IO-Link Analog Hub~~LKHA-04UA-TC
IO-Link Analog Hub~~LKHA-04UA-QC

----IO-Link System Manual

IO-Link

Preface

1. **Scope of this manual:**

   This manual applies to the ELCO IO-Link analog hub.

   The information in this manual enables you to run the IO-Link analog hub as IO-Link device connected to IO-Link master.

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 IO-Link analog hub.

   Covered topics are:

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

4. **Technical support:**

   This manual describes the characteristics and the usage of IO-Link analog hub.

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

   Additional information about ELCO products is available:

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

5. **Disclaimer of liability:**

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

1 Hardware parameters

ARTICLE PROPERTIES

PRODUCT TYPE	IO-LINK IP20 Hubs	**OPERATION TYPE**	Voltage and current input and output can be configured, thermal resistance, thermocouple input
DESCRIPTION	4-channel analog I/O module, 4 Pin M12		

ELECTRICAL CONNECTION

IO-LINK	1×M12 A-code 4 Pin, Male	**INPUT**	2 × 10 Pos terminals
POWER SUPPLY	Included in IO-Link interface	**OUTPUT**	2 × 10 Pos terminals

ELECTRICAL DATA

INPUT	4	**OUTPUT**	4
INPUT SUPPLY CURRENT	200 mA per channel	**OUTPUT TYPE**	Current: 0 ... 20 mA, 4 ... 20 mA Voltage: 0 ... 10 V
INPUT TYPE	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V, thermocouple: J, K, T, N, E type, PT100, PT1000	**OUTPUT IMPEDANCE**	Current: < 450 Ω; Voltage: > 1 kΩ
INPUT IMPEDANCE	Current: 250 Ω Voltage: 1 MΩ	**OUTPUT RESOLUTION**	16 Bits
INPUT RESOLUTION	16 Bits	**CONVERSION TIME**	12 ms
CONVERSION TIME	Current, Voltage: 12 ms Thermocouple: 50 ms	**MEASUREMENT ACCURACY**	±0.3%
MEASUREMENT ACCURACY	±0.3%		

DIAGNOSTICS

COMMUNICATION STATUS	LED indication, communication message	**SHORT-CIRCUIT**	LED indication
VOLTAGE DETECTION	LED indication	**OVERLOAD**	LED indication

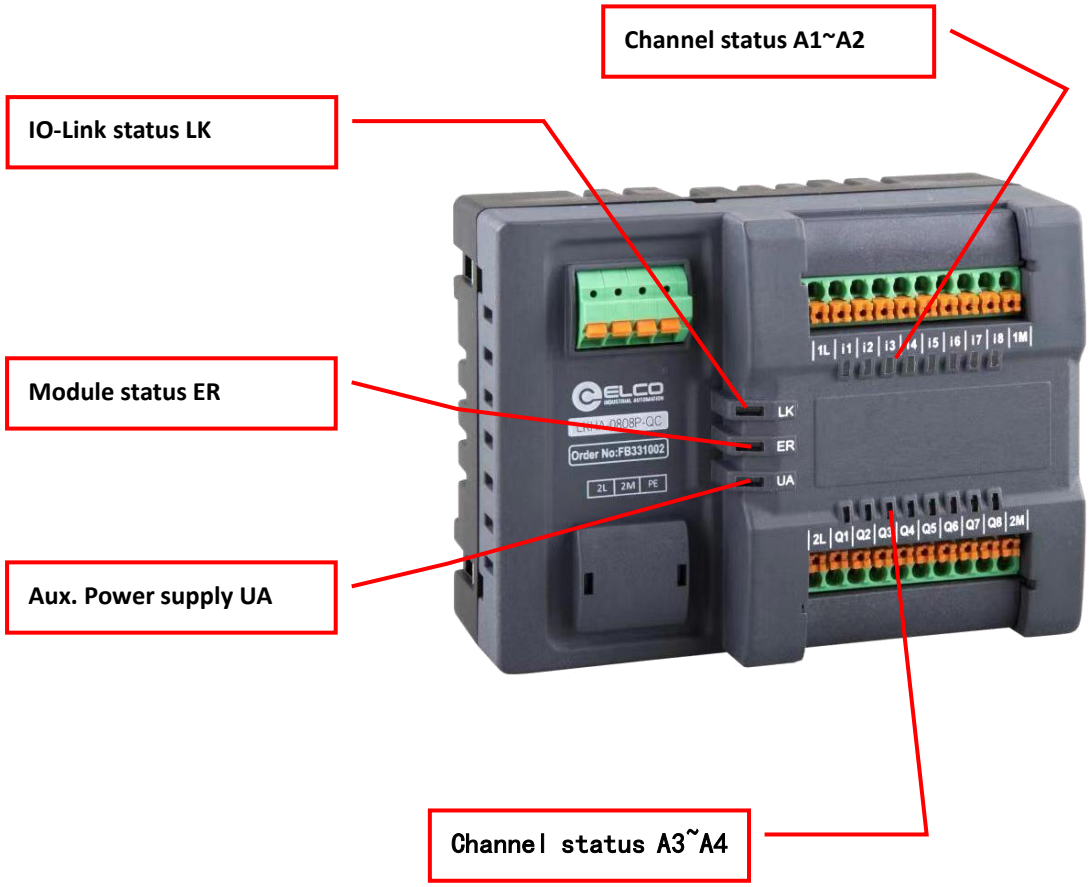
GENERAL DATA

PROTECTION CLASS	IP20	**OPERATING TEMPERATURE**	-25 ... +70 °C
DIMENSIONS	91 × 70 × 38 mm	**STORAGE TEMPERATURE**	-40 ... +85 °C

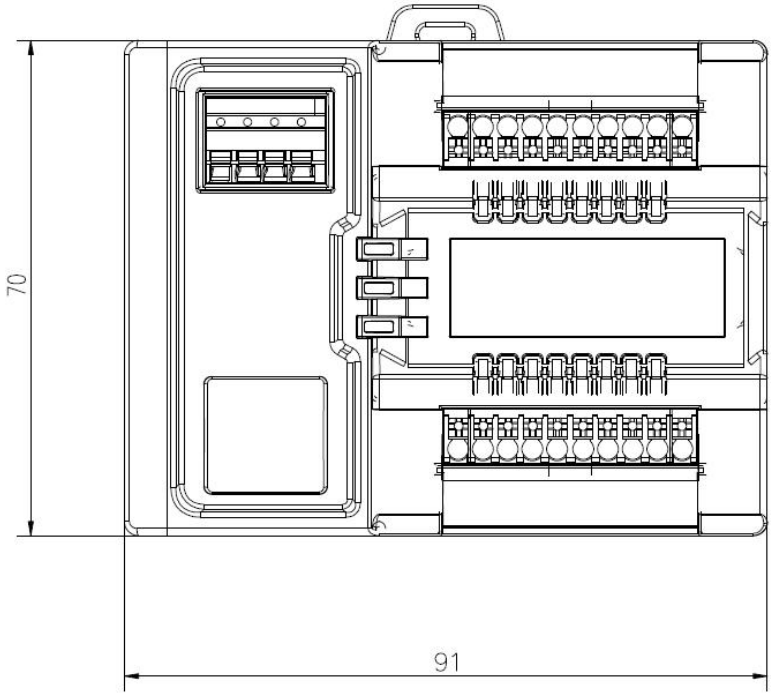
APPROVALS

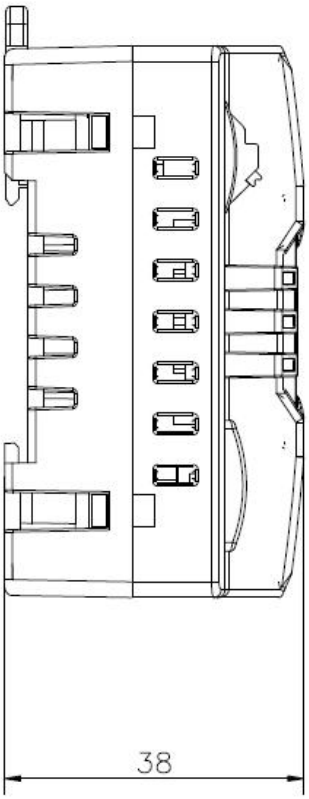
2 LED Indication

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



3 Mounting dimensions



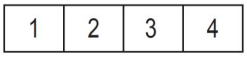


4 Analog module wiring guidance

Please follow basic electrical regulations for connection operations. For personal and equipment safety, we recommend disconnecting the power supply during wiring operations.

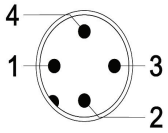
4.1 Communication connection

1）4-Pos terminals IO-Link connector（LKHA-04UA-TC）



Terminal	Class-A
1	Power supply 24V+
2	-
3	Power supply GND
4	IO-Link C/Q

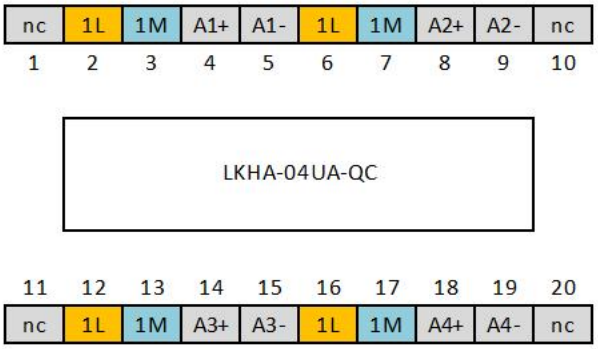
2）M12 A-Code IO-Link connector（LKHA-04UA-QC）



Terminal	Class-A
1	Power supply 24V+
2	-
3	Power supply GND
4	IO-Link C/Q

4.2 Signal connection terminal

The signal terminals of the analog module include two 10-Pos terminals, as shown in the following figure:

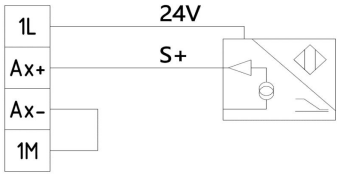


Terminals are defined as follows：

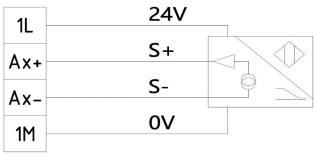
Terminal	Function	Remark
1L	Sensor power supply +	24V
1M	Sensor power supply -	0V
Ax +	Analog signal +	
Ax -	Analog signal -	

4.3 Analog signal wiring

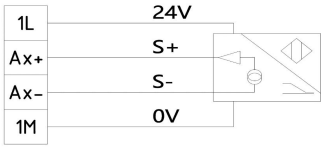
a) Passive current input signal - two wire signal. (Ax - and 1M on the module need to be short circuited)



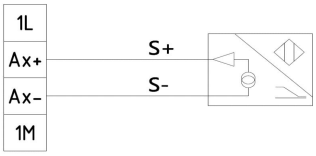
b) Active current input signal - three wire or four wire signal. (The three wire sensor S - and 0V share the same wire, and the module needs to be short circuited with Ax - and 1M)



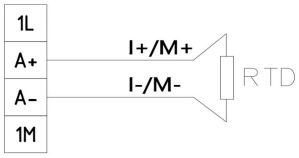
c) Voltage input signal. (The voltage signals are all active signals. If the sensors S - and 0V share the same wire, the module needs to be short circuited with Ax - and 1M)



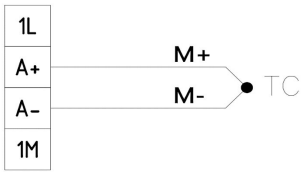
d) Current or voltage output signal. (Output as active current signal)



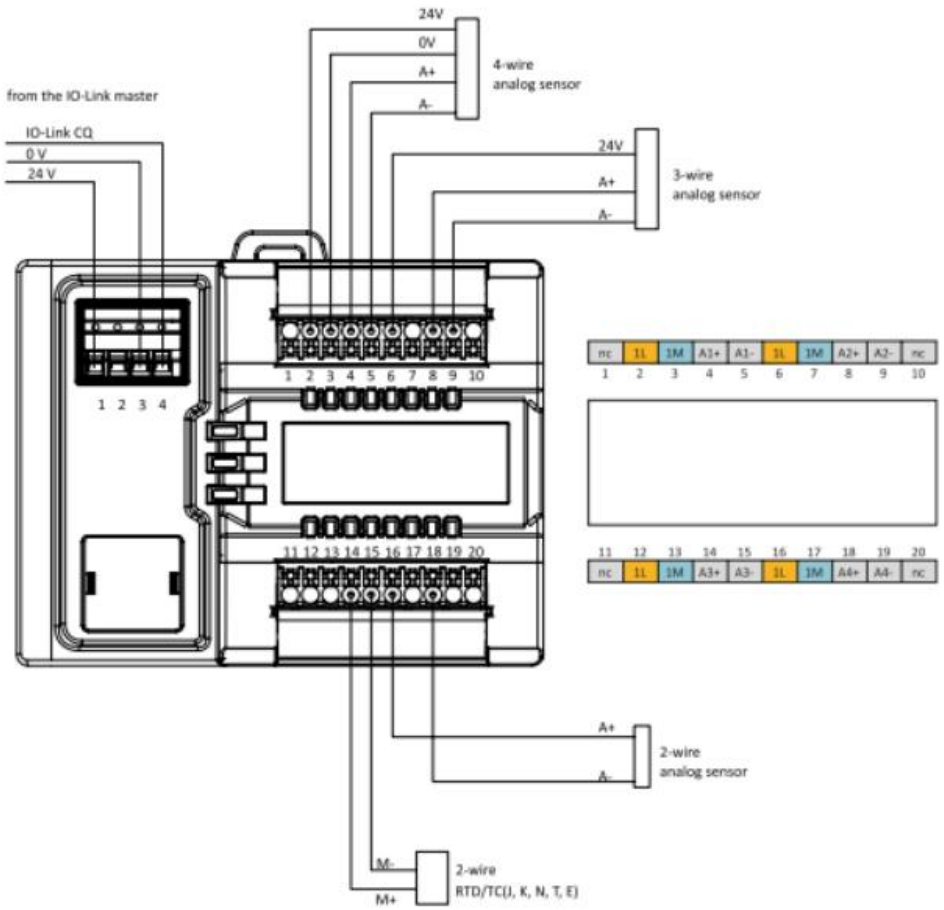
e) Two-wire thermal resistance signal.



f) Thermocouple signal.(J, K, T, N, E)



WIRING DIAGRAM



5 LED fault indicator

Name	Status	Meaning	Fault cause
Module communication Indicator LK	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
Fault status Indicator ER	Green	Work normally	-
	Red	Working abnormally	1. Power supply is abnormal 2. Channel abnormal (short circuit, overload, etc.) 3. Module is damaged
Signal Indicator X	Red	Signal abnormality	1. Short circuit 2. Overvoltage or undervoltage
	Green	Signal normally	-
	Off	No signal	-

6 Signal address assignment

Each IO Link analog module has a total of 4 channels for connecting signals, and each channel contains 4 terminals (1L, 1M, Ax+, Ax -). The following list shows the corresponding relationship between the signal status and IO Link transmission bytes of each connector by model.

LKHA-04UA-Tx/Qx takes 12 bytes Input and 8 bytes Output.

Byte	Byte	Channel	e.g
Input/Output Byte 0~7	Byte 0 Byte 1	Channel 1	IW 0 QW 0
	Byte 2 Byte 3	Channel 2	IW 2 QW 2
	Byte 4 Byte 5	Channel 3	IW 4 QW 4
	Byte 6 Byte 7	Channel 4	IW 6 QW 6
Diagnose Byte 8~11	Byte 8	Signal exceeds the lower limit	IB 8
	Byte 9	Signal exceeds the upper limit	IB 9
	Byte 10	Port short circuit	IB 10
	Byte 11	Power supply error	IB 11

IB 8	0	1	2	3	4	5	6	7
Signal exceeds the lower limit	channel 1	channel 2	channel 3	channel 4	null	null	null	null
IB 9	0	1	2	3	4	5	6	7
Signal exceeds the upper limit	channel 1	channel 2	channel 3	channel 4	null	null	null	null
IB 10	0	1	2	3	4	5	6	7
Port short circuit*	channel 1	channel 2	channel 3	channel 4	null	null	null	null
IB 11	0	1	2	3	4	5	6	7
Power supply error	channel 1	channel 2	channel 3	channel 4	null	null	null	null

Port short circuit* : This is only valid when the analog output is in the range of 0-10 V.

6.1 Instruction of Analog Value

PLC controller processes analog values in a binary system; the analog input module transfers analog process signals into digital signals; the analog output module transfers the digital output value into an analog signal.

Digital analog values are suitable to the same rated input and output value; each analog signal occupies 1 word PLC address, i. e. each analog signal corresponds to 16 bit. The symbol of analog is set on bit15: 0 represents '+'; 1 represents '1'. For the analog module with resolution less than 16 bits, the analog value is saved in the format of left justifying; the idle least significant bit is padded with '0'.

Example: analog value18035 can be expressed in binary system as follows:

Resolution	Analog Value															
Bit No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
16bit	0	1	0	0	0	1	1	0	0	1	1	1	0	0	1	1
14bit	0	1	0	0	0	1	1	0	0	1	1	1	0	0	0	0

Analog signal types can be divided into the following types: current unipolarity value is 0~20mA and 4~20mA, voltage unipolarity value is 0~10V, thermal resistance supports PT100/PT1000, and thermocouple supports multiple TC types (Type J, K, T, N, E).

Note: Analog output only supports rated analog value; overshoot range only represents input module.

- **Analog value within unipolar current input/output range:**

System Value			Input/Output Range		
	Decimalism	hexadecimal	0~20mA	4~20mA	
104.999%	32767	7FFF	≥ 23.7 mA	≥ 22.96 mA	Overflow, lock the maximum
	31208	79E8			Overshoot range
100%	31207	79E7	20 mA	20 mA	Rated range
75%	23405	5B6D	15 mA	16 mA	
0.0032%	1	1			
0%	0	0	0 mA	4 mA	
	-1	FFFF			
-75%	-23405	A493	0 mA	0 mA	Underflow, lock the least value
-100%	-31207	8619			
	-31208	8618			
-104.999%	-32768	8000	0 mA	0 mA	

- **Analog value within unipolar voltage input/output range:**

System Value			Input/Output Range		
	Decimalism	hexadecimal	0~5 V	0~10 V	
104.999%	32767	7FFF	≥ 5.926 V	≥ 11.85 V	Overflow, lock the maximum
	31208	79E8			Overshoot range
100%	31207	79E7	5 V	10 V	Rated range
75%	23405	5B6D	3.75 V	7.5 V	
0.0032%	1	1			
0%	0	0	0 V	0 V	
	-1	FFFF			
-75%	-23405	A493	0 V	0 V	Underflow, lock the least value
-100%	-31207	8619			
	-31208	8618			
-104.999%	-32768	8000	0 V	0 V	

- **Analog value within PT x00 thermal resistance:**

System Value	Input/Output Range

	Decimalism	hexadecimal	-200~+850 ℃	
	32767	7FFF	≥ 850.1 ℃	Overflow, lock the maximum
	8500	2134	850 ℃	Rated range
	6375	18E7	637.5 ℃	
	10	A	1 ℃	
	0	0	0 ℃	
	-10	FFF6	-1 ℃	
	-1500	FA24	-150 ℃	
	-2000	F830	-200 ℃	
	-32768	8000	≤ -200.1 ℃	Underflow, lock the least value

- **Analog value within thermocouple:**

Type J，K，T，N，E thermocouple determines the rated input and output range according to the temperature range of the scale. Dividing the decimal value of the system by 10, the current temperature can be obtained. The resolution is 0.1 C, and the maximum or minimum value can be locked out beyond the limit.

6.2 ISDU parameter description

The ISDU parameters of the analog module can be set through the IODD file.

Index	Sub index	Name	Access Rights	Default Value
16	0	Vendor Name	RO	ELCO
17	0	Vendor Text	RO	www.elco-holding.com
18	0	Product Name	RO	LKHA-04UA-TC
19	0	Product ID	RO	FB331022
20	0	Product Text	RO	IO-Link Analog Input/Output Module IP20
21	0	Serial number	RO	00000000
22	0	Hardware Revision	RO	HW-V0.01
23	0	Firmware Revision	RO	FW-V0.01
24	0	Application Specific Tag	RO	***
64	0	Port1 Config	RW	0xff, 0x06, 0x01, 0x00
	1	Range	RW	0xff
	2	Filter Setting	RW	0x06
	3	Enable Diagnostic	RW	0x01
	4	Cold-junction compensation	RW	0x00
65	0	Port2 Config	RW	0xff, 0x06, 0x01, 0x00
	1	Range	RW	0xff
	2	Filter Setting	RW	0x06
	3	Enable Diagnostic	RW	0x01
	4	Cold-junction compensation	RW	0x00
66	0	Port3 Config	RW	0xff, 0x06, 0x01, 0x00
	1	Range	RW	0xff
	2	Filter Setting	RW	0x06
	3	Enable Diagnostic	RW	0x01
	4	Cold-junction compensation	RW	0x00
67	0	Port4 Config	RW	0xff, 0x06, 0x01, 0x00
	1	Range	RW	0xff
	2	Filter Setting	RW	0x06
	3	Enable Diagnostic	RW	0x01
	4	Cold-junction compensation	RW	0x00

6.3 ISDU parameter modification

The following table lists the meanings represented by the parameter modification values of Index64~67, which users can modify according to their needs.

Range	**0x2f**	**Voltage In 0...10V**
	0x3f	**Voltage Out 0...10V**
	0x4f	**Current In 0...20mA**

	0x47	Current In 4...20mA
	0x50	Current Out 0...20mA
	0x51	Current Out 4...20mA
	0x70	Thermocouple J
	0x71	Thermocouple K
	0x72	Thermocouple T
	0x73	Thermocouple N
	0x74	Thermocouple E
	0x80	RTD PT100
	0x81	RTD PT1000
	0xff	Channel Deactive

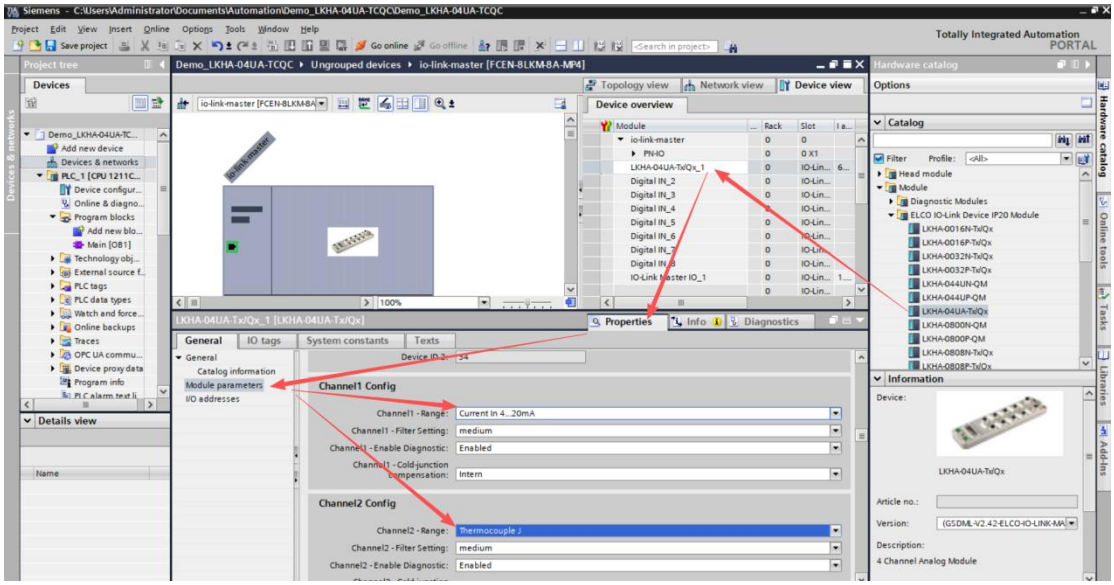
Filter	0x0	extremely weak
	0x3	weak
	0x6	medium
	0x9	strong
	0xC	extremely strong

Enable Diagnostic	0x0	Disabled
	0x1	Enabled

Cold-junction	0x0	Intern
	0x1	None

7 Example of Configuration Usage

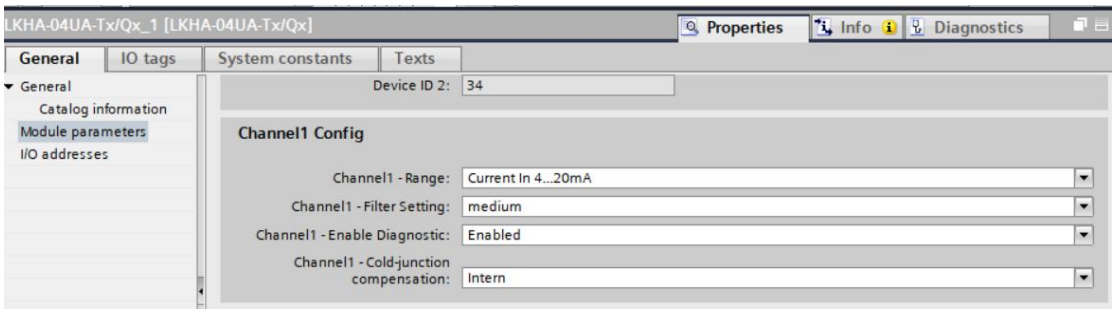
7.1 Use Siemens PLC TIA



To configure the LKHA-04UA-TC/QC using Siemens TIA, follow these steps:

1. Use the FCEN-8LKM-8A-MP4 master station. In the hardware catalog, locate the LKHA- 04UA-TX/QX and place it in the first slot of the master station.

2. Click on “Properties - Module parameters - channel config”. Then, select the channel range. In this example program, for channel 1, “current in 4...20mA” is selected, and for channel 2, “Thermocouple J” is chosen. Keep other parameters as their default values.



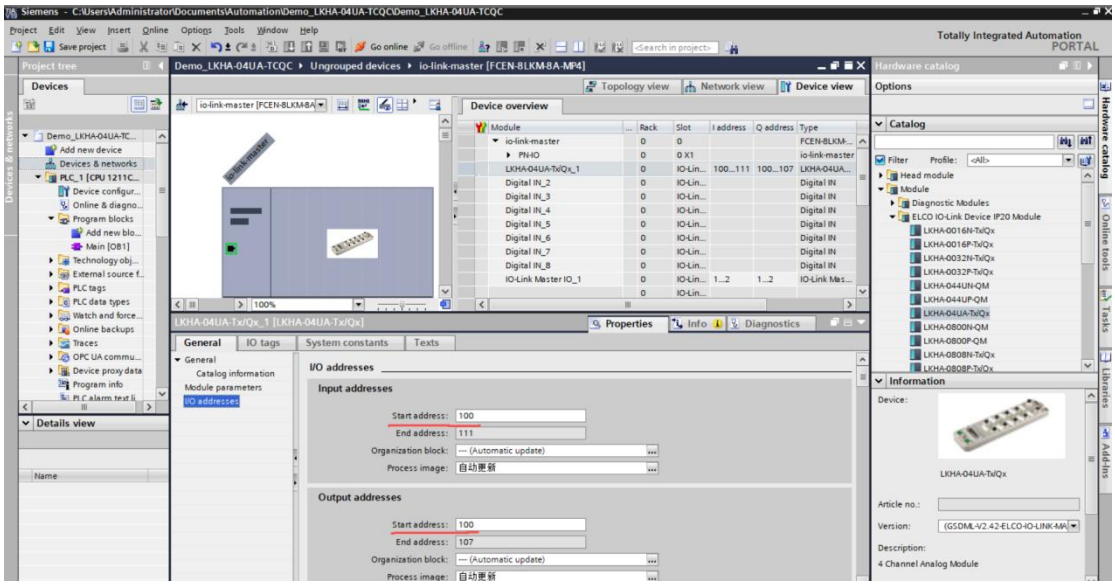
Parameter Introduction:

channel - range: This is for selecting the channel function.

channel - filter setting: It is used to choose the filtering capability. There are five levels of filtering degrees available, and the middle value is selected by default.

channel - Enable Diagnostic: Diagnostic is enabled by default. You can choose to turn off the alarm diagnosis.

channel - cold - junction compensation: The default setting is “intern”. It is not recommended to change this.



In the demo, the starting input address of the module is IB100, and the starting output address of the module is QB100.

Block title: "Main Program Sweep (Cycle)"

Comment

Network 1:

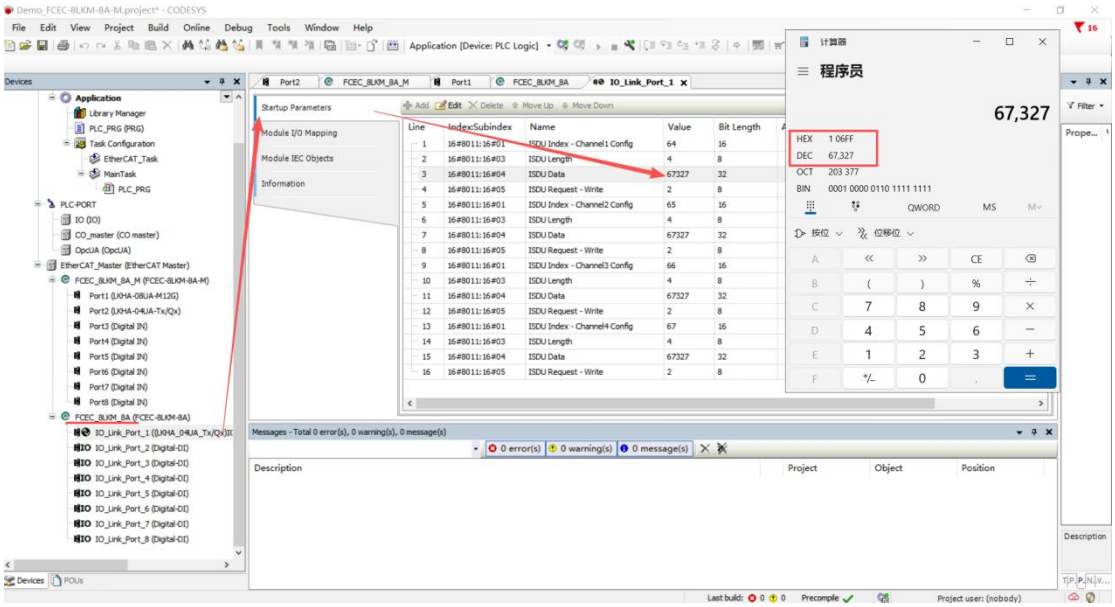
Comment

```
1  // LKHA-04UA-TC/QC
2  // Channel 1 current in 4-20mA  (0-31207)
3  "LKHA-04UA-TC_Channel 1" := "IW100";
4  // channel 2 Temperature Detection of Type J Thermocouple (The procedure is the same for other types)
5  // The temperature value is obtained by dividing the channel detection value by 10.
6  "LKHA-04UA-TC_Channel 2" := "IW102"/10;
```

7.2 Use Elco PLC with Codesys.

7.2.1 FCEC-8LKM-8A + LKHA-04UA-TC

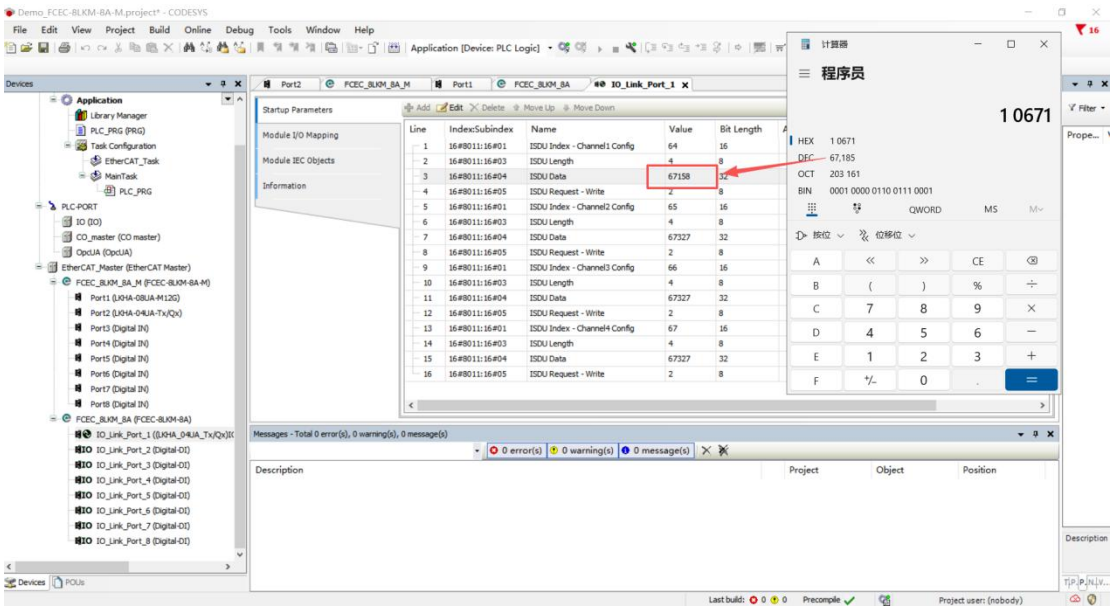
In the demo, use the FCEC-8LKM-8A IO-Link master station. Right-click on port 1, select "Plug Device", then double-click on LKHA - 04UA - TX/QX to add this module to Port 1 of the master station.



Double-click on LKHA-04UA-TX.QX at port1. In the Startup Parameters, the default value of ISDU Data is 67327. When converted to hexadecimal, it is 0x106FF. Referring to the previous ISDU parameter table, 0x106FF represents Enable Diagnostic (0x01), Filter Setting: medium (0x06), and channel-range: Deactive (0xFF).

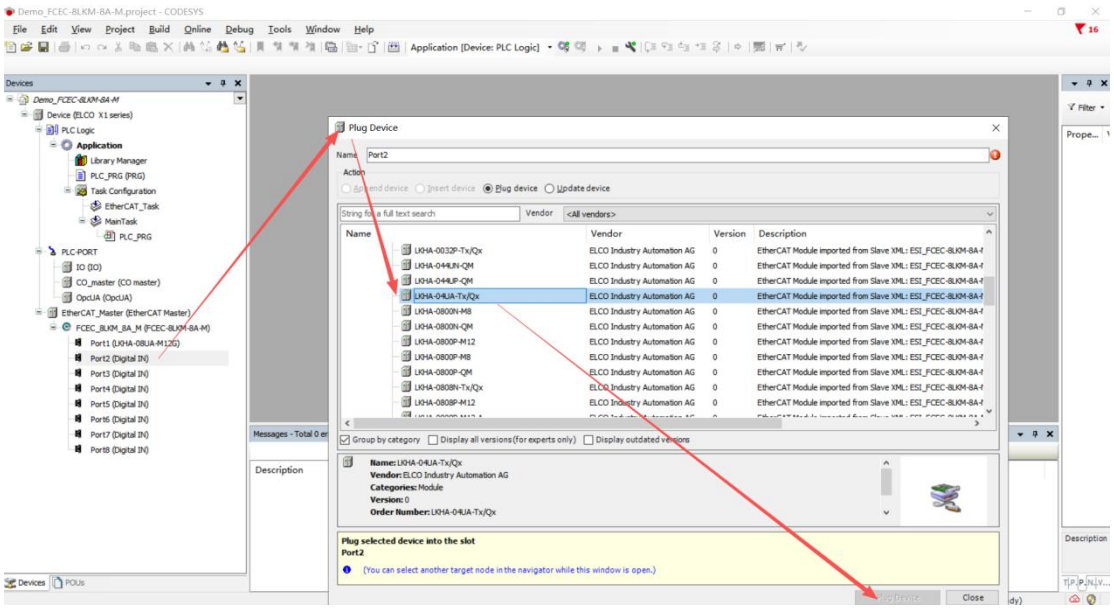
64	0	Port1 Config	RW	0xff, 0x06, 0x01, 0x00
	1	Range	RW	0xff
	2	Filter Setting	RW	0x06
	3	Enable Diagnostic	RW	0x01
	4	Cold-junction compensation	RW	0x00

In the demo, set Channel 1 as a Type K thermocouple. As we know from the ISDU parameter table, 0x71 represents a Type K thermocouple. We replace FF in 0x106FF with 71, which is converted to decimal as 67185. Fill this value into the ISDU DATA Value to complete the setting of Channel 1. The setting method for other channel - ranges is the same as this.

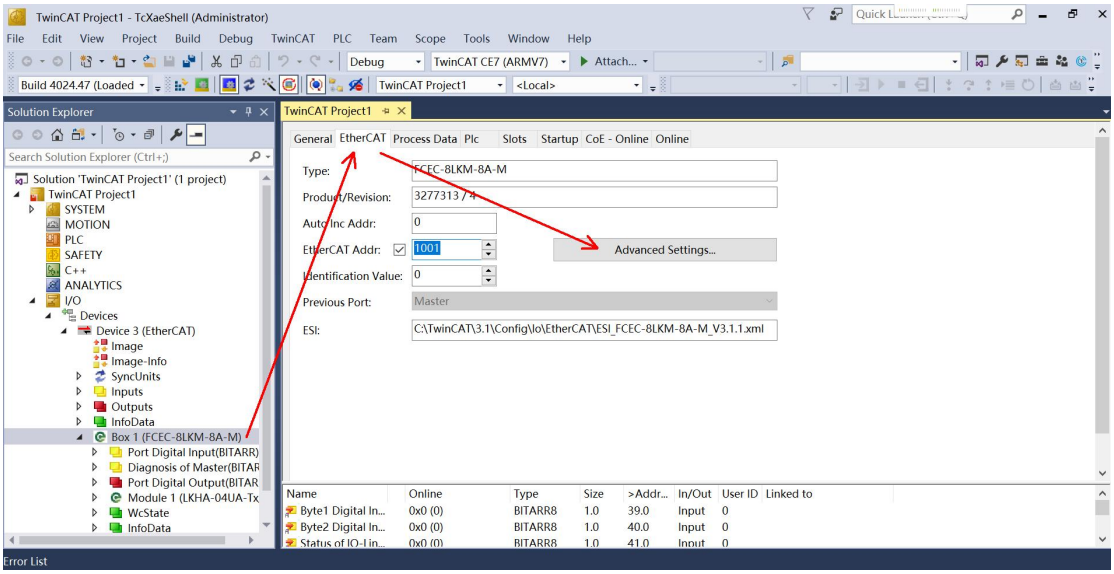


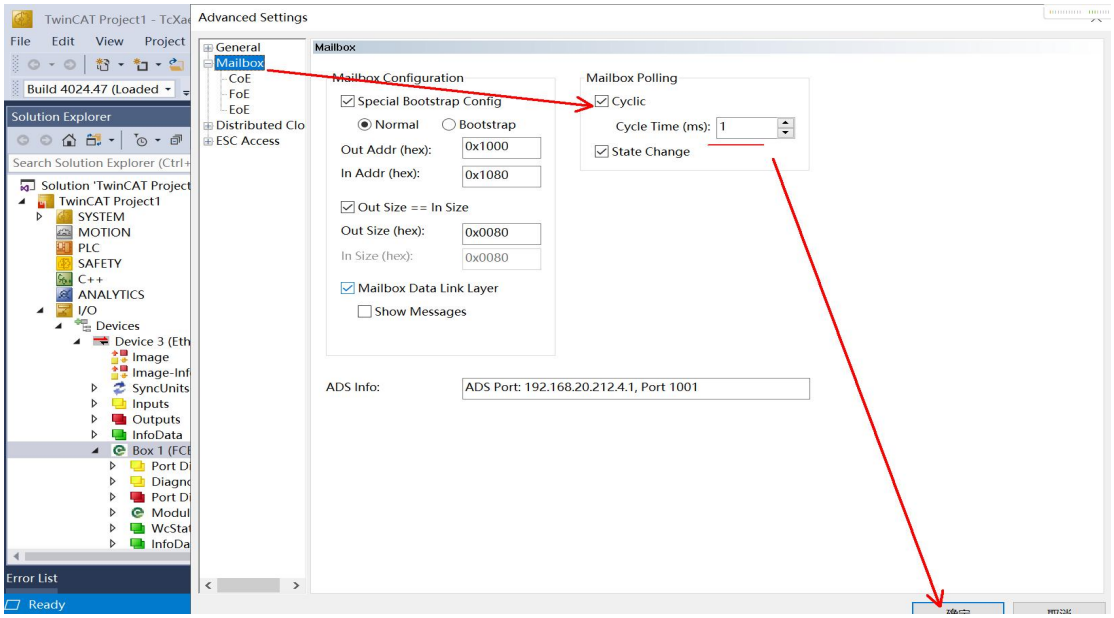
7.2.2 FCEC-8LKM-8A-M + LKHA-04UA-TC

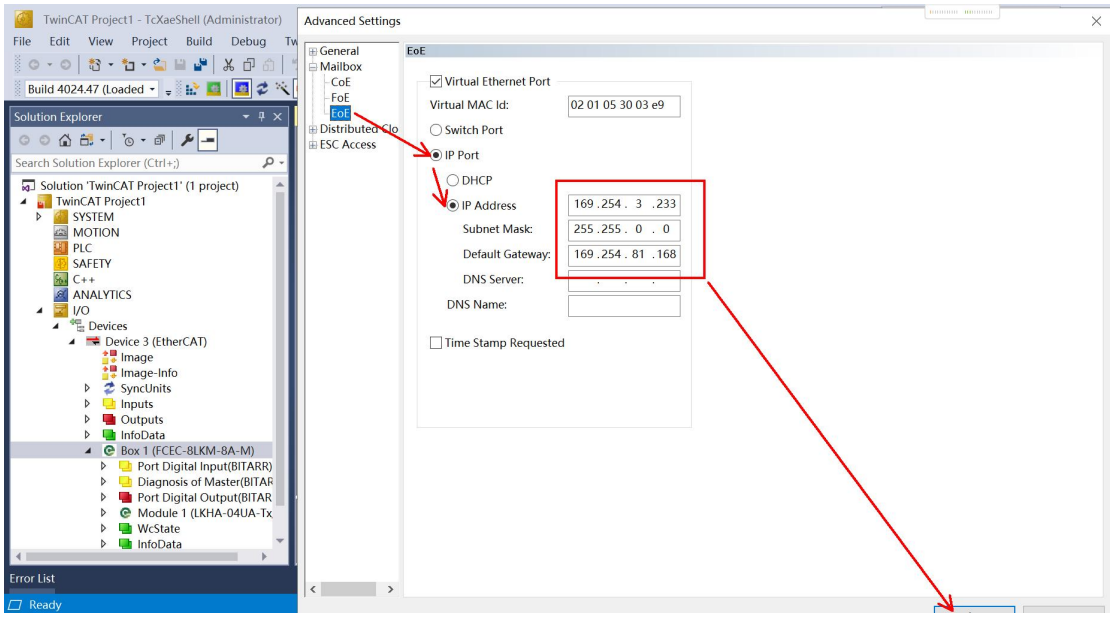
In the other demo, use the FCEC-8LKM-8A-M IO-Link master station. Right-click on port 2, select "Plug Device", then double-click on LKHA - 04UA - TX/QX to add this module to Port 2 of the master station



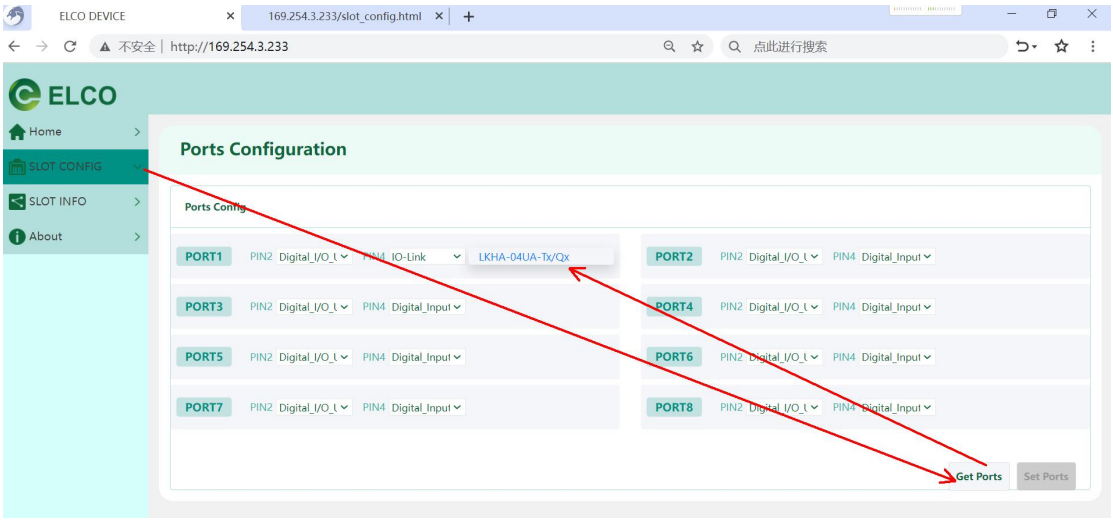
When using the FCEC-8LKM-8A-M, the parameter settings of the LKHA - 04UA - QC/TC need to be configured via the web. For the FCEC-8LKM-8A-M, an IP address needs to be set for the module using the EOE function. The methods are as follows:


TwinCAT Project1 - TcXaeShell (Administrator)
Solution Explorer
TwinCAT Project1
General EtherCAT Process Data Plc Slots Startup CoE - Online Online
Type: FCEC-8LKM-8A-M
Product/Revision: 3277313 / 4
Auto Inc Addr: 0
EtherCAT Addr: 1001
Identification Value: 0
Advanced Settings...
Previous Port: Master
ESI: C:\TwinCAT\3.1\Config\Io\EtherCAT\ESI_FCEC-8LKM-8A-M_V3.1.1.xml
Box 1 (FCEC-8LKM-8A-M)
Error List

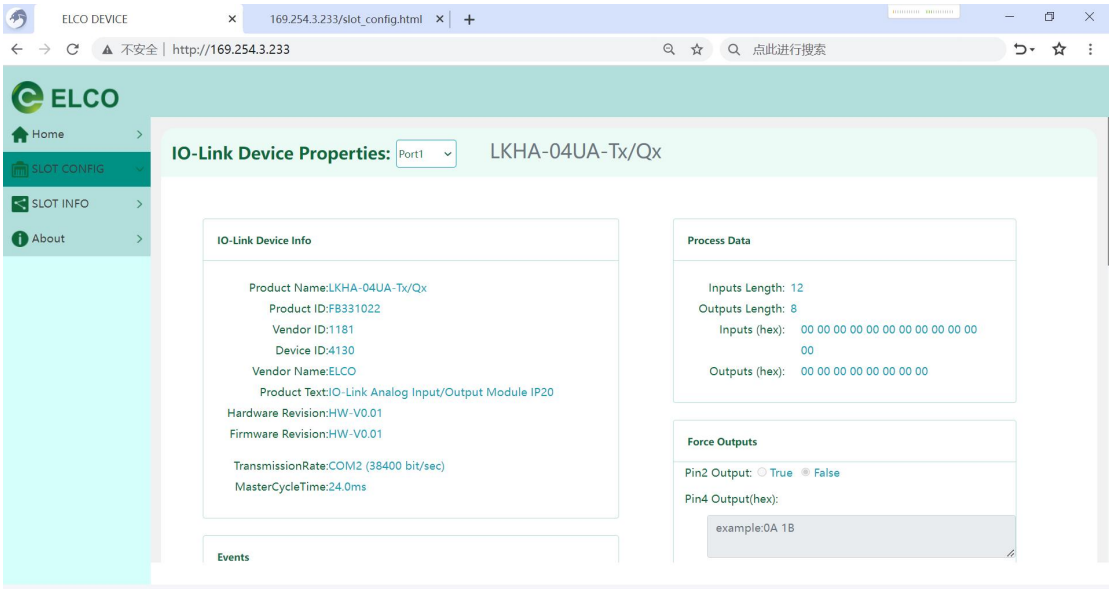

Advanced Settings
General
Mailbox
CoE
FoE
EoE
Distributed Clo
ESC Access
Mailbox Configuration
Special Bootstrap Config
Normal
Bootstrap
Out Addr (hex): 0x1000
In Addr (hex): 0x1080
Out Size == In Size
Out Size (hex): 0x0080
In Size (hex): 0x0080
Mailbox Data Link Layer
Show Messages
Mailbox Polling
Cyclic
Cycle Time (ms): 1
State Change
ADS Info: ADS Port: 192.168.20.212.4.1, Port 1001
Error List
Ready


Advanced Settings
EoE
Virtual Ethernet Port
Virtual MAC Id: 02 01 05 30 03 e9
Switch Port
IP Port
DHCP
IP Address 169 . 254 . 3 . 233
Subnet Mask: 255 . 255 . 0 . 0
Default Gateway: 169 . 254 . 81 . 168
DNS Server:
DNS Name:
Time Stamp Requested
Box 1 (FCEC-8LKM-8A-M)
Error List
Ready

The EOE has been set up, and the module has now been assigned the IP address 169.254.3.233. Log in to this URL using a browser to access the parameter page of the module.



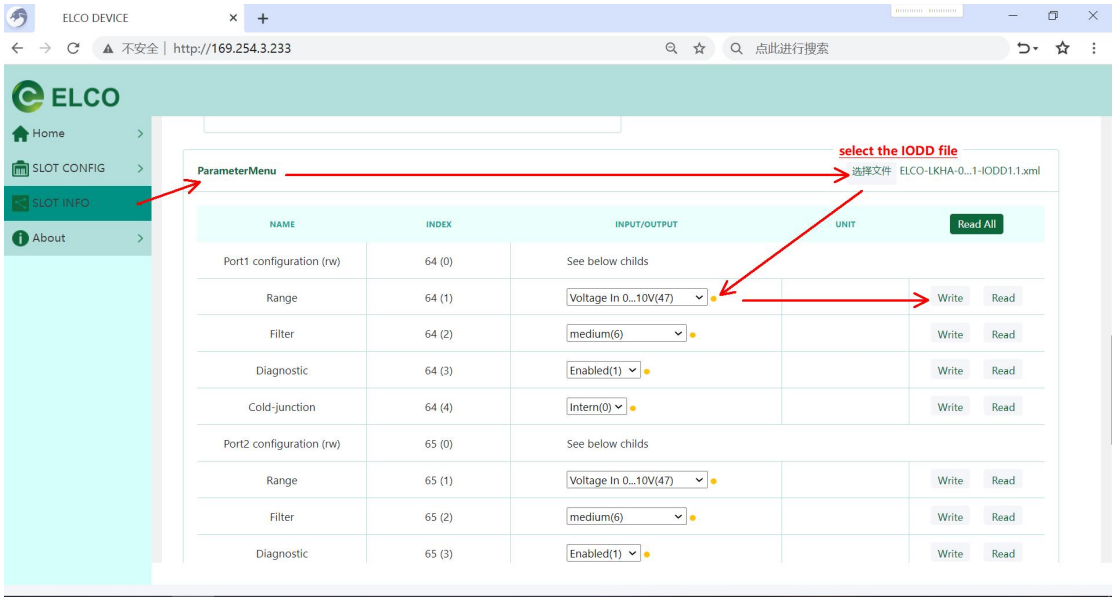
When the LKHA - 04UA - TC module is connected to PORT1, click "Get Ports". At this time, the slave information of PORT1 can be read and the model will be displayed as shown in the figure. Click on this model to enter the information page of the LKHA - 04UA - TC.



Scroll down to find the IODD selection page. Operate as shown in the figure. Select the IODD of the LKHA - 04UA - TC. Choose the channel function in the parameters and write it. To confirm whether the writing is successful, click the "Read" button after writing to check.

You can download the IODD file of this module from this address.

https://www.elcoautomation.com/en-us/upload/download/ELCO-LKHA-04UA-TxQx-20240221-IODD1.1.zip


ELCO DEVICE
不安全 | http://169.254.3.233
点此进行搜索
ELCO
Home
SLOT CONFIG
SLOT INFO
About
ParameterMenu
select the IODD file
选择文件
ELCO-LKHA-0...1-IODD1.1.xml
NAME
INDEX
INPUT/OUTPUT
UNIT
Read All
Port1 configuration (rw)
64 (0)
See below childs
Range
64 (1)
Voltage In 0...10V(47)
Filter
64 (2)
medium(6)
Diagnostic
64 (3)
Enabled(1)
Cold-junction
64 (4)
Intern(0)
Port2 configuration (rw)
65 (0)
See below childs
Range
65 (1)
Voltage In 0...10V(47)
Filter
65 (2)
medium(6)
Diagnostic
65 (3)
Enabled(1)
Write
Read