

# FCEN-8LKM-8A-MP4 Module

# ----EtherNet/IP System Manual





Tianjin ELCO Automation Co., Ltd. 05/2024 Version 1.0



# Preface

# 1. Scope of this manual:

This manual applies to the FCEN-8LKM-8A-MP4 module of ELCO. The information in this manual enables you to run the FCEN-8LKM-8A-MP4 module on 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-MP4 module for the EtherNet/IP 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 dial 400-608-4005 if you have any questions about the products described in this manual. Additional information about ELCO products is available: <u>http://www.elco-holding.com/</u>

# 5. Disclaimer of liability:

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



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# **1. Product overview**

# 1.1 Introduction

The FCEN-8LKM-8A-MP4 module supporting IO-Link function is a new type of distributed I/O system. 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-MP4 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.

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 v1.1.3 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 Туре

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No. Type Des		Description	
		EtherNet/IP IO-Link master module	
1		8 IO-Link interfaces (8*Class-A)	
T	FUEIN-8LKIVI-8A-IVIP4	2 male+female, 7/8" 4-PIN power supply	
		2 female, M12 D-Code fieldbus interface	



# 2. Technical characteristics

#### 2.1 IO-Link master

Each FCEN-8LKM-8A-MP4 module occupies an EtherNet/IP slave address. Depending on the type, up to 8 IO-Link devices can be connected. As an EtherNet/IP slave, the FCEN-8LKM-8A-MP4 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 EtherNet/IP 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.

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 (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 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

Ordering data		
Product type	FCEN-8LKM-8A-MP4	
Description	8 IO-Link ports	
Communication		
Protocol	EtherNet/IP , Profinet	
Operating modes	Auto-negotiation, Auto-MDI/MDI-X	
Transfer rate	10/100 Mbps	
Addressing	DHCP, BOOTP	
Power supply		
Supply voltage	24 VDC(1830 VDC)	
Self consumption	Max. 200mA	
System&Input supply	Us, Max. 8A	
Output supply	Ua, Max. 8A	
Electrical isolation	Us and Ua: 24V separated, 0V connected	
Connections		
Power supply	2 x 7/8" 4pin, Male+Female	
Fieldbus	2 x M12 D-code 4pin, Female	
Signals	8 x M12 A-code 5pin, Female	
Interface		
IO-Link ports	8	
IO-Link type	8*Class-A	
IO-Link version	IO-Link V1.1.3	
IO-Link communication rates	COM1(4.8kbps), COM2(38.4kbps), COM3(230.4kbps)	
Input channels	Max. 16 (8*Pin4+8*Pin2)	
Input supply current	Pin1&Pin3: 1.6A per channel	
Input type	PNP sensors, mechanical switches, dry contacts, etc	
Input delay	1.6 ms	
Output channels	Max. 8 (8*Pin2)	
Output current	Max. 2A per channel	
Output type	Lamps, solenoidvalve, 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		
Housing material	Casting Zinc Alloy	
Protection	IP67	
Temperature	Operating -25+70 °C, Storage -40+85 °C	
Dimensions (W*H*D)	60x230x37.8 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".

IO-Link master indicator





# 3. Installation 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-MP4 can be installed in almost any location.

FCEN-8LKM-8A-MP4 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:

	FCEN-8LKM-8A-MP4
Installation width	60 mm
Installation height	230 mm
Installation depth	37.8 mm



# 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-MP4 module adopts 24VDC power supply, and power IO-Link sensor hub by extensible cable, voltage range 18~30VDC, standard 7/8" 4-PIN 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 FCEN-8LKM-8A-MP4, 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	Output power supply Ua+	24V
2	System and input power supply Us+	24V
3	System and input power supply Us-	0V
4	Output power supply Ua-	0V



# **3.3.3 Module BUS connection**

FCEN-8LKM-8A-MP4 module, supporting 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/output A	
5	Protection Earth PE	

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.



# 3.4 Setting the IP Address of module

The FCEN-8LKM-8A-MP4 module can set the operation mode of receiving 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 operating modes represented by the rotary code switch settings:

Rotary code switch	Function	
000	Activate DHCP and BOOTP functions.	
	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.	
001~254	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.	
	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.	



255~299	Illegal address, invalid setting.		
	The original network parameters of the module		
	will not be changed.		
300~998	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.		

The default factory settings 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 3.4.1) or Webserver (section 3.4.2).

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

When the rotary code switch is selected as 000, the FCEN-8LKM-8A-MP4 module allocates network parameters such as IP addresses and subnet masks through DHCP software. This section takes the BOOTP-DCP 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.

Network Settir	ıgs						×
Defaults		 					_
Subnet Mask:	255	255		255		0	
Gateway:	0	0		0		0	
Primary	0	0		0		0	
Secondary DNS:	0	0		0		0	
Domain Name:			_				
	(	 OK			Ca	ncel	



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.

5	BOOTP/DHCP Server 2.3	
F	le <u>T</u> ools <u>H</u> elp	
Γ	equest History Slear History .dd to Relation Lis	]
	Chr:min Type Ethernet Address (MAC) IP Address Hostname	
	8:56:11 DHCP 12:34:56:78:9A:BC 8:56:08 DHCP 12:34:56:78:9A:BC	
Γ	New Delete Enable BOOTP Enable DHCP Disable BOOTP/DHCP	
	Ethernet Address (MAC) Type IP Address Hostname Description	
	tatus	]

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:

BOOTP/DHCP Serve	er 2.3	
File Tools Help Request History Clear History .dd to 1 Ohr:min Type 9:02:47 DHCP 9:02:37 DHCP	Relation Lis Ethernet Address (MAC) IP Address Hostname 12:34:56:78:9A:BC	
9:02:26 DHCP 9:02:16 DHCP 9:02:05 DHCP 9:01:55 DHCP 9:01:44 DHCP Relation List New Delete Enabl Ethernet Address (MA	New Entry         X           Ethernet Address         12:34:56:78:9A:BC           IP         192 . 168 . 1 . 108           Hostname:	<u> </u>
-Status Unable to service DHCP	? request from 12:34:56:78:9A:BC.	Entries 0 of 256

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:

<b>5</b> 50 1	воотр/днс	P Serv	er 2.3			
Fil	e <u>T</u> ools <u>H</u> e	lp				
Re	equest Histor	y				
0	Clear Histor	y dd to	Relation Lis			
	(hr:min	Type	Ethernet Address (MAC)	IP Address	Hostname	<b>^</b>
	9:05:46	DHCP	12:34:56:78:9A:BC	192. 168. 1. 108		
	9:05:46	DHCP	12:34:56:78:9A:BC			
	9:05:35	DHCP	12:34:56:78:9A:BU			
	9:05:25 9:05:14	DHCP	12:34:50:10.9A.DC 12:34:56:78:94:BC			
	9:05:04	DHCP	12:34:56:78:9A:BC			
	9:04:53	DHCP	12:34:56:78:9A:BC			~
	· · ·					
Re	elation List					
	New Delet	e Enab	le BOOTP Enable DHCP Di	sable BOOTP/DHCP		
F	Ethernet Add	iress (M.	AC)   Type   IP Address	Hostname	Description	
	12:34:56:78:	9A:BC	DHCP 192.168.1.10	38		
,						R- tui ta
	atus	100 1	7-1	70-01-PC		Entries -
Se	ent 192.100.1	108 το	Ethernet address 12.04.00	: (8:9A:BU		1 of 250

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:

Sootp/DHCP Server 2.3			
<u>F</u> ile <u>T</u> ools <u>H</u> elp			
Request History			
Clear History dd to Relation Lis			
Ohr:min Type Ethernet Address	(MAC) IP Address	Hostname	~
9:16:25 DHCP 12:34:56:78:9A:B 9:05:46 DHCP 12:34:56:78:9A:B 9:05:46 DHCP 12:34:56:78:9A:B	C 192.168.1.108		-
9:05:35 DHCP 12:34:56:78:9A:B 9:05:25 DHCP 12:34:56:78:9A:B			
9:05:14 DHCP 12:34:56:78:9A:B 9:05:04 DHCP 12:34:56:78:9A:B			~
Relation List New Delete Enable BOOTP Enable I	HCP Disable BOOTP/DHCP	]	
Ethernet Address (MAC) Type IP i	Address Hostname	Description	
12:34:56:78:9A:BC DHCP 192.	168.1.108		
Status			Entries
[Disable DHCP] Command successful			1 of 256



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.

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

When the rotary code switch is selected from 001 to 254, the FCEN-8LKM-8A-MP4 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<u>http://192.168.250.xxx/webif/</u> 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. Module Address Assignment

This section mainly introduces the signal point arrangement order and address assignment of the FCEN-8LKM-8A-MP4 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.

# 4.1 Connection type and address assignment

The FCEN-8LKM-8A-MP4 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:

Data size	Instance ID	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.



# 4.2 INPUT data address assignment

The FCEN-8LKM-8A-MP4 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	Modulo status	Indicate the status of IO-Link		
07		master and IO-Link port.		
٥ <u>م</u>	Input signal of Master	Process input data for IO-Link		
89	input signal of Master	Master SIO mode.		
1057	IO-Link Port 0	Process input data for Port 0.		
58105	IO-Link Port 1	Process input data for Port 1.		
106153	IO-Link Port 2	Process input data for Port 2.		
154201	IO-Link Port 3	Process input data for Port 3.		
202249	IO-Link Port 4	Process input data for Port 4.		
250297	IO-Link Port 5	Process input data for Port 5.		
298345	IO-Link Port 6	Process input data for Port 6.		
346393	IO-Link Port 7	Process input data for Port 7.		

# 4.2.1 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	IO-Link Communication Status						
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port7	Port6	Port5	Port4	Port3	Port2	Port1	Port0

 $\textbf{Byte 1} \hspace{0.1 in} ( \hspace{0.1 in} \textbf{IO-Link Device Diagnosis} ) \\$ 

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	c Device	Diagno	sis				
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port7	Port6	Port5	Port4	Port3	Port2	Port1	Port0

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	Port7	Port6	Port5	Port4	Port3	Port2	Port1	Port0

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	IO-Link Port Output Overload						
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Port	Port7	Port6	Port5	Port4	Port3	Port2	Port1	Port0

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 overvoltage, undervoltage, and disconnection of the voltage.



Otherwise, the point indication is 0.

Byte 5	Power	Power Supply Diagnosis						
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0
Mean	Ua_H	Ua_L	Us_H	Us_L	Ua_S	-	-	-
	High	Low	High	Low	Short			
	voltage	voltage	voltage	voltage	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	Port7	Port6	Port5	Port4	Port3	Port2	Port1	Port0

# 4.2.2 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 st	atus of	port 0~3	3						
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	Port3	Port3	Port2	Port2	Port1	Port1	Port0	Port0			
	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4			
		Digital input status of port 4~7									
Byte 9	Digital	input st	atus of	port 4~	7						
Byte 9 Bit	Digital Bit_7	input st Bit_6	atus of Bit_5	port 4~: Bit_4	7 Bit_3	Bit_2	Bit_1	Bit_0			
Byte 9 Bit No.	Digital Bit_7 15	input st Bit_6 14	atus of Bit_5 13	port 4~ Bit_4 12	7 Bit_3 11	Bit_2 10	Bit_1 09	Bit_0 08			
Byte 9 Bit No. Pin	Digital Bit_7 15 Port7	input st Bit_6 14 Port7	atus of Bit_5 13 Port6	port 4~ Bit_4 12 Port6	7 Bit_3 11 Port5	Bit_2 10 Port5	Bit_1 09 Port4	Bit_0 08 Port4			



# 4.2.3 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 1041	Port0	Byte 0~31 of IO-Link input signal data
Byte 4243	Port0	Byte 0~1 of IO-Link status
Byte 4445	Port0	Byte 0~1 of Vendor_ID from IO-Link device
Byte 4648	Port0	Byte 0~2 of Device_ID from IO-Link device
Byte 4957	Port0	Byte 0~8 of IO-Link event
Byte 5889	Port1	Byte 0~31 of IO-Link input signal data
Byte 9091	Port1	Byte 0~1 of IO-Link status
Byte 9293	Port1	Byte 0~1 of Vendor_ID from IO-Link device
Byte 9496	Port1	Byte 0~2 of Device_ID from IO-Link device
Byte 97105	Port1	Byte 0~8 of IO-Link event
Byte 106137	Port2	Byte 0~31 of IO-Link input signal data
Byte 138139	Port2	Byte 0~1 of IO-Link status
Byte 140141	Port2	Byte 0~1 of Vendor_ID from IO-Link device
Byte 142144	Port2	Byte 0~2 of Device_ID from IO-Link device
Byte 145153	Port2	Byte 0~8 of IO-Link event
Byte 154185	Port3	Byte 0~31 of IO-Link input signal data
Byte 186187	Port3	Byte 0~1 of IO-Link status
Byte 188189	Port3	Byte 0~1 of Vendor_ID from IO-Link device
Byte 190192	Port3	Byte 0~2 of Device_ID from IO-Link device
Byte 193201	Port3	Byte 0~8 of IO-Link event
Byte 202233	Port4	Byte 0~31 of IO-Link input signal data
Byte 234235	Port4	Byte 0~1 of IO-Link status
Byte 236237	Port4	Byte 0~1 of Vendor_ID from IO-Link device
Byte 238240	Port4	Byte 0~2 of Device_ID from IO-Link device
Byte 241249	Port4	Byte 0~8 of IO-Link event
Byte 250281	Port5	Byte 0~31 of IO-Link input signal data
Byte 282283	Port5	Byte 0~1 of IO-Link status



Byte 284285	Port5	Byte 0~1 of Vendor_ID from IO-Link device
Byte 286288	Port5	Byte 0~2 of Device_ID from IO-Link device
Byte 289297	Port5	Byte 0~8 of IO-Link event
Byte 298329	Port6	Byte 0~31 of IO-Link input signal data
Byte 330331	Port6	Byte 0~1 of IO-Link status
Byte 332333	Port6	Byte 0~1 of Vendor_ID from IO-Link device
Byte 334336	Port6	Byte 0~2 of Device_ID from IO-Link device
Byte 337345	Port6	Byte 0~8 of IO-Link event
Byte 346377	Port7	Byte 0~31 of IO-Link input signal data
Byte 378379	Port7	Byte 0~1 of IO-Link status
Byte 380381	Port7	Byte 0~1 of Vendor_ID from IO-Link device
Byte 382384	Port7	Byte 0~2 of Device_ID from IO-Link device
Byte 385393	Port7	Byte 0~8 of IO-Link event

Taking PortO 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.

Byte 1041	IO-Link input signal data
Byte 10	Byte 0 of IO-Link device input signal data
Byte 11	Byte 1 of IO-Link device input signal data
	Byte 2~30 of IO-Link device input signal data
Byte 41	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

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

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.

Byte 4445	Vendor_ID from IO-Link device
Byte 44	Vendor_ID (High Byte) of device connected
Byte 45	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.

Byte 4648	Vendor_ID from IO-Link device
Byte 46	Device ID (High Byte) of device connected
Byte 47	Device ID (Mid Byte) of device connected
Byte 48	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.



	Event_1								
Byte 49	IOL Eve	IOL EventQualifier1							
Bit	Bit_7	Bit_7 Bit_6 Bit_5 Bit_4 Bit_3 Bit_2 Bit_1 Bit_0							
Mean	Mo	ode	Ту	ре		-	-		
Byte 50	IOL Eve	entCode	e1 (High	Byte)					
Byte 51	IOL Eve	entCode	e1 (Low	Byte)					
	Event_	Event_2							
Byte 52	IOL Eve	entQual	ifier2						
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0	
Mean	Mo	ode	Ту	ре		-	-		
Byte 53	IOL Eve	entCode	2 (High	Byte)					
Byte 54	IOL Eve	entCode	e2 (Low	Byte)					
	Event_	3							
Byte 55	IOL Eve	entQual	ifier3						
Bit	Bit_7	Bit_6	Bit_5	Bit_4	Bit_3	Bit_2	Bit_1	Bit_0	
Mean	Mo	ode	Ту	ре		-	-		
Byte 56	IOL Eve	entCode	e3 (High	Byte)					
Byte 57	IOL Eve	entCode	e3 (Low	Byte)					

The meaning represented by each byte is as follows:



# 4.3 OUTPUT data address assignment

The FCEN-8LKM-8A-MP4 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	Madula Control	Control the function (diagnosis				
01		or restart) of IO-Link port.				
2 2	Output signal of Master	Process output data for IO-Link				
23		Master SIO mode.				
435	IO-Link Port 0	Process output data for Port 0.				
<b>3667</b> IO-Link Port 1		Process output data for Port 1.				
6899	IO-Link Port 2	Process output data for Port 2.				
100131	IO-Link Port 3	Process output data for Port 3.				
132163	IO-Link Port 4	Process output data for Port 4.				
164195 IO-Link Port 5		Process output data for Port 5.				
<b>196227</b> IO-Link Port 6		Process output data for Port 6.				
278259	IO-Link Port 7	Process output data for Port 7.				

# 4.3.1 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	Port7	Port6	Port5	Port4	Port3	Port2	Port1	Port0

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	Port7	Port6	Port5	Port4	Port3	Port2	Port1	Port0

#### 4.3.2 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 0~3								
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	Port3	Port3 Port3 Port2 Port2 Port1 Port1 Port0 Port0							
	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	
Byte 3	Digital	output	status c	of port 4	~7				
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	Port7	Port7	Port6	Port6	Port5	Port5	Port4	Port4	
	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	Pin2	Pin4	

# 4.3.3 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.



Output	Port	Description
Byte 435	Port0	Byte 0~31 of IO-Link output signal data
Byte 3667	Port1	Byte 0~31 of IO-Link output signal data
Byte 6899	Port2	Byte 0~31 of IO-Link output signal data
Byte 100131	Port3	Byte 0~31 of IO-Link output signal data
Byte 132163	Port4	Byte 0~31 of IO-Link output signal data
Byte 164195	Port5	Byte 0~31 of IO-Link output signal data
Byte 196227	Port6	Byte 0~31 of IO-Link output signal data
Byte 228259	Port7	Byte 0~31 of IO-Link output signal data

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

Taking PortO 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.

Byte 435	IO-Link output signal data
Byte 4	Byte 0 of IO-Link device output signal data
Byte 5	Byte 1 of IO-Link device output signal data
	Byte 2~30 of IO-Link device output signal data
Byte 35	Byte 31 of IO-Link device output signal data



# 4.4 CONFIG data address assignment

The FCEN-8LKM-8A-MP4 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	Config data	Description	
0.0	Modulo configuration	General configuration for the	
05		overall module.	
A 25	Port configuration	Pin type and safe state	
435	Port configuration	configuration for ports.	
3643	IO-Link Port 0	Configuration for IO-Link Port 0.	
4451	IO-Link Port 1	Configuration for IO-Link Port 1.	
5259	IO-Link Port 2	Configuration for IO-Link Port 2.	
6067	IO-Link Port 3	Configuration for IO-Link Port 3.	
6875	IO-Link Port 4	Configuration for IO-Link Port 4.	
7683	IO-Link Port 5	Configuration for IO-Link Port 5.	
8491	IO-Link Port 6	Configuration for IO-Link Port 6.	
9299	IO-Link Port 7	Configuration for IO-Link Port 7.	

# 4.4.1 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.

Byte offset	bit	PD_IN	PD_OUT
Х	0	Port0 Pin4	Not supported.
	1	Port0 Pin2	Port0 Pin2
	6	Port3 Pin4	
	7	Port3 Pin2	Port3 Pin2
X+1	0	Port4 Pin4	Not supported.
	1	Port4 Pin2	Port4 Pin2
	6	Port7 Pin4	Not supported.
	7	Port7 Pin2	Port7 Pin2

# 0-Port based assignment.



# <u>1-Pin based assignment.</u>

Byte offset	bit	PD_IN	PD_OUT
х	0	Port0 Pin4	No supported.
	1	Port1 Pin4	No supported.
	6	Port6 Pin4	No supported.
	7	Port7 Pin4	No supported.
X+1	0	Port0 Pin2	Port0 Pin2
	1	Port1 Pin2	Port1 Pin2
	6	Port6 Pin2	Port6 Pin2
	7	Port7 Pin2	Port7 Pin2

# 4.4.2 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 419	Pin4 type of Port 0~7	
Byte 2027	Pin2 type of Port 0~7	
Byte 2835	Pin2 safe state of Port 0~7	

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

# Byte 4...19 (Pin4 type of Port 0~7)

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 419	<b>19</b> Pin4 type of Port 0~7	
Byte 45Pin4 type of Port 0 (0=empty, 1=DI, 32=IO-Link)		
Byte 67 Pin4 type of Port 1 (0=empty, 1=DI, 32=IO-Link		



Byte 89	Pin4 type of Port 2 (0=empty, 1=DI, 32=IO-Link)
Byte 1011	Pin4 type of Port 3 (0=empty, 1=DI, 32=IO-Link)
Byte 1213	Pin4 type of Port 4 (0=empty, 1=DI, 32=IO-Link)
Byte 1415	Pin4 type of Port 5 (0=empty, 1=DI, 32=IO-Link)
Byte 1617	Pin4 type of Port 6 (0=empty, 1=DI, 32=IO-Link)
Byte 1819	Pin4 type of Port 7 (0=empty, 1=DI, 32=IO-Link)

# **Byte 20...27** (Pin2 type of Port 0~7)

This section is used to set the properties of Pin2 in 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 2027	Pin2 type of Port 0~7
Byte 20	Pin2 type of Port 0 (0=DI, 1=DO, 3=Universal)
Byte 21	Pin2 type of Port 1 (0=DI, 1=DO, 3=Universal)
Byte 22	Pin2 type of Port 2 (0=DI, 1=DO, 3=Universal)
Byte 23	Pin2 type of Port 3 (0=DI, 1=DO, 3=Universal)
Byte 24	Pin2 type of Port 4 (0=DI, 1=DO, 3=Universal)
Byte 25	Pin2 type of Port 5 (0=DI, 1=DO, 3=Universal)
Byte 26	Pin2 type of Port 6 (0=DI, 1=DO, 3=Universal)
Byte 27	Pin2 type of Port 7 (0=DI, 1=DO, 3=Universal)

# Byte 28...35 (Pin2 safe state of Port 0~7)

This section is used to set the safety status of Pin2 output 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.

Byte 2835	Pin2 safe state of Port 0~7	
Byte 28	Pin2 safe state of Port 0	
	(0=SetTo0, 1=SetTo1, 2=HoldLast)	



Byte 29	Pin2 safe state of Port 1
	(0=SetTo0, 1=SetTo1, 2=HoldLast)
Byte 30	Pin2 safe state of Port 2
	(0=SetTo0, 1=SetTo1, 2=HoldLast)
Byte 31	Pin2 safe state of Port 3
	(0=SetTo0, 1=SetTo1, 2=HoldLast)
Byte 32	Pin2 safe state of Port 4
	(0=SetTo0, 1=SetTo1, 2=HoldLast)
Byte 33	Pin2 safe state of Port 5
	(0=SetTo0, 1=SetTo1, 2=HoldLast)
Byte 34	Pin2 safe state of Port 6
	(0=SetTo0, 1=SetTo1, 2=HoldLast)
Byte 35	Pin2 safe state of Port 7
	(0=SetTo0, 1=SetTo1, 2=HoldLast)

# 4.4.3 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.

CONFIG	Port	Description	
Byte 3637	Port0	IO-Link Port Cycle Time	
Byte 38	Port0	IO-Link Port Validation and Backup	
Byte 3940	Port0	Byte 0~1 of Vendor_ID to IO-Link device	
Byte 4143	Port0	Byte 0~2 of Device_ID to IO-Link device	
Byte 4445	Port1	IO-Link Port Cycle Time	
Byte 46	Port1	IO-Link Port Validation and Backup	
Byte 4748	Port1	Byte 0~1 of Vendor_ID to IO-Link device	
Byte 4951	Port1	Byte 0~2 of Device_ID to IO-Link device	

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



Byte 5253	Port2	IO-Link Port Cycle Time
Byte 54	Port2	IO-Link Port Validation and Backup
Byte 5556	Port2	Byte 0~1 of Vendor_ID to IO-Link device
Byte 5759	Port2	Byte 0~2 of Device_ID to IO-Link device
Byte 6061	Port3	IO-Link Port Cycle Time
Byte 62	Port3	IO-Link Port Validation and Backup
Byte 6364	Port3	Byte 0~1 of Vendor_ID to IO-Link device
Byte 6567	Port3	Byte 0~2 of Device_ID to IO-Link device
Byte 6869	Port4	IO-Link Port Cycle Time
Byte 70	Port4	IO-Link Port Validation and Backup
Byte 7172	Port4	Byte 0~1 of Vendor_ID to IO-Link device
Byte 7375	Port4	Byte 0~2 of Device_ID to IO-Link device
Byte 7677	Port5	IO-Link Port Cycle Time
Byte 78	Port5	IO-Link Port Validation and Backup
Byte 7980	Port5	Byte 0~1 of Vendor_ID to IO-Link device
Byte 8183	Port5	Byte 0~2 of Device_ID to IO-Link device
Byte 8485	Port6	IO-Link Port Cycle Time
Byte 86	Port6	IO-Link Port Validation and Backup
Byte 8788	Port6	Byte 0~1 of Vendor_ID to IO-Link device
Byte 8991	Port6	Byte 0~2 of Device_ID to IO-Link device
Byte 9293	Port7	IO-Link Port Cycle Time
Byte 94	Port7	IO-Link Port Validation and Backup
Byte 9596	Port7	Byte 0~1 of Vendor_ID to IO-Link device
Byte 9799	Port7	Byte 0~2 of Device_ID to IO-Link device

Taking PortO 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.

Byte 3637	IO-Link	IO-Link Port Cycle Time (1.6ms~11.2ms)						
Value (INT)	0	16	32	48	64	68	72	76
Cycle time	Auto	16	32	48	64	8.0	96	11 2
(ms)	7.010	1.0	5.2	4.0	0.4	0.0	5.0	11.2
	IO-Link	Port Cy	cle Time	e (12.8m	ns~24ms	;)		
Value (INT)	80	84	88	92	96	100	104	108
Cycle time (ms)	12.8	14.4	16.0	17.6	19.2	20.8	22.4	24.0
	IO-Link	Port Cy	cle Time	e (25.6m	ns~36.8r	ns)		
Value (INT)	112	116	120	124	128	129	130	131
Cycle time (ms)	25.6	27.2	28.8	30.4	32.0	33.6	35.2	36.8
	IO-Link	IO-Link Port Cycle Time (38.4ms~49.6ms)						
Value (INT)	132	133	134	135	136	137	138	139
Cycle time (ms)	38.4	40.0	41.6	43.2	44.8	46.4	48.0	49.6
	IO-Link	Port Cy	cle Time	e (51.2m	ns~62.4r	ns)		
Value (INT)	140	141	142	143	144	145	146	147
Cycle time (ms)	51.2	52.8	54.4	56.0	57.6	59.2	60.8	62.4
	IO-Link	Port Cy	cle Time	e (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 Cy	cle Time	e (76.8m	ns~88ms	;)		
Value (INT)	156	157	158	159	160	161	162	163
Cycle time	76.8	78 4	80.0	81.6	83.2	84 8	86 4	88.0
(ms)	. 0.0			01.0				00.0
	IO-Link	Port Cy	cle Time	e (89.6m	ns~100.8	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	IO-Link Port Cycle Time (102.4ms~113.6ms)						
Value (INT)	172	173	174	175	176	177	178	179
Cycle time	102.4	104.0	105.6	107.2	100 0	110 /	112.0	112 6
(ms)	102.4	104.0	105.0	107.2	100.0	110.4	112.0	115.0
	IO-Link	IO-Link Port Cycle Time (115.2ms~126.4ms)						
Value (INT)	180	181	182	183	184	185	186	187
Cycle time	115 2	116.9	110 /	120.0	121 6	172.7	17/ 9	176 /
(ms)	115.2	110.0	110.4	120.0	121.0	123.2	124.0	120.4
	IO-Link	IO-Link Port Cycle Time (128ms~132.8ms)						
Value (INT)	188	189	190	191	-	-	-	-
Cycle time	120.0	120 6	121 2	122.0				
(ms)	120.0	129.0	151.2	197.9	-	-	-	-

**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.

Byte 3940	Vendor_ID from IO-Link device
Byte 39	Vendor_ID (High Byte) of device connected
Byte 40	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.

Byte 4143	Vendor_ID from IO-Link device
Byte 41	Device ID (High Byte) of device connected
Byte 42	Device ID (Mid Byte) of device connected
Byte 43	Device ID (Low Byte) of device connected



# 5. Configuration Commissioning (AB PLC)

#### 5.1 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:

 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.

<ul> <li>► Assets</li> <li>► Logical Model</li> <li>▲ I/O Configuration</li> </ul>	选择 Module 类型	
<ul> <li>▲ ■ 1/56 Backplane, 1/56-A4</li> <li>▶ [0] 1756-L71 sudu</li> <li>▲ ▶ [1] 1756-EN2TR EN2TR</li> </ul>	輸入 Module 类型的搜索文本 清除过滤器 ✓ Module Type Category Filters	(C) Module Type Vendor Filte
<ul> <li>▲ Ethernet</li> <li>              1756-EN2TR EN2TR          </li> <li>             FCEN-8LKM-8A-MP4 FCEN</li></ul>	<ul> <li>✓ Analog</li> <li>✓ CIP Motion Converter</li> <li>✓ Communication</li> <li>✓ Communications</li> </ul>	Dialight Elco (Tian Jin) Electroni Endress+Hauser FANUC CORPORATION
The Constraller Organia (the Loci of Organia	Catalog Number Description     FCEN-SLKM-SA-M FCEN-SLKM-SA-M FCEN-SLKM-SA-MP4 FCEN-SLKM-SA-MP4 FX20-GW FX20-GW-EP00	Vendor Category Elco Communications Adapter Elco Communications Adapter Elco Communications Adapter
Search Results Watch Ready		

# 5.2 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-MP4 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-MP4 (with IP address 192.168.0.11 set in advance), with expansion ports Port0 and Port5 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".

💰 新建项目		? <b>X</b>
1756-L71 Co example	ontrolLogix® 5570 Controller	
版本(V):	31 •	
机架(C):	1756-A4 4-Slot ControlLogix Chassis	
槽(S):	0 •	
安全授权(A):	无保护	
	□ 仅使用选定的安全授权进行身份验证和授权(U)	
Secure With:	O Logical Name <controller name=""></controller>	
	O Permission Set	
说明(D):		
Dashundan mu		
Redundancy :	(L)	
	取消 上一步(B) 下一步(N)	完成(F)



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.

New Module		X
General* Conne	ection RSNetWorx Module Info Internet Prote	col Port Configuration Network Time Sync
Type:	1756-EN2TR 1756 10/100 Mbps Ethernet Brid	Ige, 2-Port, Twisted-Pair Media Change Type 🗲
Parent:	Local	Ethernet Address
Name:	EN2TR	Private Network: 192.168.1.
Description:		IP Address:     192 . 168 . 0 . 5
	<b>.</b>	C Host Name:
Module Definit	tion	
Revision:	Change 10.001	Slot:
Electronic Key	ying: Compatible Module	
Connection: Time Sync Co	None onnection: None	
, i		
		_
Status: Creating		OK Cancel Help



3) Add the FCEN-8LKM-8A-MP4 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-MP4, and click "Create".

FILE EDIT VIEW S Controller Organizer Controller example Controller Tags	SEARCH LOGIC	COMMUNICATIONS TOC event	SUS WINDOW HE	LP L LP L LP L LP L LP L LP L L L L L L L L L L L L L	CIERER 41-44-∢> 40-40 ← Favorites Add-On Safety
• Lun       • Kun         • Run       • Kun         • Controller Organizer       • Offi         • Controller example       • Controller Tags	☐ ☐ ⑦ ♥    ´ Path: <nor line 1. ▼ ₽ ×</nor 	event v to Portonia v to Portonia v to Portonia v to Edit	s a Redun	a 🐺 🔅 👘 C A 🕈 a Idancy 🖓	Car Car Car Car Car Car Car Car
Run     Image: Controller Organizer       Image: Controller Controller Additional Controller Additional Controller Additional Controller Controler Controller Controller Controller Con	´ Path: <nor fline Ⅱ. ▼ ₽ ×</nor 	ne> No Forces ▶, No Edit	s a Redun	ک کے انجا	
Controller Organizer	line ॥. ▼ ₽ ×	No Forces 🕨 No Edit	s 🔒 Redun	idancy 📑	
Controller Organizer	<del>▼</del> ∓ ×				
Controller example Controller Tags					
<ul> <li>Controller example</li> <li>Controller Tags</li> </ul>					
Controller Fault Hai     Power-Up Handler     Tasks     MainTask     b MainProgram     Unscheduled     Unscheduled     Motion Groups     Ungrouped Axes     b Logical Model     I/O Configuration     1756 Backplane, 17	756-A4 ENZTR	elect Module Type Catalog Module Discovery i Enter Search Text for Moduk Module Type Category Analog CIP Motion Converter Communication Communications Catalog Number FCEN-8LKM-8A-M FCEN-8LKM-8A-M	Favorites 7 Clear Fi Filters Description FCEN-SLAW-SA-M FCEN-SLAW-SA-MPA	ilters → Mo ✓ Ele ✓ FAN Vent Bloc Elec	Hi dule Type Vendor Filters light o (Tian Jin) Electronics ress-Hauser UC CORPORATION dor Category o ( Communications Adapter o G Communications Adapter

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.

New Module	Clear Filters	×
General* Conne	ection Module Info Internet Protocol Port Configuration Network	
Туре:	FCEN-8LKM-8A-MP4 FCEN-8LKM-8A-MP4	
Vendor:	Elco (Tian Jin) Electronics Co., Ltd.	
Parent:	EN2TR	
Name:	FCEN	Ethernet Address Private Netwo 192 168 1
Description:		IP Address: 192,168,0,11     Host Name:
Module Definit Revision:	ion 1.001	
Electronic Key	ing: Compatible Module	
Connections:	Control/Status+IOL32+Status	
	Change	
Status: Creating		OK Cancel Help



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 4.4 for the allocation of data addresses. Set the Port0 and Port5 ports to IO-Link mode, and set the values of FCEN:C.Port0\_Pin4\_Type and FCEN:C.Port5\_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: C.Port0~7 to 3.

Controller Organizer 🔷 🖛 🗙	Controller Tags - example(controller) ×			
8 -	Scope: Bexample  Show: All Tags	•	T. Enter Name Filter	
✓ Scontroller example	Mana	ant Males A Tara	- Mart Chala	Dete T
Controller Tags	Name	== value + Ford	e Mar Style	Data Iy
Controller Fault Handler	<ul> <li>FCEN:C</li> </ul>	{}	{}	_04D0:F
Power-Up Handler	FCEN:C.Disable_Global_Diagnosis	0	Decimal	SINT
A S MalaTasks	FCEN:C.Disable_System_Power_Supply_Diagnosis	0	Decimal	SINT
<ul> <li>b MainProgram</li> </ul>	FCEN:C.Disable_Auxiliary_Power_Supply_Diagnosis	0	Decimal	SINT
= Unscheduled	FCEN:C.Process_Data_Layout	0	Decimal	SINT
A Government	FCEN:C.Port0_Pin4_Type	32	Decimal	INT
<ul> <li>Ungrouped Axes</li> <li>Assets</li> </ul>	FCEN:C.Port1_Pin4_Type	0	Decimal	INT
ls Logical Model	FCEN:C.Port2_Pin4_Type	0	Decimal	INT
▲ ⊆ I/O Configuration	FCEN:C.Port3_Pin4_Type	0	Decimal	INT
IT756 Backplane, 1756-A4	FCEN:C.Port4_Pin4_Type	0	Decimal	INT
<ul> <li> <sup>1</sup> [1] 1756-EN2TR EN2TR     </li> </ul>	FCEN:C.Port5_Pin4_Type	32	Decimal	INT
🖌 💑 Ethernet	FCEN:C.Port6_Pin4_Type	0	Decimal	INT
🖞 1756-EN2TR EN2TR ∿ FCEN-8LKM-8A-MP4 FCEN	FCEN:C.Port7_Pin4_Type	0	Decimal	INT
	FCEN:C.Port0_Pin2_Type	3	Decimal	SINT
	FCEN:C.Port1_Pin2_Type	3	Decimal	SINT
	Monitor Tags Edit Tags	•		
	Errors			
📴 Controller Organ 🛍 Logical Organizer	0 Errors 1 🗴 0 Warnings 0 0 Messages			
🗩 Search Results 🐺 Watch				

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-MP4 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.

Controller Tags - example(controller) ×					
Scope: Dexample  Show: All Tags		🔻 🏹 Ente			
Name	≕i- Value *	Force Ma <sup>*</sup> S	tyle	Data Type	Descri 🔶
FCEN:C	{}	{}		_04D0:FCEN_8LKM_8A_MP4_0C	=
<ul> <li>FCEN:11</li> </ul>	{}	{}		_04D0:FCEN_8LKM_8A_MP4_B6	
FCEN:I1.ConnectionFaulted	0	C	Decimal	BOOL	
FCEN:I1.Data	{}	{} C	Decimal	SINT[394]	
FCEN:01	{}	{}		_04D0:FCEN_8LKM_8A_MP4_9E	
<ul> <li>FCEN:O1.Data</li> </ul>	{}	{} C	Decimal	SINT[260]	
FCEN:01.Data[0]	0	0	Decimal	SINT	
FCEN:O1.Data[1]	0	C	Decimal	SINT	
FCEN:01.Data[2]	0	C	Decimal	SINT	
<ul> <li>FCEN:01.Data[3]</li> </ul>	0	C	Decimal	SINT	
<ul> <li>FCEN:01.Data[4]</li> </ul>	0	C	Decimal	SINT	
<ul> <li>FCEN:01.Data[5]</li> </ul>	0	C	Decimal	SINT	
FCEN:01.Data[6]	0	C	Decimal	SINT	
FCEN:01.Data[7]	0	0	Decimal	SINT	
FCEN:01.Data[8]	0	C	Decimal	SINT	-
Monitor Tags Edit Tags	•	111			•



7) Due to the absence of an IO-Link slave output auxiliary power supply signal, the Port0 and Port5 indicator lights of LKHA-16UP-M12G are set to IO-Link mode and connected in red. It is necessary to refer to section 4.3 for module OUTPUT data address assignment, and set FCEN:O1.Data[2].1 and FCEN:O1.Data[3].3 to 1. After a successful assignment, the light\_00 remains yellow and light\_01 remains green of Port0; the light\_10 remains yellow and light\_11 remains green of Port5.

ope: Dexample - Show: All Tags		• <u>t</u> D		
Name	≡∎ - Value	* Force Ma*	Style	Data Type
<ul> <li>FCEN:01.Data[2]</li> </ul>		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
<ul> <li>FCEN:O1.Data[3]</li> </ul>		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.



#### 5.3 Import Add-On Instruction

For the convenience of connecting the FCEN-8LKM-8A-MP4 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-MP4 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 CompactLogix or ControlLogix. 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-MP4 module from the pop-up menu L5X file, click the "Open" button to import.





Jimport Add-C	On Instruction	-	<ul> <li>G Ø № III ▼</li> </ul>	X
最近使用的项目	库 系统3 	文件夹 1.	Administrator 系统文件夹	
桌面		文件夹 <b>見文件</b> そ	系统文件夹 其他厂家EDS文件 文件夹	
が出入る は算机	AOL Logix 35.7 I	Compact67.L5X Designer XML File KB KHA.L5X	AOL FCEN.L5X Logix Designer XML File 151 KB	
「「」「」「」「」」「」「」」「」」「」」「」」「「」」「」」「」」「」」「」	43.3	KB		
	File <u>n</u> ame: Files of <u>type</u> :	AOI_FCEN	• L5X) •	<u>Open</u> Cancel Help

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.

▲ ⊆ Assets	
🖌 🖼 Add-On Instructions	
▲ 🕾 AOI_FCEN	=
Parameters and Local Tags	
🗈 Logic	
🖌 🛁 Data Types	
4 🖼 User-Defined	
1910 UDT_FCEN	
# UDT_FCEN_Configuration	
191 UDT_FCEN_Inputs	
# UDT_FCEN_IO_Link_Port_Data	
# UDT_FCEN_Outputs	
🖩 Strings	
🕨 🖩 Add-On-Defined	

#### 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-MP4 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.

💰 Logix Designer - example [1756-L71 31.11]*	- 6 >
FILE EDIT VIEW SEARCH LOGIC CO	IMMUNICATIONS TOOLS WINDOW HELP
🏷 🖆 🗎 🖶 🗶 🗇 ĉነ 🤊 🦿 🔤	🖬 🔹 🕫 🍺 ங 🔁 🐻 🖓 🖓 🎼 🖓 🖓
RUN     OK     Path: AB_ETHIP     Energy Storage	4)192.168.0.5\Backplane()*
The second secon	forces k, No caus el Redundancy 42 ~
Controller Organizer 🗸 🕂 🗙	B MainProgram - MainKoutine" ×
ð ¶	
Power-Up Handler	FCEN-8LKM-8A-MP4
✓ ⊆ Tasks	0 A01 FCEN Master Control Tag
A O MainTask	FOEN_Raw_Config FOENC FOEN_Raw_Config FOENC
<ul> <li>5 MainProgram</li> </ul>	FCEN_Raw_Output_Data FCENO1 Data
Parameters and Local Tags	FCEN_Port_Data Port_Data FCEN_Port_Data Port_Data
In MainRoutine	FOEN.Port_2 Data ECEN.Port_3 Data
Motion Groups	FCEN_Port_A_Data Port4_Data
Ungrouped Axes	FOEN_FOIT_5_Data POIT_Data FOEN_FOIT_6_Data POIT_Data
▲ 🖾 Assets 🗉	FCEN_Port_7_Data Port7_Data Monored_FCEFN_Data_Maneed_Master_Data
▲ GAdd-On Instructions	
▲ ⊕ AOI_FCEN	
Parameters and Local Tags	(End)
IB Logic	
🖌 🖳 Data Types	
▲ 🗟 User-Defined	
8 UDT_FCEN	
# UDT_FCEN_Configuration	
# UDT_FCEN_Inputs	
# UDT_FCEN_IO_LIIK_FOIL_Data	
Strings	
Add-On-Defined	Frons
Controller Organizer	
Search Results 😹 Watch	

# 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	Unique Control Tag for AOI Module	AOI_FCEN	Master_Control_Tag
FCEN_Raw_Config	Raw config data from Module Defined Tags	SINT[100]	Module_Name:C
FCEN_Raw_Input_Data	Raw input data from Module Defined Tags	SINT[394]	Module_Name:I1.Data
FCEN_Raw_Output_Data	Raw output data from Module Defined Tags	SINT[260]	Module_Name:01.Data
FCEN_Port_0_Data	All I/O Data with IO-Link Port 0	UDT_FCEN_ IO_Link_Port_Data	Port0_Data
FCEN_Port_1_Data	All I/O Data with IO-Link Port 1	UDT_FCEN_ IO_Link_Port_Data	Port1_Data
FCEN_Port_2_Data	All I/O Data with IO-Link Port 2	UDT_FCEN_ IO_Link_Port_Data	Port2_Data
FCEN_Port_3_Data	All I/O Data with IO-Link Port 3	UDT_FCEN_ IO_Link_Port_Data	Port3_Data



FCEN_Port_4_Data	All I/O Data with IO-Link Port 4	UDT_FCEN_ IO_Link_Port_Data	Port4_Data
FCEN_Port_5_Data	All I/O Data with IO-Link Port 5	UDT_FCEN_ IO_Link_Port_Data	Port5_Data
FCEN_Port_6_Data	All I/O Data with IO-Link Port 6	UDT_FCEN_ IO_Link_Port_Data	Port6_Data
FCEN_Port_7_Data	All I/O Data with IO-Link Port 7	UDT_FCEN_ IO_Link_Port_Data	Port7_Data
Mapped_FCEN_Data	All Unique data associated with FCEN-8LKM-8A-MP4	UDT_FCEN	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-MP4 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 5.2. At the same time, the signal points of the FCEN-8LKM-8A-MP4 module used in programming also need to directly call the values in the Mapped\_Master\_Data variable.

a Logix Designer - example [1756-171 31 11]	•			
■ RUN ■ OK Path: AB_ETHI	P-1\192.168.0.5\Backplane\0* 🖌 🔒 🛚 🛀 🗖 🗖			
Energy Storage Offline I. No	Forces  No Edits  Redundancy	Alarms Bit	Timer/Counter Input/Outpu	Compare (
Controller Organizer 👻 🕂 🛪	💷 Program Parameters and Local Tags - MainProgram 🛛 🗙			
ē •	Scope: 5 MainProgram V Show: All Tags		👻 🏹 Enter Nan	ie Filter
▲ Scontroller example	Namo	lleage	Value t E	arco Mat Sty
Controller Tags		Usage	value	Ce Ma Sty
Controller Fault Handler		Local	{}	{}
Power-Up Handler	▶ Mapped_Master_Data.I		{}	{}
A @ MainTask	Mapped_Master_Data.O		{}	{}
4 b MainProgram	Mapped_Master_Data.C		{}	{}
Parameters and Local Tags	▶ Master_Control_Tag	Local	{}	{}
🗈 MainRoutine	Port0 Data	Local	{}	{}
Unscheduled	Port1 Data	Local	11	1.1
- Groups		Level	()	()
Ungrouped Axes	Portz_Data	Local	{}	{}
Assets	Port3_Data	Local	{}	{}
	Port4_Data	Local	{}	{}
Parameters and Local Tags	Port5_Data	Local	{}	{}
la Logic	▶ Port6_Data	Local	{}	{}
🖌 🗐 Data Types	▶ Port7 Data	Local	()	()
4 🖼 User-Defined			()	()
# UDT_FCEN				
# UDT_FCEN_Configuration	( ) Manitan Taga Fdit Taga			_
88 UDT_FCEN_Inputs	(Monitor lags / Edit lags /			

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-MP4 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".

Program Parameters and Local Tags - MainProgram 🗙					
Scope: & MainProgram   Show: All Tags		▼ T. Enter N	ame Filter		
Name	=∎ - Usage	Value 🔸	Force Ma*	Style	Data Type
<ul> <li>Mapped_Master_Data</li> </ul>	Local	{}	{}		UDT_FCEN
<ul> <li>Mapped_Master_Data.I</li> </ul>		{}	{}		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
Monitor Tags/Edit Tags/	•	111			4

🔳 Prog	ram Parameters and L	ocal Tags - MainProgram	×						
Scope:	৳ MainProgram 🔹	Show: All Tags			👻 🏹 Enter Na	ame Filter			
Nam	e		==  <b>~</b>	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	
4 N	lapped_Master_Data.O				{}	{}		UDT_FCEN_Outputs	_
>	Mapped_Master_Data.C	Disable_Diag			0		Decimal	SINT	-
Þ	Mapped_Master_Data.C	.Reserved_1			0		Decimal	SINT	
Þ	Mapped_Master_Data.C	.Output_Data			0		Decimal	INT	
- N	lapped_Master_Data.C				{}	{}		UDT_FCEN_Configura	đ
Þ	Mapped_Master_Data.C	.Disable_Global_Diag			0		Decimal	SINT	
Þ	Mapped_Master_Data.C	.Disable_Us_Diag			0		Decimal	SINT	
Þ	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	
Þ	Mapped_Master_Data.C	Port_2_Function			0		Decimal	INT	-
I ► \M	lonitor Tags ( Ed	it Tags/		•	111			4	



#### 5.4 Webserver

The FCEN-8LKM-8A-MP4 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 to in Section 3.4. Then, using the latest version of Chrome, Edge, or Safari browser, enter <a href="http://xxx.xxx.xxx.wxx/webif/">http://xxx.xxx.xxx/webif/</a> 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-MP4 module has been pre assigned to 192.168.0.11. Without connecting to the PLC, Port0 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-MP4 module. Then open the browser and enter in the address bar <a href="http://192.168.0.11/webif/">http://192.168.0.11/webif/</a>. 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 PORT0 to IO-Link and click the "Set Ports" button to make the modification effective.

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C ELCO					
Home > SLOT CONFIG ∨	Ports Configuration				
SLOT INFO	Ports Config				
About >	PORTO PIN2 Digital_IO_t V PIN2 Digital_IO_t V PI	IN4 Digital_Input 🗸			
	PORTI PIN2 Digital_IO_L V PIN4 Digital_input V	IN4 Digital_Input 🗸			
	PORT2 PIN2 Digital_IO_L V PIN4 Digital_Input V PORT6 PIN2 Digital_IO_L V PI	IN4 Digital_Input 🗸			
	PORT3 PIN2 Digital_IO_L V PIN4 Digital_Input V PORT7 PIN2 Digital_IO_L V PI	IN4 Digital_Input 🗸			
			Get Ports	Set Ports	

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

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Home	>	Ports (	Configur	ation									
SLOT INFO	>	Ports Con	fig										
Opload Opload Opload	>	PORT0	PIN2 Digital	_1/0_l 🗸	PIN4 IO-Link	~	BNI IOL-302-002- K006	PORT4	PIN2 Digital_I/O_U 🗸	PIN4 Digital_Input 🗸			
		PORTI	PIN2 Digital_	_1′0_l ∨	PIN4 Digital_Input	~		PORT5	PIN2 Digital_I/O_U 🗸	PIN4 Digital_Input 🗸			
		PORT2	PIN2 Digital_	_1/0_l ∨	PIN4 Digital_Input	~		PORT6	PIN2 Digital_I/O_U 🗸	PIN4 Digital_Input 🗸			
		PORT3	PIN2 Digital	_1′0_l ∨	PIN4 Digital_Input	~		PORT7	PIN2 Digital_I/O_U 🗸	PIN4 Digital_Input 🗸			
											Get Ports	Set Ports	•



4) You can directly click on the IO-Link device found in the search, or select port PortO 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.





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.

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SLOT INFO	~	Index(dec):
Dupload	>	65
(i) About	>	Subindex(dec):
		Result Read O Write
		Data(hex):
		f0 f0
		Apply Clear
		ОК

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

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Home	>	ParameterMenu			C	100se File Balluff-BN	IDD1.1.xr	nl	
SLOT INFO	~	NAME	INDEX	INPUT/OUTPUT	UNIT	Read A	11		
n Upload	>	Inversion (rw)	64 (0)	See below childs					
() About	>	Port 0 - Pin 4	64 (1)	Input not inverted(false) Input inverted(true)		Write	Read		
		Port 1 - Pin 4	64 (2)	●Input not inverted(false)○Input inverted(true)		Write	Read		
		Port 2 - Pin 4	64 (3)	●Input not inverted(false)○Input inverted(true)		Write	Read		
		Port 3 - Pin 4	64 (4)	● Input not inverted(false) ○ Input inverted(true)		Write	Read		
		Port 4 - Pin 4	64 (5)	Input not inverted(false) O Input inverted(true)		Write	Read		
		Port 5 - Pin 4	64 (6)	●Input not inverted(false)○Input inverted(true)		Write	Read		
		Port 6 - Pin 4	64 (7)	Input not inverted(false) Input inverted(true)		Write	Read		



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.

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A Home	>								
SLOT CONFIG	>	ParameterMenu				Choose File Balluff-E	NIDD1.	xml	
SLOT INFO	~	NAME	INDEX	INPUT/OUTPUT	UNIT	Read	I All		
DUpload	>	Inversion (rw)	64 (0)	See below childs					
() About	>	Port 0 - Pin 4	64 (1)	Input not inverted(false) Input inverted(true)		Write	Read		
		Port 1 - Pin 4	64 (2)	Input not inverted(false) Input inverted(true)		Write	Read		
		Port 2 - Pin 4	64 (3)	Input not inverted(false) Input inverted(true)		Write	Read		
		Port 3 - Pin 4	64 (4)	Input not inverted(false) O Input inverted(true)		Write	Read		
		Port 4 - Pin 4	64 (5)	Input not inverted(false) O Input inverted(true)		Write	Read		
		Port 5 - Pin 4	64 (6)	<ul> <li>Input not inverted(false) Input inverted(true)</li> </ul>		Write	Read		
		Port 6 - Pin 4	64 (7)	Input not inverted(false) Input inverted(true)		Write	Read		

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.

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C ELCO	)						
A Home	>	Direction (rw)	65 (0)	See below childs			
SLOT CONFIG	>	Port 0 - Pin 4	65 (1)	○ Input(false)	Write	Read	
SLOT INFO	~	Port 1 - Pin 4	65 (2)	○ Input(false)	Write	Read	
O Upload	>	Port 2 - Pin 4	65 (3)	○ Input(false)	Write	Read	
About	>	Port 3 - Pin 4	65 (4)	○ Input(false)	Write	Read	
		Port 4 - Pin 4	65 (5)	○ Input(false)	Write	Read	
		Port 5 - Pin 4	65 (6)	○ Input(false)	Write	Read	
		Port 6 - Pin 4	65 (7)	○ Input(false)	Write	Read	
		Port 7 - Pin 4	65 (8)	● Input(false) 〇 Output(true) ●	Write	Read	
		Port 0 - Pin 2	65 (9)	● Input(false) 〇 Output(true) •	Write	Read	
		Port 1 - Pin 2	65 (10)	Input(false) Output(true)	Write	Read	
		Port 2 - Pin 2	65 (11)	Input(false) Output(true) •	Write	Read	

Note: The operation of modifying ISDU parameters of the IO-Link slave through Webserver can be carried out with the FCEN-8LKM-8A-MP4 module connected to the PLC normally.



# 6. Alarm diagnosis

#### 6.1 LED fault indicator

With the LED indicator on the FCEN-8LKM-8A-MP4 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	
	Yellow	IO-Link connection OK	_	
Expansion channel Indicator	Green	Ordinary digital signal	_	
	Yellow flash	No IO-Link connection	Check the IO-Link cable connection	
	Dod	1. Short circuit	1. Check the cable connection	
IO-Link	Reu	2. Output signal overload	2. Module channel is damaged	
	Red flash	IO-Link connection	1. Check the configuration	
	Neu nash	incorrect	2.Check IO-Link device status	
Gateway	Green	Work normally	-	
status Indicator MOD	Red	Working abnormally	<ol> <li>Power supply is abnormal</li> <li>Channel abnormal (short circuit, overload, etc.)</li> <li>Module is damaged</li> </ol>	
Comm.	Green	Communication normal	_	
status Indicator NET	Red	Communication abnormal	<ol> <li>Network cable failure</li> <li>Check the configuration</li> <li>Module is damaged</li> </ol>	
Network status	Green	Network Cable connects normal.	_	
Indicator Lk1, 2	Off	Network cable connects error.	<ol> <li>Network cable failure</li> <li>Module is damaged</li> </ol>	
Comm. data	Yellow flash	Data exchange.	-	
Indicator ACT1, 2	Off	No data exchange.	<ol> <li>Check the configuration</li> <li>Check the network hardware</li> </ol>	
Power	Green	Supply voltage normal	_	
supply Indicator	Red	Supply voltage abnormal	<ol> <li>Overvoltage or undervoltage</li> <li>Module is damaged</li> </ol>	
Us, Ua	Off	No power supply	1.Power supply cable failure 2. Module is damaged	



# 6.2 FCEN Module Address Assignment

The default connection name for the FCEN-8LKM-8A-MP4 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	Modulo status	Indicate the status of IO-Link		
07		master and IO-Link port.		
0	Input signal of Master	Process input data for IO-Link		
09	input signal of Master	Master SIO mode.		
1057	IO-Link Port 0	Process input data for Port 0.		
58105	IO-Link Port 1	Process input data for Port 1.		
106153	IO-Link Port 2	Process input data for Port 2.		
154201	IO-Link Port 3	Process input data for Port 3.		
202249	IO-Link Port 4	Process input data for Port 4.		
250297	IO-Link Port 5	Process input data for Port 5.		
298345	IO-Link Port 6	Process input data for Port 6.		
346393	IO-Link Port 7	Process input data for Port 7.		
Byte	Output data	Description		
Byte 01	Output data Module Control	Description Control the function (diagnosis		
Byte 01	Output data Module Control	Description Control the function (diagnosis or restart) of IO-Link port.		
Byte 01 23	Output data Module Control Output signal of Master	DescriptionControl the function (diagnosis or restart) of IO-Link port.Process output data for IO-Link		
Byte 01 23	Output data Module Control Output signal of Master	Description Control the function (diagnosis or restart) of IO-Link port. Process output data for IO-Link Master SIO mode.		
Byte 01 23 435	Output data Module Control Output signal of Master IO-Link Port 0	DescriptionControl the function (diagnosis or restart) of IO-Link port.Process output data for IO-Link Master SIO mode.Process output data for Port 0.		
Byte 01 23 435 3667	Output data Module Control Output signal of Master IO-Link Port 0 IO-Link Port 1	DescriptionControl the function (diagnosis or restart) of IO-Link port.Process output data for IO-Link Master SIO mode.Process output data for Port 0.Process output data for Port 1.		
Byte 01 23 435 3667 6899	Output data Module Control Output signal of Master IO-Link Port 0 IO-Link Port 1 IO-Link Port 2	DescriptionControl the function (diagnosis or restart) of IO-Link port.Process output data for IO-Link Master SIO mode.Process output data for Port 0.Process output data for Port 1.Process output data for Port 2.		
Byte 01 23 435 3667 6899 100131	Output data Module Control Output signal of Master IO-Link Port 0 IO-Link Port 1 IO-Link Port 2 IO-Link Port 3	DescriptionControl the function (diagnosis or restart) of IO-Link port.Process output data for IO-Link Master SIO mode.Process output data for Port 0.Process output data for Port 1.Process output data for Port 2.Process output data for Port 3.		
Byte 01 23 435 3667 6899 100131 132163	Output data Module Control Output signal of Master IO-Link Port 0 IO-Link Port 1 IO-Link Port 2 IO-Link Port 3 IO-Link Port 4	DescriptionControl the function (diagnosis or restart) of IO-Link port.Process output data for IO-Link Master SIO mode.Process output data for Port 0.Process output data for Port 1.Process output data for Port 2.Process output data for Port 3.Process output data for Port 4.		
Byte 01 23 435 3667 6899 100131 132163 164195	Output data Module Control Output signal of Master IO-Link Port 0 IO-Link Port 1 IO-Link Port 2 IO-Link Port 3 IO-Link Port 4 IO-Link Port 5	DescriptionControl the function (diagnosis or restart) of IO-Link port.Process output data for IO-Link Master SIO mode.Process output data for Port 0.Process output data for Port 1.Process output data for Port 2.Process output data for Port 3.Process output data for Port 4.Process output data for Port 5.		
Byte 01 23 435 3667 6899 100131 132163 164195 196227	Output data Module Control Output signal of Master IO-Link Port 0 IO-Link Port 1 IO-Link Port 2 IO-Link Port 3 IO-Link Port 4 IO-Link Port 5 IO-Link Port 6	DescriptionControl the function (diagnosis or restart) of IO-Link port.Process output data for IO-Link Master SIO mode.Process output data for Port 0.Process output data for Port 1.Process output data for Port 2.Process output data for Port 3.Process output data for Port 4.Process output data for Port 5.Process output data for Port 6.		



Byte	Config data	Description		
03	Module configuration	General configuration for the		
		overall module.		
435 Port configuration		Pin type and safe state		
		configuration for ports.		
3643	IO-Link Port 0	Configuration for IO-Link Port 0.		
4451	IO-Link Port 1	Configuration for IO-Link Port 1.		
5259	IO-Link Port 2	Configuration for IO-Link Port 2.		
6067	IO-Link Port 3	Configuration for IO-Link Port 3.		
6875	IO-Link Port 4	Configuration for IO-Link Port 4.		
7683	IO-Link Port 5	Configuration for IO-Link Port 5.		
8491	IO-Link Port 6	Configuration for IO-Link Port 6.		
9299	IO-Link Port 7	Configuration for IO-Link Port 7.		