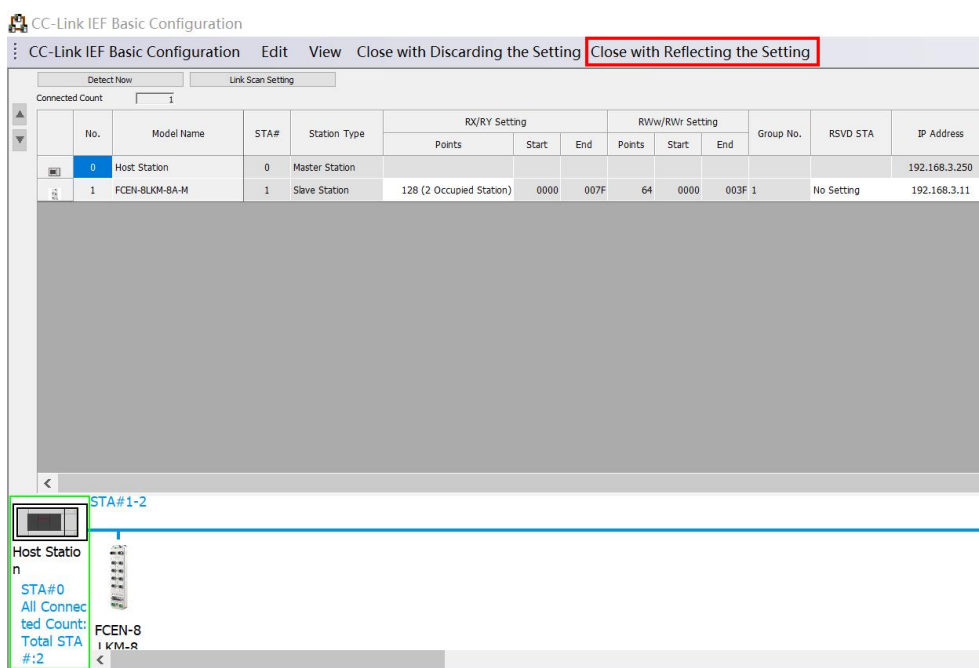
E) In the newly opened parameter settings window, you can select "Parameter Read" and click the "Execute" button to read the set parameters in modules that have already been connected to the network.



F) If you want to change the module parameters, you can select "Parameter Write", click "Cancel All Selections" to cancel all selections and check the parameters that need to be changed. After setting, click the "Execute" button to write the module parameters that you want to change.

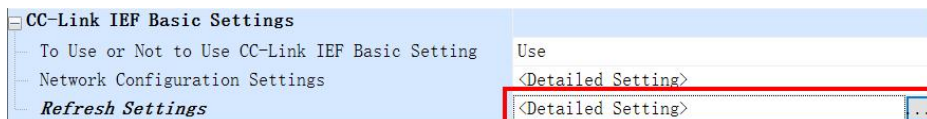


G) After setting up, click the "Close with Reflecting the Setting" button to save the content of network configuration and close the interface.

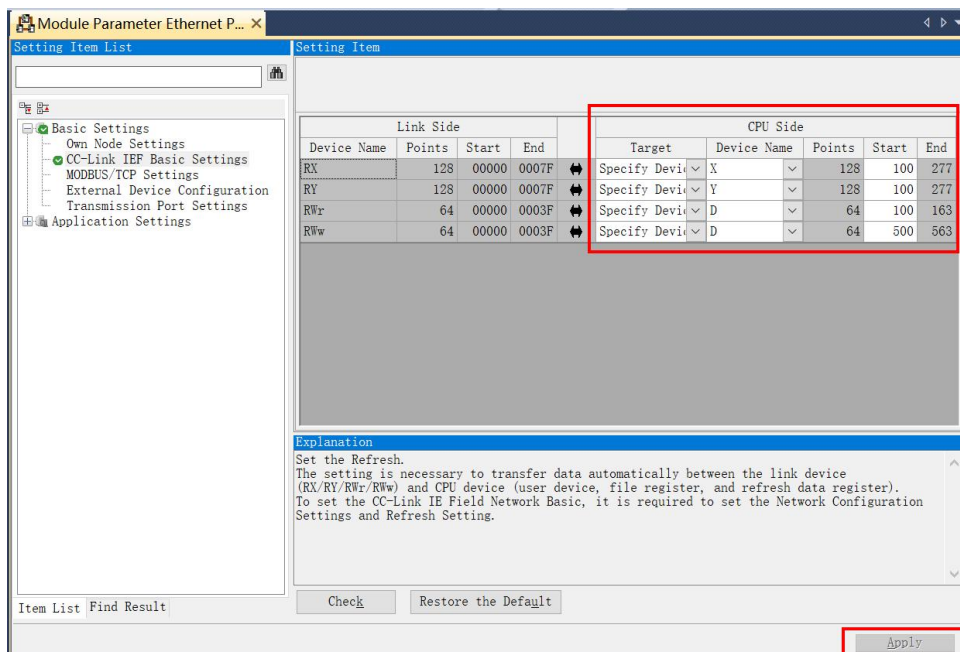


g. Set up CC Link IE Field Basic network refresh and mapping.

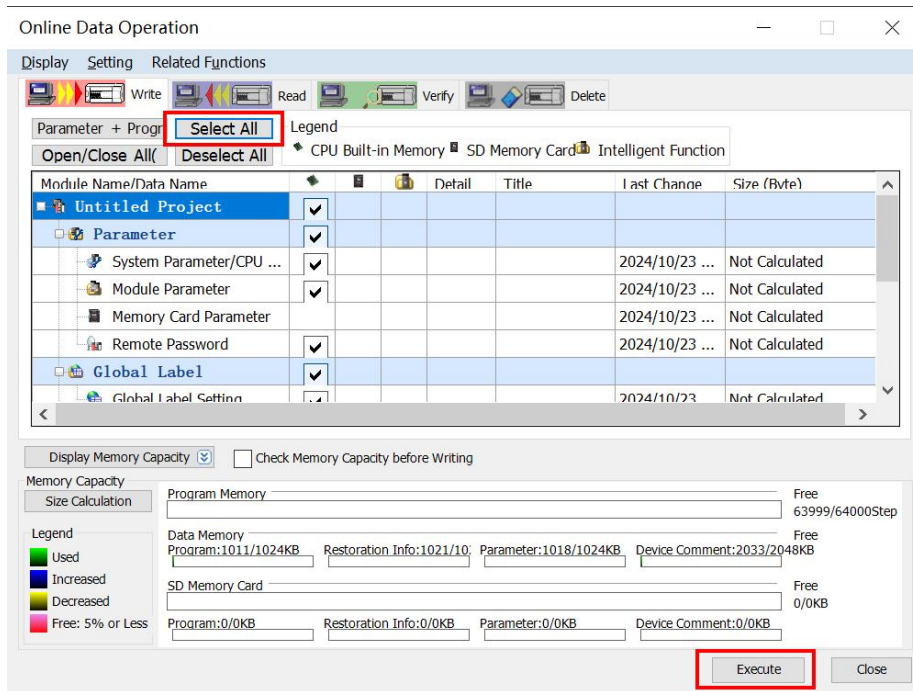
A) Click the button to the right of "Refresh Settings" or double-click the text to open the "Detailed Setting" option.



B) In the newly opened "Setting Item" interface, assign mapping addresses for RX, RY, RWr, and RWw in the PLC as needed, and then click the "Apply" button as shown in the figure.



8) At this point, the network settings have been completed and the program can be downloaded to the PLC. Select "Online>Write to PLC..." to open the download window, choose "Select All" and click the "Execute" button to execute the download.



9) When the NET indicator light of FCEN-8LKM-8A-M module is green and constantly on, it indicates that the configuration is successful and the module has established communication connection with the PLC.

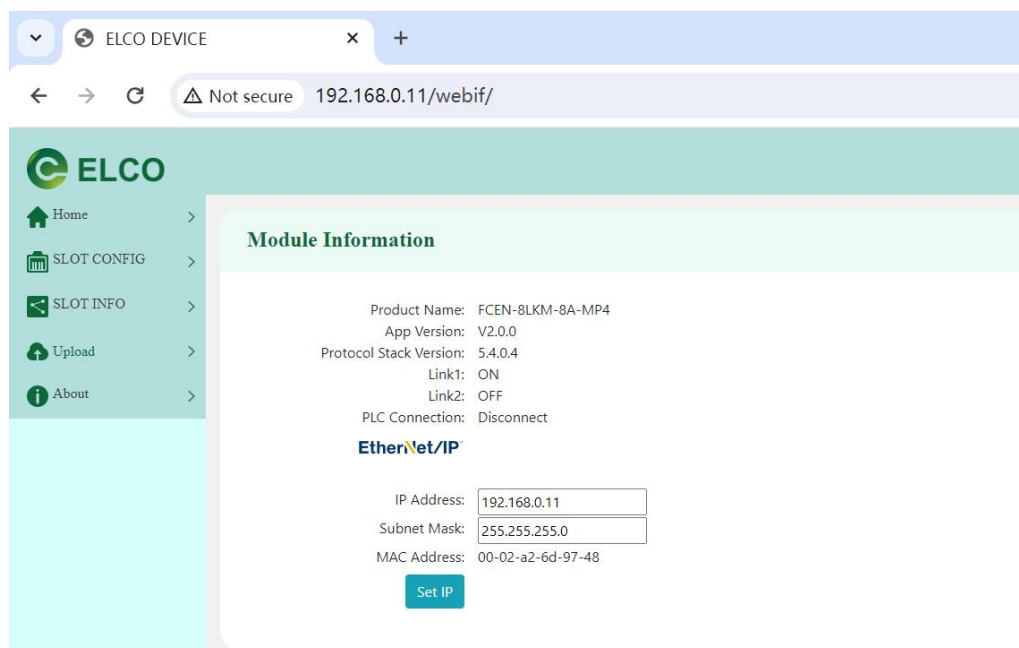
## 8. Webserver

The FCEN-8LKM-8A-M module integrates Webserver internally. Users can access the Webserver through the IP address, set the parameters of the module, read and write input and output signals, and set the ISDU parameters of the IO-Link device. (When the module is connected to the PLC, only the IO signal status can be read and ISDU of IO-Link device can be set.)

In order to access the Webserver of the module, users need to first assign an IP address to the module. The method of assigning an IP address can be referred by rotary switch or programming software. Then using the latest version of Chrome, Edge, or Safari browser, enter [HTTP://xxx.xxx.xxx.xxx/webif/](http://xxx.xxx.xxx.xxx/webif/) to access the module. (xxx.xxx.xxx.xxx is the IP address assigned by the module)

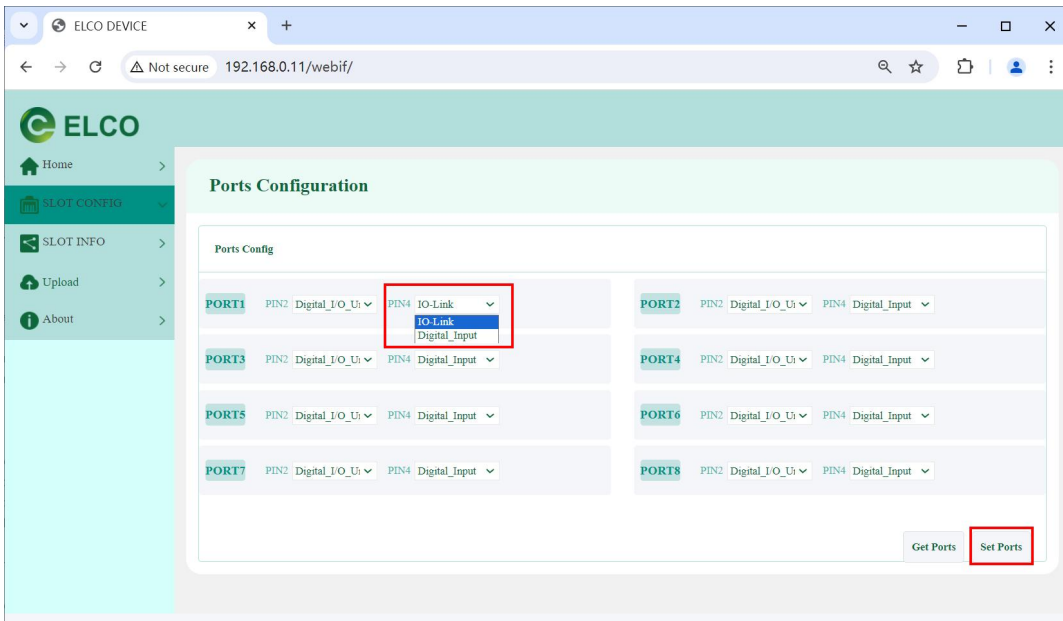
In this example, the IP of FCEN-8LKM-8A-M module has been pre assigned to 192.168.0.11. Without connecting to the PLC, Port1 is connected to the BNI007Z module of Balluff. Show how to enable port IO-Link function and allocate port properties of the Balluff module by importing an IODD file.

- 1) Set the IP address of the computer to 192.168.0.xxx on the same network segment as the FCEN-8LKM-8A-M module. Then open the browser and enter in the address bar <http://192.168.0.11/webif/> . You can see the homepage of the module Webserver.

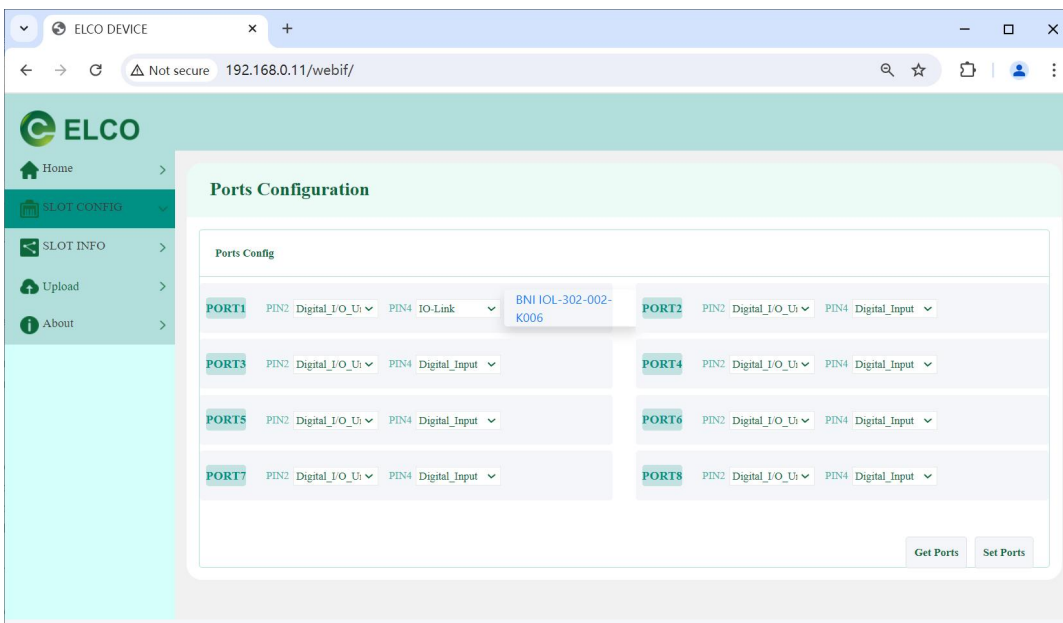


2) Click on the "SLOT CONFIG" item to enter the Ports Configuration interface, where you can read or set the port properties of 8 IO-Link interfaces.

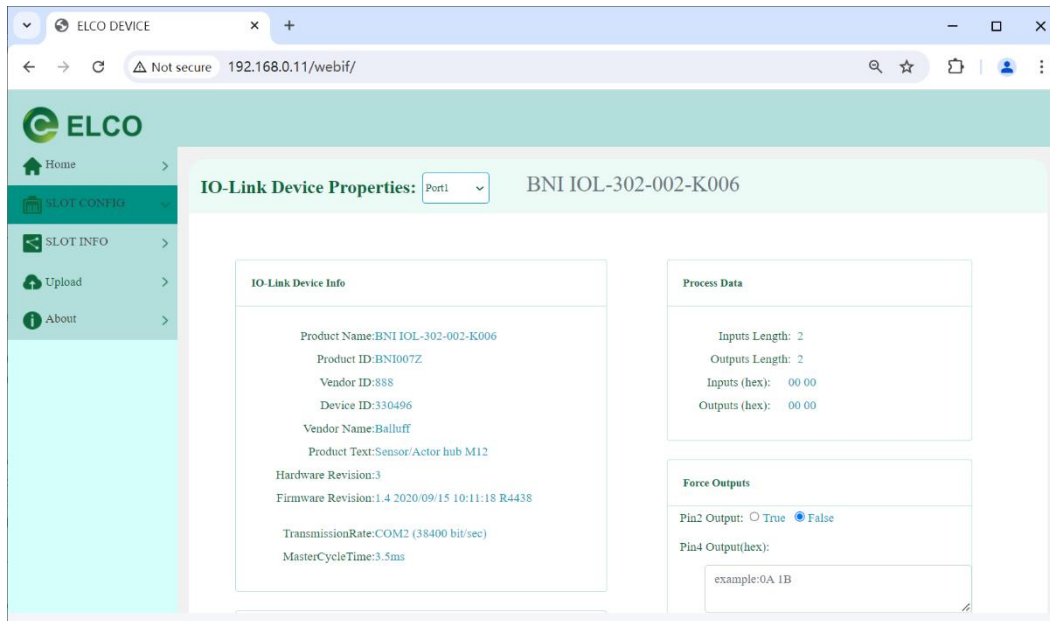
Set PIN4 of PORT1 to IO-Link and click the "Set Ports" button to make the modification effective.



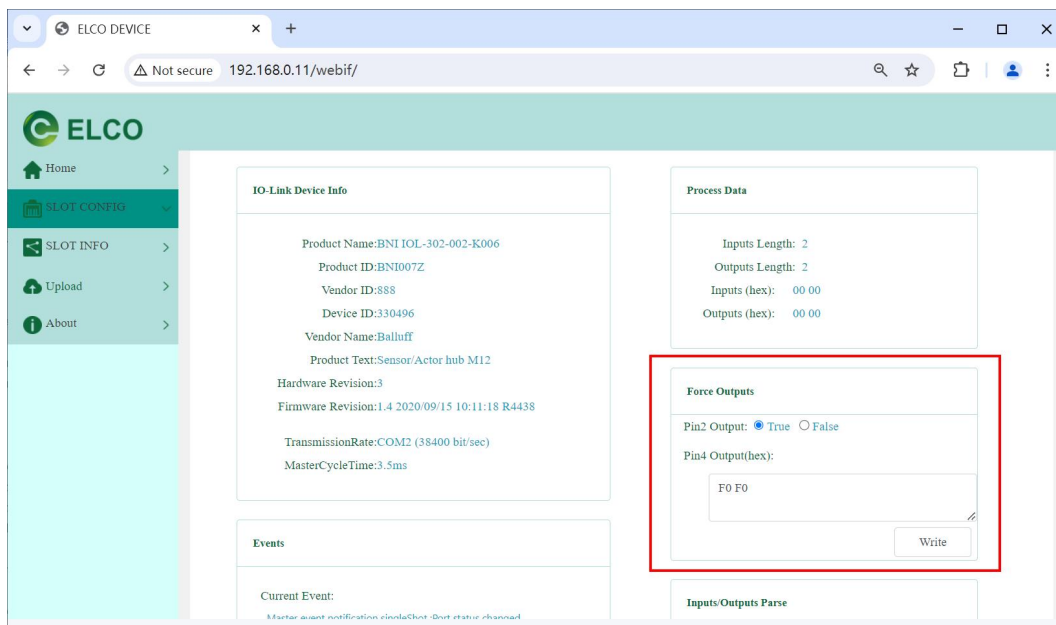
3) After successful modification, it can be seen that Port1 automatically searches for the connected IO-Link device.



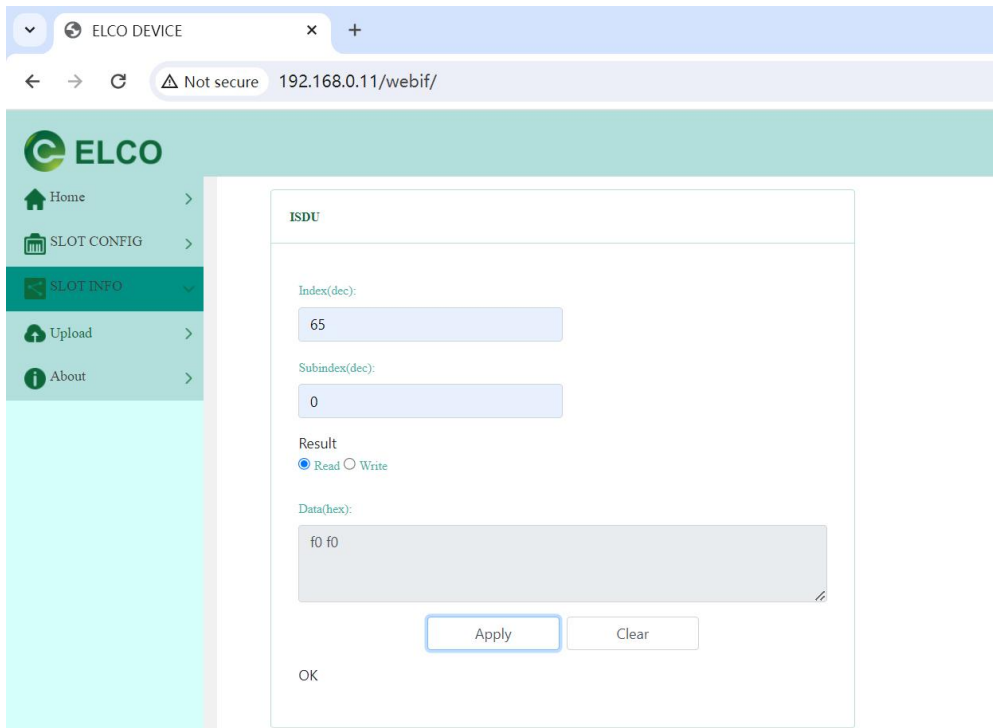
4) You can directly click on the IO-Link device found in the search, or select port Port1 through the "SLOT INFO" item to enter the details page of the IO-Link port. Basic information such as device ID, transmission rate, and process data length of the IO-Link device can be read.



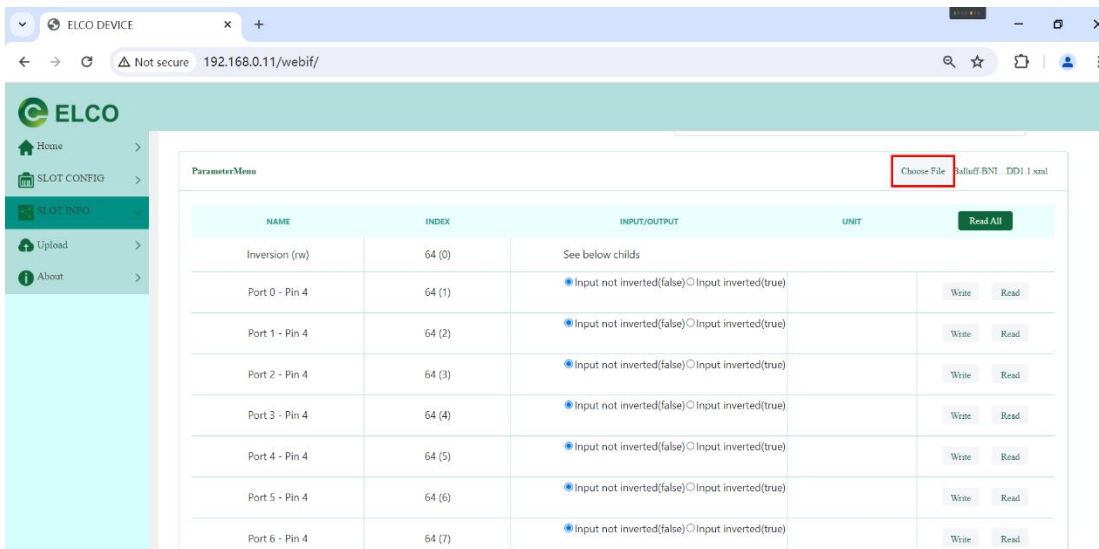
5) "Force Outputs" are used to force Pin2 output to the IO-Link master port, achieving the goal of enabling auxiliary power supply to the IO-Link slave. At the same time, the output value of the IO-Link slave can be written in the "Pin4 Output" interface. Click "Write" button to make it effective.



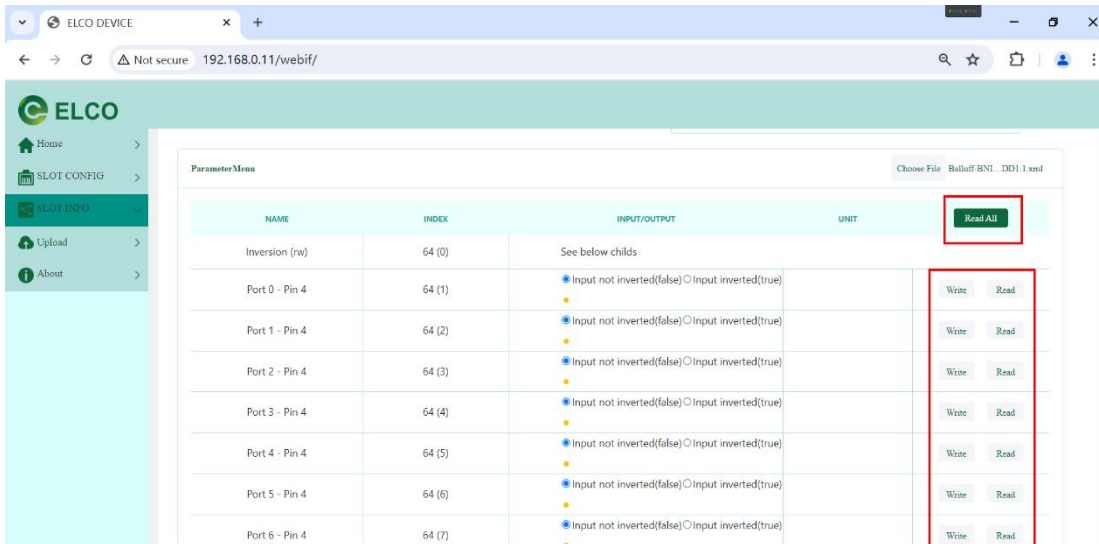
6) Users can directly use the ISDU column on the page to define the parameters of the IO-Link slave to be modified through Index and Subindex, and then read or write values in Data.



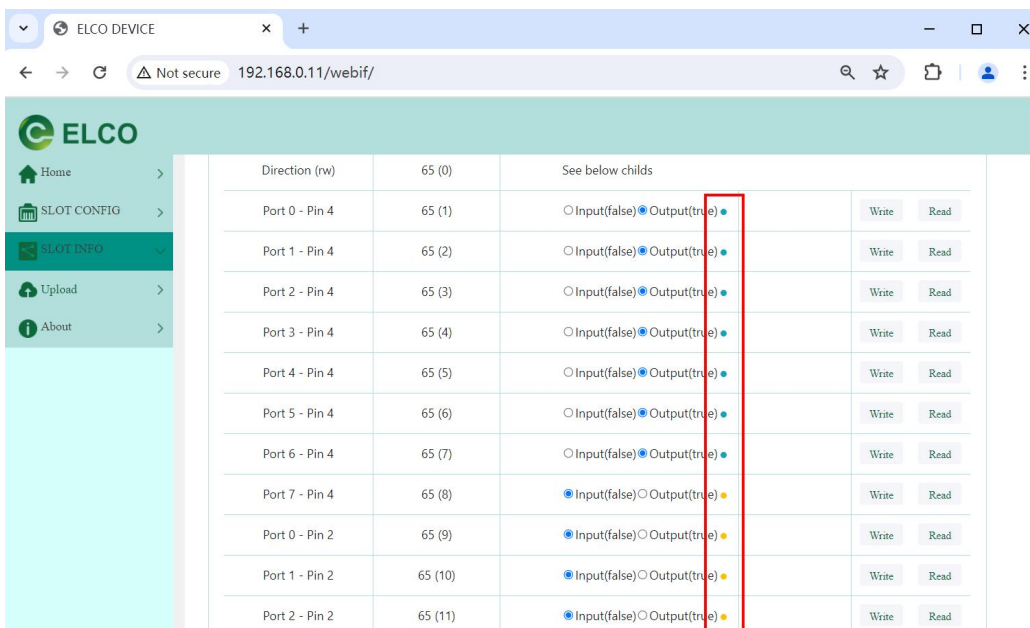
7) Users can also visually edit the ISDU parameters of IO-Link slave by importing IO-Link device IODD files. Click the "Choose File" button to import the prepared IODD file. Once successful, you can see the ISDU parameters of the IO-Link slave.



8) You can obtain all the current ISDU values of IO-Link slave by clicking the "Read All" button, but a large number of parameters can result in a long reading time. It is recommended to read and write the corresponding ISDU parameters through the "Read" or "Write" button corresponding to each parameter.



9) After each parameter, there will be corresponding colored dots to represent the status of this parameter. No dots represent offline values, green dots represent newly written values, and yellow dots represent read values.



**Note:** The operation of modifying ISDU parameters of the IO-Link slave through Webserver can be carried out with the FCEN-8LKM-8A-M module connected to the PLC normally.

## 9. Alarm diagnosis

### 9.1 LED fault indicator

With the LED indicator on the FCEN-8LKM-8A-M module, users can easily and quickly determine the current working status of the module. (For the appearance of the indicator, please refer to Section 2.5 "LED Indication Function")

Name	Status	Meaning	Fault cause
<b>Expansion channel Indicator IO-Link</b>	Yellow	IO-Link connection OK	–
	Green	Ordinary digital signal	–
	Yellow flash	No IO-Link connection	Check the IO-Link cable connection
	Red	1. Short circuit 2. Output signal overload	1. Check the cable connection 2. Module channel is damaged
	Red flash	IO-Link connection incorrect	1. Check the configuration 2. Check IO-Link device status
<b>Gateway status Indicator MOD</b>	Green	Work normally	–
	Red	Working abnormally	1. Power supply is abnormal 2. Channel abnormal (short circuit, overload, etc.) 3. Module is damaged
<b>Comm. status Indicator NET</b>	Green	Communication normal	–
	Red	Communication abnormal	1. Network cable failure 2. Check the configuration 3. Module is damaged
<b>Network status Indicator Lk1, 2</b>	Green	Network Cable connects normal.	–
	Off	Network cable connects error.	1. Network cable failure 2. Module is damaged
<b>Comm. data Indicator ACT1,2</b>	Yellow flash	Data exchange.	-
	Off	No data exchange.	1. Check the configuration 2. Check the network hardware
<b>Power supply Indicator Us, Ua</b>	Green	Supply voltage normal	–
	Red	Supply voltage abnormal	1. Over voltage or undervoltage 2. Module is damaged
	Off	No power supply	1. Power supply cable failure 2. Module is damaged

## 9.2 EtherNet/IP address assignment

The default connection name for the FCEN-8LKM-8A-M module is “Control/Status+IOL32+Status”. This connection contains the input and output signals and status of the IO-Link master, as well as 32 bytes of data input and output and IO-Link slave status information for each IO-Link port. It contains 394 bytes of INPUT, 260 bytes of OUTPUT, and 100 bytes of CONFIG. The table below lists the various data classifications, which can be found in Chapter 4 for details.

Byte	Input data	Description
0...7	Module status	Indicate the status of IO-Link master and IO-Link port.
8...9	Input signal of Master	Process input data for IO-Link Master SIO mode.
10...57	IO-Link Port 1	Process input data for Port 1.
58...105	IO-Link Port 2	Process input data for Port 2.
106...153	IO-Link Port 3	Process input data for Port 3.
154...201	IO-Link Port 4	Process input data for Port 4.
202...249	IO-Link Port 5	Process input data for Port 5.
250...297	IO-Link Port 6	Process input data for Port 6.
298...345	IO-Link Port 7	Process input data for Port 7.
346...393	IO-Link Port 8	Process input data for Port 8.
Byte	Output data	Description
0...1	Module Control	Control the function (diagnosis or restart) of IO-Link port.
2...3	Output signal of Master	Process output data for IO-Link Master SIO mode.
4...35	IO-Link Port 1	Process output data for Port 1.
36...67	IO-Link Port 2	Process output data for Port 2.
68...99	IO-Link Port 3	Process output data for Port 3.
100...131	IO-Link Port 4	Process output data for Port 4.
132...163	IO-Link Port 5	Process output data for Port 5.
164...195	IO-Link Port 6	Process output data for Port 6.
196...227	IO-Link Port 7	Process output data for Port 7.
228...259	IO-Link Port 8	Process output data for Port 8.
Byte	Configdata	Description
0...3	Module configuration	General configuration for the overall module.
4...35	Port configuration	Pin type and safe state configuration for ports.
36...43	IO-Link Port 1	Configuration for IO-Link Port 1.
44...51	IO-Link Port 2	Configuration for IO-Link Port 2.
52...59	IO-Link Port 3	Configuration for IO-Link Port 3.

<b>60...67</b>	IO-Link Port 4	Configuration for IO-Link Port 4.
<b>68...75</b>	IO-Link Port 5	Configuration for IO-Link Port 5.
<b>76...83</b>	IO-Link Port 6	Configuration for IO-Link Port 6.
<b>84...91</b>	IO-Link Port 7	Configuration for IO-Link Port 7.
<b>92...99</b>	IO-Link Port 8	Configuration for IO-Link Port 8.

## 9.3 PROFINET address assignment

This section mainly introduces the signal point arrangement order and address assignment of the FCEN-8LKM-8A-M module, mainly to indicate the clear sequence of signals. This picture shows the I/O signal and status of the IO-Link master:

Device overview						
Module	...	Rack	Slot	I address	Q address	Type
io-link-master		0	0			FCEN-8LKM-8A-M
PN-HO		0	0 X1			io-link-master
Digital IN_1		0	IO-Link port 1			Digital IN
Digital IN_2		0	IO-Link port 2			Digital IN
Digital IN_3		0	IO-Link port 3			Digital IN
Digital IN_4		0	IO-Link port 4			Digital IN
Digital IN_5		0	IO-Link port 5			Digital IN
Digital IN_6		0	IO-Link port 6			Digital IN
Digital IN_7		0	IO-Link port 7			Digital IN
Digital IN_8		0	IO-Link port 8			Digital IN
IO-Link Master IO_1		0	IO-Link Master IO	0...1	0...1	IO-Link Master IO
IO-Link Communication Status_1		0	IO-Link Communication Status	2		IO-Link Communi...
IO-Link Device Diagnosis_1		0	IO-Link Device Diagnosis	3		IO-Link Device Dia...
Master Port Error_1		0	Master Port Error	4		Master Port Error
Power Supply Status_1		0	Power Supply Status	5		Power Supply Status
Disable IO-Link Diagnosis_1		0	Disable IO-Link Diagnosis		2	Disable IO-Link Di...

## 9.4 CC-Link IE FB address assignment

This section mainly introduces the signal point arrangement order and address allocation of the FCEN-8LKM-8A-M module, which is used to clarify the signal arrangement order. The signal points and status information of the IO-Link master occupy the RX and RY areas, while the input and output signal data of the IO-Link slave device occupy the RWr and RWw areas.

Due to the fixed data length of the IO-Link master, it is necessary to determine the number of station addresses allocated by the IO-Link master in the CC-Link IE FB network based on the data size of the configured IO-Link slave devices. According to the definition of CC-Link IE FB network, each site contains 64 bits RX and RY, as well as 32 Words RWr and RWw.

When the data length of a single IO-Link slave device connected to a port is 1-16 bytes, the IO-Link master needs to occupy “2 Occupied Stations” (default setting); When the data length of a single IO-Link slave device connected to a port is 17-24 bytes, the IO-Link master needs to occupy “3 Occupied Stations”; When the data length of a single IO-Link slave device connected to a port is 25-32 bytes, the IO-Link master needs to occupy “4 Occupied Stations”. These figures show the occupancy information of software components in the FCEN module:

2 Occupied Stations:

Link Side			
Device Name	Points	Start	End
RX	128	00000	0007F
RY	128	00000	0007F
RWr	64	00000	0003F
RWw	64	00000	0003F

3 Occupied Stations:

Link Side			
Device Name	Points	Start	End
RX	192	00000	000BF
RY	192	00000	000BF
RWr	96	00000	0005F
RWw	96	00000	0005F

4 Occupied Stations:

Link Side			
Device Name	Points	Start	End
RX	256	00000	000FF
RY	256	00000	000FF
RWr	128	00000	0007F
RWw	128	00000	0007F