IO-LINK SOLUTION

----CC-Link IE Field Basic System Manual

CC-Link IE Field Basic

Preface

1. Scope of this manual:

This manual applies to the ELCO CC-Link IE Field Basic Compact67 series IO-Link module.

The information in this manual enables you to run the Compact67 IO-Link module on CC-Link IE Field Basic 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 describes the hardware of the CC-Link IE Field Basic Compact67 series IO-Link module.

Covered topics are:

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

4. Technical support:

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:

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.

Contents

1. Product overview

1.1 Introduction

The Compact67 module supporting IO-Link function is a new type of distributed I / O system. The simple and easy to install

Fieldbus system Compact67 is especially suitable for applications in rough environments.

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.
ELCO new Compact67 product 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. Optional interface of Class-A or Class-B. 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.
The IO-Link hub launched at the same time, as an IO-Link device, complies with the IO-Link v1.1 and supports COM2 (38.4kbps). It can be connected with the IO-Link master of ELCO or other brands, which is used to collect digital input signals on-site and control digital output signals. Each hub can connect up to 16 digital signals. With ELCO 8-port IO-Link master module, it can transmit up to 128 digital signals.

1.3 Features

- Up to IP67 protection class
- Designed with IO-Link v1.1 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

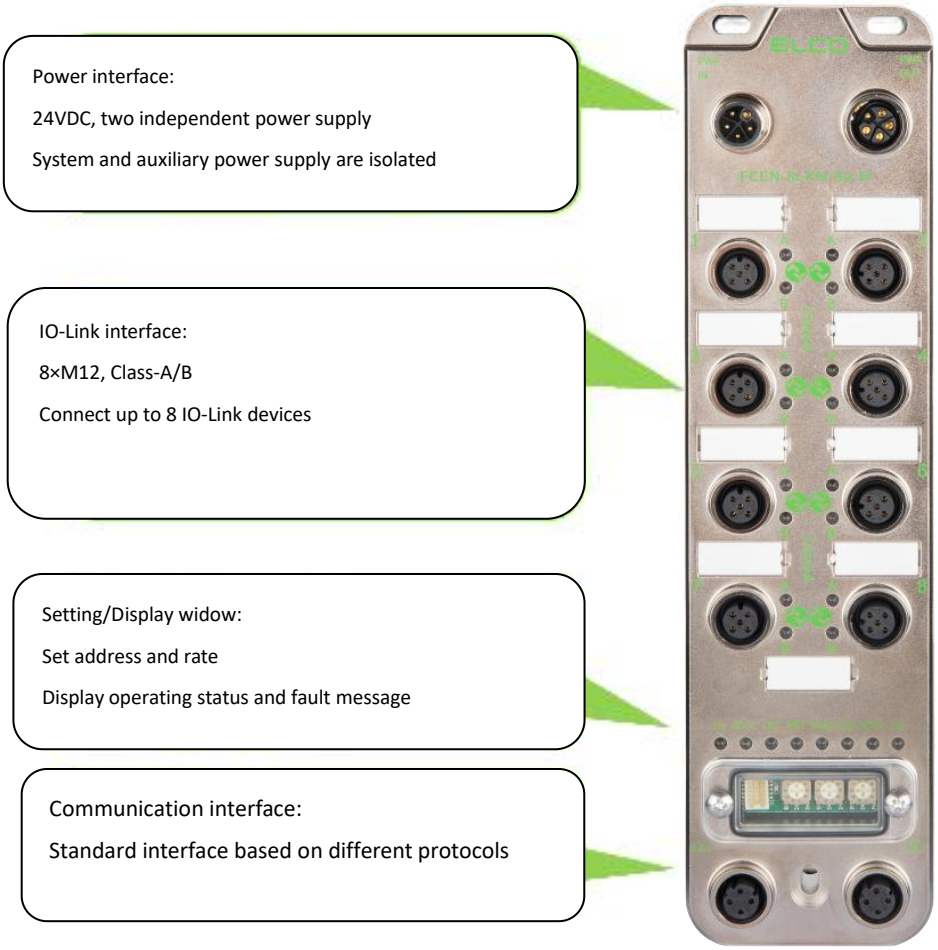
1.4 Type

No.	Type	Description
1	FCCB-8LKM-8A-M	CC-Link IE Field Basic IO-Link master module 8 IO-Link interfaces (8*Class-A) 2 male+female, M12 L-Code power supply 2 female, M12 D-Code fieldbus interface
2	LKHA-1600P-M12	IO-Link sensor hub Class-A (LKHA) interface 16 PNP input signal or dry contact 8 female, M12 A-Code signal interface
3	LKHA-088UP-M12	IO-Link sensor hub Class-A (LKHA) interface 8 PNP input signal or dry contact & 8 PNP input or output configurable 8 female, M12 A-Code signal interface
4	LKHA-16UP-M12	IO-Link sensor hub Class-A (LKHA) interface 16 PNP input or output configurable 8 female, M12 A-Code signal interface
5	LKHA-0800P-M8	IO-Link sensor hub Class-A (LKHA) interface 8 PNP input signal or dry contact 8 female, M8-3pin signal interface
6	LKHA-08UP-M8	IO-Link sensor hub Class-A (LKHA) interface 8 PNP input or output configurable 8 female, M8-3pin signal interface
7	LKHA-0800P-M12	IO-Link sensor hub Class-A (LKHA) interface 8 PNP input signal or dry contact 4 female, M12 A-Code signal interface
8	LKHA-08UP-M12	IO-Link sensor hub

		Class-A (LKHA) interface 8 PNP input or output configurable 4 female, M12 A-Code signal interface
9	LKHA-1600N-M12	IO-Link sensor hub Class-A (LKHA) interface 16 NPN input signal or dry contact 8 female, M12 A-Code signal interface
10	LKHA-088UN-M12	IO-Link sensor hub Class-A (LKHA) interface 8 NPN input signal or dry contact & 8 NPN input or output configurable 8 female, M12 A-Code signal interface
11	LKHA-16UN-M12	IO-Link sensor hub Class-A (LKHA) interface 16 NPN input or output configurable 8 female, M12 A-Code signal interface

2. Technical characteristics

2.1 IO-Link master

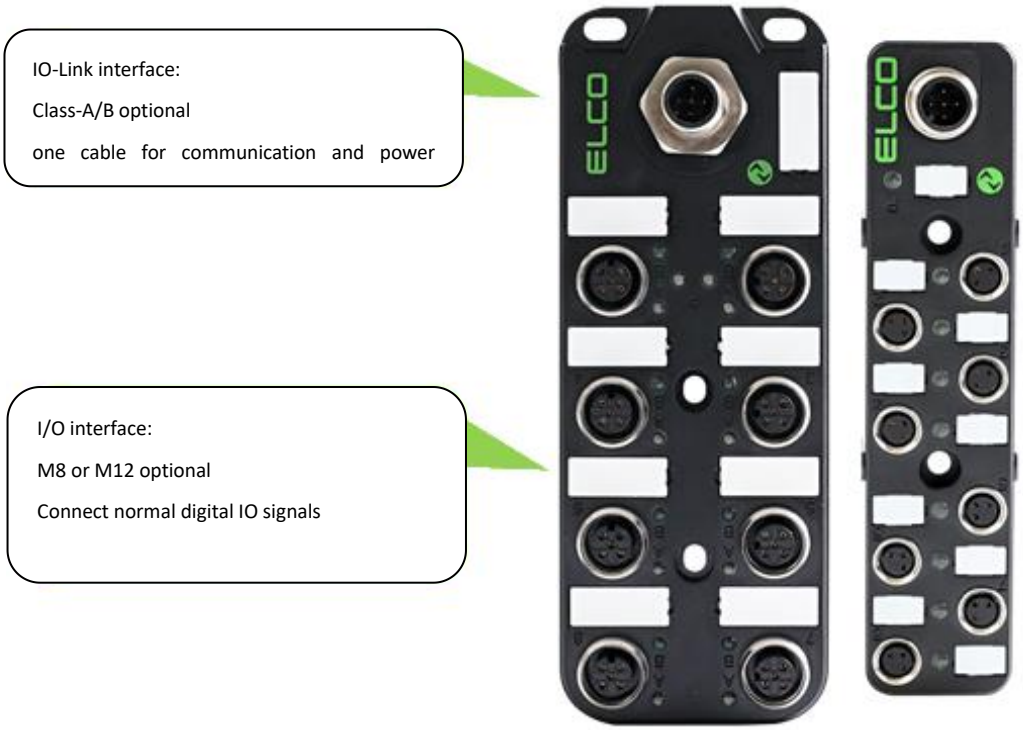


Each Compact67 series IO-Link master occupies an CC-Link IE Field Basic address. Depending on the type, up to 8 IO-Link devices can be connected. Depending on the specific requirements, select the module of Class-A or Class-B interface.

As an CC-Link IE Field Basic slave, the Compact67 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 CC-Link IE Field Basic 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 or the SIO mode used as standard digital input and output in the programming software as required. Due to there are two IO-Link specifications, Class-A and Class-B, users need to select different types of IO-Link master modules according to their needs and IO-Link device characteristics.

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 sensor 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 standard and supports COM2 (38.4kbps) 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 sensor 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 and M8.

M12 A-Code, 2 digital or 1 analog are available.

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 unshielded 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 can be used as auxiliary power supply, so input IO-Link hub can use three-core cable, output IO-Link hub requires a four-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 five-core cable should be used.

2.4 Hardware

2.4.1 IO-Link master

FCCB-8LKM-8A-M

ARTICLE PROPERTIES

PRODUCT TYPE	IO-Link Master	**PROTOCOL**	CC-LINK IE Fied Basic
DESCRIPTION	IO-Link master for CC-LINK IE Fied Basic, Metal housing, 8 IO-Link master ports	**OPERATING MODES**	CC-Link IE Field Basic Hub
		TRANSFER RATE	10/100 Mbps

ELECTRICAL DATA

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

FUNCTIONAL SAFETY

MTTF (40 °C)	62a

GENERAL DATA

HOUSING MATERIAL	Casting Zinc Alloy	**OPERATING TEMPERATURE**	-25 ... +70 °C
PROTECTION	IP67	**STORAGE TEMPERATURE**	-40 ... +85 °C
DIMENSIONS	60 × 230 × 32.6 mm		

2.4.2 M12-16 signals IO-Link sensor hub

PNP signal type

Ordering data			
Product type	LKHA-1600P-M12	LKHA-088UP-M12	LKHA-16UP-M12
Description	16DI，Class-A，8*M12	8DI+8DI/DO，Class-A, 8*M12	16DI/DO，Class-A，8*M12
Connections			
IO-Link	Class-A：1 x M12 A-code 4pin，Male		
Power supply	Included in IO-Link interface		
Signals	8 x M12 A-code 5pin，Female		
Interface			
Input channels	16	Max. 16	Max. 16
Input supply current	Max. 200mA per channel		
Input type	PNP sensors，mechanical switches，dry contacts，etc..		
Input delay	1.6 ms		
Output channels	-	Max. 8	Max. 16
Output current	Max. 500mA per channel，2A in total		
Output type	Lamps，solenoid valve，etc..		
Output frequency	Resistive load 100Hz，Inductive load 5Hz		
Diagnostics			
Communication indication	LED indication，Communication message		
Voltage detection	Support，Low voltage alarm		
Short-circuit & Overload	Support，LED indication		
General data			
Protection	IP67		
Temperature	Operating -25...+70 °C，Storage -40...+85 °C		
Dimensions（W*H*D）	55x145x29 mm		

NPN signal type

Ordering data			
Product type	LKHA-1600N-M12	LKHA-0808N-M12	LKHA-16UN-M12
Description	16DI，Class-A，8*M12	8DI+8DI/DO，Class-A，8*M12	16DI/DO，Class-A，8*M12
Connections			
IO-Link	Class-A：1 x M12 A-code 4pin，Male		
Power supply	Included in IO-Link interface		
Signals	8 x M12 A-code 5pin，Female		
Interface			
Input channels	16	Max. 16	Max. 16
Input supply current	Max. 200mA per channel		
Input type	NPN sensors，mechanical switches，dry contacts，etc..		
Input delay	1.6 ms		
Output channels	-	Max. 8	Max. 16
Output current	Max. 500mA per channel，2A in total		
Output type	Lamps，solenoid valve，etc..		
Output frequency	Resistive load 100Hz，Inductive load 5Hz		
Diagnostics			
Communication indication	LED indication，Communication message		
Voltage detection	Support，Low voltage alarm		
Short-circuit & Overload	Support，LED indication		
General data			
Protection	IP67		
Temperature	Operating -25...+70 °C，Storage -40...+85 °C		
Dimensions（W*H*D）	55x145x29 mm		

2.4.3 M8-8 signals IO-Link sensor hub

Ordering data		
Product type	LKHA-0800P-M8	LKHA-08UP-M8
Description	8DI，Class-A，8*M8	8DI/DO，Class-A，8*M8
Connections		
IO-Link	Class-A：1 x M12 A-code 4pin，Male	
Power supply	Included in IO-Link interface	
Signals	8 x M8　3pin，Female	
Interface		
Input channels	8	Max. 8
Input supply current	Max. 200mA per channel	
Input type	PNP sensors，mechanical switches，dry contacts，etc..	
Input delay	1.6 ms	
Output channels	-	Max. 8
Output current	Max. 500mA per channel，2A in total	
Output type	Lamps，solenoid valve，etc..	
Output frequency	Resistive load 100Hz，Inductive load 5Hz	
Diagnostics		
Communication indication	LED indication，Communication message	
Voltage detection	Support，Low voltage alarm	
Short-circuit & Overload	Support，LED indication	
General data		
Protection	IP67	
Temperature	Operating -25...+70 °C，Storage -40...+85 °C	
Dimensions（W*H*D）	55x145x29 mm	

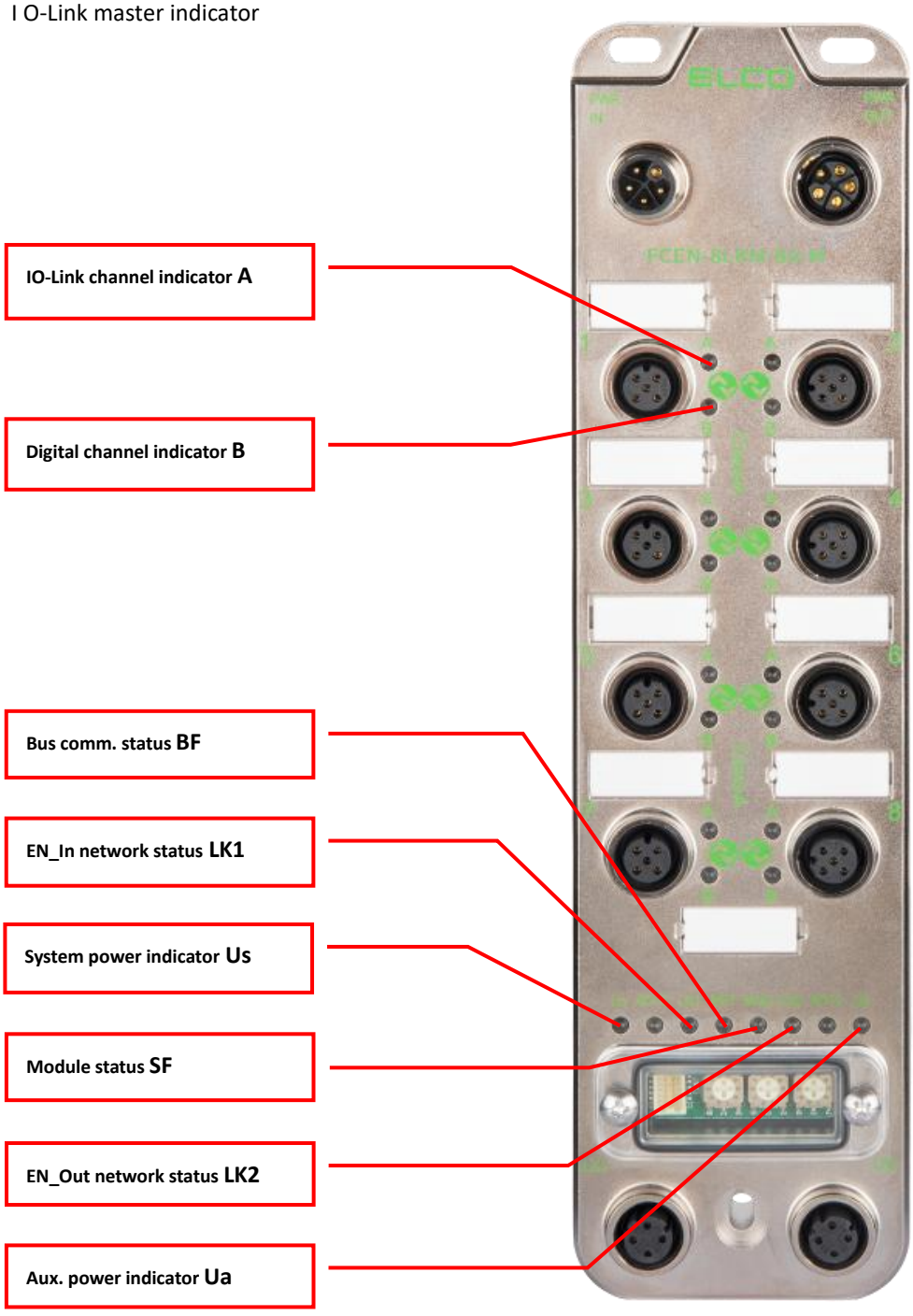
2.4.4 M12-8 signals IO-Link sensor hub

Ordering data		
Product type	LKHA-0800P-M12	LKHA-08UP-M12
Description	8DI，Class-A，4*M12	8DI/DO，Class-A，4*M12
Connections		
IO-Link	Class-A：1 x M12 A-code 4pin，Male	
Power supply	Included in IO-Link interface	
Signals	4 x M12 A-code 5pin，Female	
Interface		
Input channels	8	Max. 8
Input supply current	Max. 200mA per channel	
Input type	PNP sensors，mechanical switches，dry contacts，etc..	
Input delay	1.6 ms	
Output channels	-	Max. 8
Output current	Max. 500mA per channel，2A in total	
Output type	Lamps，solenoid valve，etc..	
Output frequency	Resistive load 100Hz，Inductive load 5Hz	
Diagnostics		
Communication indication	LED indication，Communication message	
Voltage detection	Support，Low voltage alarm	
Short-circuit & Overload	Support，LED indication	
General data		
Protection	IP67	
Temperature	Operating -25...+70 °C，Storage -40...+85 °C	
Dimensions（W*H*D）	55x93x29 mm	

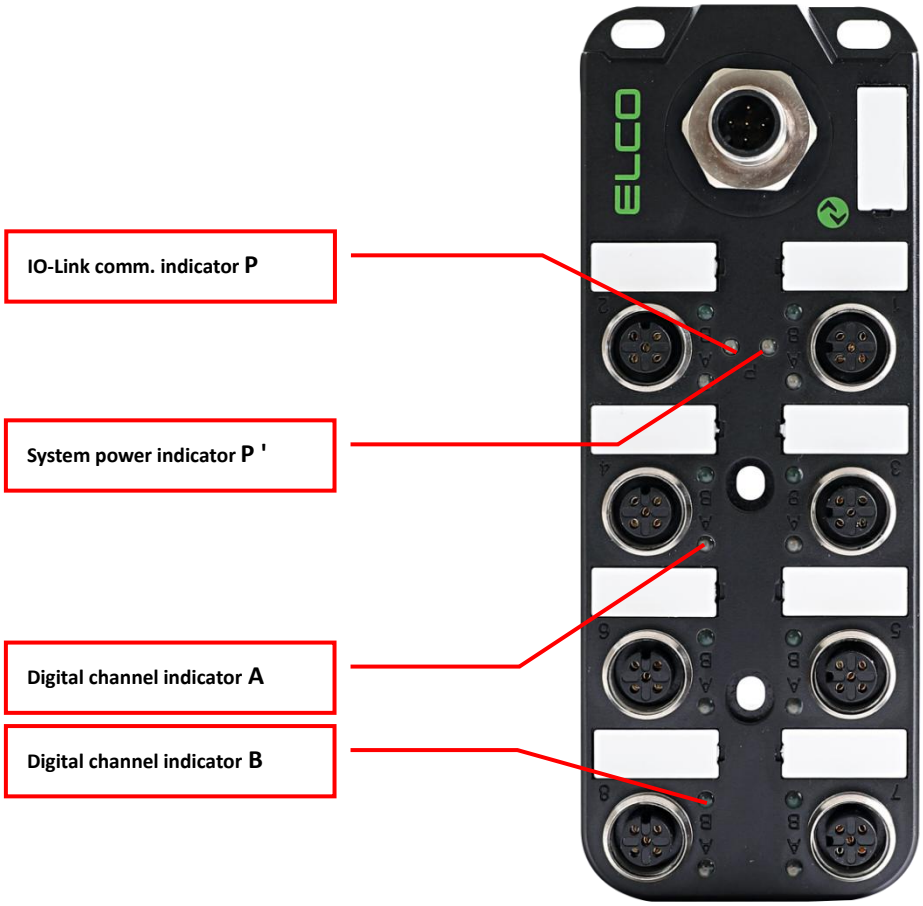
2.5 LED indicator

The module's indicator can clearly indicate its operating status. For specific fault indications and solutions, please refer to Section 5.1 “LED Fault Indicator”.

I O-Link master indicator



IO-Link sensor hub indicator

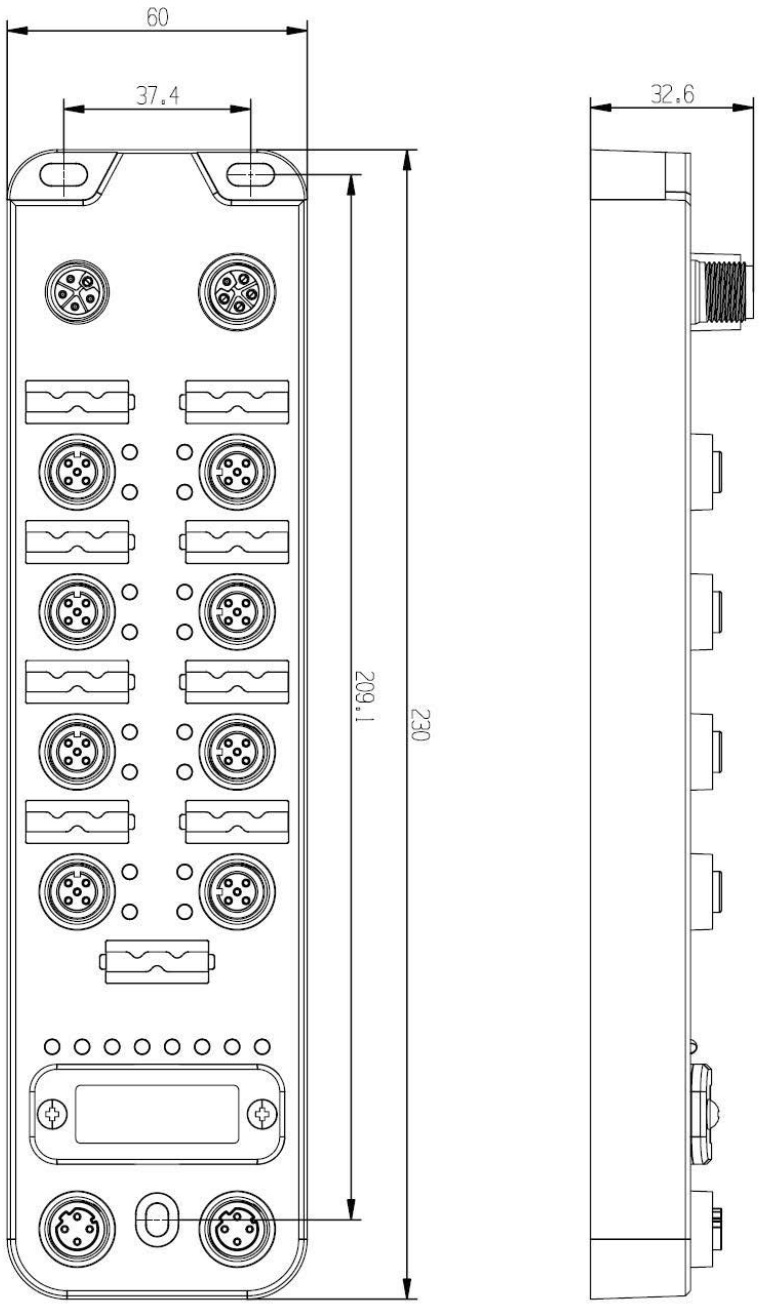


2.6 General system layout

3. Installation wiring

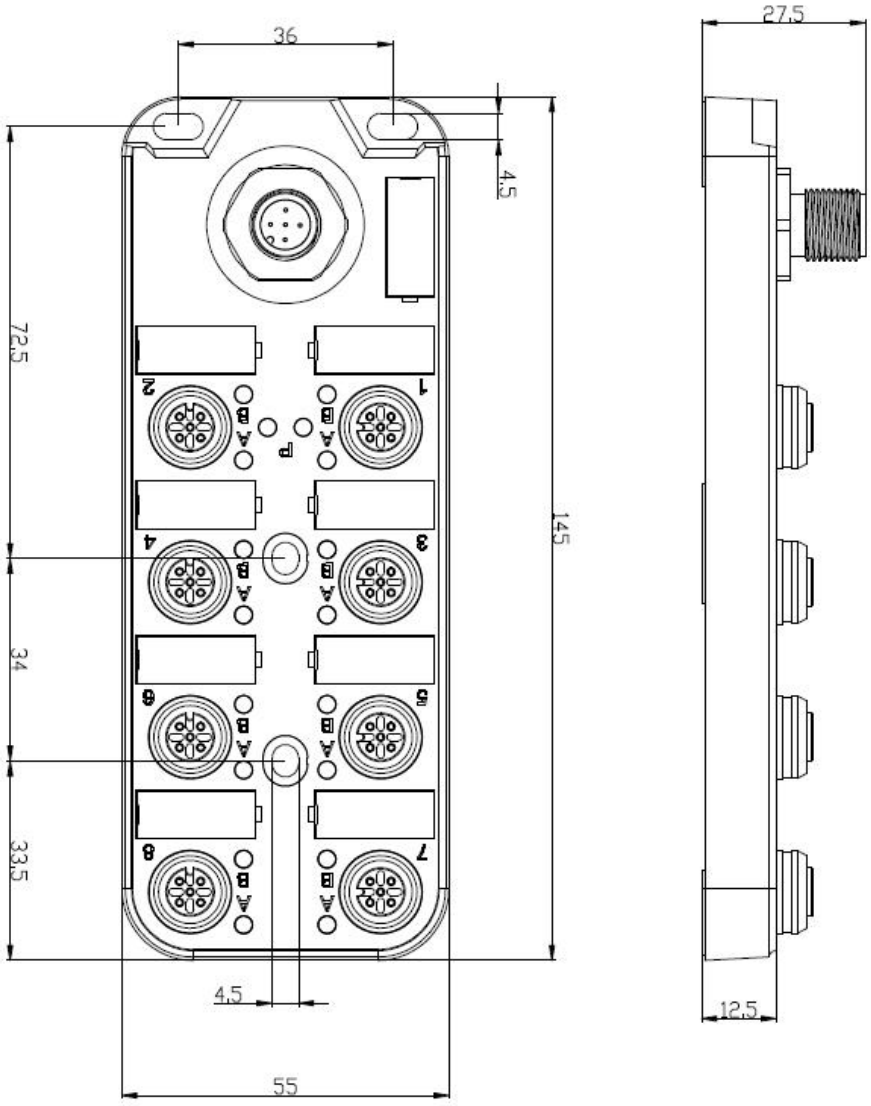
3.1 Installation dimensions

3.1.1 IO-Link master dimensions

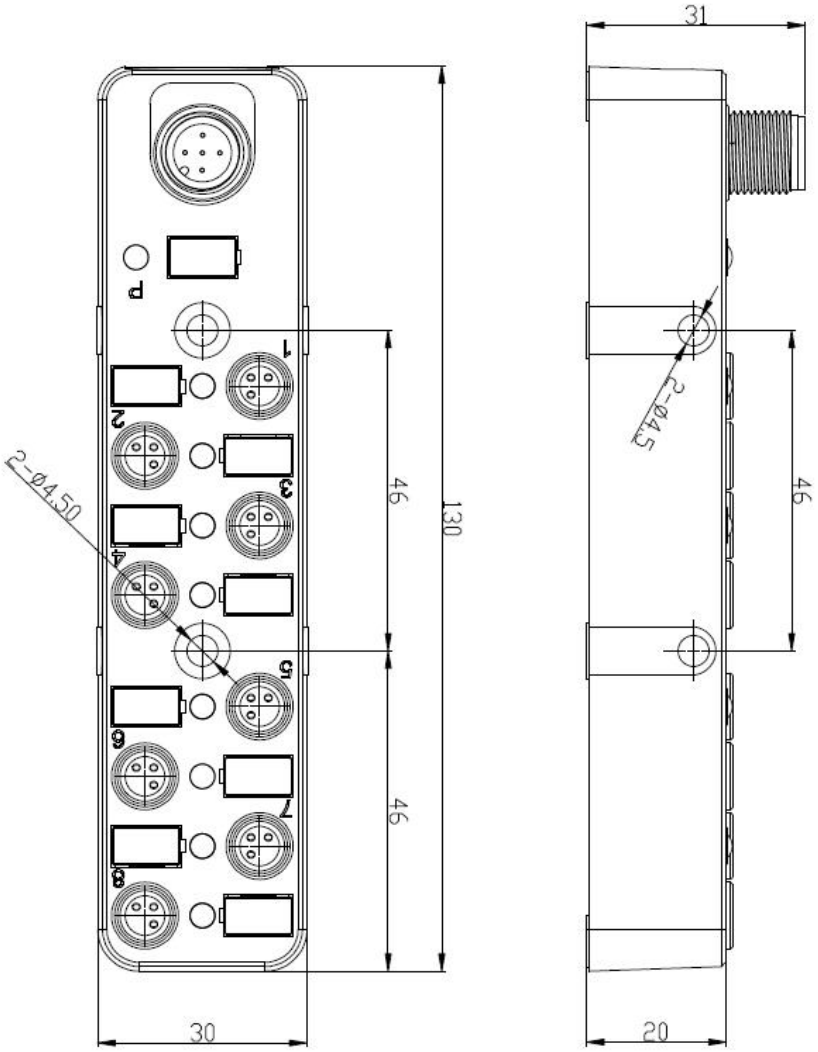


3.1.2 IO-Link sensor hub dimensions

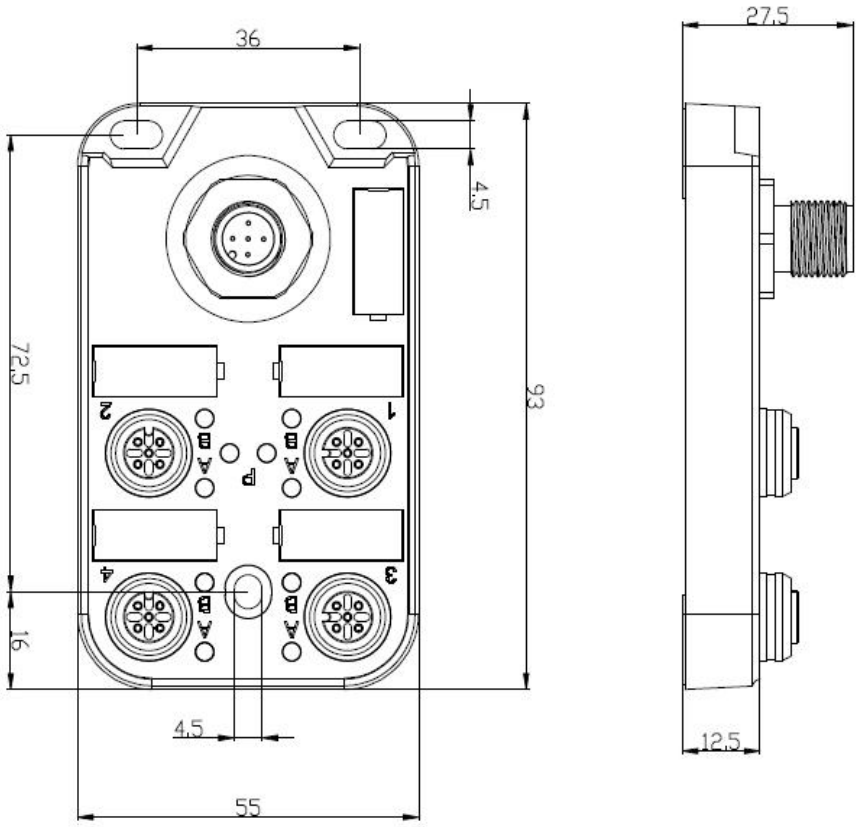
1) 16 signals, M12 interface



2) 8 signals, M8 interface



3) 8 signals, M12 interface



3.2 Installation position and size

Thanks to IP67 high protection level and excellent resistance to vibration and interference, Compact67 products can be installed in almost any location.

The Compact67 series uses a compact design to minimize installation space. Its IO-Link master module and IO-Link sensor hub use standard dimensions. The following table shows the module installation dimensions:

	Master	16 signals M12	8 signals M8	8 signals M12
Installation width	60mm	55mm	30mm	55mm
Installation height	230mm	145mm	130mm	93mm
Installation depth	32.9mm	29mm	31mm	29mm

3.3 Wiring Compact67

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

3.3.1 Connecting Compact67 to protective earth (PE)

- Always connect the Compact67 to protective earth.
- The module also requires this connection to protective earth in order to discharge any interference currents to ground, and for EMC compatibility.
- Always make sure you have a low-impedance connection to protective earth.

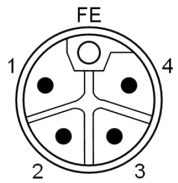
3.3.2 Compact67 power supply

Compact67 IO-Link module adopts 24VDC power supply, and power IO-Link signal hub by extensible cable, voltage range 18~30VDC, standard M12 L-Code connector.

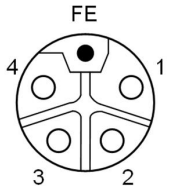
The power supply of IO-Link master is divided into two parts: System and sensor power supply Us (+24V, 0V), and auxiliary power supply Ua (P24, N24). Us is used for module chips and input signal power supply, while Ua is used for output signal power supply.

For Compact67 IO-Link module, the two power supply are partially isolated, electrical isolation between Us+ and Ua+, and internally connected between Us- and Ua-.

1) Power in connector (Male)



2) Power out connector (Female)



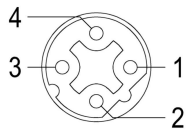
3) Power definition

Terminal	Function	Power supply
1	System and input power supply Us+	24V
2	Output power supply Ua-	0V
3	System and input power supply Us-	0V
4	Output power supply Ua+	24V
5	Function earth FE	

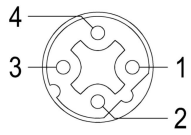
3.3.3 Compact67 BUS connection

Compact67 module, supporting CC-Link IE Field Basic protocol, transmits signals by a shielded cable, D-Code M12 connector.

1) BUS-In (Female)



2) BUS-Out (Female)



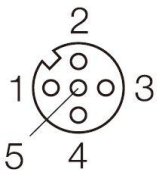
3) Bus definition

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)



M12 connector

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

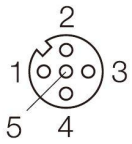
3）The power supply (Pin1 and Pin3) and signal input power supply come from the system power supply Us, and the auxiliary power supply and signal output power supply come from the auxiliary power supply Ua.

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.

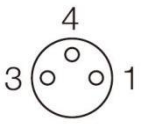
3.3.5 IO-Link hub digital signal cable connection

All Compact67 series IO-Link sensor hubs are connected through standard 5-pin M12 or 3-pin M8 connectors. Each M12 port can connect up to 2 signals (input or output), and each M8 port can connect 1 signal (input or output).

1）Signal I/O connector(Female)



M12 connector



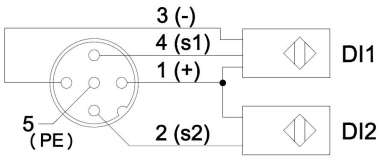
M8 connector

2）Digital signal port definition

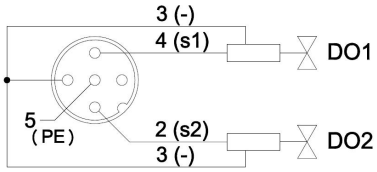
Terminal	M12 connector		M8 connector
1	Power supply 24V+		Power supply 24V +
2	Signal input/output B	2nd signal	-
3	Power supply GND		Power supply GND
4	Signal input/output A	1st signal	Signal input / output
5	Shielded grounding PE		-

3）Wiring example

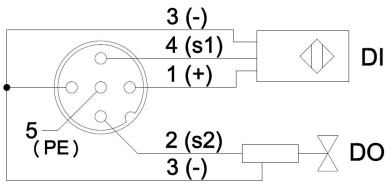
A) Double PNP input signal – 1 connector connects 2 DI, LKHA-1600P-M12, LKHA-088UP-M12, LKHA-16UP-M12, LKHA-0800P-M12, LKHA-08UP-M12 support this connection.



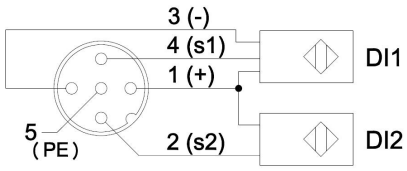
B) Double PNP output signal – 1 connector connects 2 DO, LKHA-088UP-M12, LKHA-16UP-M12, LKHA-08UP-M12 support this connection.



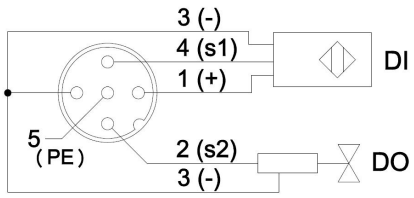
C) PNP Input and output signal – 1 connector connects 1 DI and 1 DO. LKHA-088UP-M12, LKHA-16UP-M12, LKHA-08UP-M12 support this connection.



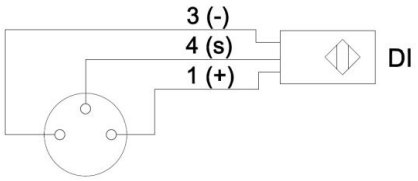
D) Double NPN input signal – 1 connector connects 2 DI, LKHA-1600N-M12, LKHA-088UN-M12, LKHA-16UN-M12 support this connection.



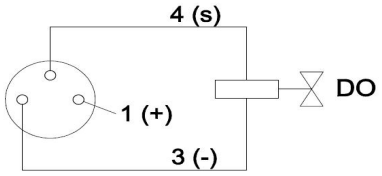
E) NPN Input and output signal – 1 connector connects 1 DI and 1 DO. LKHA-088UN-M12, LKHA-16UN-M12 support this connection.



F) Single PNP input signal – 1 connector connects 1 DI, LKHA-0800P-M8, LKHA-08UP-M8 support this connection.



G) Single PNP output signal – 1 connector connects 1 DO, LKHA-08UP-M8 support this connection.



3.4 IO-Link master signal address assignment

This section mainly introduces the signal point arrangement order and address allocation of the FCCB-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 FCCB-8LKM-8A-M 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

3.4.1 RX and RY data address assignment

The FCCB-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 (88 bits of RX and 16 bits of RY), with the rest being idle data. Please refer to Section 5.2 “Process image area”.

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

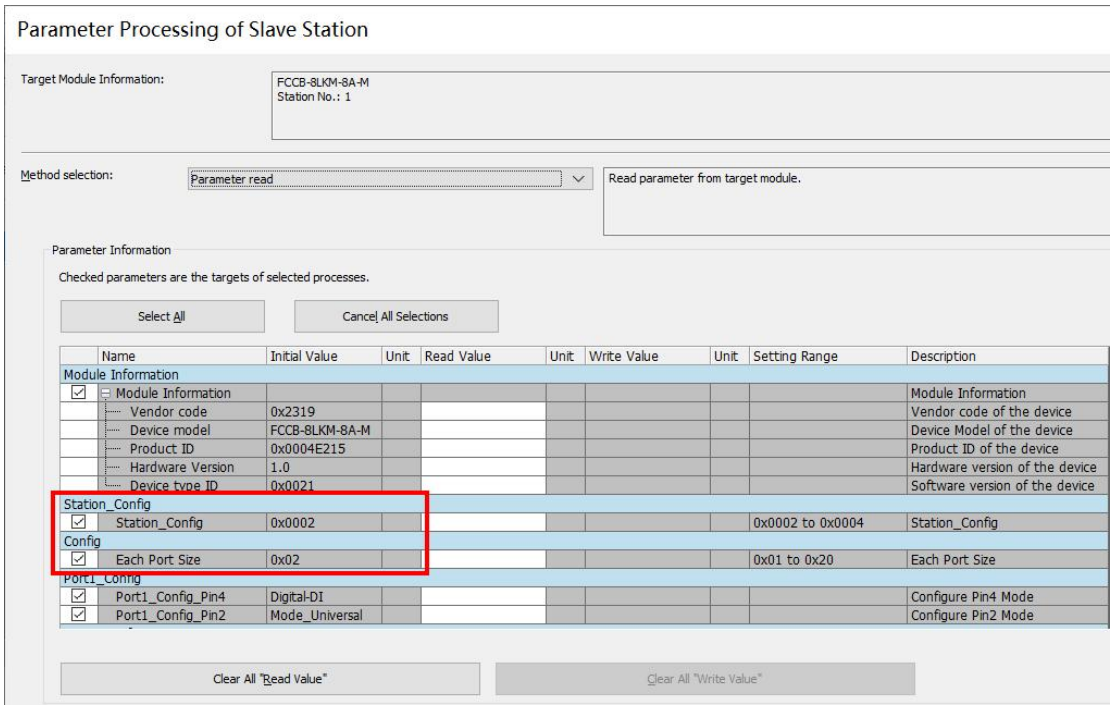
RX	Input data	Description
RX 00…0F	Input signal of Master	Process input data for IO-Link Master SIO mode.
RX 10…57	Module status	Indicate the status of IO-Link master and IO-Link port.
RX 58…7F (2 Stations) **RX 58…BF** (3 Stations) **RX 58…FF** (4 Stations)	Reserved	Reserved
RY	**Output data**	**Description**
RY 00…0F	Output signal of Master	Process output data for IO-Link Master SIO mode.
RY 10…7F (2 Stations) **RY 10…BF** (3 Stations) **RY 10…FF** (4 Stations)	Reserved	Reserved

3.4.2 RWr and RWw data address assignment

The FCCB-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'.



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
RWr 00	IO-Link Port 1	Process input data for Port 1.

RWw 00		
RWr 01 **RWw 01**	IO-Link Port 2	Process input data for Port 2.
RWr 02 **RWw 02**	IO-Link Port 3	Process input data for Port 3.
RWr 03 **RWw 03**	IO-Link Port 4	Process input data for Port 4.
RWr 04 **RWw 04**	IO-Link Port 5	Process input data for Port 5.
RWr 05 **RWw 05**	IO-Link Port 6	Process input data for Port 6.
RWr 06 **RWw 06**	IO-Link Port 7	Process input data for Port 7.
RWr 07 **RWw 07**	IO-Link Port 8	Process input data for Port 8.
RWr 08…3F **RWw 08…3F**	Reserved	Reserved

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

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

RWr 0E…0F **RWw 0E…0F**	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 '3 Occupied 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.
RWr 30…3B **RWw 30…3B**	IO-Link Port 5	Process input data for Port 5.
RWr 3C…47 **RWw 3C…47**	IO-Link Port 6	Process input data for Port 6.
RWr 48…53 **RWw 48…53**	IO-Link Port 7	Process input data for Port 7.
RWr 54…5F **RWw 54…5F**	IO-Link Port 8	Process input data for Port 8.

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

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

3.5 IO-Link hub signal address assignment

Compact67 series IO-Link hubs have three dimensions: 16 signals_8 M12 ports (Port1 ~ Port8), 8 signals_8 M8 ports (Port1 ~ Port8), 8 signals_4 M12 ports (Port1 ~ Port4). Each M12 port has 5 pins (Pin1 ~ Pin5) and each M8 port has 3 pins (Pin1, Pin3, Pin4). The following table shows the match up between the signal status of each connector and the CC-Link IE Field Basic bus

transmission byte.

1) 8 DI modules LKHA-0800P-M12, LKHA-0800P-M8

This module takes 1 byte of input.

Byte	Bit	M12 connector LKHA-0800P-M12	M8 connector LKHA-0800P-M8	e. g.
Input Byte 0	Bit 0	P1.Pin4	P1.Pin4	I 0.0
	Bit 1	P1.Pin2	P2.Pin4	I 0.1
	Bit 2	P2.Pin4	P3.Pin4	I 0.2
	Bit 3	P2.Pin2	P4.Pin4	I 0.3
	Bit 4	P3.Pin4	P5.Pin4	I 0.4
	Bit 5	P3.Pin2	P6.Pin4	I 0.5
	Bit 6	P4.Pin4	P7.Pin4	I 0.6
	Bit 7	P4.Pin2	P8.Pin4	I 0.7

2) 4 DI 4 DO module LKHA-0404P-M8

This module takes 1 byte of input and 1 byte of output, but since each signal has only 4 pins, the input signal occupies I 0.0 ~ I 0.3, the rest I 0.4 ~ I 0.7 is useless, and the output signal occupies Q 0.4 ~ Q 0.7, the rest Q 0.0 ~ Q 0.3 is useless.

Byte	Bit	M8 connector LKHA-0404P-M8	e. g.
Input Byte 0	Bit 0	P1.Pin4	I 0.0
	Bit 1	P2.Pin4	I 0.1
	Bit 2	P3.Pin4	I 0.2
	Bit 3	P4.Pin4	I 0.3
Output Byte 0	Bit 4	P5.Pin4	Q 0.4
	Bit 5	P6.Pin4	Q 0.5
	Bit 6	P7.Pin4	Q 0.6
	Bit 7	P8.Pin4	Q 0.7

3) 8DI/ DO module LKHA-08UP-M12, LKHA-08UP-M8

The module occupies 8 bits for input and 8 bits for output; I-address and Q-address are configurable according to actual application, and the rest addresses are useless. E.g. two signals of first interface are used as input, then I 0.0 and I 0.1 are occupied; Q 0.0 and Q 0.1 are useless.

Byte	Bit	M12 connector LKHA-0800P-M12	M8 connector LKHA-0800P-M8	e. g.

Input/Output Byte 0	Bit 0	P1.Pin4	P1.Pin4	I 0.0 Q 0.0
	Bit 1	P1.Pin2	P2.Pin4	I 0.1 Q 0.1
	Bit 2	P2.Pin4	P3.Pin4	I 0.2 Q 0.2
	Bit 3	P2.Pin2	P4.Pin4	I 0.3 Q 0.3
	Bit 4	P3.Pin4	P5.Pin4	I 0.4 Q 0.4
	Bit 5	P3.Pin2	P6.Pin4	I 0.5 Q 0.5
	Bit 6	P4.Pin4	P7.Pin4	I 0.6 Q 0.6
	Bit 7	P4.Pin2	P8.Pin4	I 0.7 Q 0.7

4) 16 DI module LKHA-1600P-M12, LKHA-1600N-M12

This module takes 2 bytes of input.

Byte	Bit	M12 connector	e. g.
Input Byte 0	Bit 0	Port1.Pin4	I 0.0
	Bit 1	Port1.Pin2	I 0.1
	Bit 2	Port2.Pin4	I 0.2
	Bit 3	Port2.Pin2	I 0.3
	Bit 4	Port3.Pin4	I 0.4
	Bit 5	Port3.Pin2	I 0.5
	Bit 6	Port4.Pin4	I 0.6
	Bit 7	Port4.Pin2	I 0.7
Input Byte 1	Bit 0	Port5.Pin4	I 1.0
	Bit 1	Port5.Pin2	I 1.1
	Bit 2	Port6.Pin4	I 1.2
	Bit 3	Port6.Pin2	I 1.3
	Bit 4	Port7.Pin4	I 1.4
	Bit 5	Port7.Pin2	I 1.5
	Bit 6	Port8.Pin4	I 1.6
	Bit 7	Port8.Pin2	I 1.7

5) 8 DI + 8 DO module LKHA-0808P-M12

This module takes 1 byte of input and 1 byte of output.

Byte	Bit	M12 connector	e. g.
Input Byte 0	Bit 0	Port1.Pin4	I 0.0
	Bit 1	Port1.Pin2	I 0.1
	Bit 2	Port2.Pin4	I 0.2
	Bit 3	Port2.Pin2	I 0.3
	Bit 4	Port3.Pin4	I 0.4
	Bit 5	Port3.Pin2	I 0.5
	Bit 6	Port4.Pin4	I 0.6
	Bit 7	Port4.Pin2	I 0.7
Output Byte 0	Bit 0	Port5.Pin4	Q 0.0
	Bit 1	Port5.Pin2	Q 0.1
	Bit 2	Port6.Pin4	Q 0.2
	Bit 3	Port6.Pin2	Q 0.3
	Bit 4	Port7.Pin4	Q 0.4
	Bit 5	Port7.Pin2	Q 0.5
	Bit 6	Port8.Pin4	Q 0.6
	Bit 7	Port8.Pin2	Q 0.7

6) 16 DI/DO module LKHA-16UP-M12, LKHA-16UN-M12

The module occupies 16 bits for input and 16 bits for output; I-address and Q-address are configurable according to actual application, and the rest addresses are useless. E.g. two signals of first interface are used as input, then I 0.0 and I 0.1 are occupied; Q 0.0 and Q 0.1 are useless.

Byte	Bit	M12 connector	e. g.
Input/Output Byte 0	Bit 0	Port1.Pin4	I 0.0 Q 0.0
	Bit 1	Port1.Pin2	I 0.1 Q 0.1
	Bit 2	Port2.Pin4	I 0.2 Q 0.2
	Bit 3	Port2.Pin2	I 0.3 Q 0.3
	Bit 4	Port3.Pin4	I 0.4 Q 0.4
	Bit 5	Port3.Pin2	I 0.5 Q 0.5
	Bit 6	Port4.Pin4	I 0.6 Q 0.6
	Bit 7	Port4.Pin2	I 0.7 Q 0.7
Input/Output Byte 1	Bit 0	Port5.Pin4	I 1.0 Q 1.0
	Bit 1	Port5.Pin2	I 1.1 Q 1.1
	Bit 2	Port6.Pin4	I 1.2 Q 1.2
	Bit 3	Port6.Pin2	I 1.3 Q 1.3
	Bit 4	Port7.Pin4	I 1.4 Q 1.4
	Bit 5	Port7.Pin2	I 1.5 Q 1.5
	Bit 6	Port8.Pin4	I 1.6 Q 1.6
	Bit 7	Port8.Pin2	I 1.7 Q 1.7

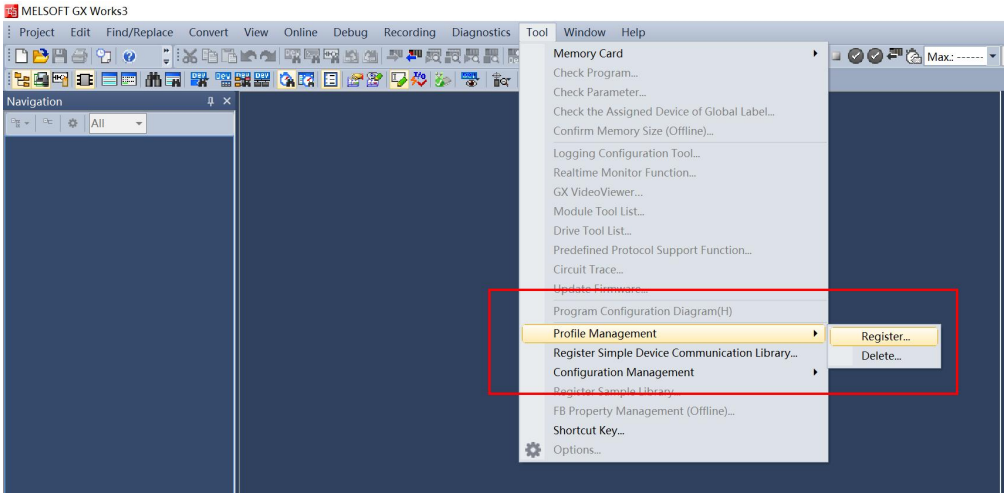
4 Module configuration by MELSOFT (Mitsubishi PLC)

This section provides users with a comprehensive understanding of how to use the FCCB-8LKM-8A-M module through a practical operation process of configuring connections. With all power and bus connections completed, use FCCB-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.

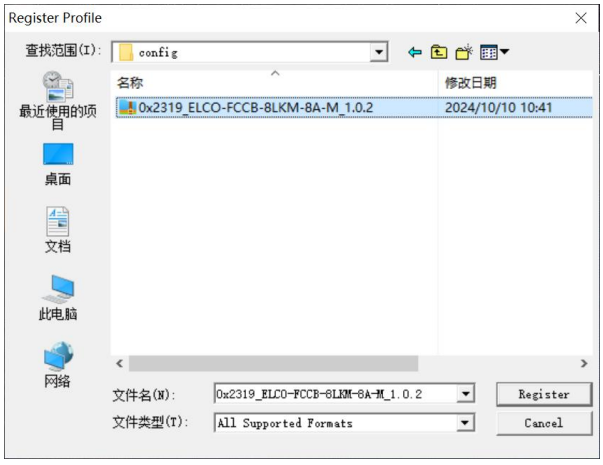
The following will show the specific process of software configuration and debugging.

1) Install CSPP configuration file for FCCB-8LKM-8A-M module

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

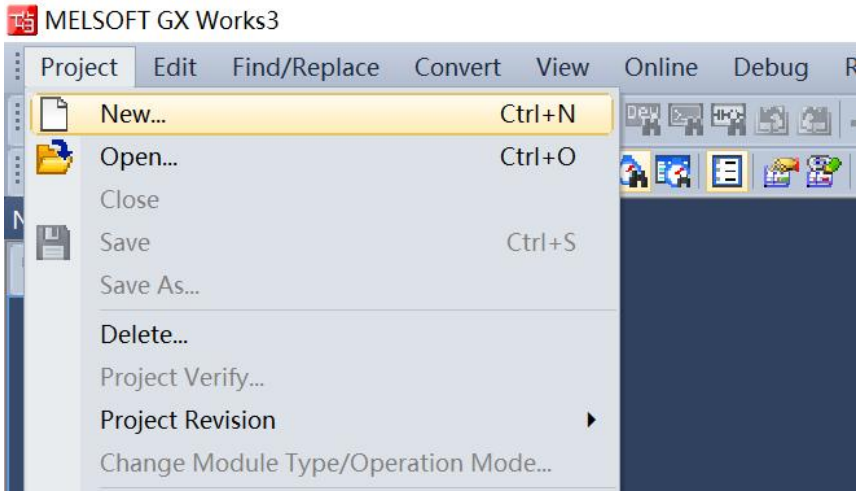


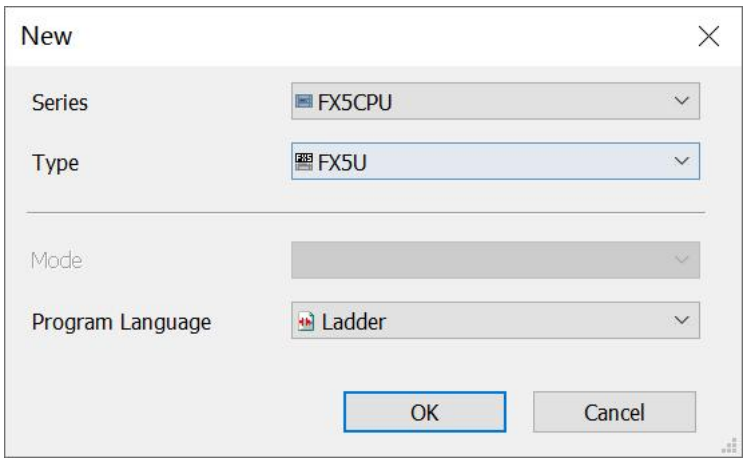
B) Select the version of the CSPP file to import and click “Register”.



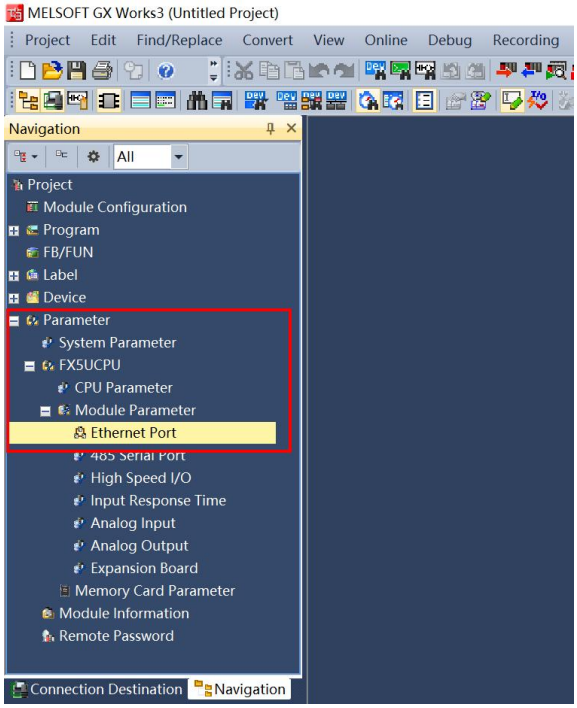
2) Create a new GX Works3 project

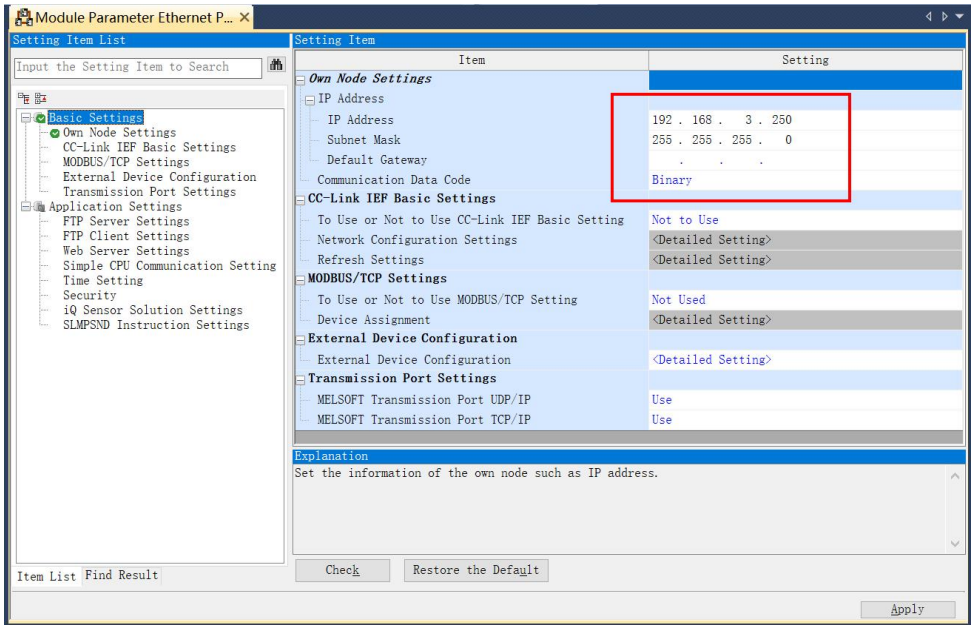
Open the MELSOFT software, click "Project>New...", select the PLC series "FX5CPU" and model "FX5U" in the pop-up dialog box, choose the programming language according to your habits, and then click "OK" to create the project.


MELSOFT GX Works3
Project
Edit
Find/Replace
Convert
View
Online
Debug
New... Ctrl+N
Open... Ctrl+O
Close
Save Ctrl+S
Save As...
Delete...
Project Verify...
Project Revision
Change Module Type/Operation Mode...

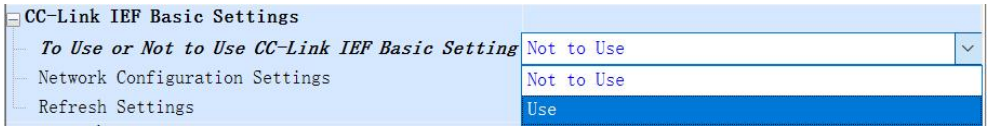

New
Series
FX5CPU
Type
FX5U
Mode
Program Language
Ladder
OK
Cancel

3) 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.



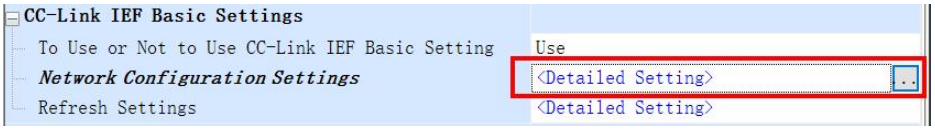


4) Enable CC Link IE Field Basic network settings, click on the "To Use or Not to use CIB Setting" option, and select "Use" to enable network settings.

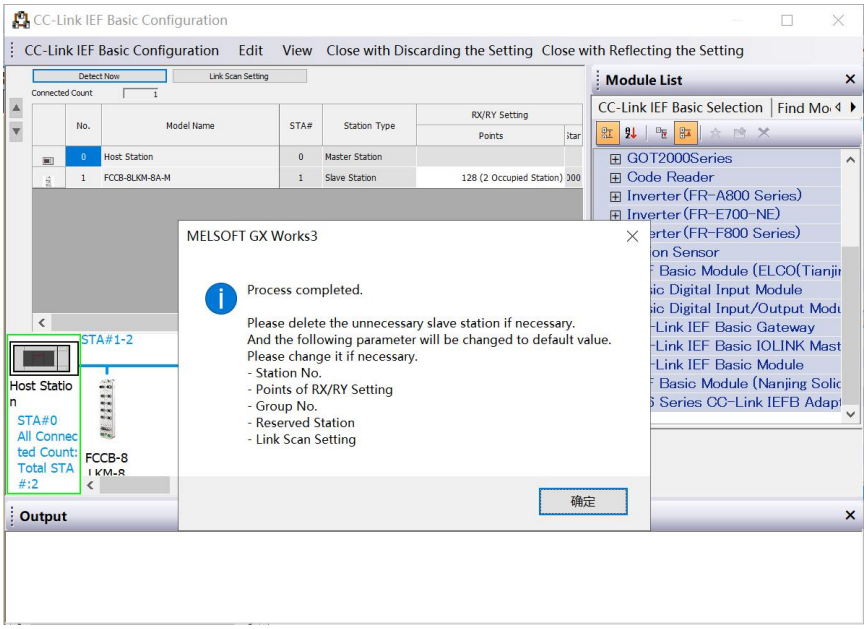


5) Perform CC Link IE Field Basic network configuration settings.

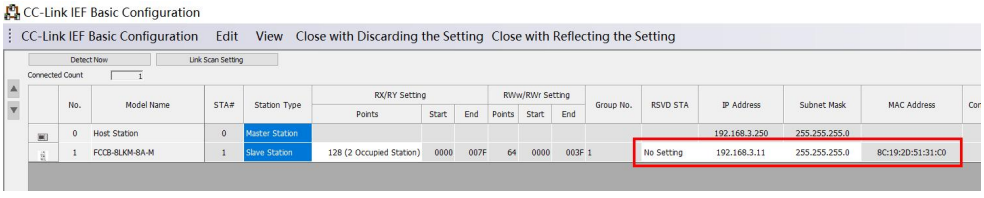
A) Click the button on the right side of "Network Configuration Settings" or double-click the text to open the "Detailed Setting" option.



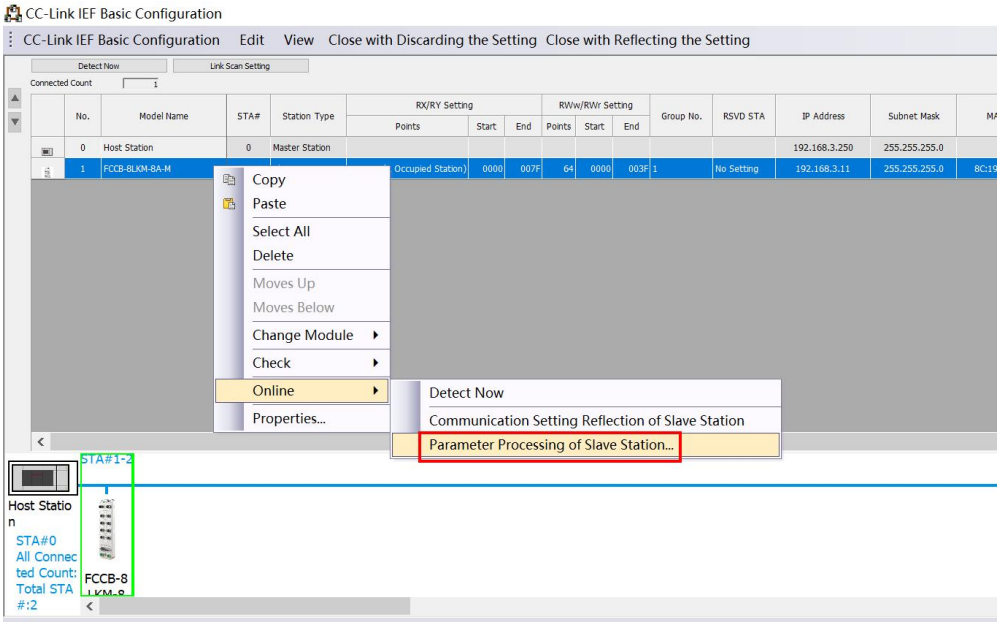
B) In the newly opened "CC-Link IE FB Configuration" window, click the "Detect Now" button to automatically scan the FCCB module connected to the PLC, as shown in the figure.



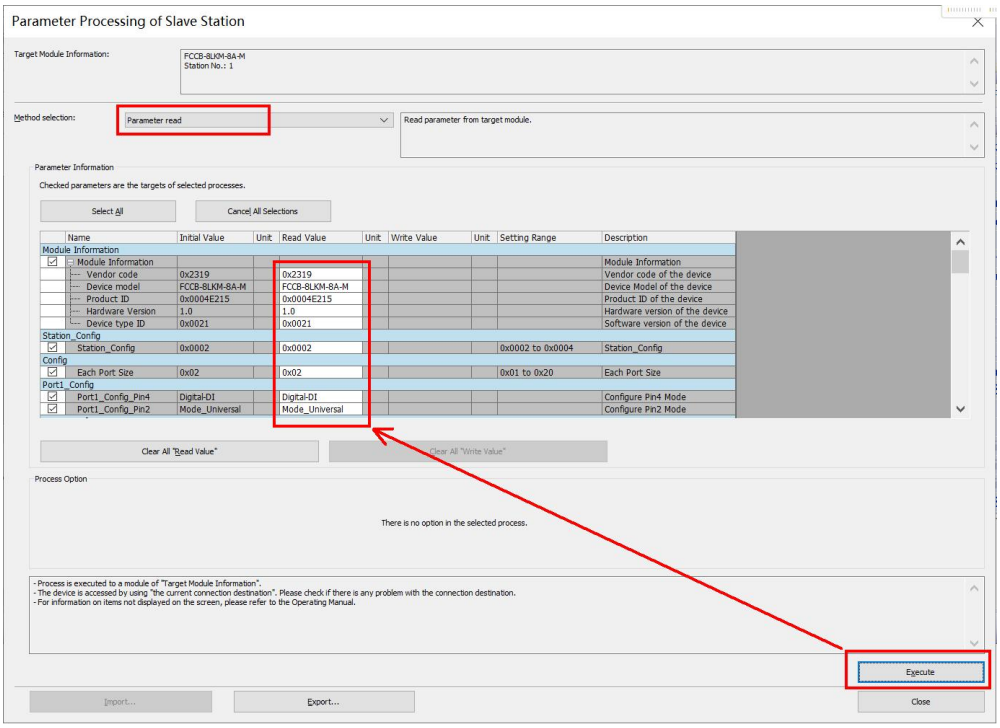
C) Here you can see the IP address and other network information of FCCB-8LKM-8A-M. Please confirm the correspondence between the IP address and the module MAC address.



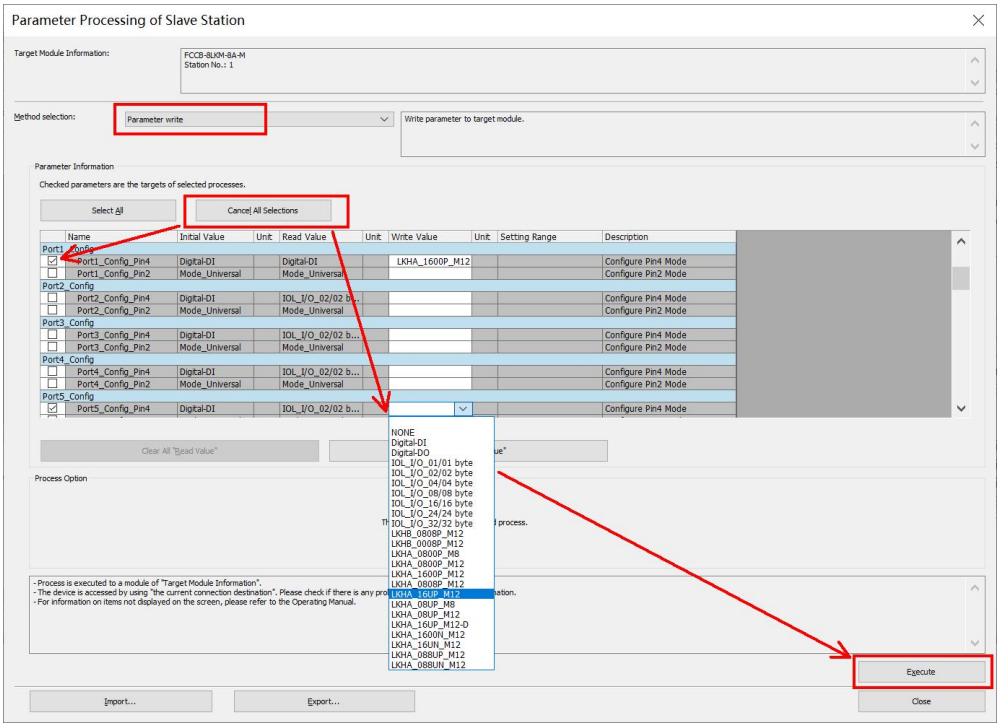
D) Right click on the FCCB-8LKM-8A-M module and select "Parameter Processing of Slave Station..." under the "Online" option to enter the module parameter settings page.



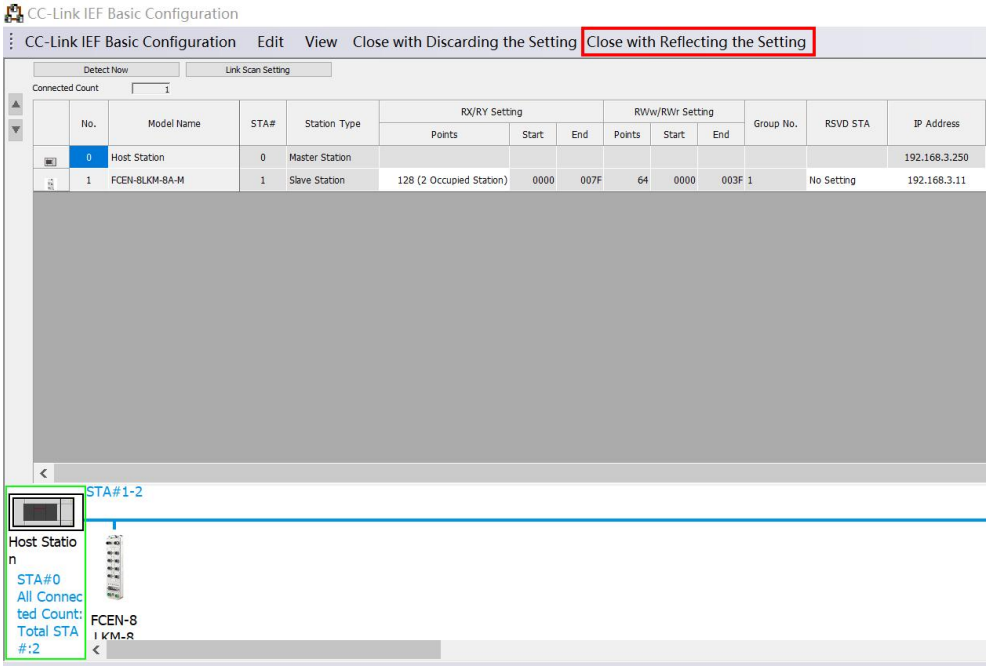
E) In the newly opened parameter settings window, you can select "Parameter Read" and click the "Execute" button to read the set parameters in modules that have already been connected to the network.



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.

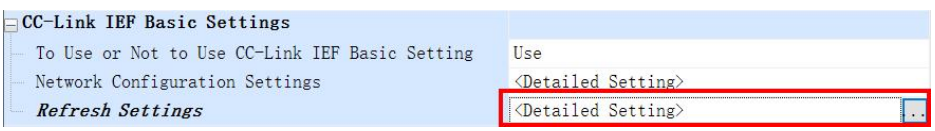


G) After setting up, click the "Close with Reflecting the Setting" button to save the content of network configuration and close the interface.

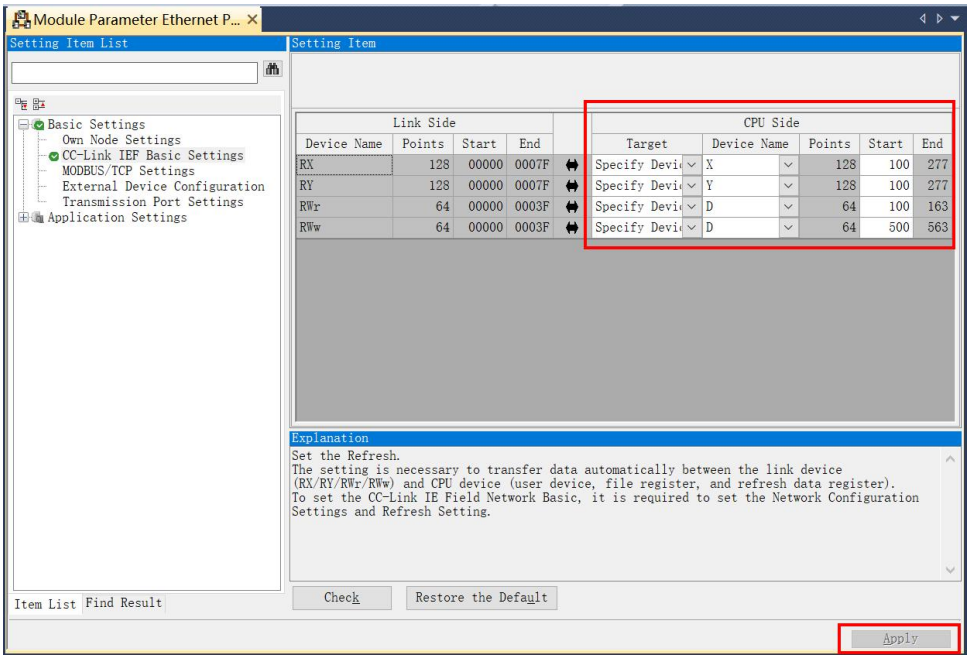


6) Set up CC Link IE Field Basic network refresh and mapping.

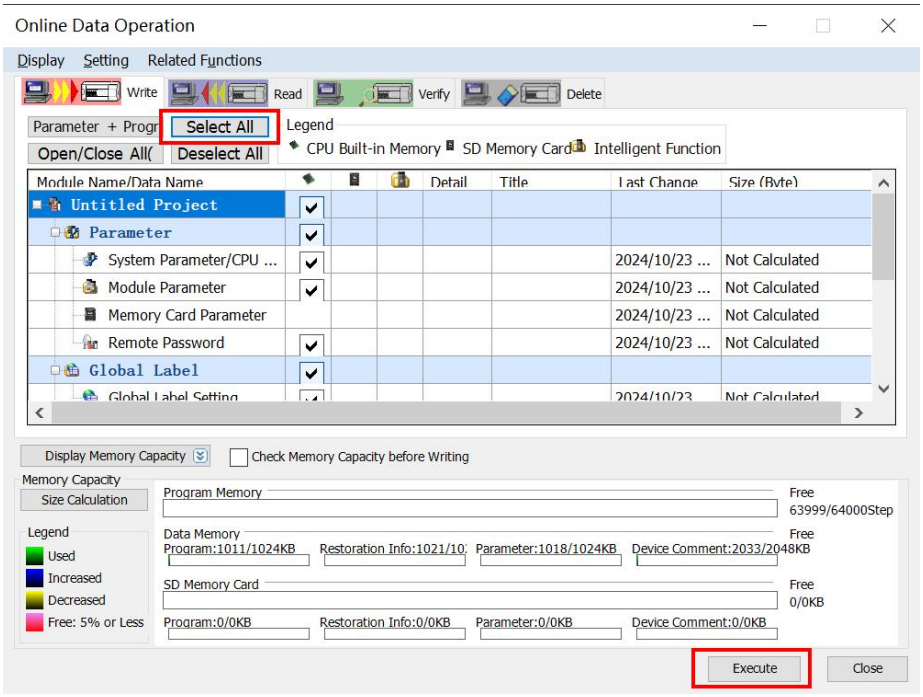
A) Click the button to the right of “Refresh Settings” or double-click the text to open the “Detailed Setting” option.



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.



7) 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.



8) When the BF indicator light of FCCB-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.

5. Alarm diagnosis

5.1 LED fault indicator

With the LED indicator on the Compact67 series IO-Link 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")

IO-Link master indicator

Name	Status	Meaning	Fault cause
Extension channel Indicator IO-Link	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
Gateway status Indicator SF	Green	Work normally	–
	Red	Working abnormally	1. Power supply is abnormal 2.Channel abnormal (short circuit, overload, etc.) 3. Module is damaged
Network status Indicator BF	Green	Communication normal	–
	Red	Communication abnormal	1. Network cable failure 2. Check the configuration 3. Module is damaged
Ethernet network status Indicator Lk1, 2	Green	Connected to the network	–
	Orange	Not connected to the network	1. Network cable failure 2. Module is damaged
	Orange flash	Network data is exchanging	Check configuration
Power supply Indicator Us, Ua	Green	Supply voltage normal	–
	Red	Supply voltage abnormal	1. Over voltage or under voltage 2. Module is damaged
	Off	No power supply	1.Power supply cable failure 2. Module is damaged

IO-Link sensor hub indicator

Name	Status	Meaning	Fault cause
Module communication Indicator P	Green flash	Receive IO-Link communication	–
	Off	No IO-Link signal received	1.Expansion cable failure 2.Master IO-Link port problem 3.Slave module is damaged
Signal / status Indicator	Red	Abnormal signal	1.Signal overload or short circuit 2.Slave module is damaged
	Green	Have signal	–
	Off	No signal	–

5.2 Process image area of IO-Link Master

Each FCCB-8LKM-8A-M module will occupy 2 Byte input and 2 Byte output as the switching signal of the IO-Link master, 8 Byte input as the IO-Link port connection status indication, and 1 Byte input to display the power supply status of the master station. The subsequent input and output bytes are determined according to the equipment configured by the IO-Link interface and are used as the signal address of the IO-Link slaves.

Different types of modules occupy different process image areas of PLC, as follows:

IN	Byte	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Signals	1	P4.Pin2	P4.Pin4	P3.Pin2	P3.Pin4	P2.Pin2	P2.Pin4	P1.Pin2	P1.Pin4
	2	P8.Pin2	P8.Pin4	P7.Pin2	P7.Pin4	P6.Pin2	P6.Pin4	P5.Pin2	P5.Pin4
Status1		Slave Power supply Error	Slave signal short circuit overload	IO-Link Wrong type	IO-Link Not connected	-	Pin2_3 Overload	Pin4_3 Overload	Pin1_3 Short circuit
	1	IO-Link Port1 status							
	2	IO-Link Port2 status							
	3	IO-Link Port3 status							
	4	IO-Link Port4 status							
	5	IO-Link Port5 status							
	6	IO-Link Port6 status							
	7	IO-Link Port7 status							
	8	IO-Link Port8 status							
Status2	9	Ua Over voltage	Ua Under voltage	Us Over voltage	Us Under voltage	Ua Short circuit	-	Connect OK	Module Not sent
OUT	Byte	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Signals	1	P4.Pin2	P4.Pin4	P3.Pin2	P3.Pin4	P2.Pin2	P2.Pin4	P1.Pin2	P1.Pin4
	2	P8.Pin2	P8.Pin4	P7.Pin2	P7.Pin4	P6.Pin2	P6.Pin4	P5.Pin2	P5.Pin4