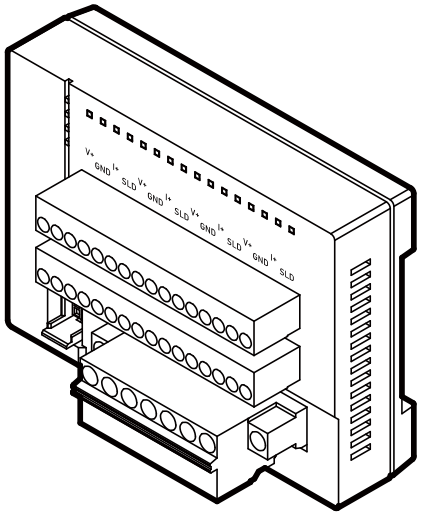
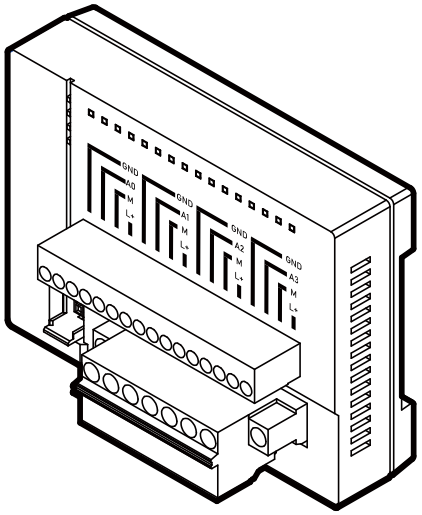
Good Thinking, Good Future

*FASTUS is a product brand of OPTEX FA.

IO-Link Hub
UR-DS4AD
UR-DS4DA

User's Manual





OPTEX FA CO., LTD.

Introduction

Thank you for purchasing the UR-DS4AD IO-Link IO-Link Hub, Analog I/O 4-input and UR-DS4DA IO-Link IO-Link Hub, Analog I/O 4-output.

This manual includes the information required to use the UR-DS4AD and UR-DS4DA.

Read this manual carefully before use, and fully understand the functions and performance before using UR-DS4AD/UR-DS4DA correctly. Also, keep this manual in a safe place after reading it, and always keep it handy.

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Revision history

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Second edition: 2024.8 (Changed description of IEC61131-2)

Contents

1. Overview 6
   - UR-DS4AD 6
   - UR-DS4DA 6
2. Included Items 6
3. Dimensions 7
   - UR-DS4AD 7
   - UR-DS4DA 7
4. Installation 8
5. System Configuration 9
6. Connection 10
   - Connection overview 10
   - Wiring to the IO-Link Master 11
     - Connecting to the IO-Link communication e-CON socket 11
     - Connecting to the IO-Link communication terminals on the power terminal block 11
   - Wiring to the analog input/output power supply 12
   - Wiring to the device terminal block for UR-DS4AD 12
   - Wiring to the device terminal block for UR-DS4DA 13
   - **Wire Installation** 13

     Wire to be used 13

     Recommended ferrule and crimping tool 14

     Wire installation method 15

     Wire with ferrule installation method 15

     Wire insertion slot shape 15

     Wire Removal 16
7. Part names 17
   - UR-DS4AD 17
   - UR-DS4DA 18

8. Specifications 19
- General Specifications 19
- IO-Link Specifications 20
- Analog input specifications for UR-DS4AD 20
- Analog output specifications for UR-DS4AD 21

9. Circuit Diagram 22
- Analog input circuit diagram for UR-DS4AD 22
- Analog output circuit diagram for UR-DS4DA 22

10. Process Data 23
- UR-DS4AD 23

Word assignment 24
- UR-DS4DA 25

Word assignment 25

11. Service Data 27
- UR-DS4AD 27
- UR-DS4DA 29

12. Events 31

13. Troubleshooting 32

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

■ UR-DS4AD

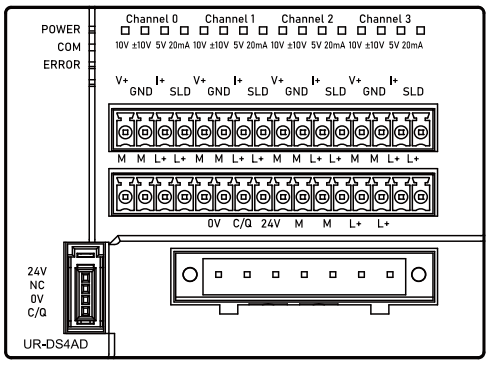
IO-Link Hub, Analog I/O 4-input UR-DS4AD is a remote analog input unit that specifies 4 analog input signals to control various actuators with process output data from the IO-Link master.
It can be used to control devices with analog output, such as changing the speed of a motor, or adjusting flow rate or fan speed.

■ UR-DS4DA

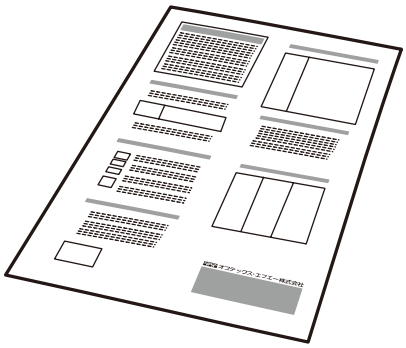
IO-Link Hub, Analog I/O 4-output UR-DS4DA is a remote analog output unit that specifies 4 analog output signals to control various actuators with process output data from the IO-Link master.

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

2. Included Items



(This illustration is for UR-DS4AD)



- Product body(UR-DS4DA／UR-DS4AD)
- Device terminal block x 2 (for UR-DS4AD)
- Device terminal block (for UR-DS4DA)
- Power terminal block

Instruction manual

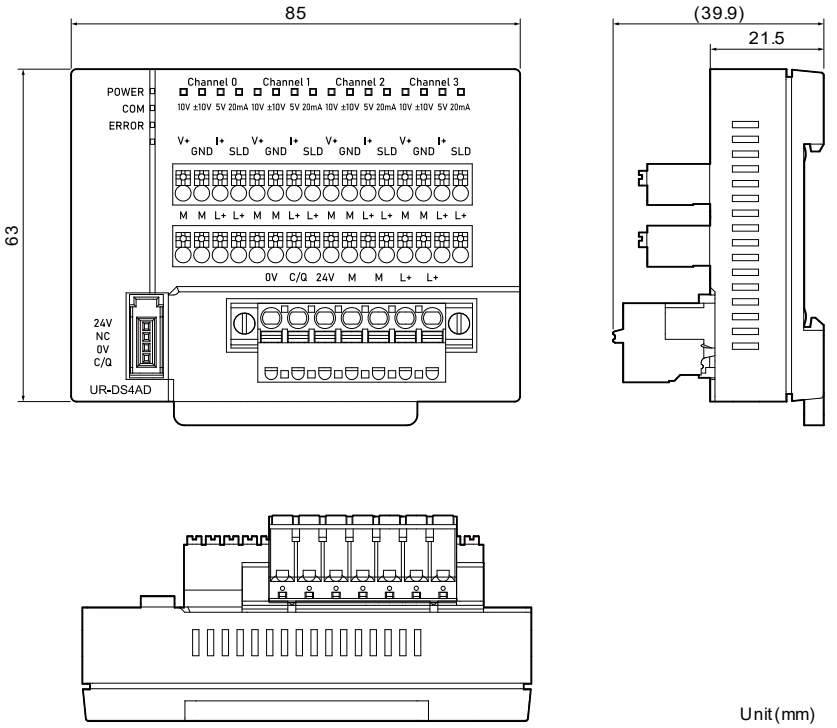
If terminal blocks are lost or damaged, order the following model.

Device terminal block : UR-FD16D (contains 1)

Power terminal block : UR-FP7T

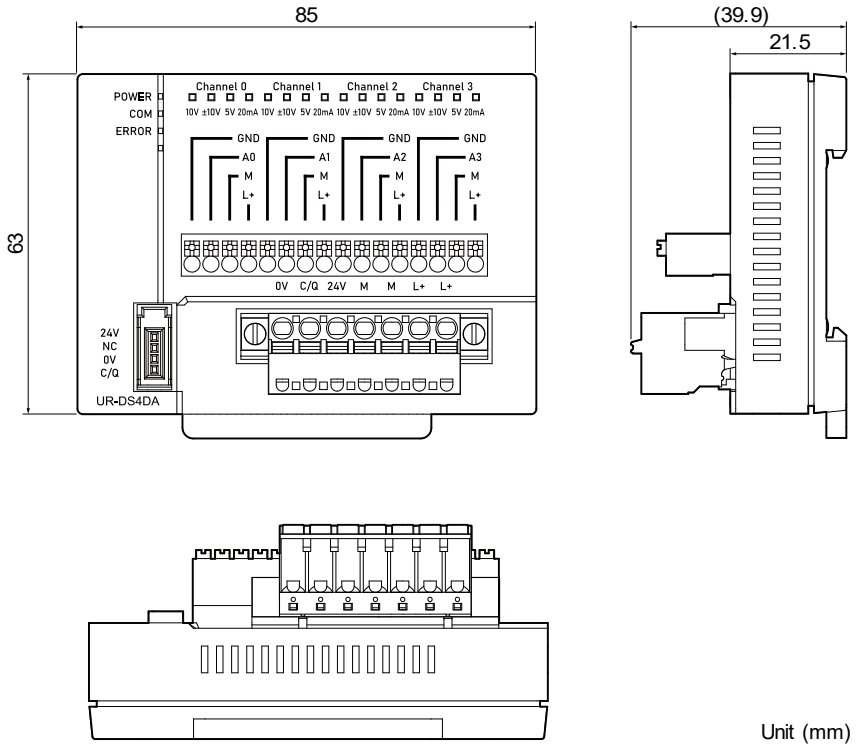
3. Dimensions

■ UR-DS4AD



Unit(mm)

■ UR-DS4DA



Unit (mm)

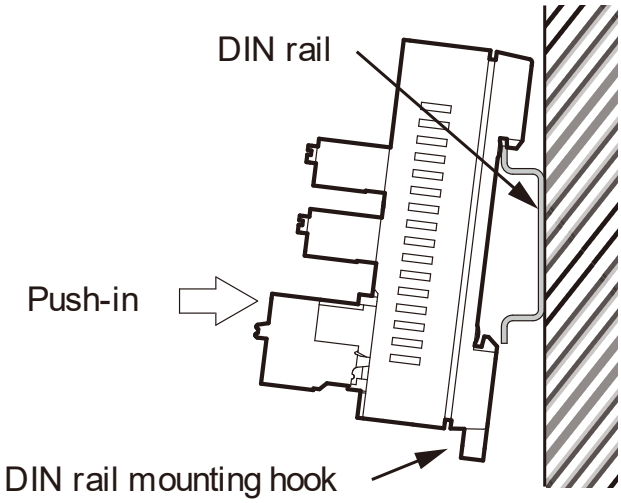
4. Installation

Follow the steps below to install UR-DS4AD/UR-DS4DA.

1. Hook the upper hook on the back of the product to the DIN rail.

2. Push the lower side from the front.

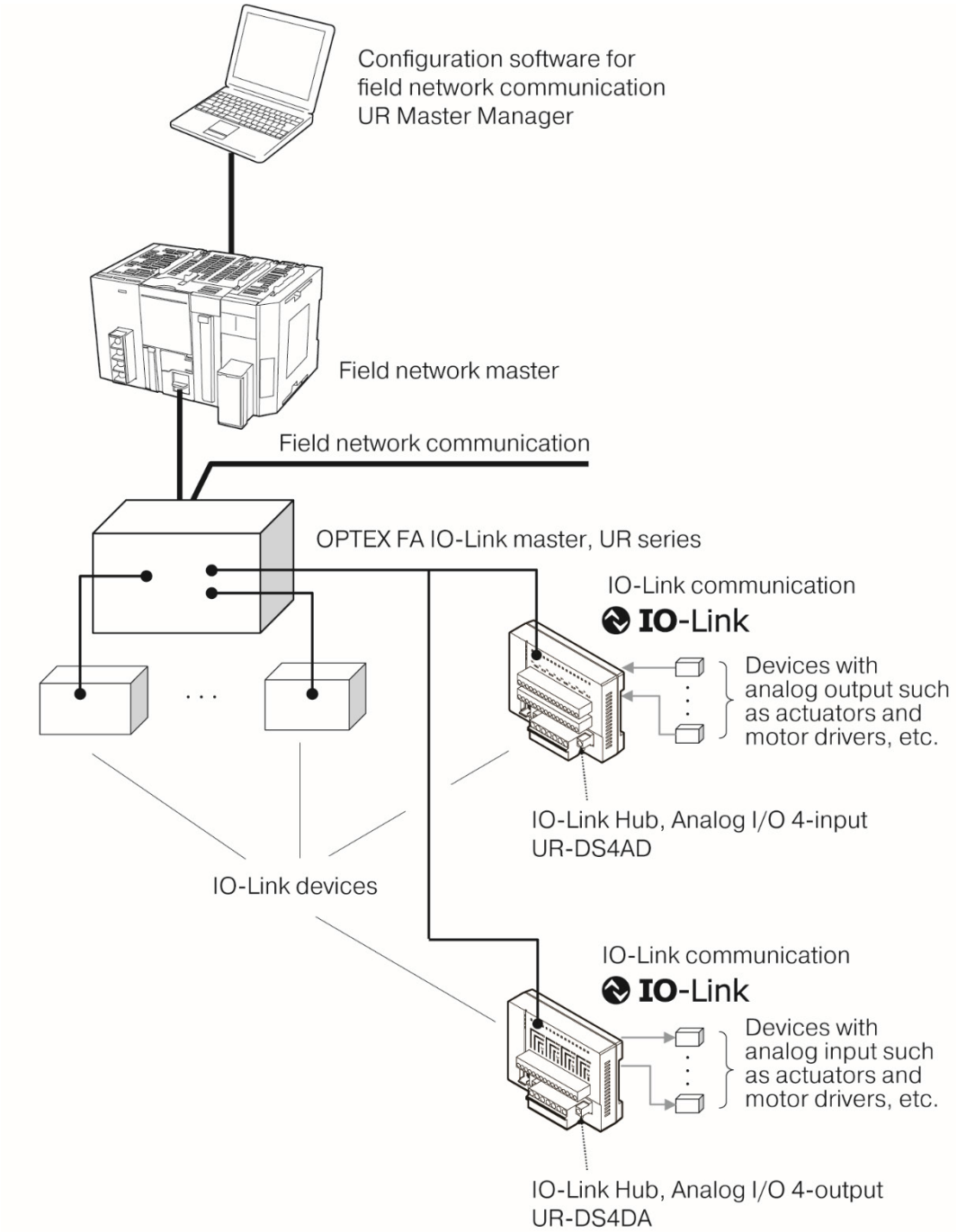
3. Push the DIN rail mounting hook up to lock the product in place.



(This illustration is for UR-DS4AD)

Install UR-DS4AD/UR-DS4DA at least 10 mm away from an adjacent device and structure.

5. System Configuration

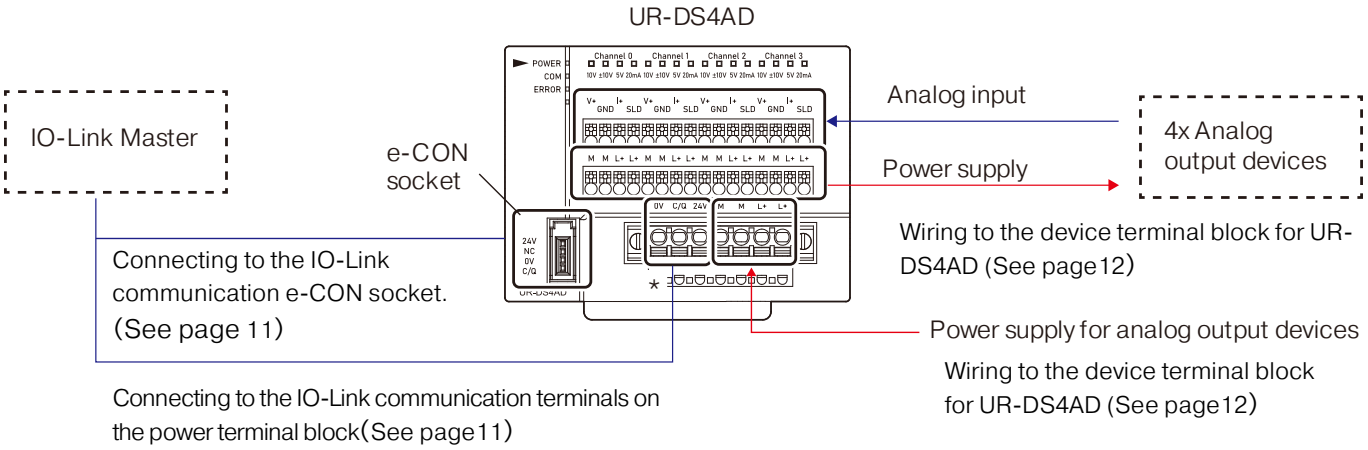


6. Connection

Connect the IO-Link master and external devices via IO-Link to the connectors and terminal blocks of UR-DS4AD/UR-DS4DA as shown below.

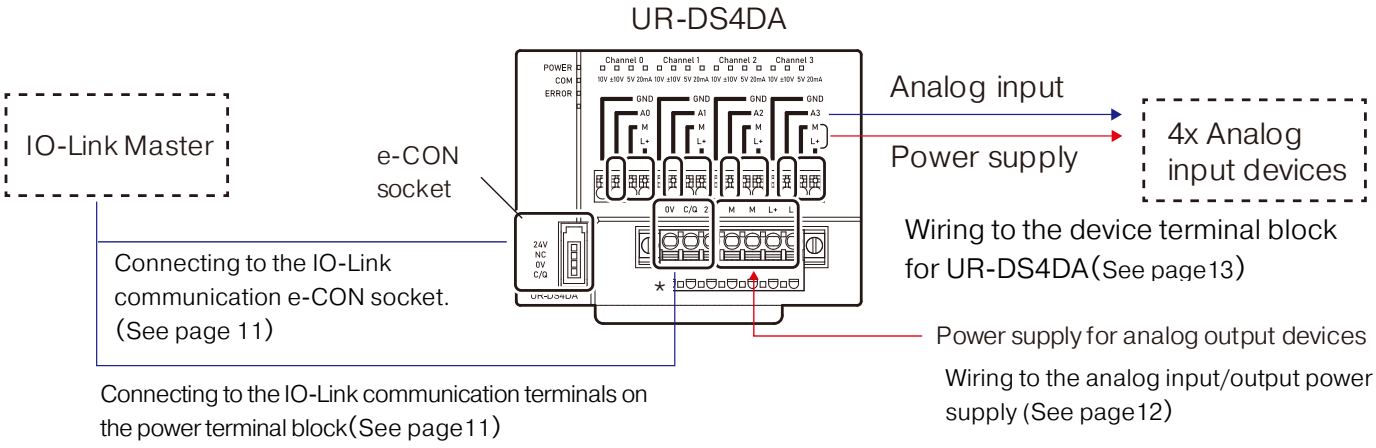
■ Connection overview

・UR-DS4AD



*Unit power (+24 V, 0 V) and C/Q are connected internally with the terminals of the e-CON socket.

・UR-DS4DA

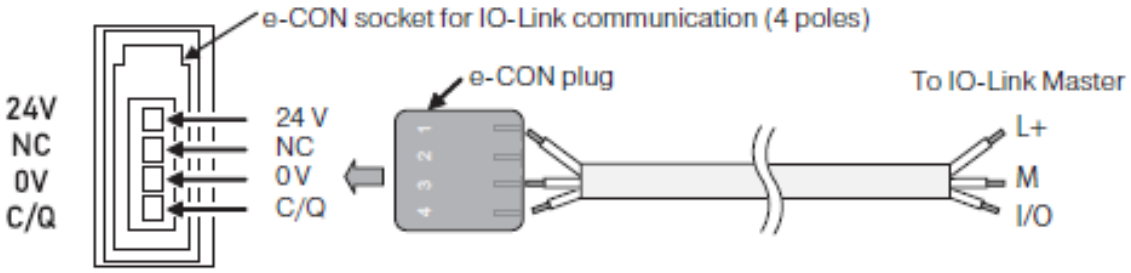


*Unit power (+24 V, 0 V) and C/Q are connected internally with the terminals of the e-CON socket.

■ 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.

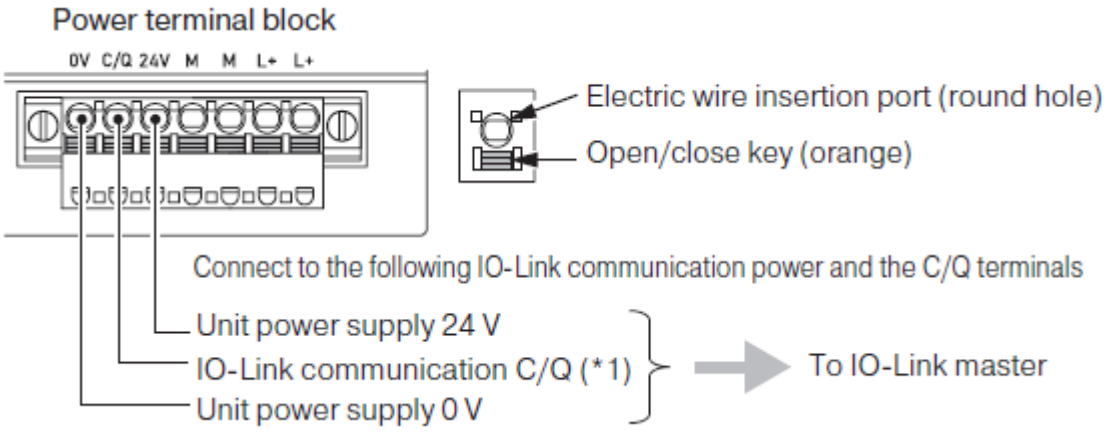


Applicable wires should be between AWG 28 to 20 stranded wires with a rated temperature of 75°C or higher.

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

Connect the 0V, C/Q, 24 V terminals on the power terminal block to the IO-Link master.

For the wires to be used and recommended ferrule, refer to "Wire Installation" on page 13.

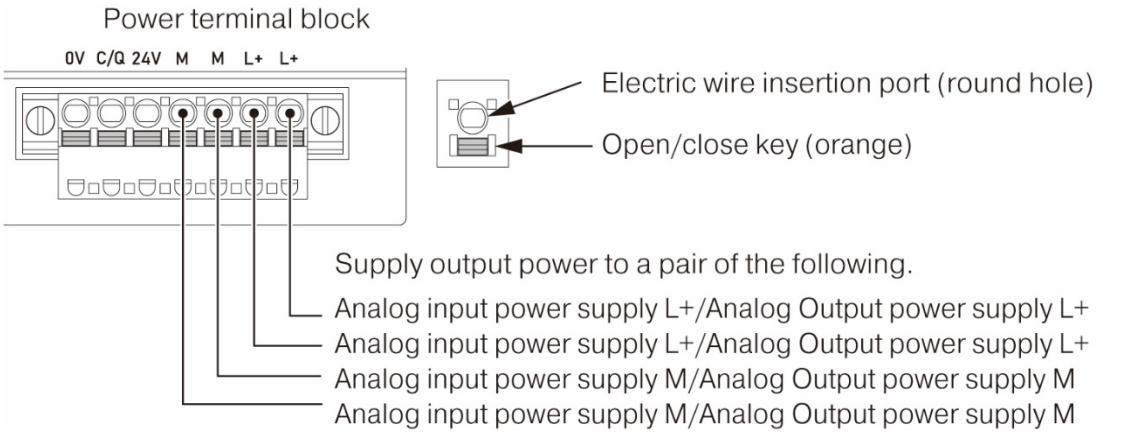


*1: C/Q is connected internally with the IO-Link communication e-CON socket.

■ Wiring to the analog input/output power supply

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

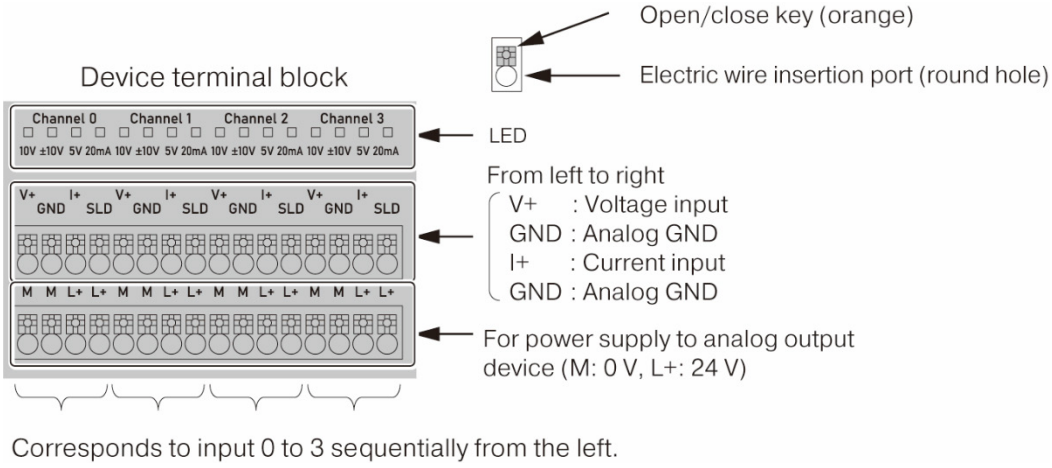
For the wires to be used and recommended ferrule, refer to "Wire Installation" on page 13.



■ Wiring to the device terminal block for UR-DS4AD

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

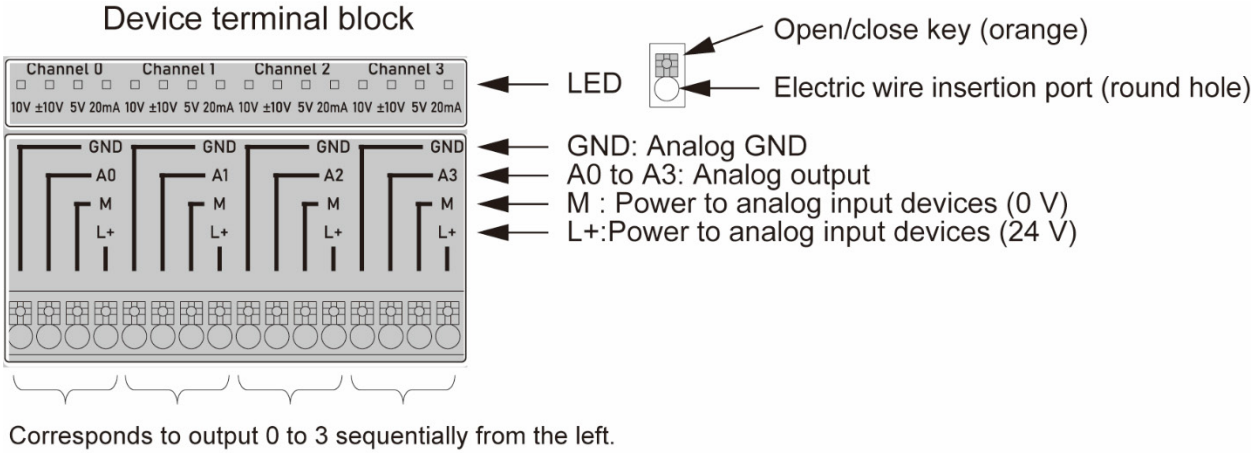
For the wires to be used and recommended ferrule, refer to "Wire Installation" on page 13.



■ Wiring to the device terminal block for UR-DS4DA

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

For the wires to be used and recommended ferrule, refer to "Wire Installation" on page 13.



■ Wire Installation

A single or stranded wire can be used, and a ferrule can be attached to the tip of the wire.

The stripped length of single or stranded wire should be 10 mm.

Wire to be used

Use wires with a diameter compatible with the terminal blocks.

・Power terminal block: +24V, 0V, L+, M, C/Q
  AWG24 to 12
  Use wires with a temperature rating of 75 ˚C or higher.

・Device terminal block:(for UR-DS4DA) L+, M, A0 to 3, GND
  AWG28 to 16
  Use wires with a temperature rating of 75 ˚C or higher.

・Device terminal block:(for UR-DS4AD) V+, I+, GND, SLD
  AWG28 to 16
  Use wires with a temperature rating of 75 ˚C or higher.

・Cable length
  Maximum 20 m (between IO-Link Master and IO-Link Hub)

Recommended ferrule and crimping tool

・Ferrule for the power terminal block

The recommended ferrule is AI 0.5-10 WH (AWG20) from PHOENIX CONTACT.

For dimensions and ferrules other than AWG20, refer to the table below.

・ Ferrule for the Device terminal block

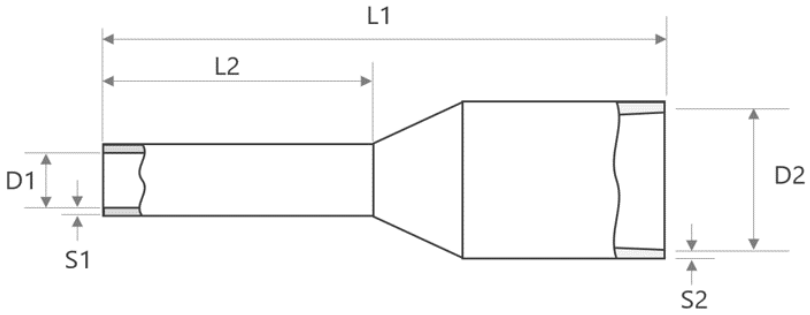
The recommended ferrule is AI 0.25-10 YE (AWG24) from PHOENIX CONTACT.

For dimensions and ferrules other than AWG24, refer to the table below.

・ Crimping tool

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.



Unit: mm

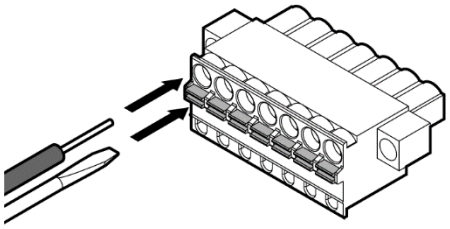
Terminal block	AWG	Ferrules from PHOENIX CONTACT							
		Model	Dimensions						Insulation sleeve color
			L1	L2	D1	S1	D2	S2	
Device terminal block	24	AI 0.25-8 YE	12.50	8.00	0.80	0.15	2.00	0.25	Yellow
	22	AI 0.34-10 TQ	14.50	10.00	0.80	0.15	2.00	0.25	Turquoise
	20	AI 0.5-10 WH	16.00	10.00	1.10	0.15	2.50	0.25	White
	18	AI 1-10 RD	16.00	10.00	1.50	0.15	3.00	0.30	Red
	16	AI 1.5-10 BK	16.50	10.00	1.80	0.15	3.40	0.30	Black
Power terminal block	24	AI 0.25-8 YE	12.50	8.00	0.80	0.15	2.00	0.25	Yellow
	22	AI 0.34-10 TQ	14.50	10.00	0.80	0.15	2.00	0.25	Turquoise
	20	AI 0.5-10 WH	16.00	10.00	1.10	0.15	2.50	0.25	White
	18	AI 1-10 RD	16.00	10.00	1.50	0.15	3.00	0.30	Red
	16	AI 1.5-10 BK	16.50	10.00	1.80	0.15	3.40	0.30	Black
	14	AI 2.5-10 BU	17.00	10.00	2.30	0.15	4.20	0.30	Blue

* The contents of ferrules are as of November 2023.

Wire installation method

1. Press the open/close key (orange) of the wire insertion port for installation with a precision flathead screwdriver.
2. Insert the wire from the wire insertion port while pressing the open/close key. Insert the wire until the tip reaches the bottom.
3. Release the open/close key to complete wiring. Pull gently to make sure it does not come loose.

Power terminal block

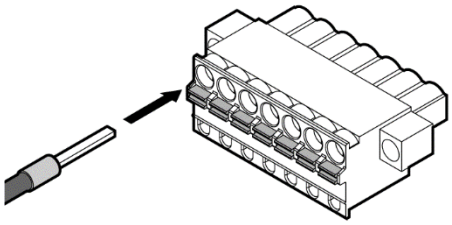


* For device terminal blocks, insert in the same way.

Wire with ferrule installation method

1. Insert the wire with the ferrule attached through the wire insertion port. Insert the ferrule until the tip of the ferrule reaches the bottom.
   (In the case of ferrule, it can be inserted without pressing the open/close key.)
2. Insert it until it reaches the bottom and the wiring is complete. Pull gently to make sure it does not come loose.

Power terminal block

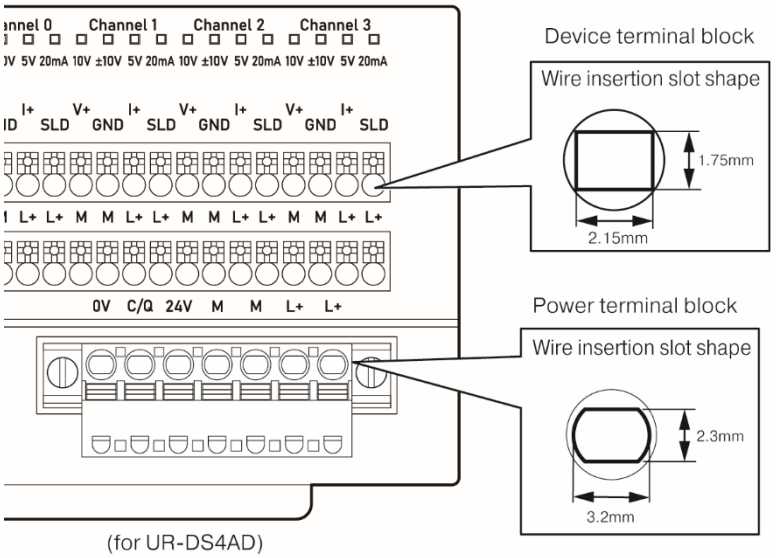


* For device terminal blocks, insert in the same way.

Wire insertion slot shape

Before inserting a wire or ferrule, check the shape of the wire insertion port below and the diameter and orientation of the wire or ferrule.

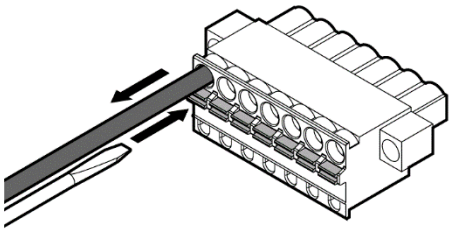
Inserting a wire or ferrule larger than the wire insertion port shown below may damage the terminal block.



Wire Removal

1. Press the open/close key (orange) of the wire insertion port to be removed with a precision flathead screwdriver.
2. Pull out the wire while holding down the open/close key.
   * If the ferrule is stuck inside the terminal block and cannot be removed, the terminal block may be damaged by forceful removal. If the ferrule is stuck, move the ferrule up, down, left, or right while pressing in the open/close key to remove the stuck part, and then pull it out.

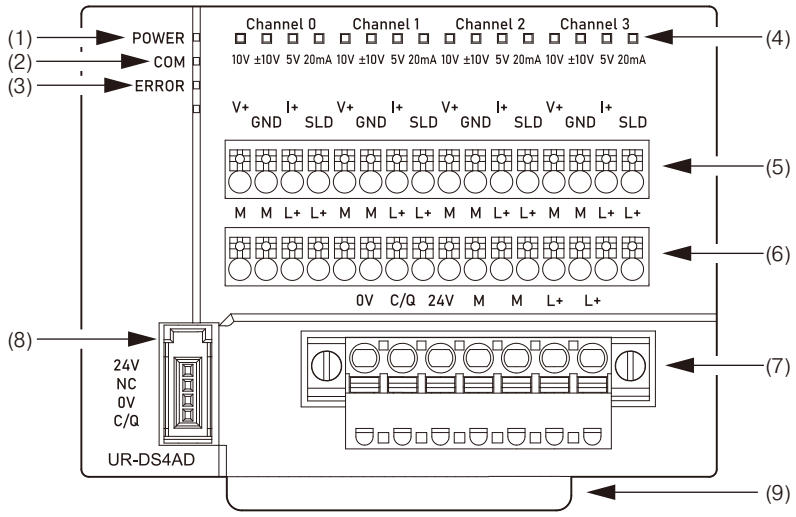
Power terminal block



* For device terminal blocks, pull out in the same way.

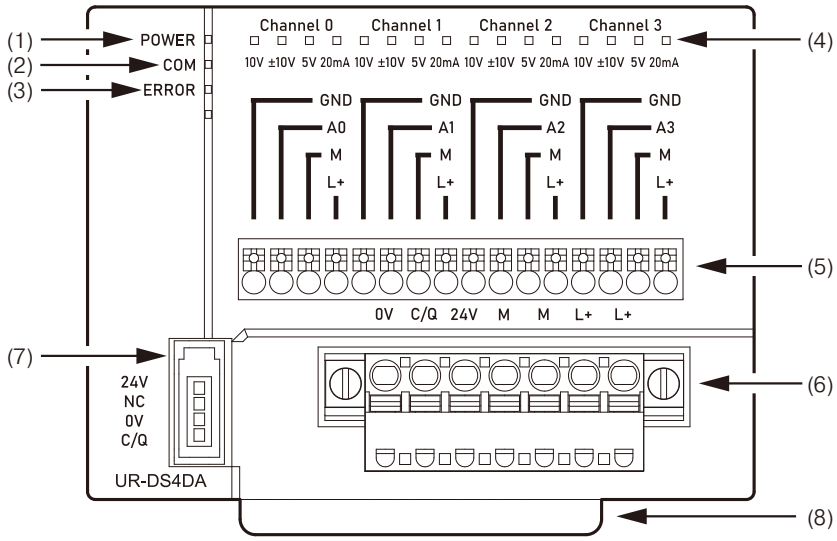
7. Part names

■ UR-DS4AD



No.	Name	Function
(1)	POWER LED (green)	Lights up when power is turned on for the analog input device.
(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)	Device 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 Input power (L+, M). This seven-pole removable connector has a pitch of 5.08 mm and a rating of 12 A. 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.

■ UR-DS4DA



No.	Name	Function
(1)	POWER LED (green)	Lights up when power is turned on for the analog output device.
(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)	Output range LED (orange)	Turns on/off based on the analog output range of each channel.
(5)	Device terminal block (A, GND, L+, M)	Connects analog output signals (A0 to A3, GND) and 24V power supply (L+, M) to analog input devices.
(6)	Power terminal block (0 V, +24 V)	Supplies unit power (+24 V, 0 V) and output power (L+, M). This seven-pole removable connector has a pitch of 5.08 mm and a rating of 12 A. 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.
(7)	e-CON socket (4-poles)	Unit power (+24 V, 0 V) and C/Q can be wired to the IO-Link master via the e-CON socket.
(8)	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		UR-DS4AD：50 mA max. (for 24 VDC) UR-DS4DA：150 mA max. (for 24 VDC, including analog current output)
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 Vibration frequency: 5 to 8.4 Hz, Single amplitude: 3.5 mm Vibration frequency: 8.4 to 150 Hz Acceleration: 10 m/s^2 (1.0 G) Number of sweeps: X,Y,Z : 10 times in each direction
Shock resistance		IEC 61131-2 compliant Peak Acceleration: 150 m/s^2 (15 G), 3 directions in each of the X,Y and Z directions, 3 times each (total 18 times)
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 IO-Link Hub
Compatible wire		Power terminal block: AWG 24 to 12 Device terminal block: AWG 28 to 16
Material		Unit: PC; DIN rail mounting hook: POM; Terminal block: PA
Weight		UR-DS4AD：Approx. 105 g (including terminal blocks, when not wired) UR-DS4DA：Approx. 95 g (including terminal blocks, when not wired)
Included accessories		Instruction manual, Device terminal block (UR-DS4AD：two pieces, UR-DS4DA：one pieces), 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	UR-DS4AD	8 bytes
	UR-DS4DA	0 byte
Process output data byte count	UR-DS4AD	1 byte
	UR-DS4DA	9 bytes
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

MEMO

- Instead of "Application Reset", the device offers "Restore factory settings".
- The device is developed with older software assets, therefore the device uses TYPE_0 in Preoperate.
- AccessLocks/@dataStorage is implemented.
- Common Profile is not supported due to insufficient memory capacity.

■ Analog input specifications for UR-DS4AD

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.

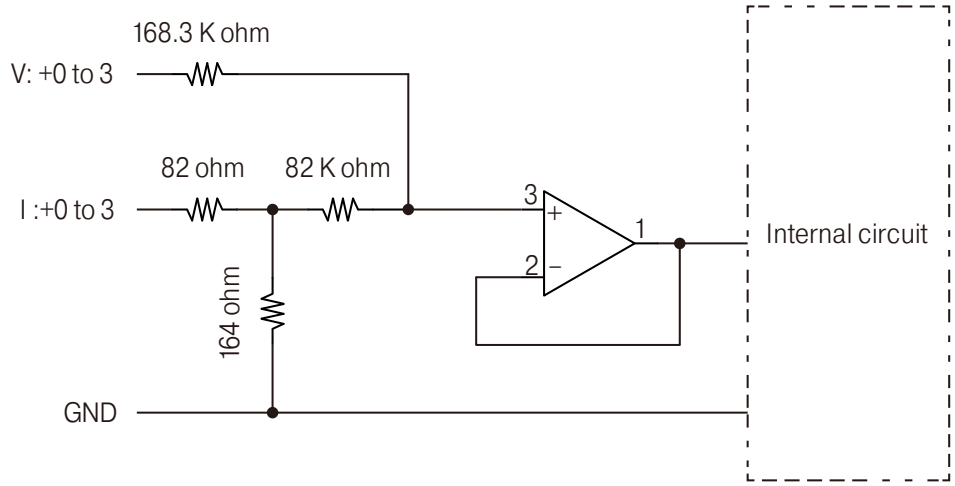
■ Analog output specifications for UR-DS4AD

Item	Specifications
Number of output channels	4 CH
Type of analog output	Voltage (0 to 10 V, -10 to 10 V, 0 to 5 V)/ Current (0 to 20 mA) switchable for all channels (Default value: Switched by process output data)
Maximum output voltage	±11 V
Maximum output current	24 mA
Voltage output equivalent impedance	0.3 ohm
Voltage accuracy	±0.2 % of F.S. (at ambient temperature of 25 °C)*1 Temperature coefficient (typical): ±8 ppm/°C (0.0008 %/°C)
Current accuracy	±0.2 % of F.S. (at ambient temperature of 25 °C) Temperature coefficient (typical): ±10 ppm/°C (0.001 %/°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 Meg ohm or higher between all I/O terminals and IO-Link terminals at 500 VDC
Inter-channel isolation	None (common)
Insulation method	Photocoupler insulation

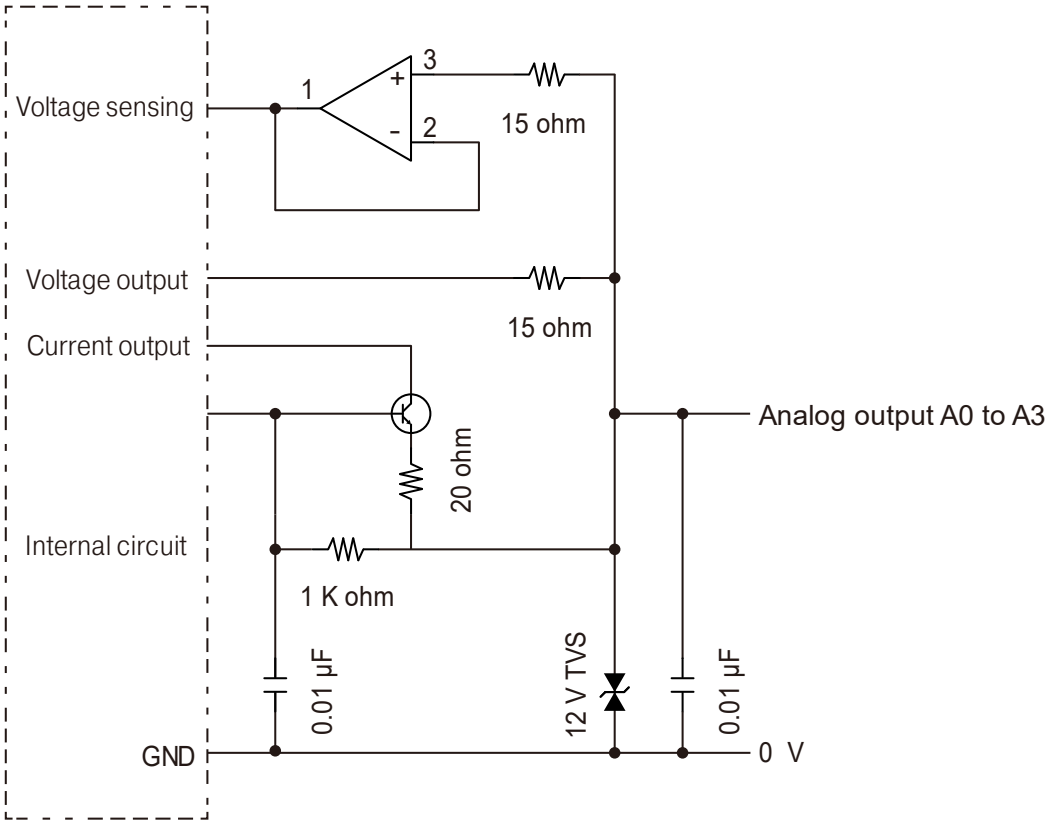
*1 Accuracy when the type of analog input is set to 0 to 10 V or -10 to 10 V. Full scale is calculated as 10 V even when 0 to 5 V or 1 to 5 V is set.

9. Circuit Diagram

■ Analog input circuit diagram for UR-DS4AD



■ Analog output circuit diagram for UR-DS4DA



10. Process Data

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

■ UR-DS4AD

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 please refer to the table below for "Word assignment" (page 24).

<table>
<tr><th>Process data</th><th>Byte</th><th>bit 7</th><th>bit 6</th><th>bit 5</th><th>bit 4</th><th>bit 3</th><th>bit 2</th><th>bit 1</th><th>bit 0</th></tr>
<tr><td rowspan="8">Process input data
(*1)</td><td>n+0</td><td colspan="8">Channel 3 Analog input upper byte</td></tr>
<tr><td>n+1</td><td colspan="8">Channel 3 Analog input lower byte</td></tr>
<tr><td>n+2</td><td colspan="8">Channel 2 Analog input upper byte</td></tr>
<tr><td>n+3</td><td colspan="8">Channel 2 Analog input lower byte</td></tr>
<tr><td>n+4</td><td colspan="8">Channel 1 Analog input upper byte</td></tr>
<tr><td>n+5</td><td colspan="8">Channel 1 Analog input lower byte</td></tr>
<tr><td>n+6</td><td colspan="8">Channel 0 Analog input upper byte</td></tr>
<tr><td>n+7</td><td colspan="8">Channel 0 Analog input lower byte</td></tr>
<tr><td rowspan="2">Process output data</td><td>n+0
(*2)</td><td colspan="2">Channel 3
Input type
0: 0 to 10 V
1: -10 to 10 V
2: 0 to 5 V
3: 0 to 20 mA</td><td colspan="2">Channel 2
Input type
0: 0 to 10 V
1: -10 to 10 V
2: 0 to 5 V
3: 0 to 20 mA</td><td colspan="2">Channel 1
Input type
0: 0 to 10 V
1: -10 to 10 V
2: 0 to 5 V
3: 0 to 20 mA</td><td colspan="2">Channel 0
Input type
0: 0 to 10 V
1: -10 to 10 V
2: 0 to 5 V
3: 0 to 20 mA</td></tr>
<tr><td colspan="8">0: 0 to 10 V, 1: -10 to 10 V, 2: 0 to 5 V, 3: 0 to 20 mA</td></tr>
</table>

*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”.

Word assignment

Example: When using the IO-Link master UR series of OPTEX FA (default setting: little endian)

<Overview>

Process data	Word	Byte	
		Upper	Upper
Process input data	N+0	Process input n+6	Process input n+7
	N+1	Process input n+4	Process input n+5
	N+2	Process input n+2	Process input n+3
	N+3	Process input n+0	Process input n+1
Process output data	N+0	N/A	Process output n+0

<Detail>

Process data	Word	Bit															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Process input data	N+0	Channel 0 Analog input upper byte								Channel 0 Analog input lower byte							
	N+1	Channel 1 Analog input upper byte								Channel 1 Analog input lower byte							
	N+2	Channel 2 Analog input upper byte								Channel 2 Analog input lower byte							
	N+3	Channel 3 Analog input upper byte								Channel 3 Analog input lower byte							
Process output data	N+0 (*1)	N/A								Channel 3 input type				Channel 2 input type		Channel 1 input type	Channel 0 input type

*1 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”.

■ UR-DS4DA

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 please refer to the table below for "Word assignment" (page 25).

Process data	Byte	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Process output data	n+0 (*1)	Channel 3 Output type		Channel 2 Output type		Channel 1 Output type		Channel 0 Output type	
		0: 0 to 10 V, 1: -10 to 10 V, 2: 0 to 5 V, 3: 0 to 20 mA							
	n+1	Channel 3 Analog output upper byte							
	n+2	Channel 3 Analog output lower byte							
	n+3	Channel 2 Analog output upper byte							
	n+4	Channel 2 Analog output lower byte							
	n+5	Channel 1 Analog output upper byte							
	n+6	Channel 1 Analog output lower byte							
	n+7	Channel 0 Analog output upper byte							
	n+8	Channel 0 Analog output lower byte							

*1 If index number 74 (“output range selection”) of the service data is “0”, specification using this process output data is enabled. If it is “1”, “2”, “3” or “4”, output will be fixed to 0 to 10 V, -10 to 10 V, 0 to 5 V and 0 to 20 mA, respectively.

Word assignment

Example: When using the IO-Link master UR series of OPTEX FA (default setting: little endian)

By default, the data is converted to little endian format and transferred to the field network, so refer to the table below.

<Overview>

Process data	Word	Byte	
		Upper	Upper
Process output data	N+0	Process output n+7	Process output n+8
	N+1	Process output n+5	Process output n+6
	N+2	Process output n+3	Process output n+4
	N+3	Process output n+1	Process output n+2
	N+4	N/A	Process output n+0

<Detail>

Process data	Word	Byte															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Process output data	N+0	Channel 0 Analog output upper byte								Channel 0 Analog output lower byte							
	N+1	Channel 1 Analog output upper byte								Channel 1 Analog output lower byte							
	N+2	Channel 2 Analog output upper byte								Channel 2 Analog output lower byte							
	N+3	Channel 3 Analog output upper byte								Channel 3 Analog output lower byte							
	N+4 (*1)	N/A								Channel 3 output type		Channel 2 output type		Channel 1 output type		Channel 0 output type	

*1 If index number 74 (“output range selection”) of the service data is “0”, specification using this process output data is enabled. If it is “1”, “2”, “3” or “4”, output will be fixed to 0 to 10 V, -10 to 10 V, 0 to 5 V and 0 to 20 mA, respectively.

11. Service Data

The service data for UR-DS4AD/UR-DS4DA that can be read and written via IO-Link ISDU handling is as follows.

■ UR-DS4AD

Name	Index number	Subindex	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.

Name	Index number	Subindex	Read/Write*1	Backup Subject	Data byte count	Default value	Setup value	Setting Details
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 to10	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	Normal status
							1	Flash the COM LED at 0.55 second intervals

■ UR-DS4DA

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 output	74	0	R/W	✓	4	0	-	Switches the output range 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 output range is switched using process output data.
							1	Sets the range to 0 to 10 V voltage output.
							2	Sets the range to -10 to 10 V voltage output.
							3	Sets the range to 0 to 5 V voltage output.
							4	Sets the range to 0 to 20 mA current output.
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 output data when outputting the maximum value of the output range. The first two bytes are the value for channel 0.
		1 to 4			2		0 to 65535*3	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 output data when outputting the output 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 output 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.
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 429496729 5	Returns the internal operation time. The unit is 7.5 minutes.

Name	Index number	Subindex number	Read/Write*1	Backup Subject	Data byte count	Default value	Setup value	Setting Details
Displayed decimal point position	193	0	R/W	✓	4	0		Specifies the decimal point position for the process output data displayed on the IO-Link Master UR series display. The first byte corresponds to channel 0.
		1 to 4		✓	1		0 to10	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 UR series display.
Device identification request (Find me)	204	0	R/W		1	-	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

*3 The maximum value is 32767 when output range is -10 to 10V.

12. Events

Events occurring in UR-DS4AD/UR-DS4DA.

Event code	Message	Details
0x4210	Temperature range has been exceeded	This occurs when the temperature on the circuit board exceeds 85°C. Generated every 10 minutes. Immediately lower the ambient temperature.
0x1800	Minimum span value is greater than Maximum span value	The minimum span value setting is greater than the maximum span value. The span width works as 32000. This event occurs only at startup.
0x1801	The setting value memory write count has been exceeded	The write count of the flash memory saving the setting values has exceeded 500,000 times. While the service life will not immediately end, the operating time will no longer be updated. Replace UR-DS4AD/UR-DS4DA promptly.

13. Troubleshooting

How to handle UR-DS4AD/UR-DS4DA when it does not work properly or when problems occur.

■Common for UR-DS4AD/UR-DS4DA

Symptom	Checkpoints and countermeasures
POWER LED does not light up	Check that voltage is applied to the Unit power's 24 V and 0 V and the I/O power's L+ and M.
	Check that the power terminal block is fully inserted, and the wiring is correct.
IO-Link communication is not working COM LED remains lit	Check that voltage is applied to the Unit power's 24 V and 0 V and the I/O power's L+ and M.
	Check that the IO-Link Master communication signal (C/Q) and UR-DS4AD/UR-DS4DA's C/Q terminal are connected and that the power terminal block is fully inserted.
	Check that the IO-Link Master setting is in IO-Link communication mode. (For IO-Link Master UR series, check the master parameter "M10. I/O function setting")
COM LED is flashing at 0.1-second intervals	IO-Link communication has broken off. Check the wiring between the IO-Link Master and C/Q.
	Check that the other IO-Link communication line (C/Q) and UR-DS4AD/UR-DS4DA's C/Q line are not wired closely for several meters or more.
	Check that the power line (inverter or servo motor drive output line) is not wired closely for several meters or more.
	Check that the IO-Link master's power (24 V, 0 V) wiring is not separate from UR-DS4AD/UR-DS4DA's 24 V and 0 V. Be sure to connect at least the 0 V for both securely.
	Check that the IO-Link communication line (C/Q) length has not exceeded 20 m.
Range switching is not possible with process output data	Is the setting value (input range) set to specify the range by setting value? Check that you have not specified anything other than "0" in the index number 74 of the service data.
ERROR LED is lit	Is the IO-Link communication once established blocked?

■UR-DS4AD

Symptom	Checkpoints and countermeasures
Conversion data of analog input signal is not output correctly	Check that the input type is properly selected by checking the Input Type LED.
	Analog input signals are input between V+ terminals 0 to 3 (voltage) or I+ terminals 0 to 3 (current) and the GND terminal, so check that the analog output wires of the analog output device are wired correctly.
	Check that the analog output setting (voltage/current range) of the analog output device matches the input setting of the UR-DS4AD.
	Check that the bit corresponding to the input range setting of the process output data of the UR-DS4AD is set correctly. If the IO-Link master is the UR series from OPTEX FA, this can be checked using the process data monitor.
	If the IO-Link master is the UR series from OPTEX FA, check if the required amount is allocated in "M40. Process input data words allocation" in the master parameter.
	Check the wiring for the correct channel number connected to the IO-Link master.
	Check that the CPU unit connected to the field network is RUN and that the program controlling the process output data is operating properly.
	Check the refresh assignment settings for process input/output data between the field network and CPU unit.
	Check that IO-Link communication with the IO-Link master is established. (COM LED blinks ON for 1 second and OFF for 0.1 second)
	Check that the maximum and minimum span values and offset values are correct.
The input type LED lights up momentarily when the power is turned on	This behavior occurs during resetting of the internal microcontroller and is not a problem in use.

Symptom	Checkpoints and countermeasures
Noise on the analog input	Select a current-output device because the impedance of the receiving equipment is lower with a current input than with a voltage input, making it more resistant to noise.
	Use shielded wires with GND on the braided wire side for the analog inputs (0 to 3 for V+ and 0 to 3 for I+) and connect these shields to the SLD terminals. Also, shorten the wiring length of analog signals by moving analog input devices and analog output devices closer together.
	Increase the averaging setting as long as possible.
	Check that the analog signal line and the power line are not wired in parallel.

■UR-DS4DA

Symptom	Checkpoints and countermeasures
Analog value is not output correctly	Check that the output type is properly selected by checking the Output Range LED.
	Analog output signals are output between A terminals 0 to 3 and the GND terminal, so check that the analog input wires of the analog input device are wired correctly.
	Check that the bit corresponding to the output range setting of the process output data of the UR-DS4DA is set correctly. If the IO-Link master is the UR series from OPTEX FA, this can be checked using the process data monitor.
	If the IO-Link master is the UR series from OPTEX FA, check if the required amount is allocated in "M41. Process output data words allocation" in the master parameter.
	Check the wiring for the correct channel number connected to the IO-Link master.
	Check that the CPU unit connected to the field network is RUN and that the program controlling the process output data is operating properly.
	Check the refresh assignment settings for process output data between the field network and CPU unit.
	Check that IO-Link communication with the IO-Link master is established. (COM LED blinks ON for 1 second and OFF for 0.1 second)
	Check that the maximum and minimum span values and offset values are correct.

Symptom	Checkpoints and countermeasures
Output range LED does not light up	Check that the IO-Link master to which the UR-DS4DA is connected is connected to the field network.
	Change the output range setting to a fixed value (0 to 10V, 0 to 20mA, etc.)
The output range LED lights up momentarily when the power is turned on	This behavior occurs during resetting of the internal microcontroller and analog outputs are turned off.
Noise on the analog output	Select a current-input device because the impedance of the receiving equipment is lower with a current input than with a voltage input. Alternatively, connect a 250Ω (for 5V) or 500Ω (for 10V) 1/4W resistor in parallel to the analog input terminal.
	Use shielded wires with GND on the braided wire side for the analog outputs (0 to 3 for A). Also, shorten the wiring length of analog signals by moving analog input devices and analog output devices closer together.
	Check that the analog signal line and the power line are not wired in parallel.

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The information in this user's manual is correct as of August 2024

UR-DS4_UM-E_002_2408