Compact67_Slim I/O Module

----Profinet System Manual

ELCO (Tianjin) Electronics Co., Ltd

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Version 1.3

Preface

1. **Scope of this manual:**
   This manual applies to the ELCO Profinet Compact67_Slim distributed I/O device.
   The information in this manual enables you to run the Compact67_Slim module on Profinet in a distributed I/O device.
2. **Basic knowledge requirements**
   This manual presumes a general knowledge in the field of automation engineering and describes the components based on the data valid at the time of its release. ELCO reserves the right of including a product information for each new component, and for each component of a later version.
3. **Guide**
   This manual describes the hardware of the Profinet Compact67_Slim distributed I/O device.
   Covered topics are:
   - Installation and wiring
   - Commissioning and diagnostics
   - Components
   - Article numbers
   - Technical specifications

4. **Technical support:**
   This manual describes the characteristics and the usage of a Compact67_Slim distributed I/O device.
   Please contact your local ELCO representative or dial 400-608-4005 if you have any questions about the products described in this manual.
   Additional information about ELCO products is available:
   http://www.elco-holding.com/

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

Table of contents

1. Product overview

1.1 Introduction

The distributed I/O devices Compact67_Slim is a Pofinet IO devices with IP67 protection level.

1.2 Applications

Compact67_Slim distributed I/O device provides a reliable solution for the field bus I/O system which connects controllers and is applied in harsh field environment.
Compact 67_Slim module based on 32mm wide IP67 housing with standardized installation allows a safe and reliable operation in the harsh working environment where water, dust and vibration may occur. These characteristics make them suitable for many applications, such as material conveying system, automatic assembly system and so on.
Other functions include supporting input and output of multiple signals. Embedded high-brightness LED diagnosis helps maintainers to judge I/O, module and network status more easily.

1.3 Features

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

1.4 Product type list

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

2. Technical characteristics

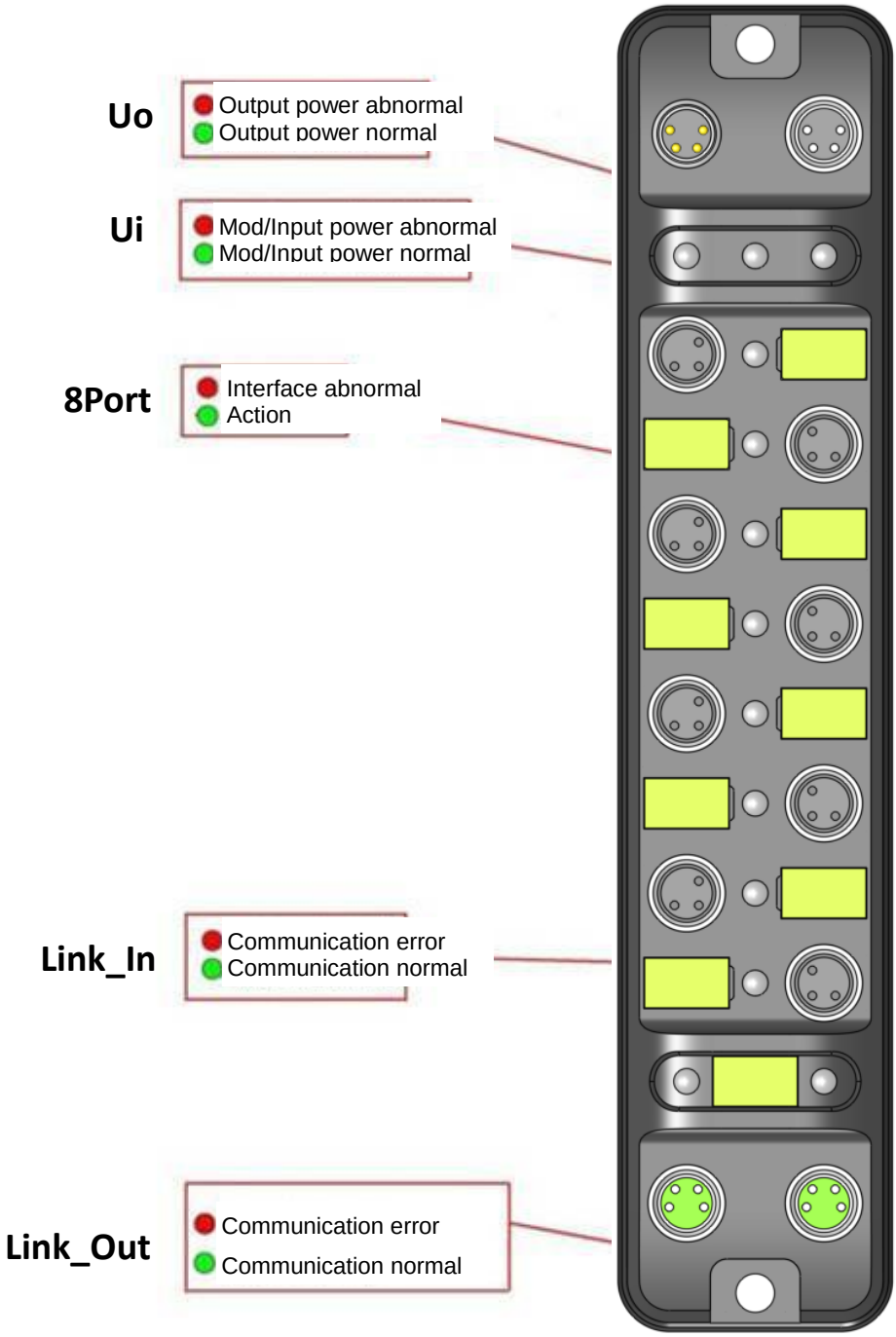
2.1 Hardware parameters

Item	FEPN-0800P-M8	FEPN-0404P-M8	FEPN-08UP-M8
Input points	8	4	Max. 8
Output points	0	4	Max. 8
Profinet Bus-in	2 x M8 4pin，Female		
Profinet Bus-out	2 x M8 4pin，Female		
I/O signal	8 x M8 3pin，Female		
Power in	2 x M8 4pin，Male		
Power out	2 x M8 4pin，Female		
Mod/Input Voltage	24VDC (18~30V)		
Output Voltage	24VDC (18~30V)		
Maximum output current	N/A	Per channel 0.5A，total 4A	
Output short circuit current	N/A	Per channel 20mA	
Max frequency	N/A	100Hz	
Output Voltage	N/A	Voltage-0.7V	
Output type	N/A	PNP	
Input signal ”0”	Low level：0~5V		
Input signal ”1”	High level：15~30V		
Input delay	0.5ms		
Input current	6.4mA		
Input supply current	Holding current 100mA，Action current 150mA		
Normal input voltage	24VDC (10~30V)		
Input type	PNP		
Operation temperature	-25℃...70℃		
Storage	-40℃...80℃		

temperature	
Anti-vibration Class	IE068-2-6
Anti-interference EMC	EN 61000-6-2
Protection class	IP67
Operating life	100,000 Hour

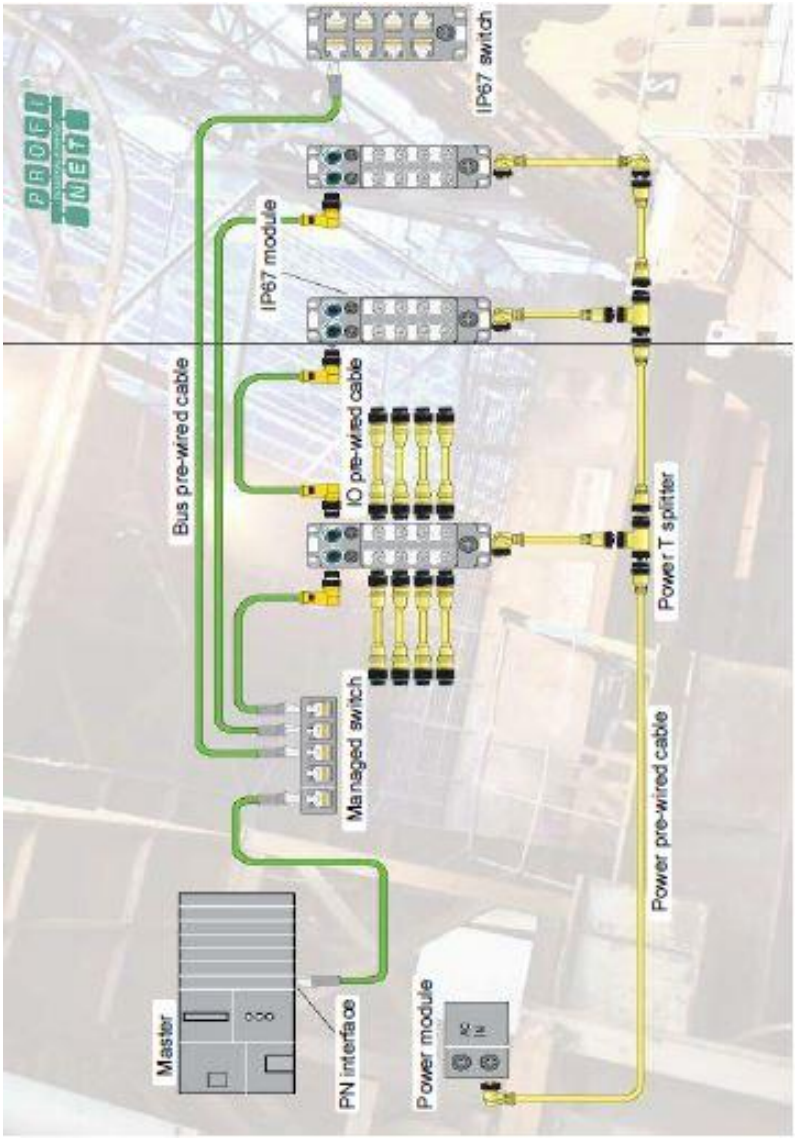
2.2 LED Indication

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



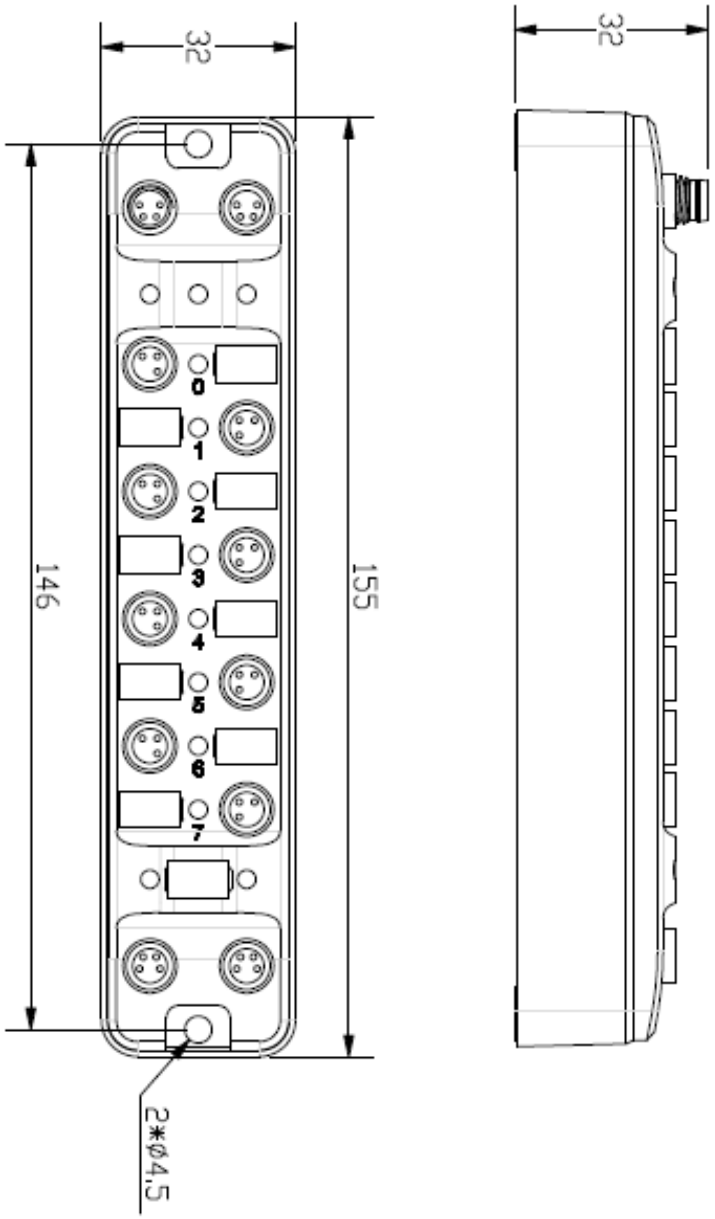
2.3 General system layout

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



3. Installing

3.1 Mounting dimensions



3.2 Mounting position, mounting dimensions

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

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

3.3 Assigning names in PROFINET I/O devices

Each Profinet protocol Compact67_Slim distributed I/O device is assigned to a unique device ID (i.e. MAC address) at the factory, while addressing to each Compact67_Slim device based on device name during configuration and as per the user program. Therefore, it's necessary to assign names for each Compact67_Slim I/O device before the configuring and debugging.

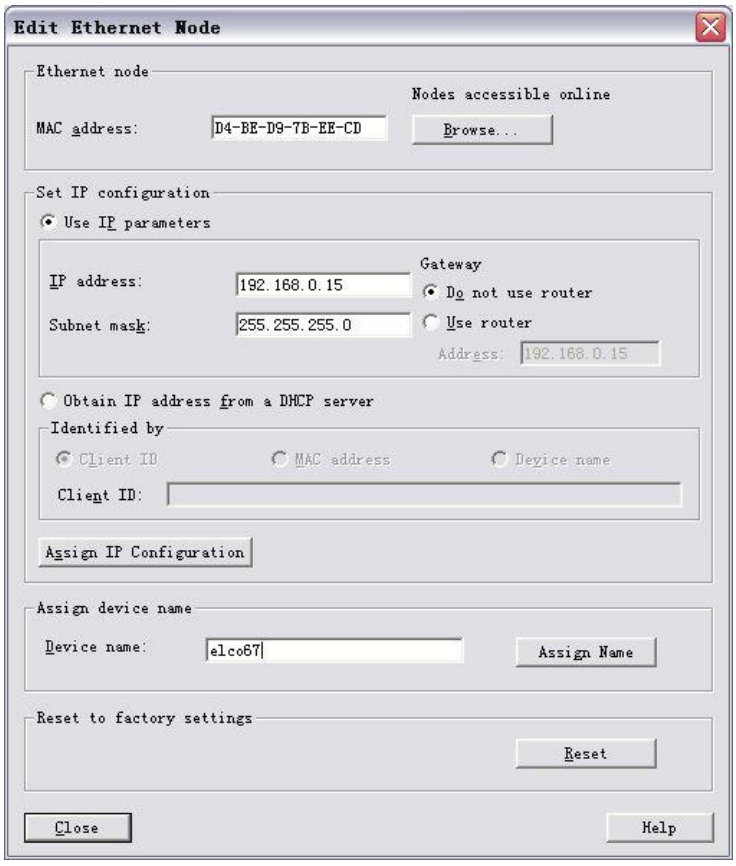
3.3.1 Setting method—Siemens Step7

It's convenient to assign names and IP addresses in PROFINET IO devices through SIEMENS Step7 software, please carry out the following steps:

1) Provide power for the Compact67_Slim and connect it to engineering computer in the same network via a switch or cable connection.

2) In the Step7 software HW-Config, select PLC > Ethernet > Edit Ethernet Node

3) In the pop-up window, click Browse button, select the Compact67_Slim module via the MAC address to assign device name and confirm.

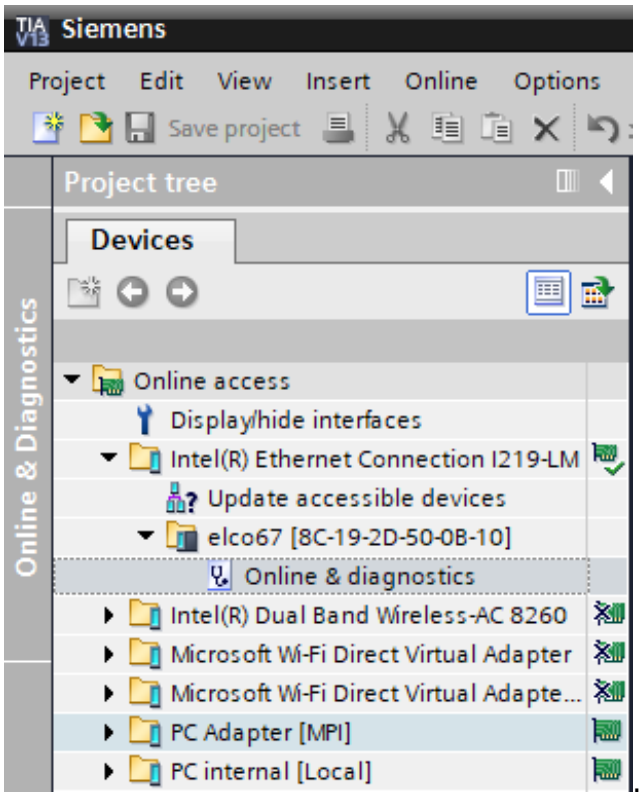


4) Assign the device name for the Compact67_Slim module by clicking button Assign Name in the dialog "Edit Ethernet Node".

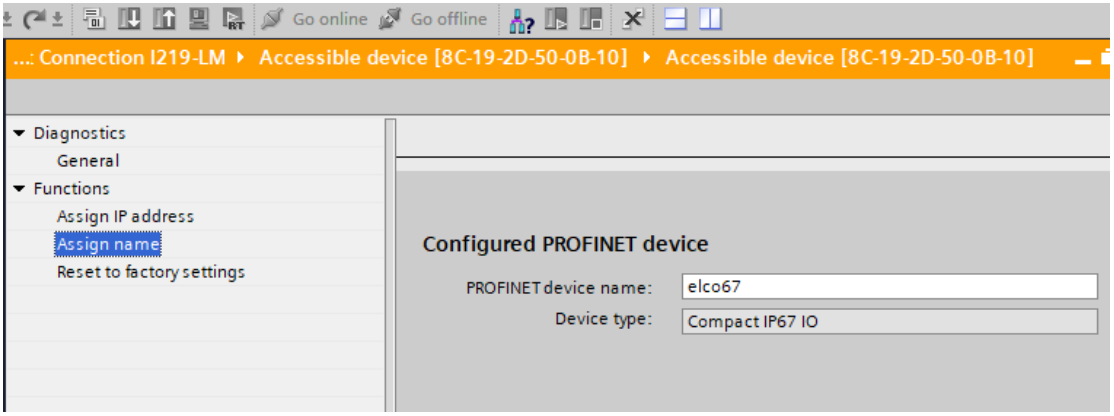
5) Assign the new IP address directly to Compact67_Slim module by clicking the button "Assign IP Configuration". (IP address assignment can also be carried out during configuration of the I/O Devices)
6) Now, with the new assigned device name as an identifier of the Compact67_Slim module, you can configure and debug in the program.

3.3.2 Setting method—Siemens Portal

It's convenient to assign names and IP addresses in PROFINET IO devices through SIEMENS Portal software, please carry out the following steps:
1) Provide power for the Compact67_Slim and connect it to engineering computer in the same network via a switch or cable connection.
2) In the Portal software "Project tree", "Online access". Select the corresponding network card of the computer and update the accessible device.
3) In the tree structure, you can see the Profinet device connected by the current computer, and select the Compact67_Slim device to assign the device name through the MAC address.



4) In the "Online Access" window on the right, you can assign the set device name to the Compact67_Slim device through the "Assign Name" option.
5) Assign the new IP address directly to Compact67_Slim module by clicking the button "Assign IP Configuration". (IP address assignment can also be carried out during configuration of the I/O Devices)



6) Now, with the new assigned device name as an identifier of the Compact67_Slim module, you can configure and debug in the program.

PS: The MAC address of Compact67_Slim device is marked on the side of the module in the form of laser engraving or label (the newly assigned device name may need to be re-energized to display correctly).

3.4 Wiring Compact67_Slim

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

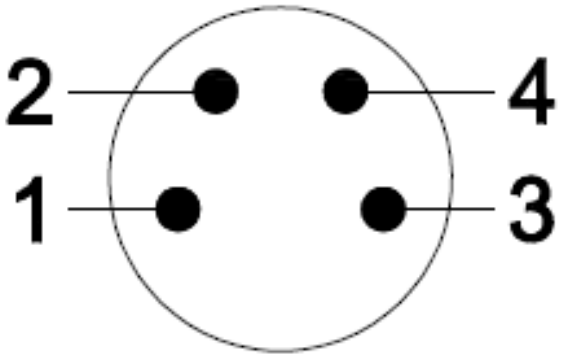
3.4.1 Connecting Compact67_Slim to protective earth (PE)

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

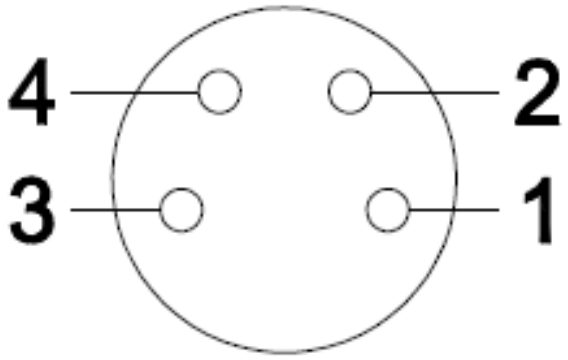
3.4.2 Compact67_Slim power supply

Compact67_Slim modules adopt 24VDC power supply, voltage range 18~30VDC, standard M8-4pin connector.
Two parts for power supply: module and input signal power supply Ui (1L+、1M), output signal power supply (2L+、2M). Electrical isolation between 1L+ and 2L+, internally connected between common point 1M and 2M.
(FEPN-0404P-M8 complete isolation of common points)

1）Power in connector view (Male)



2）Power out connector view (Female)



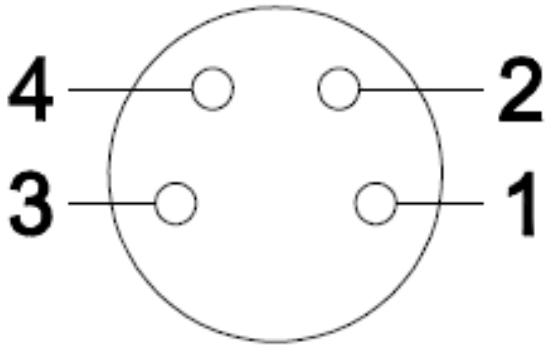
3）Power definition

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

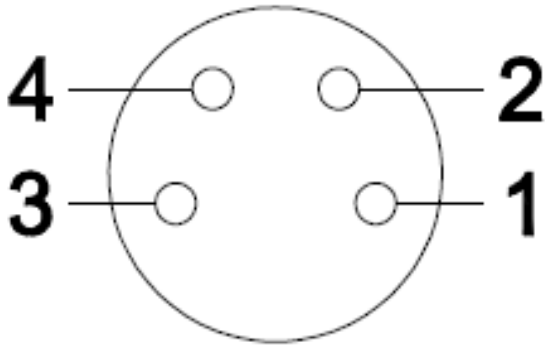
3.4.3 Compact67_Slim BUS connect

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

1）BUS-In connector view (Female)



2）BUS-Out connector view (Female)



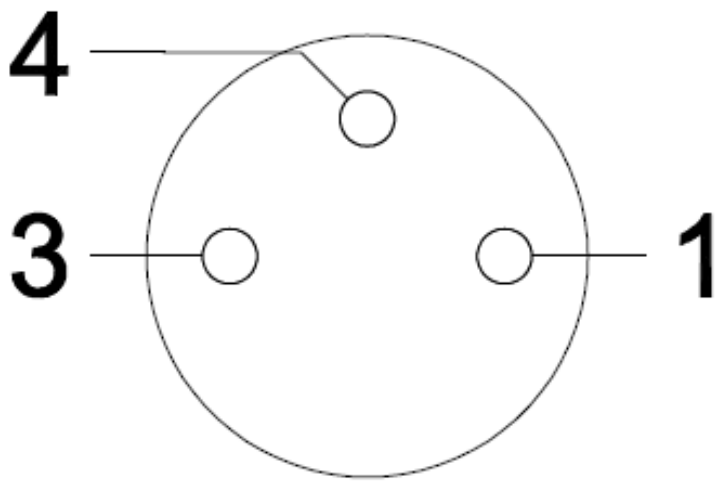
3）Bus definition

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

3.4.4 Compact67_Slim digital signal connect

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

1）Signal connector view (Female)

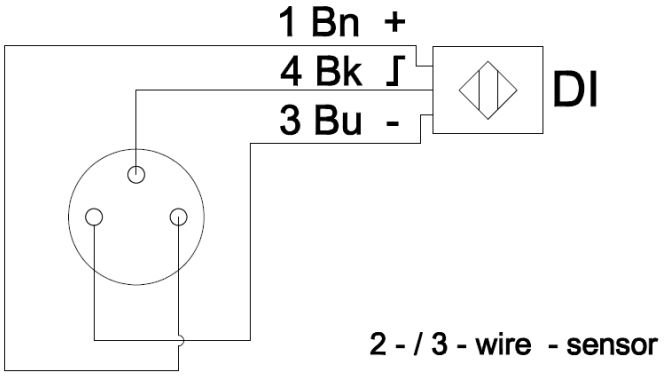


2）Digital signal interface definition

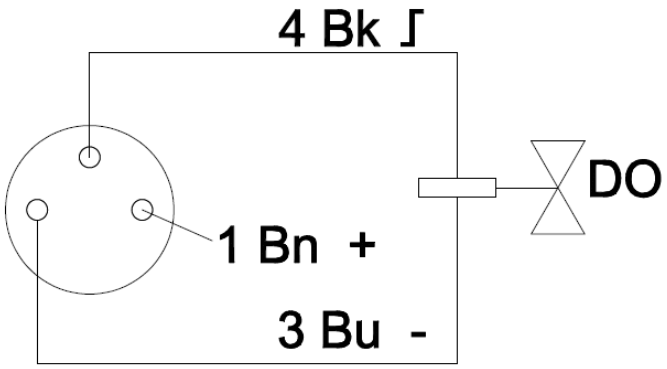
Terminal	M8 connector	
1	Power supply 24V+	
3	Power supply GND	
4	Signal in/out A	1st signal

3）Digital signal interface definition

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



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



4. Configuration Commissioning

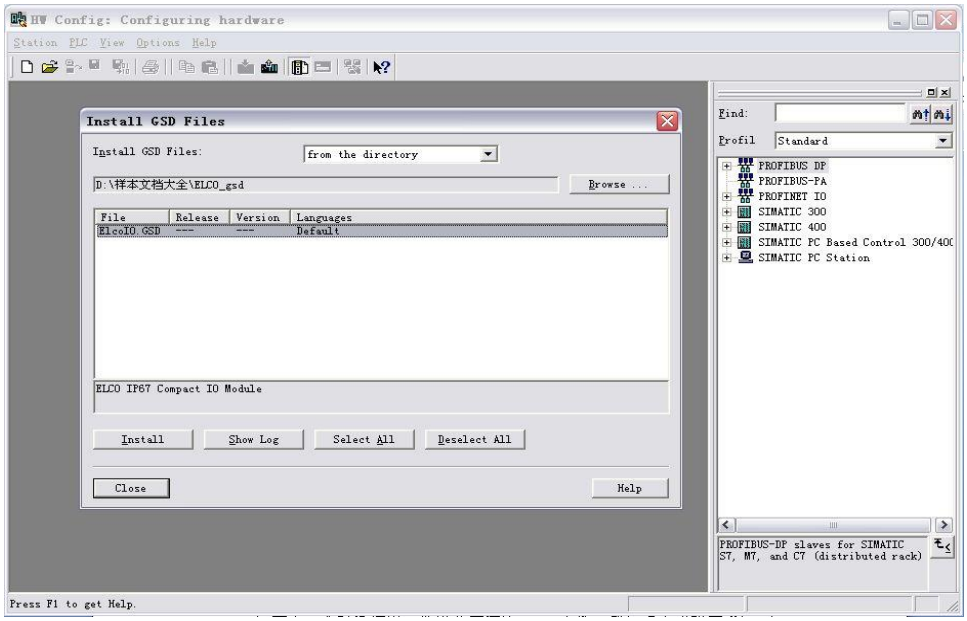
4.1 Installation of configuration files

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

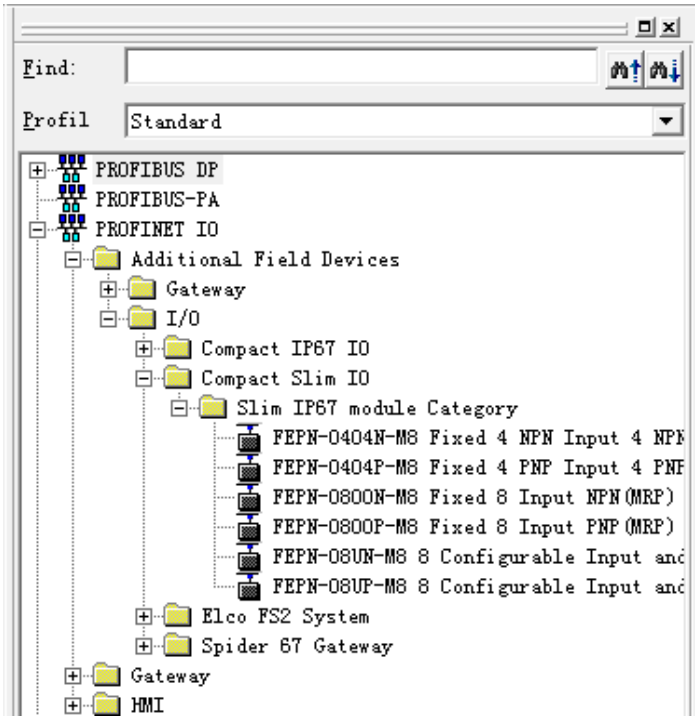
How to integrate the GSD file into the system depends on the user's configuration software, usually the Profinet GSD file enable integration with the SIEMENS Step7 in accordance with the following steps:

1) Running Step7, and then select menu command " Options>Install New GSD File..."

2) Browse to the file's directory in the next dialog, chose the GSD file and then click "Install".



3) The new additional Compact67_Slim module is shown in the directory of hardware “Additional Field Devices>I/O> Compact IP67 IO > IP67 module Category”.



4) The user can configure the Compact67_Slim module with Step7 according to the actual situation.

4.2 Signal address assignment

Each signal module with M8 interface has 8 connectors (P0~P7) for signal transmission; each connector has 3 pins (Pin1, Pin3, Pin4). The following table indicates the matchup between signal status and bytes transmitted of Profinet.

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

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

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

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

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

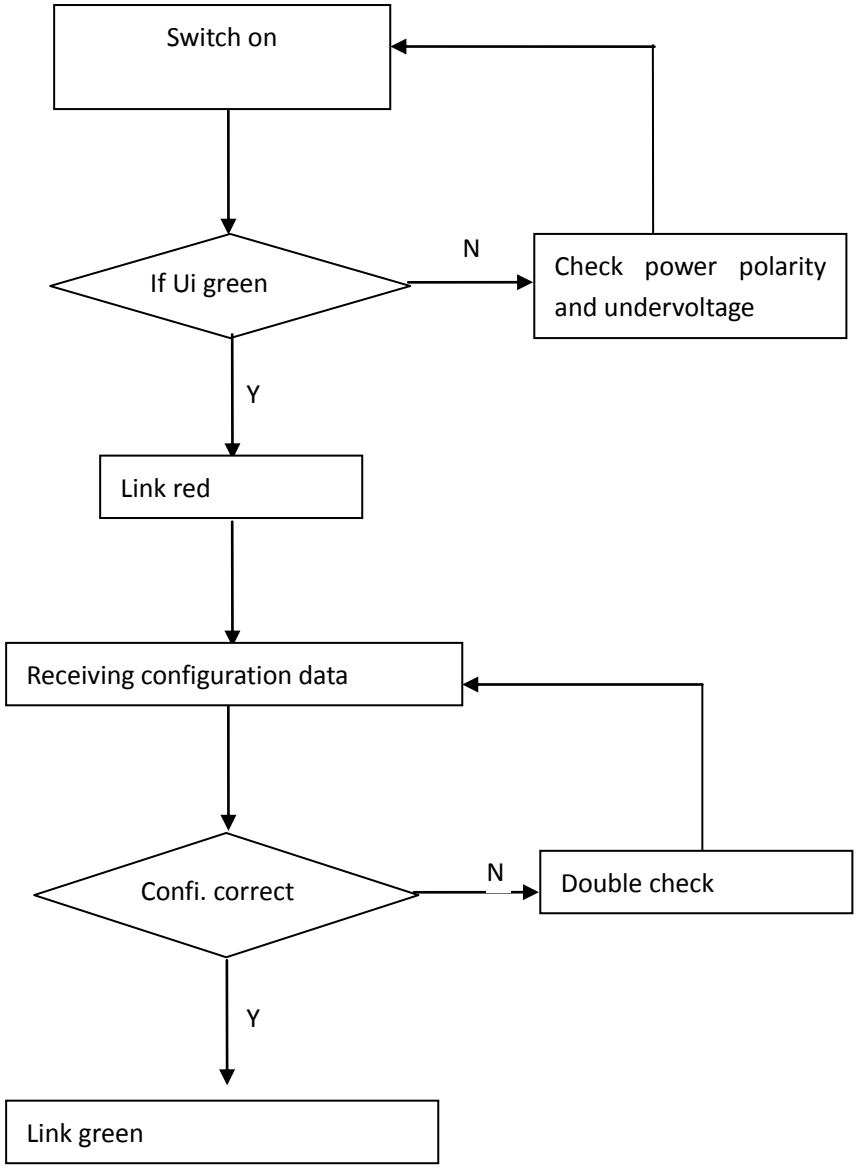
Byte	Bit	Channel	e.g
Input/Output Byte 0	Bit 0	Con0.Pin4	I 0.0 Q 0.0
	Bit 1	Con1.Pin4	I 0.1 Q 0.1
	Bit 2	Con2.Pin4	I 0.2 Q 0.2
	Bit 3	Con3.Pin4	I 0.3 Q 0.3
	Bit 4	Con4.Pin4	I 0.4 Q 0.4
	Bit 5	Con5.Pin4	I 0.5 Q 0.5
	Bit 6	Con6.Pin4	I 0.6 Q 0.6
	Bit 7	Con7.Pin4	I 0.7 Q 0.7

4.3 Module Startup Process

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

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

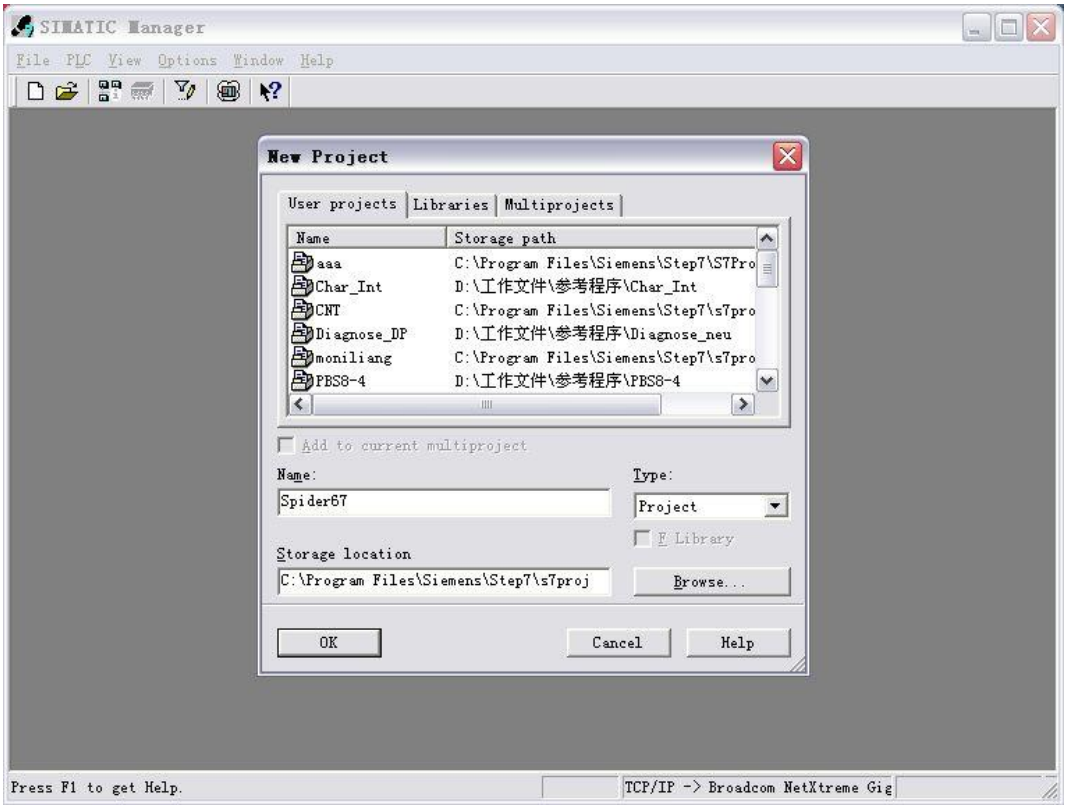
Startup of Compact67_Slim:



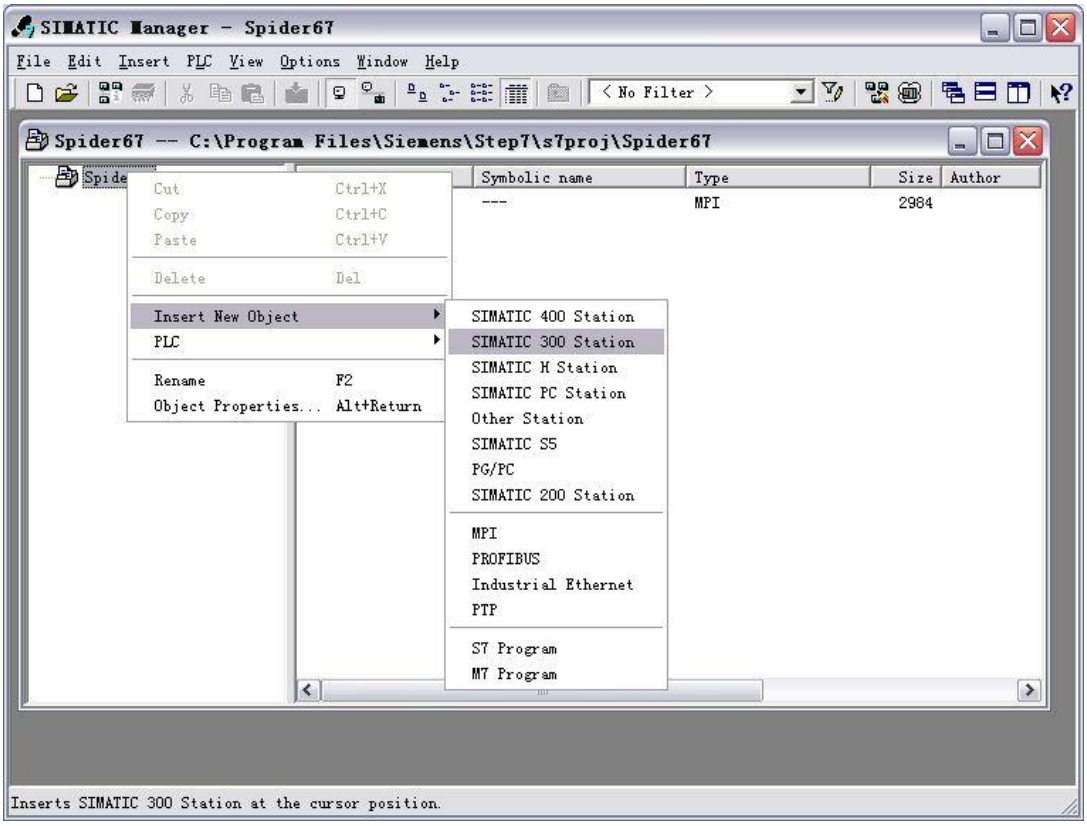
4.4 Module configuration example (Step7)

This section, through a case of connection configuration in actual operation process, makes the users fully understand how to use the Compact67_Slim distributed I/O system. In this case, using the ELCO Compact67_Slim as PROFINET slave station to connect the Siemens PROFINET controller CPU315-2PN/DP under the condition that all power and bus connection have been completed, the device name of Compact67_Slim is assigned as elco67. The following will show the specific process of software configuration and debugging.

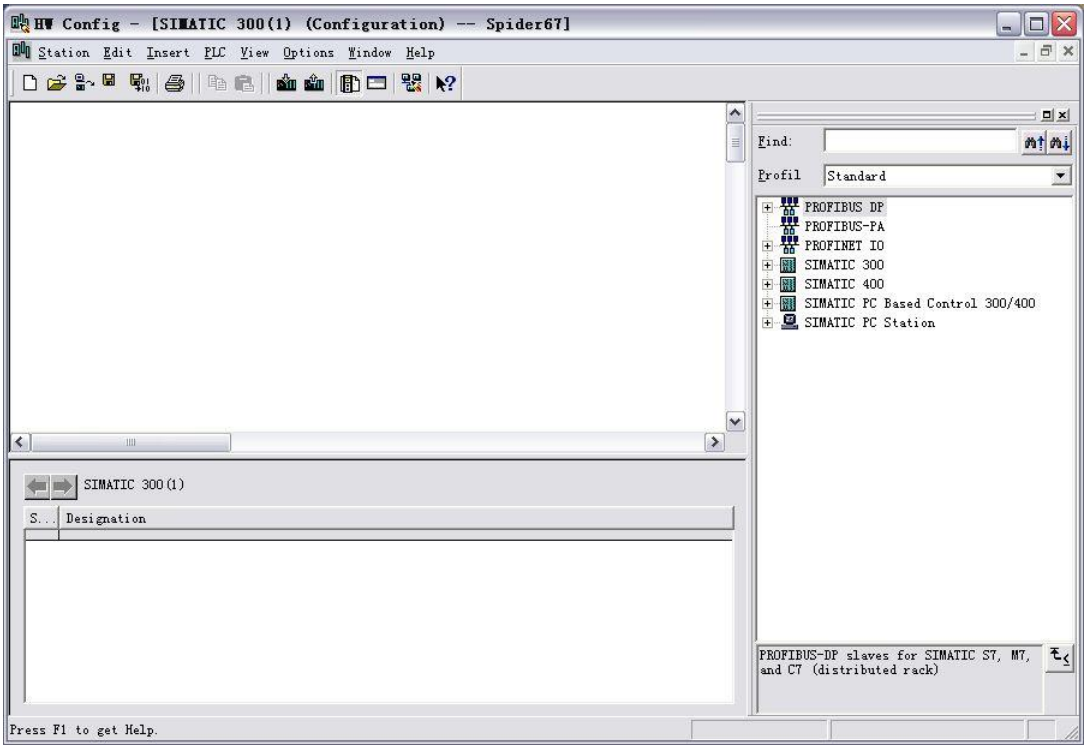
1) Create a new Step7 project



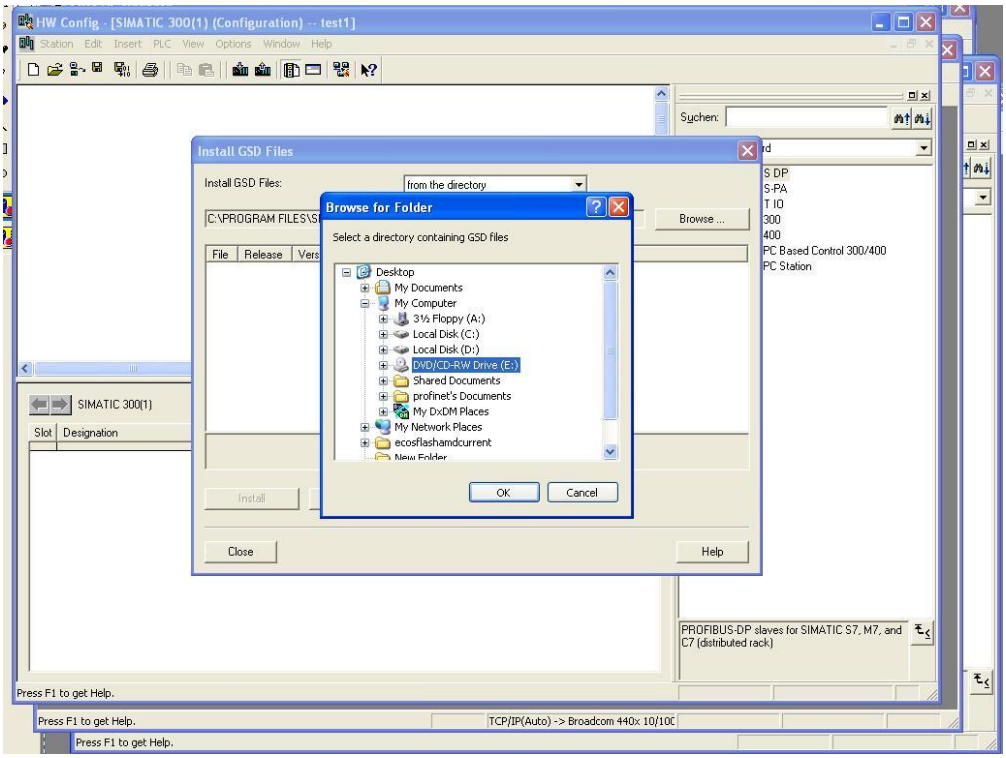
2) Insert a new SIMATIC 300 Station



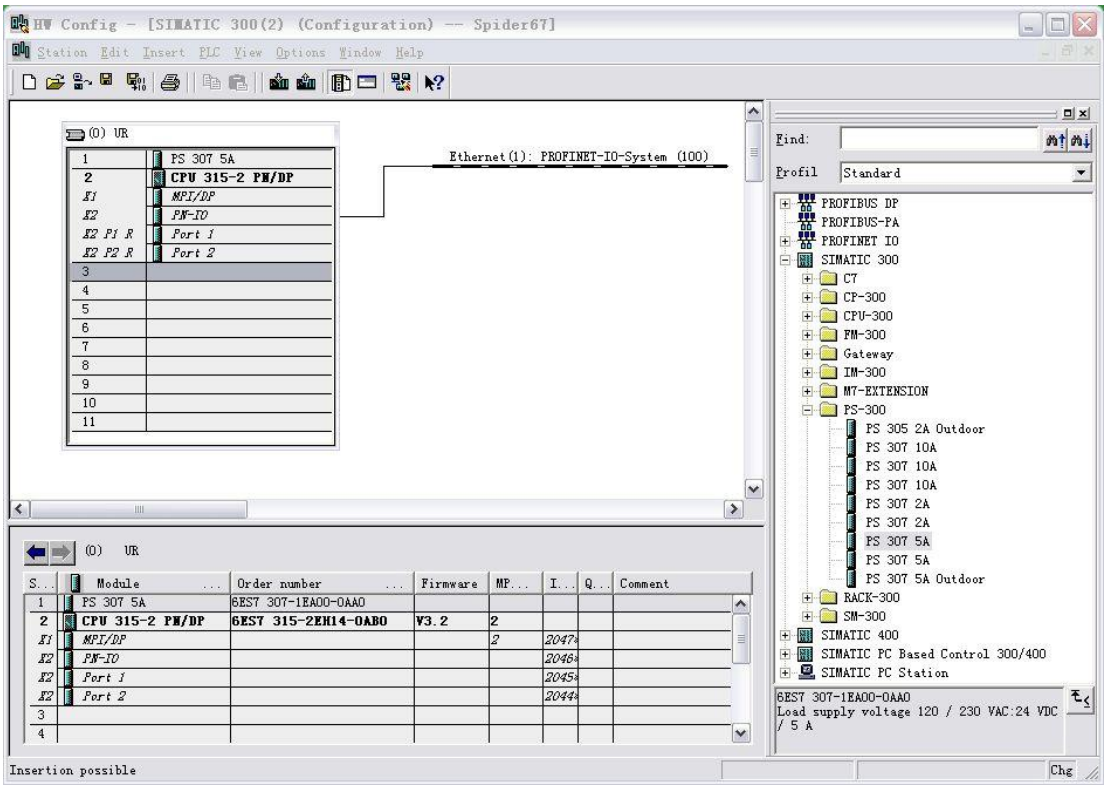
3) Double click "**Hardware"** button to start the hardware configuration tool.



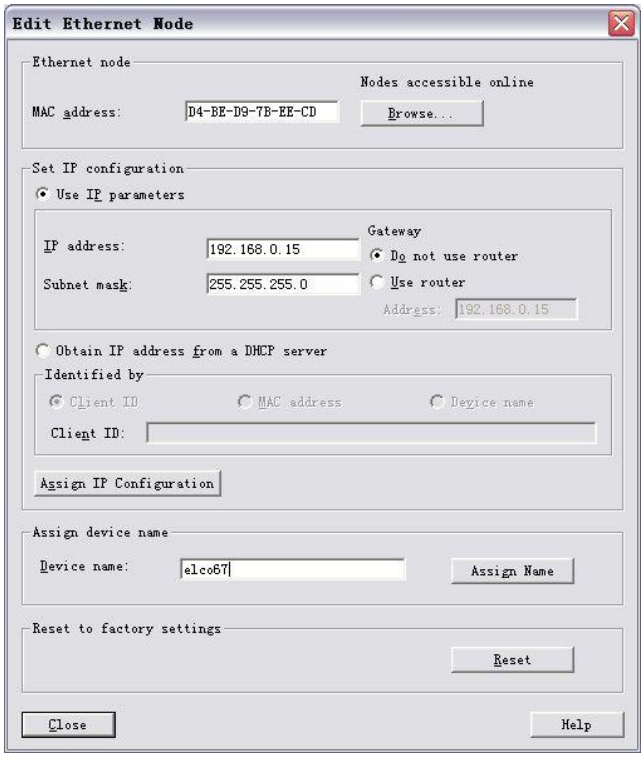
4) Install the GSD file according to section4.1



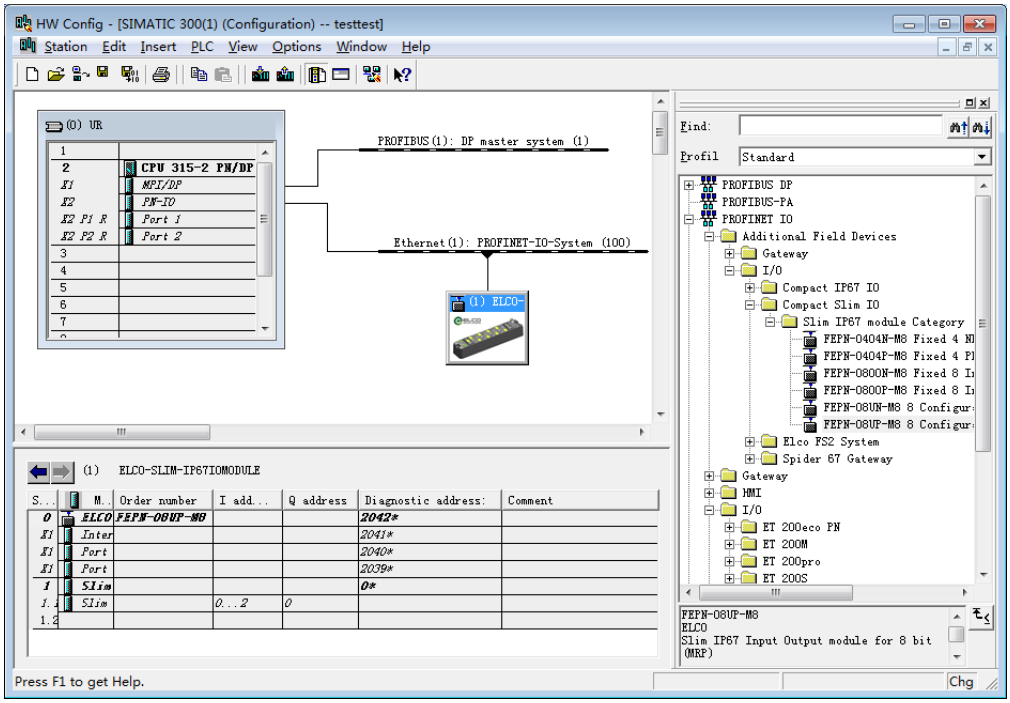
5) Change the hardware configuration, select the appropriate slot, power supply and CPU in the Catalog window, and set the properties of the CPU, bus etc.



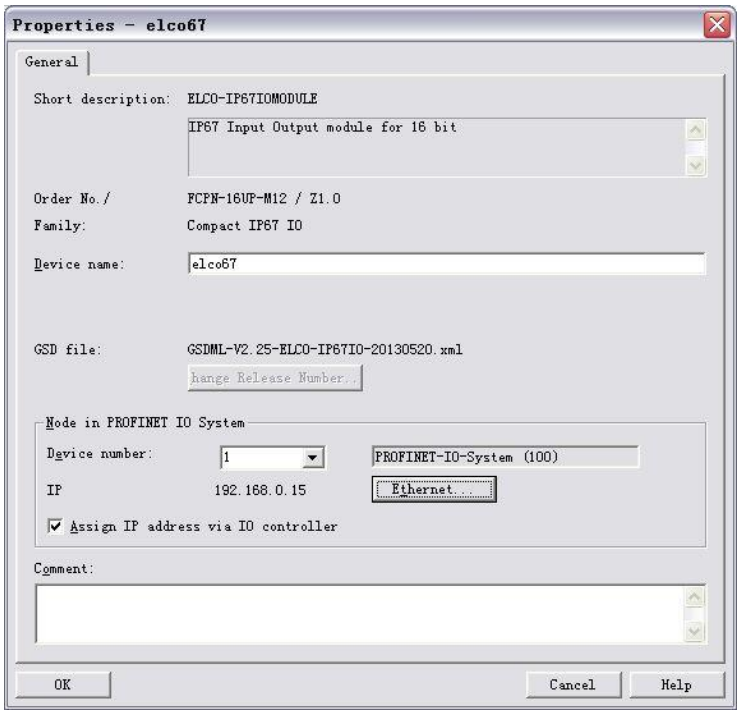
6) According to Section 3.3 user guide, select "PLC Edit Ethernet > Ethernet > Node", assign the Compact67_Slim device the name of elco67 in the pop-up window.



7) In the Catalog window, the catalog of "Profinet IO>Additional Field Devices>I/O> Compact IP67 IO>IP67 module Category", select the "FEPN-08UP-M8" and add it to the PROFINET network.



8) Double click on the newly added Compact67_Slim fill in the previously setting device name elco67 in the pop-up "**properties**" window, and assign IP address to this module via the "Ethernet.." button: 192.168.0.15. Be sure to click the option "**assign IP via IO controller**".

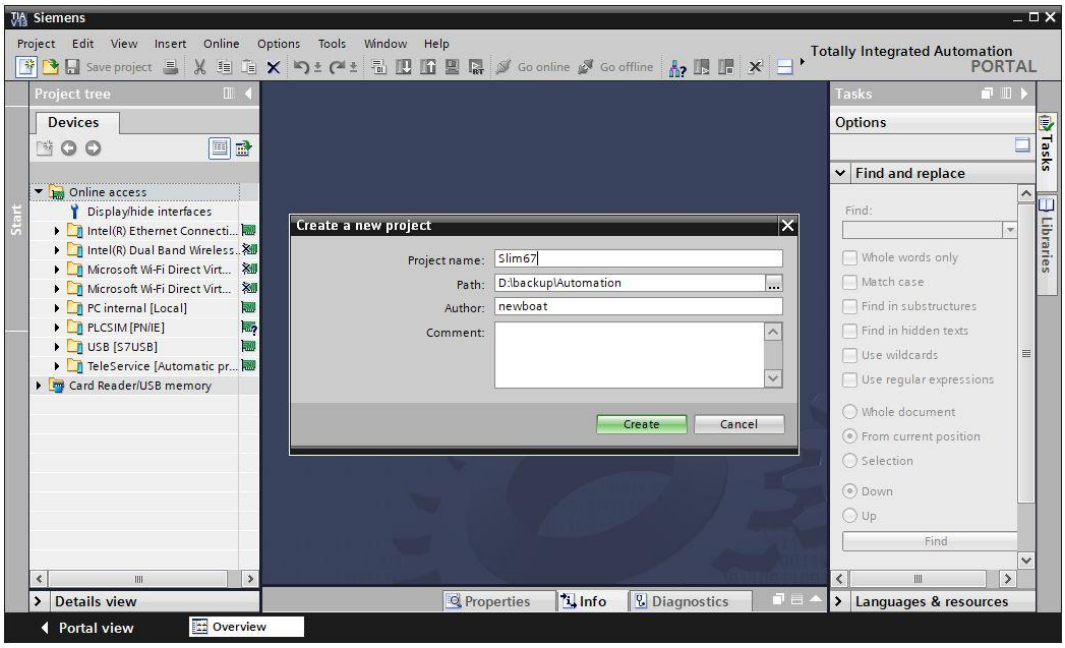


9) Save the compilation and download configuration to the PLC, until now the configuration is completed.

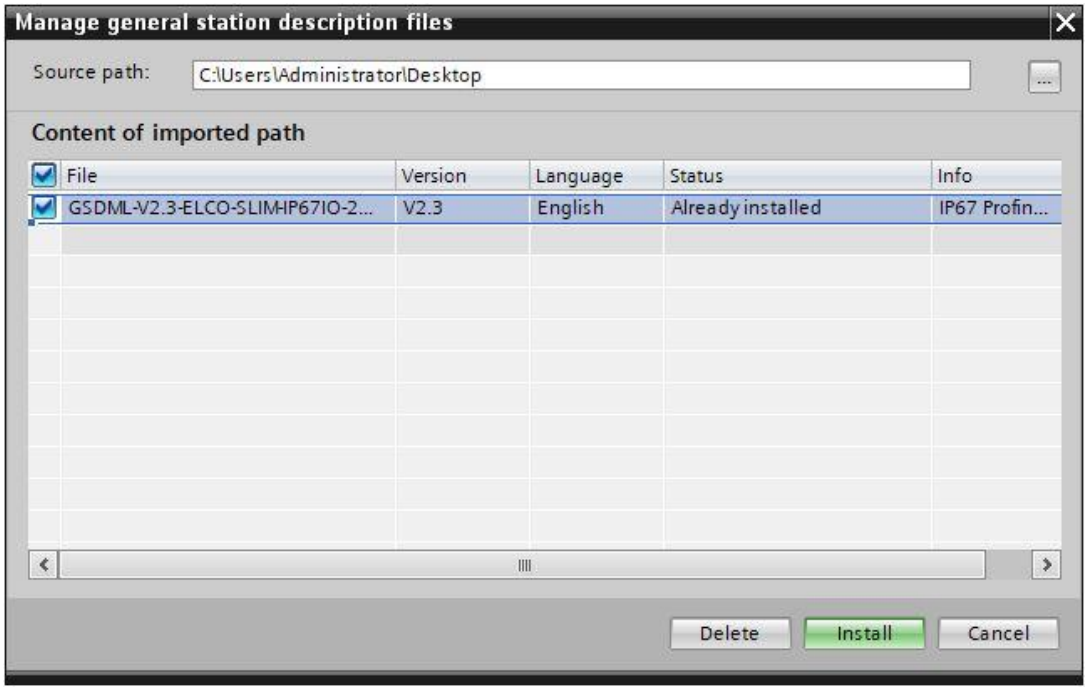
4.5 Module configuration example (Portal)

This section, through a case of connection configuration in actual operation process, makes the users fully understand how to use the Compact67_Slim distributed I/O system. In this case, using the ELCO Compact67_Slim as PROFINET slave station to connect the Siemens PROFINET controller CPU1211C under the condition that all power and bus connection have been completed, the device name of Compact67_Slim is assigned as elco67.
The following will show the specific process of software configuration and debugging.

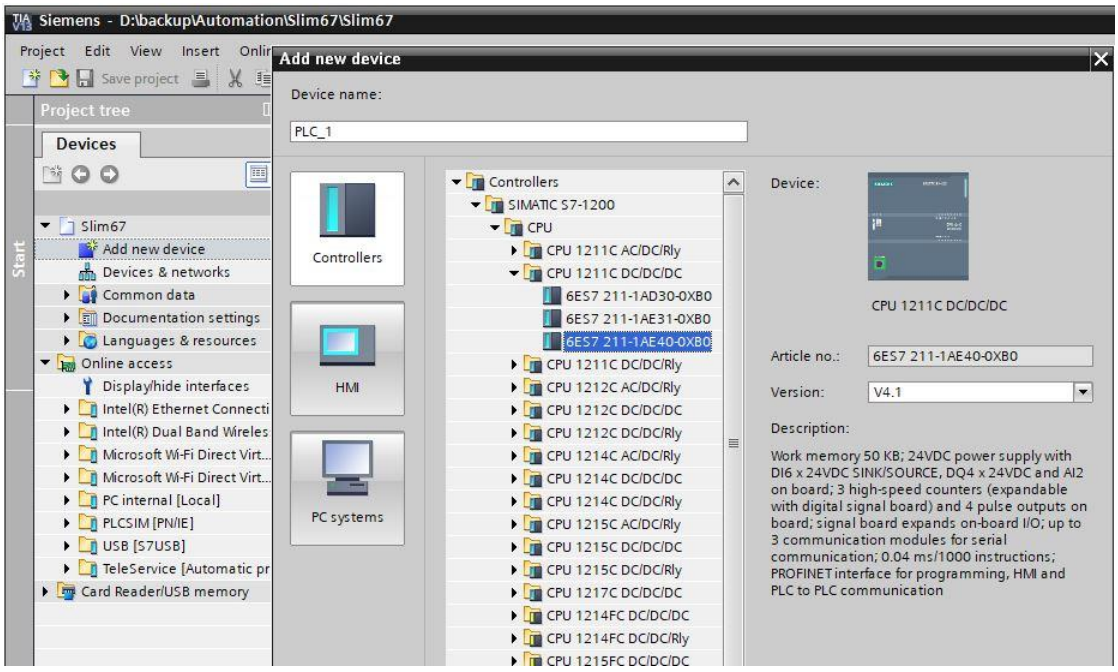
1) Create a new Portal project。



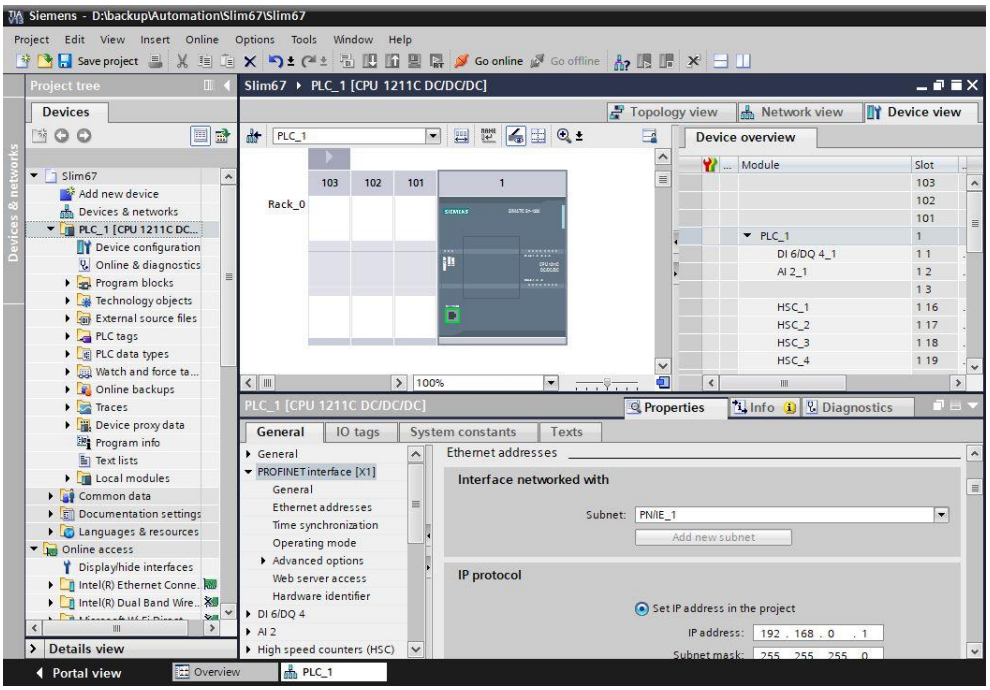
2) Install the GSD file of Compact67_Slim module.



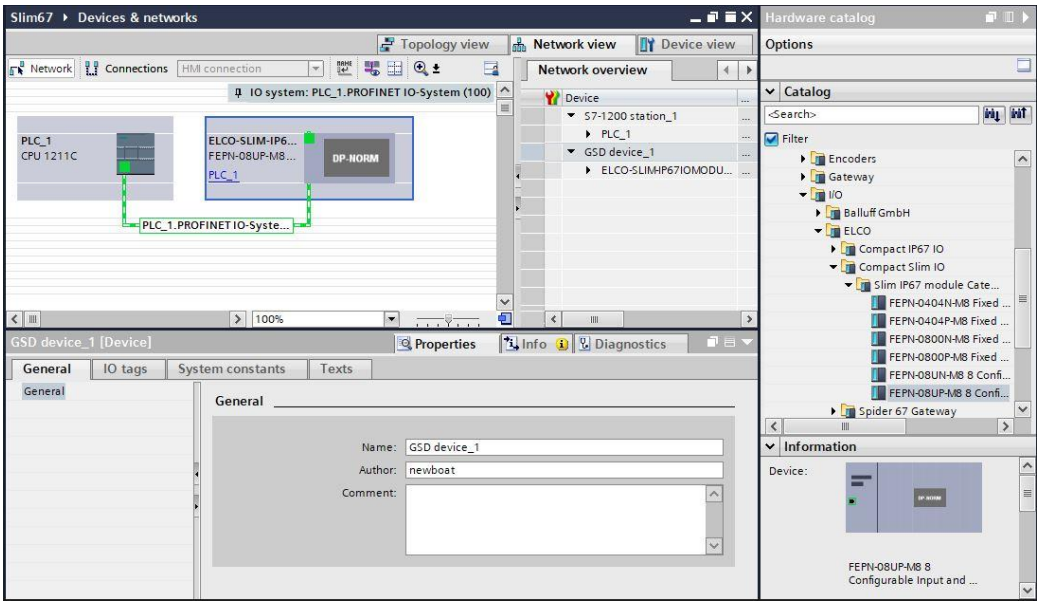
3) Double-click “Add New Device”, select the PLC model in the window.



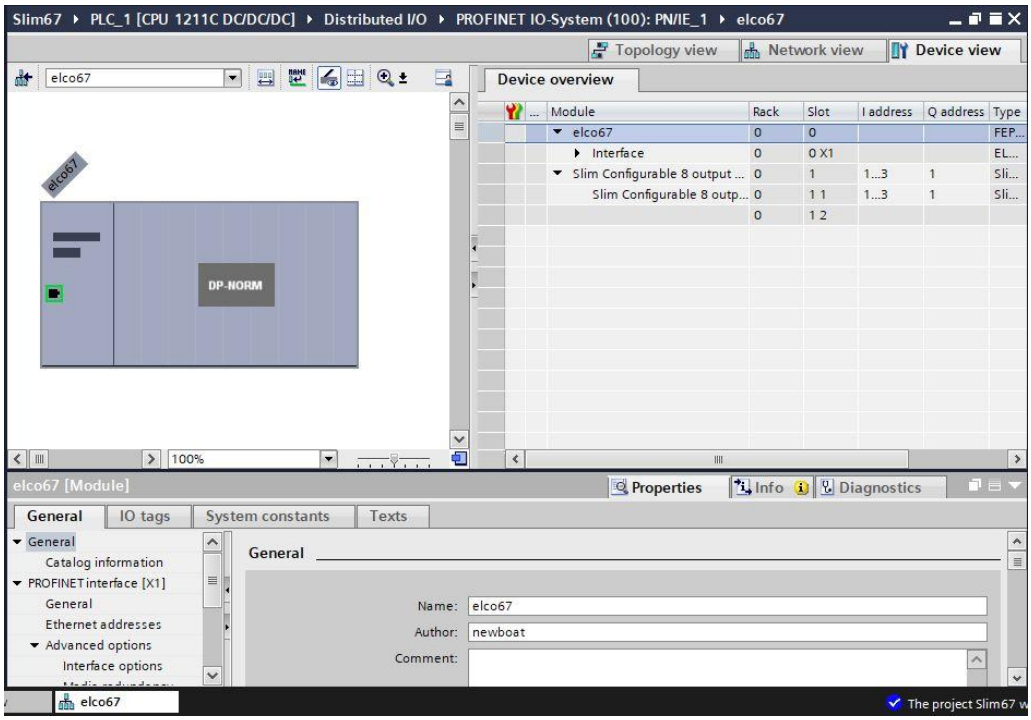
4) In the "Device View" tab of the "Device Configuration" window, set the relevant properties of PLC, click the "Add New Subnet" button to add Profinet network, and set the IP address of PLC.



5) On the Network View tab, select the FEPN-08UP-M8 module of ELCO from the Hardware Directory on the right to add to the network.



6) According to the instructions in Section 3.3, double-click the Compact67_Slim module, enter the device view of FEPN-08UP-M8, set the device name elco67 of Compact67_Slim in the window, and set the IP address.



7) After saving and compiling, the configuration is downloaded to the PLC to complete the configuration work.

5. Alarm diagnosis

5.1 LED fault indicator

With the built-in LED on Compact67_Slim distributed I/O module, users can quickly and easily diagnose the working status of module.

LED indicator				Meaning	Solution
Ui	**Uo**	**Link (In)**	**Link (Out)**		
Off	-	-	-	Module power Ui connection error	Check power supply
-	Off	-	-	Output power Uo connection error	Check power supply
Red	-	-	-	Module power Ui <18V	Replace power supply
-	Red	-	-	Output power Uo <18V	Replace power supply
-	-	Red	-	Bus-in Connection Failure	Check PN cable
Green	Green	R/G Flash	-	Power supply is OK. Network is connected, but connection has not established.	Check PN device name and IP assignment.
					Check module config.
-	-	-	Red	Bus-out Connection Failure	Check PN cable
Green	Green	-	R/G Flash	Power supply is OK. Network is connected, but connection has not established.	Check PN device name and IP assignment.
					Check module config.
Green	Green	Green	-	Module ready, data transmit through bus-in.	-
Green	Green	-	Green	Module ready, data transmit through bus-out.	-

5.2 Diagnostic information

Profinet supports an integrated diagnosis concept, each individual error occurred at the same time or some errors are transferred from the I/O devices to the I/O controller. The following steps can be carried out for the diagnosis: response to the error (for interrupt event-driven diagnosis and evaluation), check the current status of automation system (status-driven diagnosis). Users can access to SFB/SFC in Step7to evaluate the diagnostic information:

1) Diagnosis with the SFB52 in the OB1

The diagnostic data record in the system offer a diagnostic capability with additional detailed information, and the system function block SFB52 ("RDREC") is used for reading these data records.

When called, the system function block addresses the station to be diagnosed and indicated the data record to be read as the INDEX parameters. If there is no diagnostic information, the system function block is executed without output.

Since SFB 52 “RDREC” is an SFB that works asynchronously, i.e., the execution spans several SFB calls, the block can only be used in cyclic operation. A use of the block in an interrupt OB or a timed interrupt OB is not advisable. Aside from the exact position of the error, the diagnostic data records of SFB 52 also include information on the occurred error type. This information can be evaluated for further analysis purposes.

You define the maximum number of bytes to read by setting the MLEN variable, so you should select a RECORD target range of at least the same length as defined in MLEN. Output parameter VALID = TRUE indicates the successful transfer of the record to the target area RECORD. Output parameter LEN contains the length in [bytes] of the read data. Output parameter ERROR reports any errors detected during record transfer. ERROR =TRUE and the error information is written to output parameter STATUS when an error is detected.

2) Diagnosis with the SFB54 in the OB82

SFB54 "RALARM" evaluates received interrupt data and all corresponding information from peripheral modules or Profinet devices, and then the information is provided to the output parameters.

The information with additional detailed information includes both the

information of the starting interrupt OB and the information of the interrupt source. Call "RALRM" only within the interrupt OB started by the CPU operating system as a result of the peripheral device interrupt that is to be examined. The call of SFB 54 “RALARM” outside an interrupt OB is not advisable since important information on the interrupt status are not included here.

In the TINFO and AINFO cache data, you can quickly get the information such as station number, slot number, channel and occurred error type and other information.