

IO-Link Analog Hub LKHA-08UA-M12G

----IO-Link System Manual



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 analog signal hub | IO-LINK | Class-A: 1 × M12 A-code 4 pin, Male |
| DESCRIPTION | 8 AI/AO, Class-A, 8*M12 | POWER SUPPLY | Included in IO-Link interface |
| WORKING MODE | Current / voltage / TC / RTD signal type can be set | SIGNALS | 8 × M12 A-code 5 pin, Female |

ELECTRICAL DATA

| | | | |
|-----------------------------|---|-------------------------|---|
| INPUT CHANNELS | Max. 8 | OUTPUT CHANNELS | Max. 8 |
| INPUT SUPPLY CURRENT | Max. 200 mA per channel | OUTPUT TYPE | Current: 0 ... 20 mA, 4 ... 20 mA Voltage: 0 ... 10 V |
| INPUT TYPE | Current: 0 ... 20 mA, 4 ... 20 mA Voltage: 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 | RESOLUTION | 16 Bit |
| RESOLUTION | 16 Bit | CONVERSION TIME | 12 ms |
| CONVERSION TIME | Current, Voltage: 12 ms Thermocouple: 50 ms | ACCURACY | ±0.3% |
| ACCURACY | ±0.3% | | |

DIAGNOSTICS

| | | | |
|---------------------------------|---------------------------------------|-------------------------------------|-------------------------|
| COMMUNICATION INDICATION | LED indication, communication message | SHORT-CIRCUIT & OVERLOAD | Support, LED indication |
| VOLTAGE DETECTION | Support, low voltage alarm | | |

GENERAL DATA

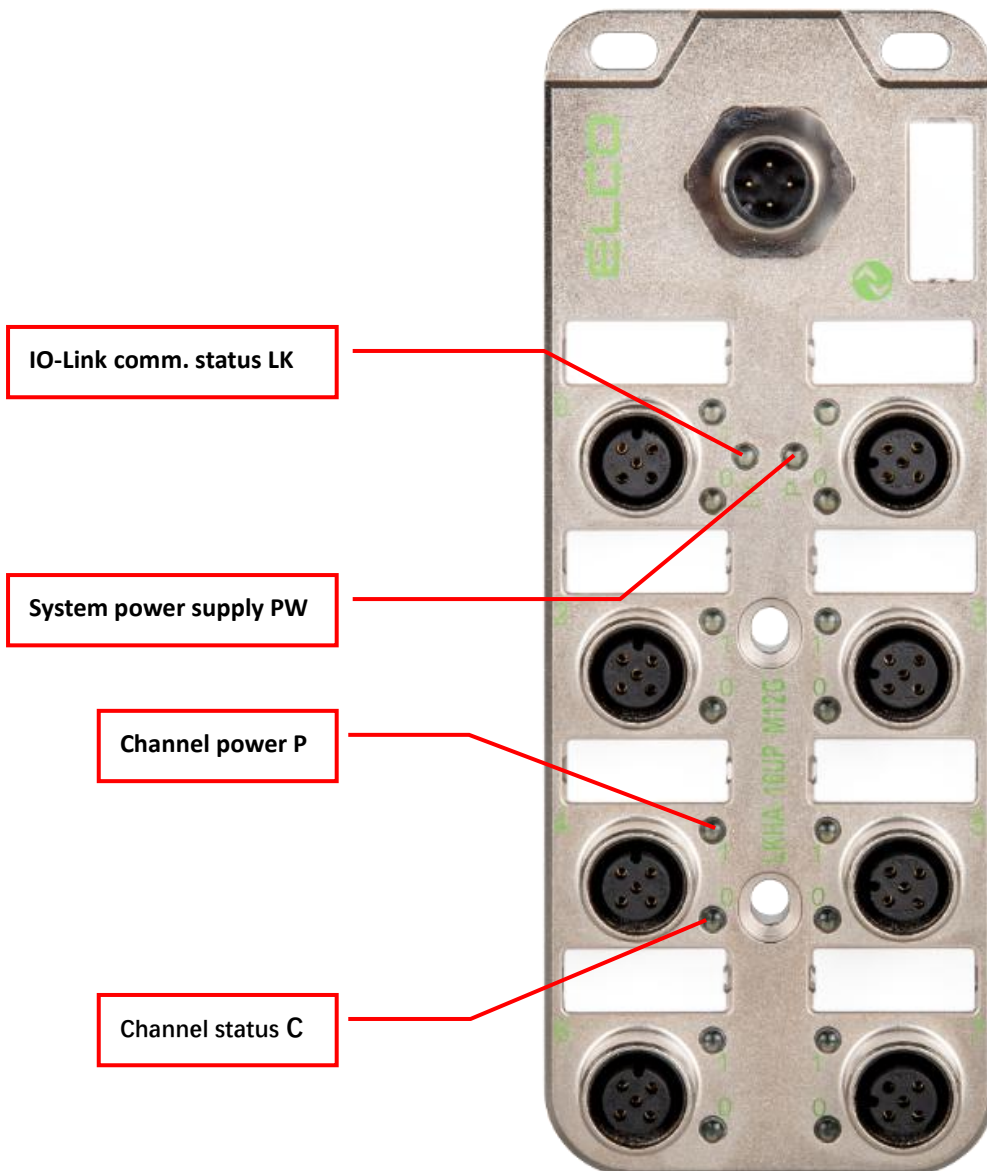
| | | | |
|--------------------------|--------------------|------------------------------|--------------------|
| HOUSING MATERIAL | Casting zinc alloy | OPERATING TEMPERATURE | -25 ... +70 °C |
| PROTECTION | IP67 | STORAGE TEMPERATURE | -40 ... +85 °C |
| RELATIVE HUMIDITY | ≤ 95% | DIMENSIONS | 55 × 145 × 27.5 mm |

APPROVALS

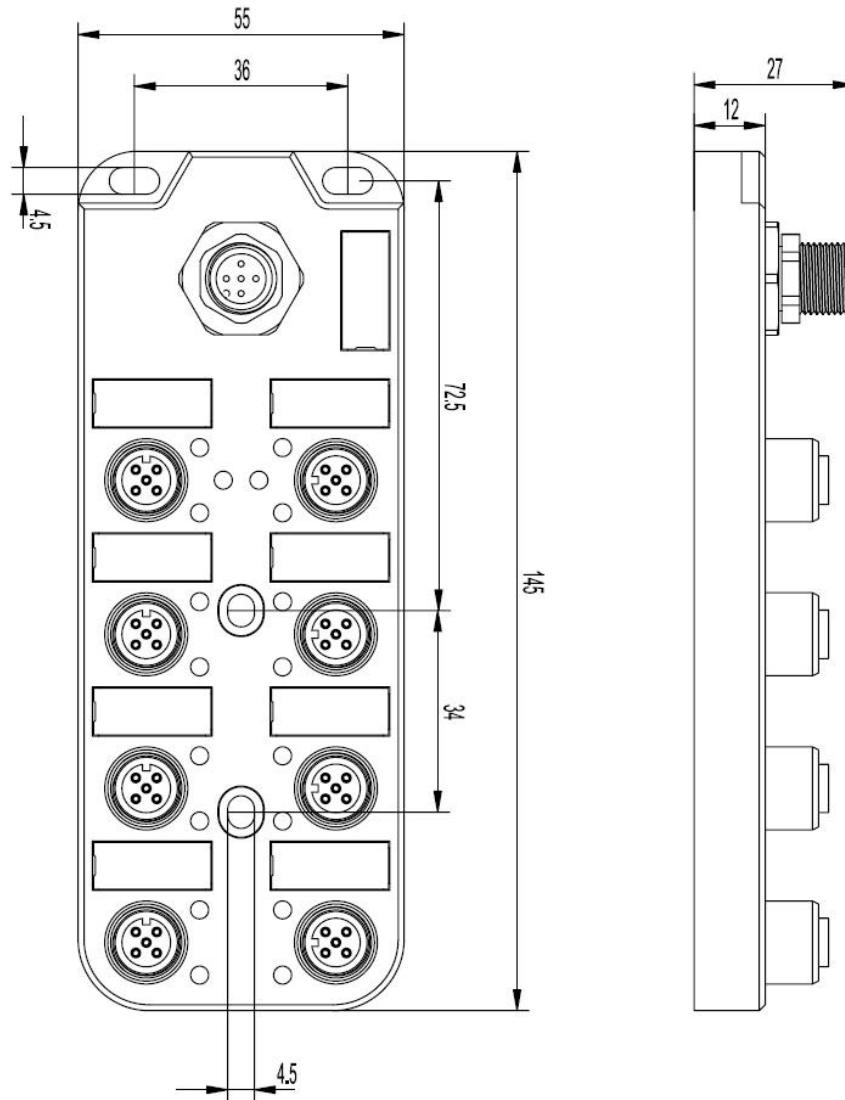


2 LED Indication

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



3 Mounting dimensions

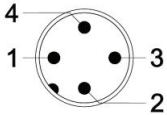


4 Analog module wiring guidance

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

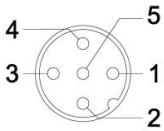
M12 A-Code IO-Link connector (4-Pin, Male)



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

4.2 Signal connection

M12 A-Code signal connector (5-Pin, Female)



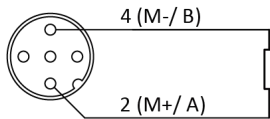
Terminals are defined as follows:

| Terminal | Function | Remark |
|----------|--------------------------|--------|
| 1 | Sensor power supply 24V+ | 24V |
| 2 | Analog signal + | |
| 3 | Sensor power supply GND | 0V |
| 4 | Analog signal - | |
| 5 | Protective earth PE | |

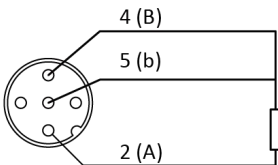
4.3 Analog signal wiring

a) Two-wire input --- One connector is used to connect one Two-wire RTD or TC input port, LKHA-08UA-M12G supports this connection.

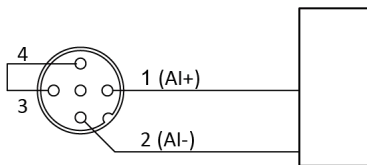
*If the thermocouple function is to be used, an additional accessory "cold-end-M12" needs to be ordered. This accessory should be installed at PORT7 of the module and is used for the cold - end compensation of the thermocouple.



b) Three-wire input --- One connector is used to connect one Three-wire RTD input port, LKHA-08UA-M12G supports this connection.

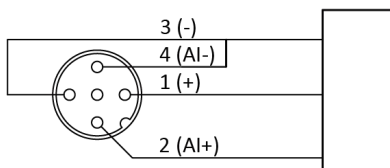


c) Two-wire input- One connector is used to connect one two-wire current input port, LKHA-08UA-M12G supports this connection.

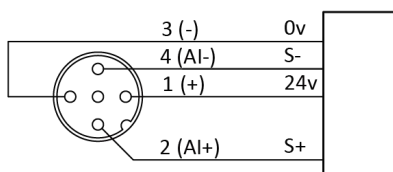


d) Three-wire input or output - One connector is used to connect one Three-wire current or voltage input or output port.

LKHA-08UA-M12G supports this connection.



e) Four-wire input or output - One connector is used to connect one four-wire current or voltage input or output port. LKHA-08UA-M12G supports this connection.



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 | <ol style="list-style-type: none"> 1. Expansion cable failure 2. Master IO-Link port problem 3. Slave module is damaged |
| Module Power Indicator PW | Green | Work normally | - |
| | Off | Abnormal power supply | <ol style="list-style-type: none"> 1. Power supply is abnormal 2. Module is damaged |
| Channel Power Indicator P | Green | Work normally | - |
| | Red | Channel power supply abnormality | <ol style="list-style-type: none"> 1. Short circuit of signal line 2. Module is damaged |
| Signal status Indicator C | Green | Signal normality | - |
| | Red | Signal abnormally | <ol style="list-style-type: none"> 1. Short circuit 2. Overvoltage or undervoltage |
| | Off | Channel deactivated | <ol style="list-style-type: none"> 1. Set channel properties 2. Confirm if comm. is OK |

6 Signal address assignment

Each IO-Link analog module has 8 connectors (Port0~Port7) for connecting signals, with 5 pins (Pin1~Pin5) inside each connector. The following list shows the signal status of each connector and the corresponding relationship between IO-Link transmission bytes by model.

LKHA-08UA-M12G takes 20 bytes Input and 16 bytes Output.

| Byte | Byte | Channel | e.g |
|---------------------------|-----------|--|-------|
| Input/Output Byte 0~15 | Byte 0 | Channel 0 | IW 0 |
| | Byte 1 | | QW 0 |
| | Byte 2 | Channel 1 | IW 2 |
| | Byte 3 | | QW 2 |
| | Byte 4 | Channel 2 | IW 4 |
| | Byte 5 | | QW 4 |
| | Byte 6 | Channel 3 | IW 6 |
| | Byte 7 | | QW 6 |
| | Byte 8 | Channel 4 | IW 8 |
| | Byte 9 | | QW 8 |
| | Byte 10 | Channel 5 | IW 10 |
| | Byte 11 | | QW 10 |
| | Byte 12 | Channel 6 | IW 12 |
| | Byte 13 | | QW 12 |
| Byte 14 | Channel 7 | IW 14 | |
| Byte 15 | | QW 14 | |
| Diagnose Byte 16~19 | Byte 16 | Signal lower limit | IB 16 |
| | Byte 17 | Signal upper limit | IB 17 |
| | Byte 18 | Channel overload (Only voltage out) | IB 18 |
| | Byte 19 | Power supply error (Port short circuit) | IB 19 |

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 value 18035 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 unipolar value is 0~20mA and 4~20mA, voltage unipolar value is 0~10V.

Note: The current input and output ranges are completely consistent, but there are differences in the voltage input and output ranges. Please refer to the table below.

- Analog value within unipolar current input/output range:

| System Value | | | Input/Output Range | | |
|--------------|--------|------|--------------------|-----------|---------------------------------|
| | Dec | Hex | 0~20mA | 4~20mA | |
| | 32767 | 7FFF | > 21 mA | > 20.8 mA | Overflow, lock the maximum |
| 104.999% | 32767 | 7FFF | 21 mA | 20.8 mA | Overshoot range |
| | 31208 | 79E8 | | | |
| 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 | - | | Overshoot range |
| -6.25% | -1950 | F862 | - | 3 mA | |
| | -32768 | 8000 | - | < 3 mA | Underflow, lock the least value |

- Analog value within unipolar voltage input range:

| System Value | | | Input Range | |
|--------------|--------|------|-------------|---------------------------------|
| | Dec | Hex | 0~10 V | |
| 104.999% | 32767 | 7FFF | - | Overflow, lock the maximum |
| | 31208 | 79E8 | - | |
| 100% | 31207 | 79E7 | 10 V | Rated range |
| 75% | 23405 | 5B6D | 7.5 V | |
| 0.0032% | 1 | 1 | | |
| 0% | 0 | 0 | 0 V | |
| | -1 | FFFF | - | |
| -104.999% | -32768 | 8000 | - | Underflow, lock the least value |

- Analog value within unipolar voltage output range:

| System Value | | | Output Range | |
|--------------|--------|------|--------------|---------------------------------|
| | Dec | | Dec | |
| 104.999% | 32767 | 7FFF | 10.5V | Overflow, lock the maximum |
| | 31208 | 79E8 | | |
| 100% | 31207 | 79E7 | 10 V | Rated range |
| 75% | 23405 | 5B6D | 7.5 V | |
| 0.0032% | 1 | 1 | | |
| 0% | 0 | 0 | 0 V | |
| | -1 | FFFF | - | |
| -104.999% | -32768 | 8000 | - | Underflow, lock the least value |

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-08UA-M12G |
| 19 | 0 | Product ID | RO | FB330083 |
| 20 | 0 | Product Text | RO | IO-Link Analog Input/Output Module IP67 |
| 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 | Port0 Config | RW | 0xFF, 0x06, 0x01, 0x00 |
| | 1 | Range | RW | 0xFF |
| | 2 | Filter Setting | RW | 0x06 |
| | 3 | Enable Diagnostic | RW | 0x01 |
| 65 | 0 | Port1 Config | RW | 0xFF, 0x06, 0x01, 0x00 |
| | 1 | Range | RW | 0xFF |
| | 2 | Filter Setting | RW | 0x06 |
| | 3 | Enable Diagnostic | RW | 0x01 |
| 66 | 0 | Port2 Config | RW | 0xFF, 0x06, 0x01, 0x00 |
| | 1 | Range | RW | 0xFF |
| | 2 | Filter Setting | RW | 0x06 |
| | 3 | Enable Diagnostic | RW | 0x01 |
| 67 | 0 | Port3 Config | RW | 0xFF, 0x06, 0x01, 0x00 |
| | 1 | Range | RW | 0xFF |
| | 2 | Filter Setting | RW | 0x06 |
| | 3 | Enable Diagnostic | RW | 0x01 |
| 68 | 0 | Port4 Config | RW | 0xFF, 0x06, 0x01, 0x00 |
| | 1 | Range | RW | 0xFF |
| | 2 | Filter Setting | RW | 0x06 |
| | 3 | Enable Diagnostic | RW | 0x01 |
| 69 | 0 | Port5 Config | RW | 0xFF, 0x06, 0x01, 0x00 |
| | 1 | Range | RW | 0xFF |
| | 2 | Filter Setting | RW | 0x06 |
| | 3 | Enable Diagnostic | RW | 0x01 |
| | | | | |
| 70 | 0 | Port6 Config | RW | 0xFF, 0x06, 0x01, 0x00 |

| | | | | |
|----|---|-------------------|----|------------------------|
| | 1 | Range | RW | 0xFF |
| | 2 | Filter Setting | RW | 0x06 |
| | 3 | Enable Diagnostic | RW | 0x01 |
| 71 | 0 | Port7 Config | RW | 0xFF, 0x06, 0x01, 0x00 |
| | 1 | Range | RW | 0xFF |
| | 2 | Filter Setting | RW | 0x06 |
| | 3 | Enable Diagnostic | RW | 0x01 |

6.3 ISDU parameter modification

The following table lists the meanings represented by the parameter modification values of Index 64~71, 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 |
| | 0xFF | Channel Deactive |

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

| | | |
|-------------------|-----|----------|
| Enable Diagnostic | 0x0 | Disabled |
| | 0x1 | Enabled |