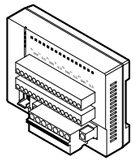
FASTUS
Good Thinking, Good Future

INSTRUCTION MANUAL

IO-Link Hub

UR-DS4AD

(4-input)



OPTEX FA CO., LTD.

Thank you for purchasing the UR-DS4AD IO-Link Hub.

This manual includes the information required to use the UR-DS4AD. Please read this manual carefully before use, and fully understand the functions and performance before using this product correctly. Also, keep this manual in a safe place after reading it, and always keep it handy.

Safety Precautions

Safety precautions for ensuring safe operation of this product are displayed as follows with the following symbols.

Precautions listed here describe important information about safety. Make sure to follow them accordingly.

Safety Symbols

⚠WARNING	Indicates that any improper operation or handling may result in moderate or minor injury, and in rare cases, serious injury or death. Also indicates a risk of serious property damage.
⚠CAUTION	Indicates that any improper operation or handling may result in minor injury or property damage.

⚠WARNING	
	Do not disassemble, repair, modify, deform under pressure or attempt to incinerate this product. Doing so may cause injury or fire.
	Do not use this product in water or in a location where it may be exposed to water. Do not use this product if wet. Doing so may cause a fire or damage the product.
	This product is not explosion-proof and should not be used around flammable or explosive gases or liquids. Doing so may cause ignition resulting in an explosion or fire.
	Do not use air dusters or any spray that uses flammable gas around the product or on the inside of the product. Doing so may cause ignition resulting in an explosion or fire.
	Do not use this product in environments other than industrial environments. If used in other environments, it may cause induction and radiation interference.
	Do not install this product or its cables in any of the following locations. Doing so may cause a fire, damage or a malfunction. 1. Locations where dust, salt, iron powders or vapor (steam) is present. 2. Locations subjected to corrosive gases or flammable gases. 3. Locations where water, oil or chemical splashes may occur. 4. Locations where heavy vibrations or impacts may occur. 5. Locations where the ambient temperature exceeds the rated range. 6. Locations subject to rapid temperature changes (or where condensation occurs). 7. Locations with strong electric or magnetic fields. 8. Outdoor locations or locations subject to direct light.
	Do not use the product at voltages or with AC power supplies that exceed the rated voltage. Doing so may cause a fire or damage the product.
	What to do in the event of a malfunction such as smoke being emitted from the product: If you detect any malfunction including emission of smoke, abnormal smells or sounds or the body becoming very hot, immediately stop operating the product and turn off the power. Failure to do so can cause fire. Repairing the product is dangerous and should in no way be performed by the customer. Contact an OPTEX FA sales representative for repairs.
	What to do if water enters the product: If water or any other liquid enters the product or the cable, immediately stop operating the product and turn off the power. Using the product in this condition may cause a fire.

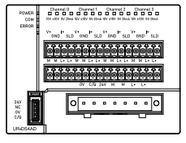
⚠CAUTION	
	Do not touch this product or the cable with wet hands. Incorrect wiring can cause product failure or malfunction.
	When wiring this product, do so properly according to this manual and specified instruction manuals. Incorrect wiring can cause product failure or malfunction.
	Connect only specified cables to this product. Use of cables other than those specified can cause malfunction.
	Keep wiring separate from high voltage and motor circuits. Using the same wiring can cause malfunction or failure. If this is unavoidable, shield with a conductor such as an earthed conduit.
	Install this product as far away as possible from high-voltage equipment, equipment that generates large switching surges and equipment that generates noise, such as welding machines or inverter motors.
	Use this product with the end plate (sold separately) mounted to the DIN rail. Make sure locking mechanisms are locked before use.
	Tighten the mounting screws that attach the power terminal block to the main unit with a torque value of 0.25 N･m or less.
	Do not apply torsional stress to cables. Doing so can cause cables and connectors to malfunction. Secure the communications cable drawn out of this product within lengths of 30 cm to ensure no load is applied to the product.
	Do not drop this product or subject it to strong impact or vibrations. Doing so can cause malfunction.
	This product generates heat during operation, so do not maintain physical contact for long periods of time. Doing so can cause low-temperature burns, etc.
	Use this product within the rated range.
	Do not cut power during communication.
	Make sure to turn OFF the power before connecting or disconnecting cables and connectors. Connection or disconnection while running can cause malfunction.
	Always hold the connector when connecting or disconnecting cables and do not apply excessive force to cables.
	When removing a connector, do not touch the terminals inside the connector or allow foreign objects to get inside.
	When using power cables or commercially available switching regulators, make sure the frame ground (FG) is grounded.
	Wait until after transient state (approx. 2 sec.) when power is turned ON before use.
	Make sure to use an isolation transformer for DC power supply.
	If a surge occurs in the power supply used, use a surge absorber for the source of generation.
	If this product used in a manner not specified by the manufacturer, the protection provided by this product may be impaired.

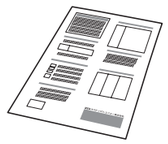
1. Overview

IO-Link Hub UR-DS4AD is a remote analog input unit that specifies 4 analog input signals to control various actuators with process input data from the IO-Link master.

It can be used to control devices with analog output, such as changing the speed of a motor, or adjusting flow rate or fan speed.

2. Included Items



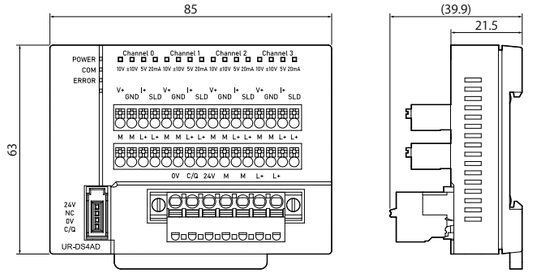


- UR-DS4AD unit
- 2x Device terminal block
- This instruction manual
- Power terminal block

* If the terminal block is lost or damaged, order the following model.
  Device terminal block: UR-FD16D (contains 1)
  Power terminal block: UR-FP7T

3. Dimensions

Unit (mm)

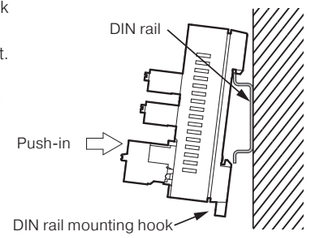


4. Installation

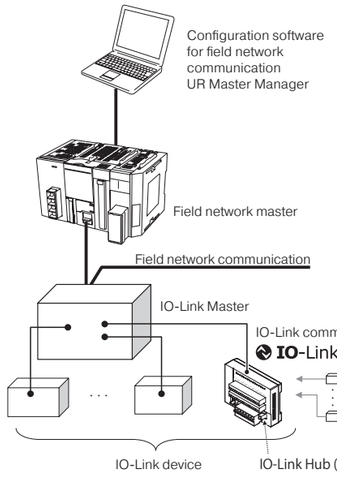
Follow the steps below to install this product.

1. Hook the upper hook on the back of the product to the DIN rail.
2. Push the lower side from the front.
3. Push the DIN rail mounting hook up to lock the product in place.

Install this product at least 10 mm away from an adjacent device and structure.



5. System Configuration



6. Connection

When inserting or removing wires from the terminal block, press the open/close key (orange part) while inserting/removing.

In the case of ferrules, they can be inserted without pressing the open/close key, but when pulling them out, press it in while doing so. Pulling out without pressing in the key may damage the terminal block.

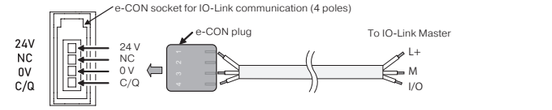
The recommended crimping tool is CRIMPFOX 6 from PHOENIX CONTACT. When using a crimping tool other than the recommended one, use a type that crimps from the top and bottom (2 directions).

If other tools are used to crimp and insert the terminal block, the terminal block may be damaged when pulling it out.

Wiring to the IO-Link master

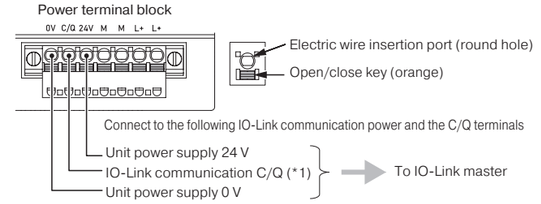
Connect the IO-Link master to either the e-CON socket on this product or the IO-Link communication terminals on the power terminal block.

・Connecting to the IO-Link communication e-CON socket



Applicable wires should be between AWG 28 to 20 wires with a rated temperature of 75˚C or higher.

・Connecting to the IO-Link communication terminals on the power terminal block

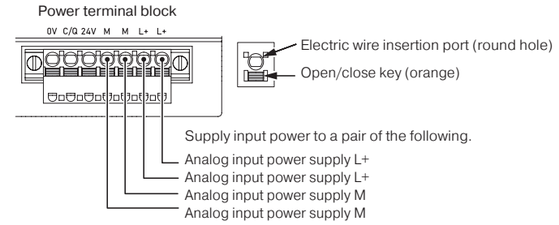


Note 1: C/Q is connected internally with the IO-Link communication e-CON socket.

Applicable wires should be between AWG 24 to 12 wires with a rated temperature of 75˚C or higher.
A ferrule, single or stranded wire can be inserted to the terminal hole.
The stripped length of single or stranded wire should be 10 mm.
The recommended ferrule is AI 0.5-10 WH (AWG20) from PHOENIX CONTACT. For dimensions and ferrules other than AWG20, refer to the UR-DS4AD/UR-DS4AD User's Manual.

Wiring to the analog input power supply

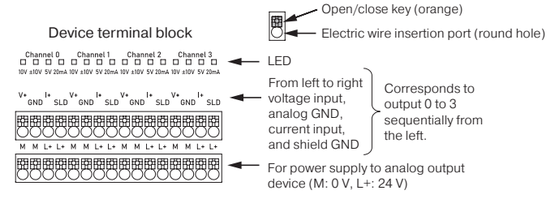
Supply power to the input device from the device terminals on the power terminal block.



Applicable wires should be between AWG 24 to 12 wires with a rated temperature of 75˚C or higher.
A ferrule, single or stranded wire can be inserted to the terminal hole.
The stripped length of single or stranded wire should be 10 mm.
The recommended ferrule is AI 0.5-10 WH (AWG20) from PHOENIX CONTACT. For dimensions and ferrules other than AWG20, refer to the UR-DS4AD/UR-DS4AD User's Manual.

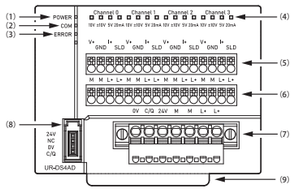
Wiring to the device terminal block

Connect the wires for power supply and input signal of input devices to the 16-channel device terminal blocks.



Applicable wires should be between AWG 28 to 16 wires with a rated temperature of 75˚C or higher.
A ferrule, single or stranded wire can be inserted to the terminal hole.
The stripped length of single or stranded wire should be 10 mm.
The recommended ferrule is AI 0.25-8 YE (AWG24) from PHOENIX CONTACT. For dimensions and ferrules other than AWG24, refer to the UR-DS4AD/UR-DS4AD User's Manual.

7. Part Names



No.	Name	Function
(1)	POWER LED (green)	Turns on when the unit power is turned on.
(2)	COM LED (green)	Illuminated: After startup, before IO-Link communication is established 1 second on 0.1 second off: IO-Link communication established 0.55 second on 0.55 second off: Find me 0.1 second on 0.1 second off: IO-Link communication cutoff
(3)	ERROR LED (Red)	Turns on when IO-Link communication stops or some other error occurs.
(4)	Input type LED (orange)	Turns on/off based on the type of analog input for each channel. 1 to 5 V is displayed as 0 to 5 V, and 4 to 20 mA is displayed as 0 to 20 mA.
(5)	Device terminal block (V+, GND, I+, GND)	Connects analog input signals (V+0 to 3, I+0 to 3, GND) and the shield wire (SLD) to the analog output device.
(6)	Analog output device power supply terminal block (L+, M)	Used to supply 24 V power (L+, M) to the analog output device.
(7)	Power terminal block (0 V, +24 V)	Supplies unit power (+24 V, 0 V) and I/O power (L+, M). This seven-pole removable connector has a pitch of 5.08 mm and a rating of 12 A. It uses AWG 24 to 12 wires. It is wired in parallel with the input power supply. Unit power (+24 V, 0 V) and C/Q are wired to the IO-Link master, and unit power is supplied by the IO-Link master. Unit power (+24 V, 0 V) and C/Q are connected internally with the terminals of the e-CON socket, and either the power terminal block or e-CON socket can be connected to the IO-Link master.
(8)	e-CON socket (4-pole)	Unit power (+24 V, 0 V) and C/Q can be wired to the IO-Link master via the e-CON socket.
(9)	DIN rail mounting hook	Slides for attaching/removing the product to/from the DIN rail.

8. Specifications

General Specifications

Item		Specifications
Power supply voltage		24 VDC +/-15% (*1)
Current consumption		50 mA max. (for 24 VDC)
Operating temperature		0 to +55°C (no freezing)
Operating humidity		5 to 95% RH (no condensation)
Storage temperature		-25 to +75°C (no freezing)
Storage humidity		5 to 95% RH (no condensation)
Vibration resistance		IEC 61131-2 compliant
Shock resistance		IEC 61131-2 compliant
Atmosphere		No corrosive gas
Operating altitude		0 to 2000 m
Installation location		In door use
Degree of protection		IP20
Measurement category		II or lower
Pollution degree		2 or lower
Applicable regulations	EMC	EMC Directive (2014/30/EU)
	Environment	RoHS Directive (2011/65/EU), China RoHS (Regulation 32)
Applicable standard		EN 61131-2 (Zone A)
Company standards		Noise resistance: Feilen Level 3 cleared
Compatible DIN rail		TH35-7.5Fe, TH35-7.5Al
Cable length		Maximum 20m (between IO-Link master and remote I/O unit)
Compatible wire		Power terminal block: AWG 24 to 12 Input terminal block: AWG 28 to 16
Material		Unit: PC; DIN rail mounting hook: POM; Terminal block: PA
Weight		Approx. 105 g (including terminal blocks, when not wired)
Included accessories		Instruction manual (this document), 2x device terminal block, power terminal block

*1 Use a Class 2 power supply or a power supply compliant with SELV (Safety Extra-Low Voltage) circuit and LIM (Limited Energy Circuit) circuit standards.

IO-Link Specifications

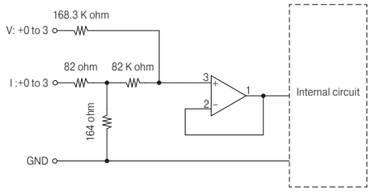
Item	Specifications
Host communication interface	IO-Link (operates as device)
Process input data byte count	8 bytes
Process output data byte count	1 byte
Minimum cycle time	0.7 ms
IO-Link revision	1.1
Communication speed	COM3 (230.4 kbps)
Communication function operation power supply	IO-Link power supply

Analog input Specifications

Item	Specifications
Number of Input channels	4 CH
Type of analog input	Voltage (0 to 10 V, -10 to 10 V, 0 to 5 V, 1 to 5 V)/ Current (0 to 20 mA, 4 to 20 mA) switchable for all channels (Default value: Switched by process output data)
Maximum input voltage	±11 V
Maximum input current	24 mA
Voltage input equivalent impedance	250.5 k ohm
Current input equivalent impedance	246 ohm
Voltage accuracy	±0.30% of F.S. (at ambient temperature of 25°C)(*1) Temperature coefficient (typical): ±80ppm/°C (0.008%/°C)
Current accuracy	±0.30% of F.S. (at ambient temperature of 25°C) Temperature coefficient (typical): ±110ppm/°C (0.011%/°C)
Input resolution	16 bits
Dielectric withstand voltage	500 VAC for one minute between I/O terminal batch and IO-Link batch
Insulation resistance	10 Mega ohm or higher between all I/O terminals and IO-Link terminals at 500 VDC
Inter-channel isolation	None (common)
Insulation method	Photocoupler insulation

*1: Accuracy when the type of analog input is set to 0 to 10 V or -10 to 10 V. Full scale is calculated as 10 V even when 0 to 5 V or 1 to 5 V is set.

9. Circuit Diagram



10. Process Data

The process data exchanged by the product with the IO-Link master using IO-Link cyclic communication is as follows.

IO-Link process data is transferred in big endian format. The table below is also in big endian format.
The IO-Link master UR series from OPTEX FA transfers IO-Link process data converted into little endian format to the host network by default, so the byte order will be the reverse of that in the table below.

Process data	Byte	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Process input data(*1)	+0	Channel 3 Analog input upper byte							
	+1	Channel 3 Analog input lower byte							
	+2	Channel 2 Analog input upper byte							
	+3	Channel 2 Analog input lower byte							
	+4	Channel 1 Analog input upper byte							
	+5	Channel 1 Analog input lower byte							
	+6	Channel 0 Analog input upper byte							
	+7	Channel 0 Analog input lower byte							
Process output data	+0 (*2)	Channel 3 Input type		Channel 2 Input type		Channel 1 Input type		Channel 0 Input type	
		0: 0 to 10 V, 1: -10 to 10 V, 2: 0 to 5 V, 3: 0 to 20 mA							

*1 If the analog input value drops below the lower limit in the 1 to 5 V input or 4 to 20 mA input, the process input data will be 32768 (0x8000).

*2 When index number 74 (“Type of analog input”) of the service data is “0”, this designation by process output data is valid. Note that the process input data is fixed at 0 to 10 V input for “1”, -10 to 10 V input for “2”, 0 to 5 V input for “3”, 1 to 5 V input for “4”, 0 to 20 mA input for “5”, and 4 to 20 mA input for “6”.

11. Service Data

The service data for this product that can be read and written via IO-Link ISDU handling is as follows.

Name	Index number	Subindex number	Read/ Write(*1)	Backup Subject	Data byte count	Default value	Setup value	Setting Details
System command	2	0	W		1	-	130	Initialization of setting value
							131	Stops IO-Link communication after reverting setting values to default values (Back-to-Box)
Device lock	12	0	R/W	✓	2	0	0	Unlocks the storage function.
							2	Storage function lock.
Tag name	24	0	R/W	✓	32	(*2)		Can be used to set a name for this unit, such as the device function or installation location.
Type of analog input	74	0	R/W	✓	4	0		Switches the input type for channels 0 to 3. The first byte is the value of channel 0. See the following for the meaning of each byte value.
		1 to 4		✓	1		0	The input type is switched using process output data.
							1	Sets to 0 to 10 V voltage input.
							2	Sets to -10 to 10 V voltage input.
							3	Sets to 0 to 5 V voltage input.
							4	Sets to 1 to 5 V voltage input.
							5	Sets to 0 to 20 mA current input.
							6	Sets to 4 to 20 mA current input.
Maximum span value	76	0	R/W	✓	8	32000		Sets the maximum span value for channels 0 to 3. Specifies the value given to the process input data when inputting the maximum value of the input range. The first two bytes are the value for channel 0.
		1 to 4			2		-32768 to 32767	Each channel is set separately. Subindex number 1 corresponds to channel 0.
Minimum span value	77	0	R/W	✓	8	0		Sets the minimum span value for channels 0 to 3. Specifies the value given to the process input data when inputting the input range value 0. The first two bytes are the value for channel 0.
		1 to 4			2		-32768 to 32767	Each channel is set separately. Subindex number 1 corresponds to channel 0.
Shift value	78	0	R/W	✓	8	0		Sets the shift value for channels 0 to 3. The span is calculated by adding this shift value to the process input data. The first two bytes are the value of channel 0.
		1 to 4			2		-32768 to 32767	Each channel is set separately. Subindex number 1 corresponds to channel 0.
Averaging time	79	0	R/W	✓	4	5		Sets the averaging time for channels 0 to 3.
		1 to 4			1		0	750 µs
							1	1.5 ms
							2	3 ms
							3	6 ms
							4	12 ms
							5	24 ms
							6	48 ms
Internal temperature	161	0	R		2		-2739 to 10461	Returns the temperature on the internal board. The unit is 0.1°C.
Operating time	162	0	R		4		0 to 4294967295	Returns the internal operation time. The unit is 7.5 minutes.
Displayed decimal point position	193	0	R/W	✓	4	0		Specifies the decimal point position for the process input data displayed on the IO-Link master UR series. The first byte corresponds to channel 0.
		1 to 4		✓	1		0 to 10	Each channel is set separately. Subindex number 1 corresponds to channel 0.
Display unit character string	194	1 to 4	R/W	✓	6	None		Specifies the unit character string for the process input data displayed on the IO-Link master UR series.
Device identification request (Find me)	204	0	R/W		1	0	0	Normal status
							1	Flash the COM LED at 0.55 second intervals

*1 R: Read only, W: Write only, R/W: Read/Write

2 The default value is 32 “”(asterisk) characters

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

*This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

- Support for the China RoHS directive

For details on the support for the China RoHS (the Administrative Measure on the Control of Pollution Caused by Electronic Information Products), see the following website.
https://www.optex-fa.com/rohs_cn/

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