FASTUS

* FASTUS is a product brand of OPTEX FA.

Ultra-High-Speed Digital Amplifier

D4RF Series

IO-Link

Easy-to-Read, Easy-to-Use, Ultra-High-Speed Fiber Sensor Amplifier

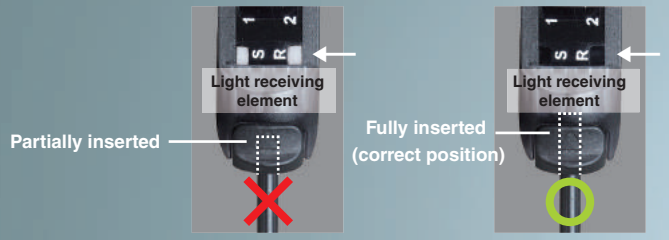
NEW MODELS **Analog output model and cable-less model added to lineup**

Enhanced operability with updated user interfaces

Highly visible OLED display and large LED indicators.
New user-friendly functions, such as hold display of received light amounts.
In addition to these features, IO-Link compatibility allows this new generation fiber amplifier to meet the needs of smart factories.

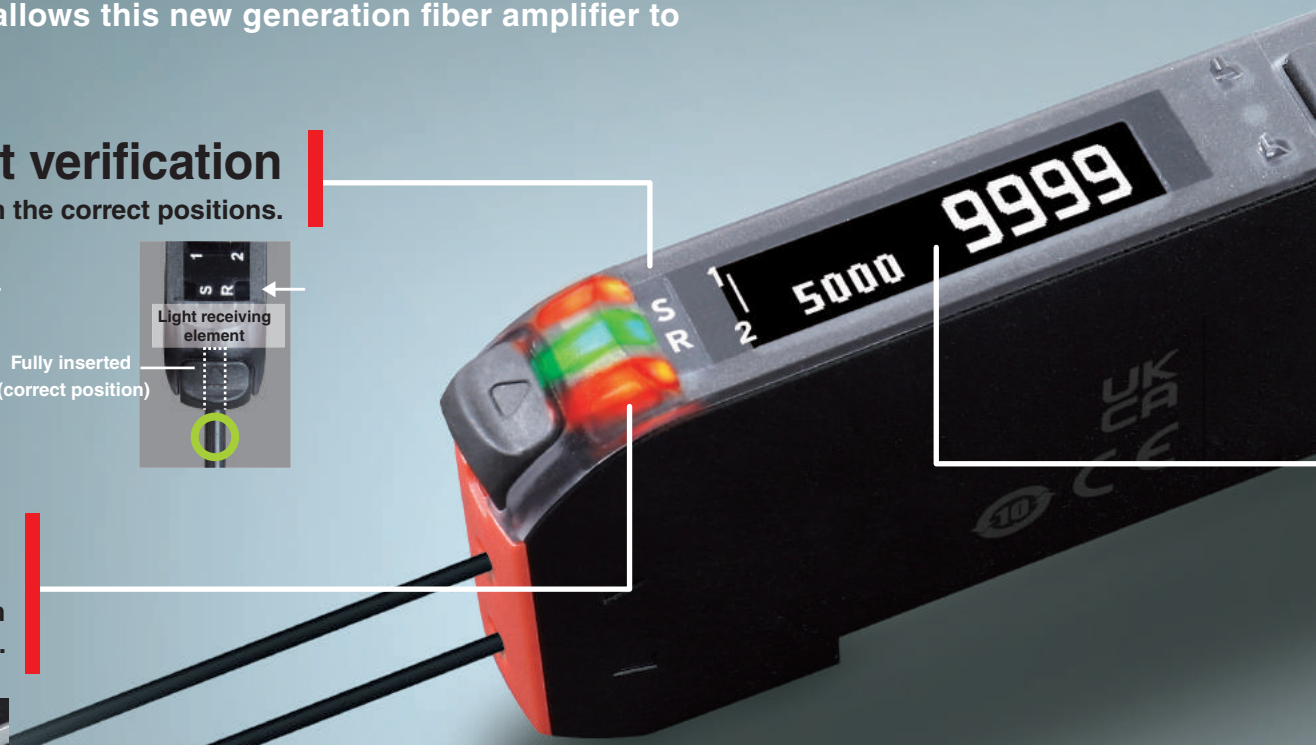
Fiber insertion indicators for instant verification

You can tell at a glance whether fiber wires are inserted in the correct positions.



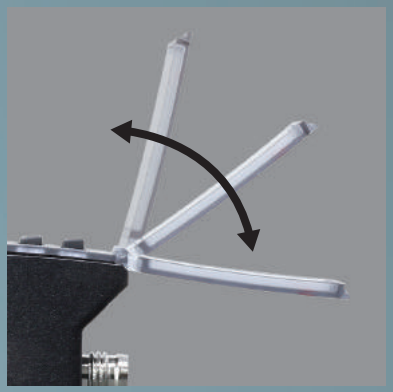
Large LED Indicators

Three-dimensional indicators provide operators with superb visibility of sensor status from a distance.



Cover with wide opening angle

The cover opens up 180°, keeping it out of the way of the buttons. In addition, the display is clearly visible because the cover hides only the buttons.



Larger Buttons for Secure Operation

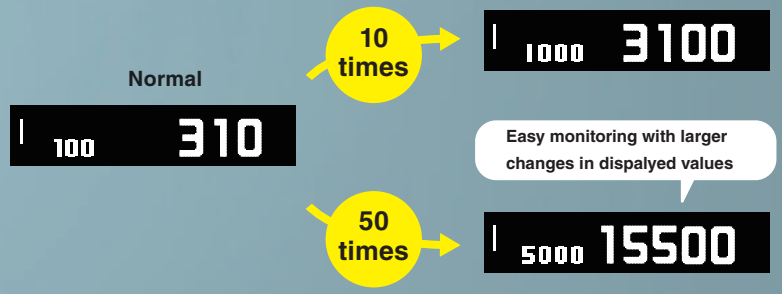
Larger buttons with the tilted top shape help operators easy setting of parameters.

Easy-to-read OLED display

In addition to clear and detailed detection status and values displayed on the OLED display, the setting menu can be displayed in English, Japanese, Korean, Simplified Chinese or Spanish.

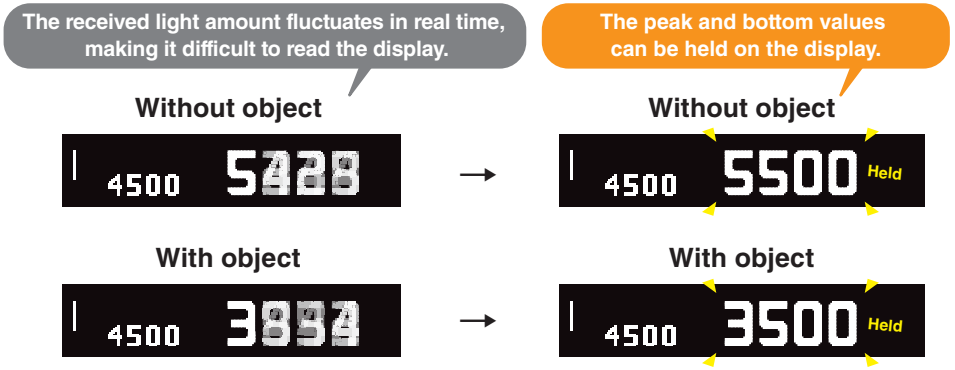
Stretch display mode of received light amount

Displayed values of threshold and received light amounts can be set to be multiplied by 10 or 50 for easier perception.



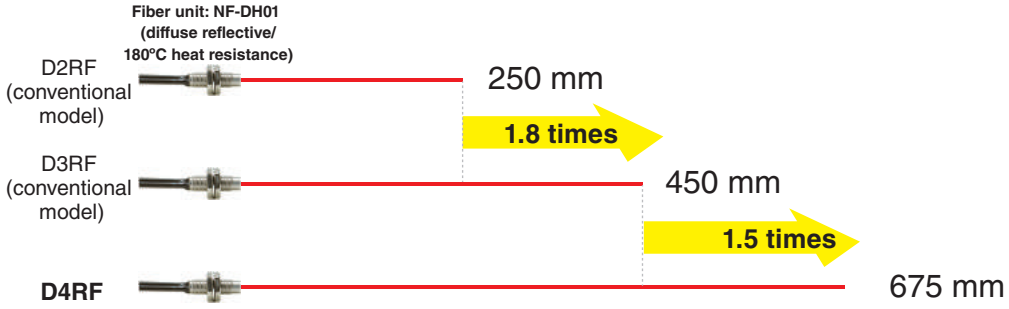
Hold display

Amounts of received light can be set to display at peak/bottom values. This makes you easier to grasp exact values of detection to adjust a threshold with correct operation margin.



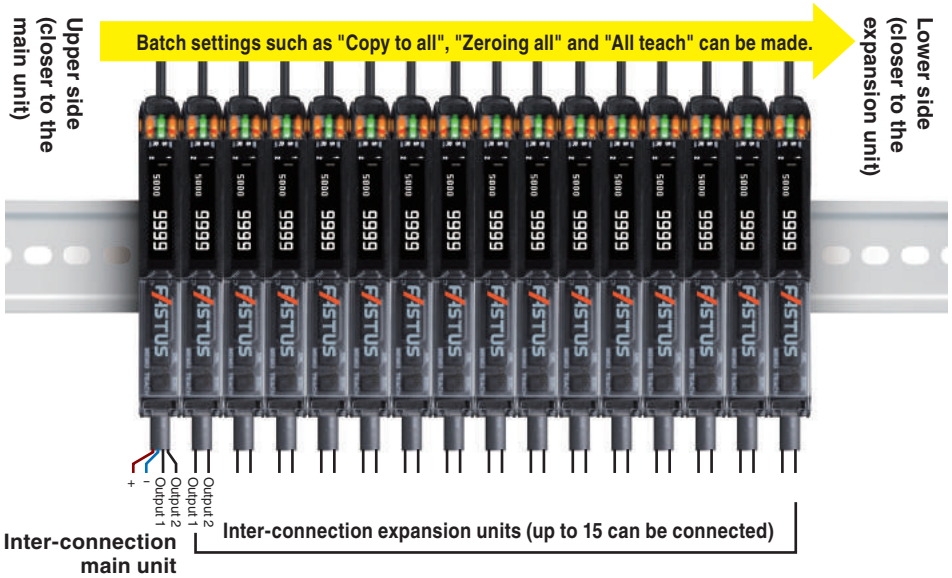
Enhanced detection in a long distance

High-power LEDs combined with a lens designed for high efficiency increased the sensing distance.
This ensures detection that is stable and resistant to dust and contamination.



Batch setting to connect amplfiers

Max. 16 units of fiber amplifier can be connected. Settings such as "Copy to all", " Zeroing all" and "All teach" are copied from the main unit to the expansion units as a batch.



Ultra-fast response time

Response time can be selected from 6 speed modes, as fast as 16 µs.
This facilitates 30,000 or more objects to be detected in 1 second.

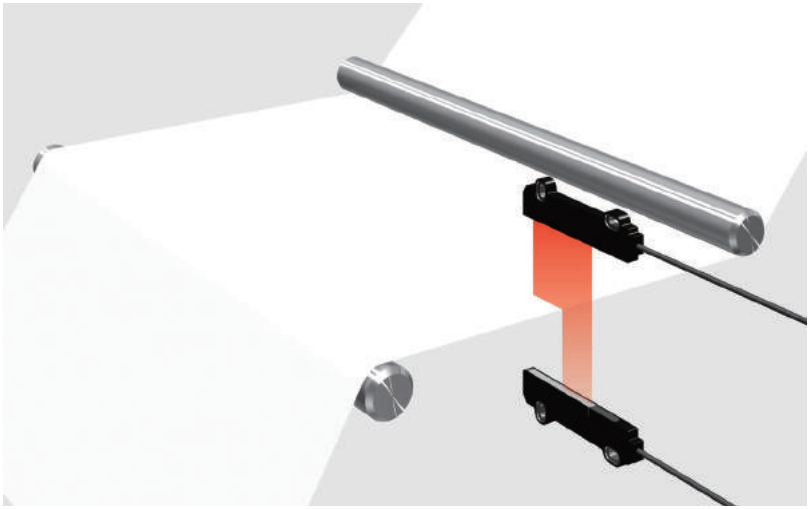
NEW MODEL Analog output model

Selectable according to your analog devices. * Current output: 4 to 20 mA * Voltage output: 0 to 10 V or 1 to 5 V

Applications

Detection of film meandering

Fiber sensor amplifier with analog output can feedback the position of the edge by analog output.



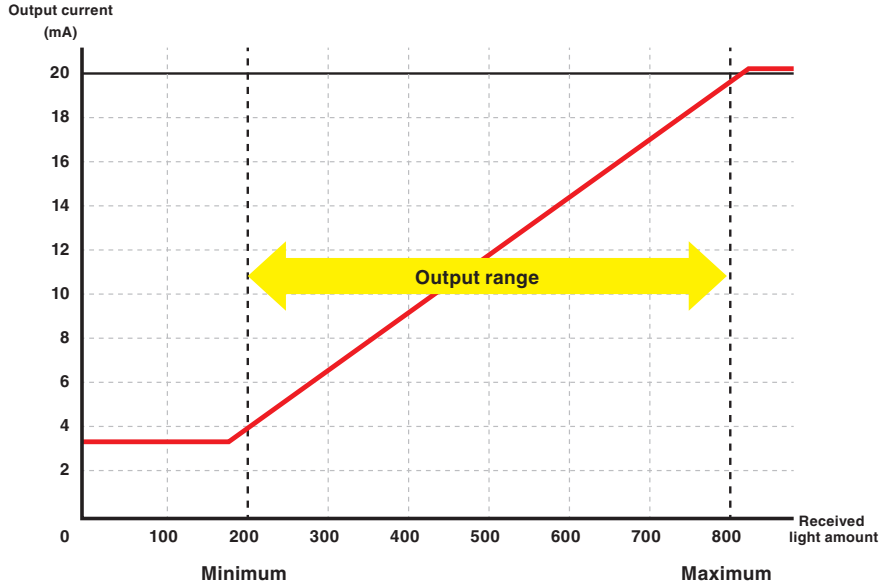
Screen fiber unit NF-TS40 can be utilized for web alignment control.
It has 40 mm width screen beam and in that area the sensor can detect edge of the film.

Useful functions

Manual adjustment of the Aanalog output range

The analog output range set with the teach function can be changed manually.

[Setting examples]
When the received light amount is within the analog output range (200 to 800), a current of 4 to 20 mA is output.



Display the setting analog output values
(4 mA → 200, 20 mA → 800)

NEW MODELS Inter-connection for communication unit

Select from the following when using D4RF with network connection (UC2-IOL).

*** Cord-less model without power supply and output wires * No OLED display saves power**

Connect to PLC via IO-Link gateway (UC2-IOL)

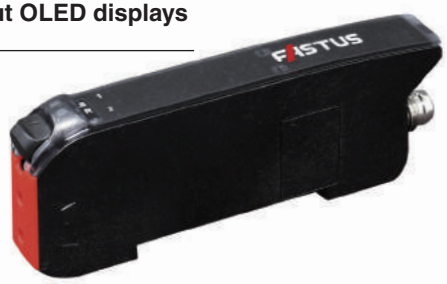
- **Max. 16 units of fiber amplifiers can be connected.**
- **Communication of output and identification.**
- **Reduced wiring : Simply connect to gateway.**
  Cable-less models are also available.
  (When inter-connecting four or more fiber amplifiers, supply power not only to the UC2 but also to the fiber amplifier master unit on the left end.)
- **Low current consumption : Models without OLED displays are also available.**

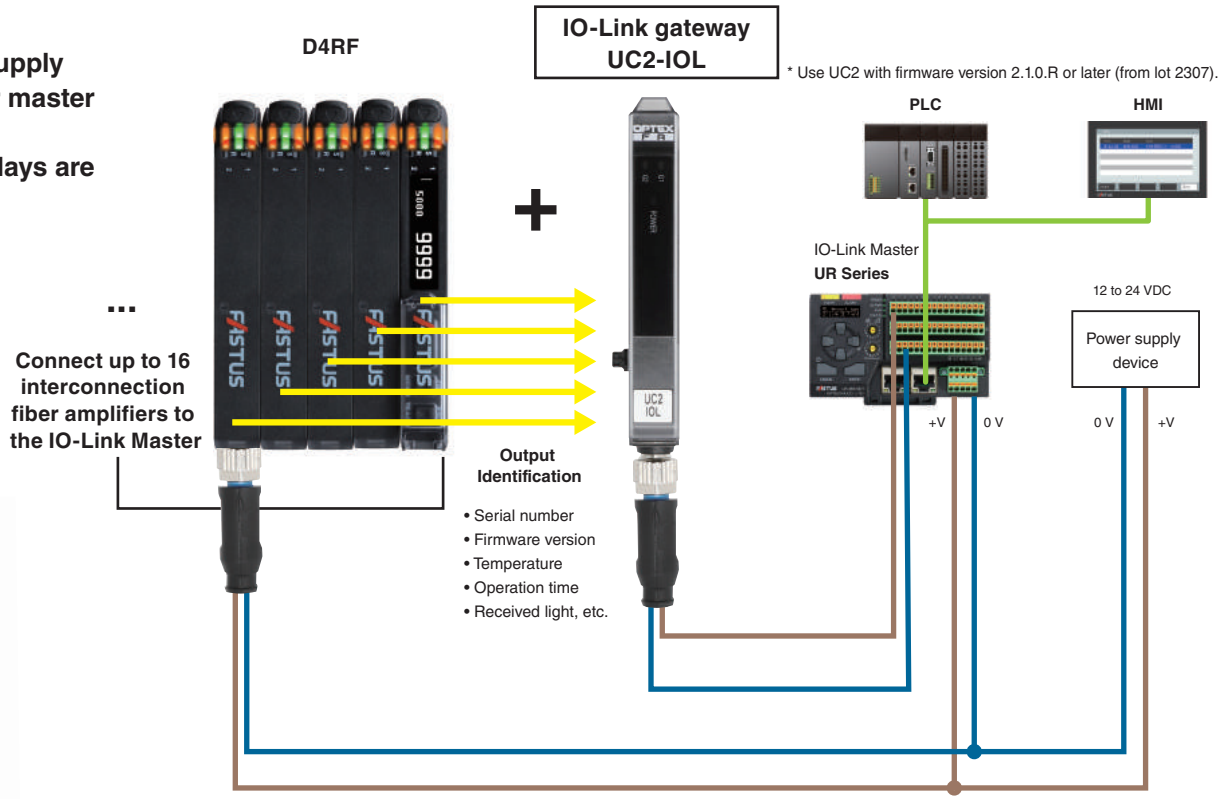
Cable-less models

D4RF-TM-0
D4RRF-TS-0
D4RF-S

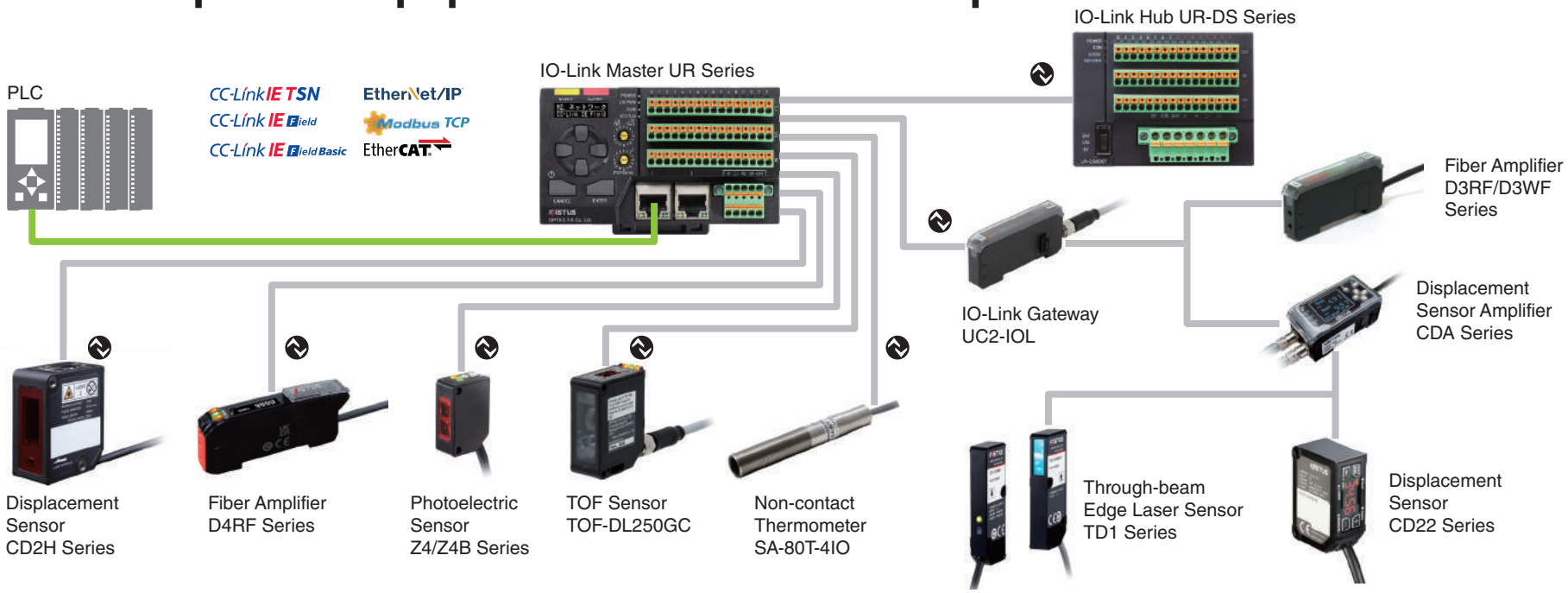
Models without OLED displays

D4RF-MC4
D4RF-S





IO-Link compatible equipment connection example



Contributes to smart factories with IO-Link support

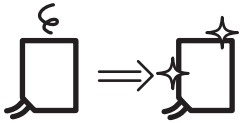
IO-Link is one of technology that connects sensors and actuators to Industrial Ethernet using digital signals to promote smart factories. OPTEX FA contributes to the development of smart factories by expanding the range of IO-Link compatible products.

Three advantages of deploying IO-Link

Advantages of IO-Link Introduction 1

Sensor information status monitoring leads to predictive maintenance and reduced downtime.

Advantages of IO-Link Introduction 2

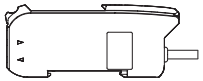
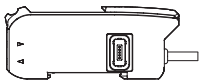
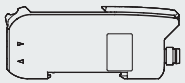
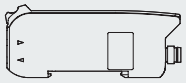
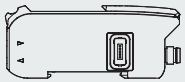
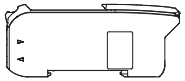
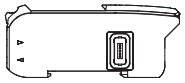
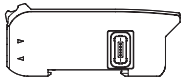


The storage of sensor setting information allows for immediate restoration even if the sensor is replaced, improving maintainability.

Advantages of IO-Link Introduction 3

Converts measured value to digital signals for transmission to PLC, making them resistant to noise and enabling long-distance communication.

Lineup

Connection	Type		Shape	No. of wires	OLED display	Interface				Model
Cable	Stand-alone models			5	Yes	2 outputs	1 input	-	-	D4RF-TD IO-Link
				4	Yes	1 output	-	1 swichable output/input	-	D4RF-T IO-Link
				5	Yes	1 output	1 input	-	1 analog output	D4RF-TA
	Inter-connection models	Main unit		5	Yes	2 outputs	1 input	-	-	D4RF-TDM
				4	Yes	1 output	-	1 swichable output/input	-	D4RF-TM
		Expansion unit		3	Yes	2 outputs	1 input	-	-	D4RF-TDS
				2	Yes	1 output	-	1 swichable output/input	-	D4RF-TS
Connector	Stand-alone models			4	Yes	1 output	-	1 swichable output/input	-	D4RF-TC4 IO-Link
	Inter-connection models	Main unit		4	Yes	1 output	-	1 swichable output/input	-	D4RF-TMC4
				2	No	-	-	-	-	D4RF-MC4
		Expansion unit		2	Yes	1 output	-	1 swichable output/input	-	D4RF-TSC4
Cable-less	Inter-connection models	Main unit		0	Yes	-	-	-	-	D4RF-TM-0
		Expansion unit		0	Yes	-	-	-	-	D4RF-TS-0
				0	No	-	-	-	-	D4RF-S

Options/Accessories

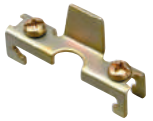
Connector cables

Straight

M84CN-2S Cable length: 2 m
M84CN-5S Cable length: 5 m
M84CN-10S Cable length: 10 m

L-shaped

M84CN-2L Cable length: 2 m
M84CN-5L Cable length: 5 m
M84CN-10L Cable length: 10 m



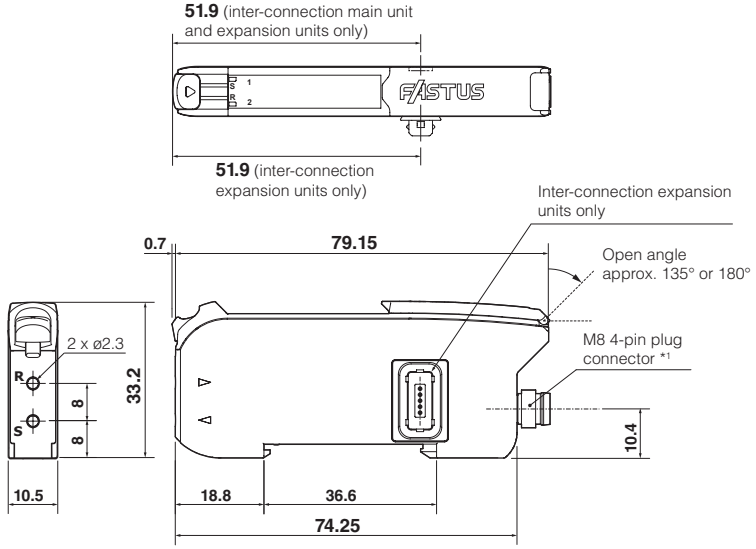
End plate
BEF-EB01-W190
(2 piece)

Refrective sheet
Diamond grade sheet
100 × 100 mm (adhesive type)

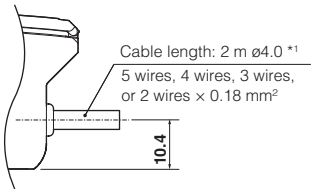
Dimensions (Unit: mm)

■ Stand-alone and inter-connection models (with display and keys) (D4RF-TD/-T/-TA/-TDM/-TM/-TDS/-TS/-TC4/-TMC4/-TSC4/-TM-0/-TS-0)

Amplifier
Connector models



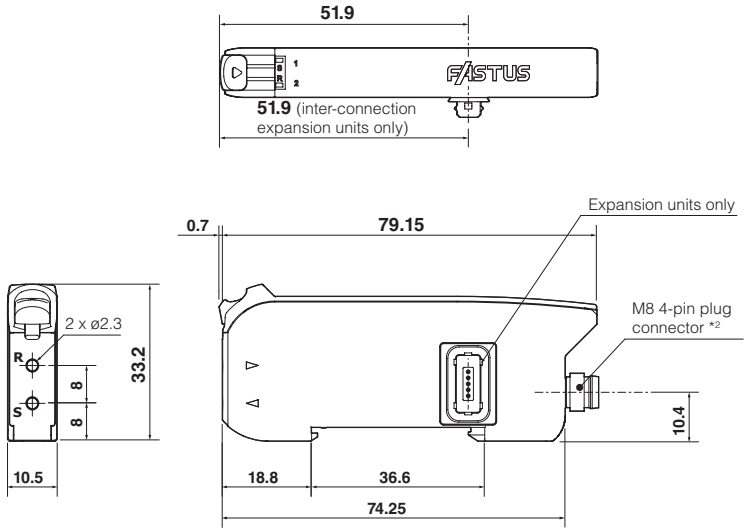
Cable models



*1 D4RF-TM-0 and D4RF-TS-0 are not equipped with connectors and cables.

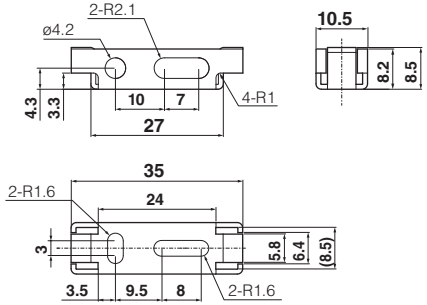
■ Inter-connection models (without display and keys) (D4RF-MC4/D4RF-S)

Amplifier
Connector models

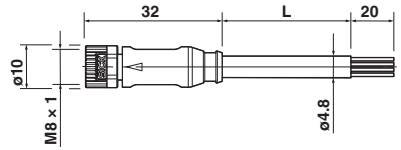


*2 D4RF-S is not equipped with connectors and cables.

Optional
Mounting bracket

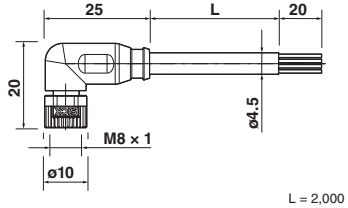


Optional
Connector cable



Cable material: PVC
Conductor cross-section: 4-wire × 0.25 mm²

L = 2,000 mm (M84CN-2S)
L = 5,000 mm (M84CN-5S)
L = 10,000 mm (M84CN-10S)



Cable material: PVC
Conductor cross-section: 4-wire × 0.25 mm²

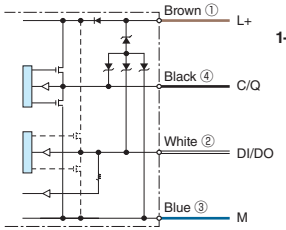
L = 2,000 mm (M84CN-2L)
L = 5,000 mm (M84CN-5L)
L = 10,000 mm (M84CN-10L)

I/O circuit diagrams

Stand-alone model (IO-Link device)

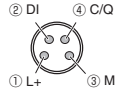
[1-output and 1-switchable-output/input models] (D4RF-T/D4RF-TC4)

IO-Link mode

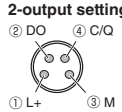


M8 connector pin layout

1-output + 1-input setting

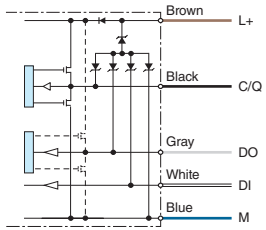


2-output setting



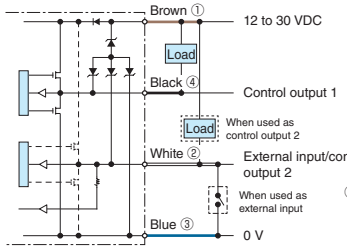
[2-outputs and 1-input models] (D4RF-TD)

IO-Link mode



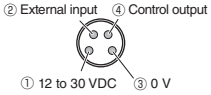
[1-output and 1-switchable-output/input models] (D4RF-T/D4RF-TC4)

SIO mode (standard I/O mode) NPN setting

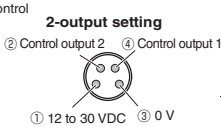


M8 connector pin layout

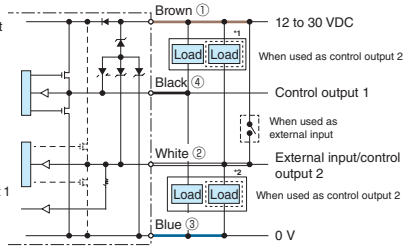
1-output + 1-input setting



2-output setting

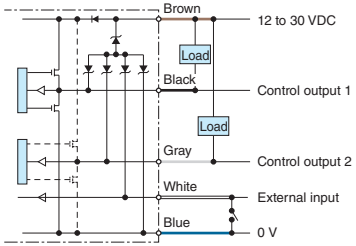


SIO mode (standard I/O mode) PNP or Push-pull setting

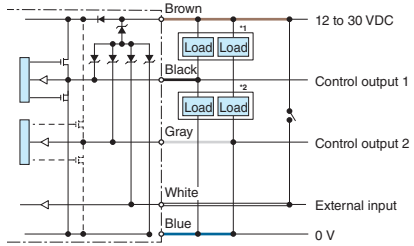


[2-outputs and 1-input models] (D4RF-TD)

SIO mode (standard I/O mode) NPN setting



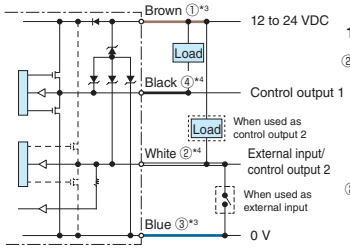
SIO mode (standard I/O mode) PNP or Push-pull setting



Inter-connection model

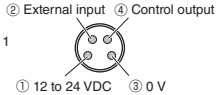
[1-output and 1-switchable-output/input models, including models without output/input wires] (D4RF-TM/D4RF-TS/D4RF-TMC4/D4RF-TSC4/D4RF-MC4/D4RF-S)

NPN setting

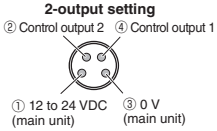


M8 connector pin layout

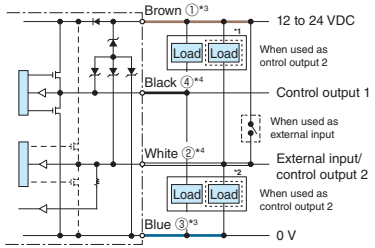
1-output + 1-input setting



2-output setting

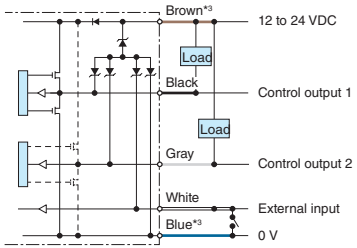


PNP or Push-pull setting

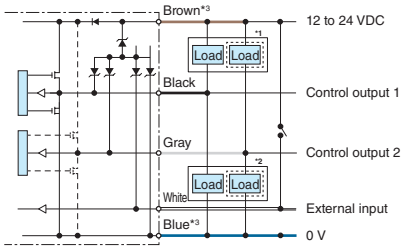


[2-outputs and 1-input models] (D4RF-TDM/D4RF-TDS)

NPN setting

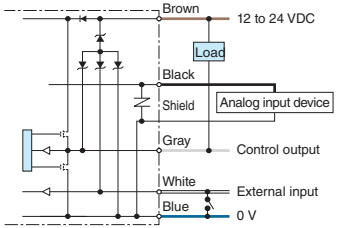


PNP or Push-pull setting

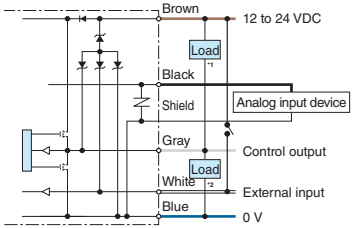


Analog output model (D4RF-TA)

NPN setting



PNP or Push-pull setting



*1 When I/O polarity is set to Push-pull and the sensor is connected with plus common circuits. *2 When I/O polarity is set to Push-pull or PNP and the sensor is connected with minus common circuits. *3 Power supply wires (Brown ①, Blue ③) are not equipped on the inter-connection expansion units.
*4 Input and output wires (White ②, Black ④) are not equipped on models "Without output/input wires".

Specifications

Type			Stand-alone model (IO-Link device)	Analog output
Model	1 output and 1 switchable output/input*1	Cable	D4RF-T	-
		Connector	D4RF-TC4	
	2 outputs and 1 input	Cable	D4RF-TD	
	Analog output	Cable	-	D4RF-TA
Light source			4-element Red LED (wavelength: 660 nm)	
Response time			16 µs, 70 µs, 250 µs, 500 µs, 1 ms, 2 ms, 8 ms	
Teach Mode			1 point, 2 points, Auto, Through, 1-point Zone, 2-point Zone, Manual	Channel A (analog output) setting: Analog 2 points teach, Analog auto teach, Manual Channel 1 (control output) setting: 1 point, 2 points, Auto, Through, 1-point Zone, 2-point Zone, Manual
Display	Digital display		OLED display 128 × 22 pixel Menu languages: English, Japanese, Korean, Simplified Chinese, Spanish	
	Indicators		2 x Output indicator (orange), Power indicator (green): Lights up when power is on (blinks during IO-Link communication for stand-alone unit)	Control output indicator (orange), Analog output indicator (orange), Power indicator (green): Lights up when power is on
Interface	Control output		NPN/PNP open collector or Push-pull selectable by setting 1 output: Max. 100 mA, 2 outputs: Max. 50 mA/30 VDC, residual voltage: 1.8 V or less	NPN/PNP open collector or Push-pull selectable by setting Max. 50 mA/30 VDC, residual voltage: 1.8 V or less
	Analog output		-	Current output: 4 to 20 mA, load impedance: 300 ohm or less Voltage output: 0 to 10 V, 1 to 5 V, output impedance: 100 ohm or less, selectable by setting
	External input		Teach, Counter-reset, Emitter off or Preset loading*2	Teach, Counter-reset, Emitter off, Hold out reset or Preset loading
	IO-Link		Control output 1 is switchable to IO-Link	-
IO-Link	Revision		1.1	-
	Baud rate		COM 3 (230.4 kbps)	-
	Number of process input data bytes		4 bytes	-
	Minimum cycle time		0.5 ms	-
Timer function			On delay, Off delay, On/off delay, Pulse output, On delay pulse, Adjustable 1 to 30,000 ms	
Output mode			Light ON/Dark ON, selectable by setting	
Connection			Cable model: 2 m, 5 wires with 2-output and 1-input models, 4 wires with 1-output and 1-swichable-output/input models, Minimum bending radius: 4 × cable diameter Connector model: M8 4-pin plug connector	Cable length 2 m Minimum bending radius: 4 × cable diameter
Insulation resistance			20 Megohm or more (with 500 VDC)	
Rating	Supply voltage	SIO mode	12 to 30 VDC ± 10% including 10% ripple (p-p)	12 to 24 VDC ± 10% including 10% ripple (p-p)
		IO-Link mode	18 to 30 VDC ± 10% including 10% ripple (p-p)	-
	Current consumption	Eco mode: Off	870 mW max. (29 mA or less at 30 VDC, 33 mA or less at 24 VDC, 52 mA or less at 12 VDC)	840 mW max. (35 mA or less at 24 VDC, 52 mA or less at 12 VDC)
		Eco mode: On	780 mW max. (26 mA or less at 30 VDC, 29 mA or less at 24 VDC, 43 mA or less at 12 VDC)	744 mW max. (31 mA or less at 24 VDC, 43 mA or less at 12 VDC)
Warm-up time			300 ms	
Applicable regulations		EMC	EU EMC directive (2014/30/EU) UK directive EMC (The Electromagnetic Compatibility Regulations 2016)	
		Environment	EU RoHS directive (2011/65/EU) UK RoHS (The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012) China RoHS (MIIT Order No.32)	
Applicable standards			EN 60947-5-2	
NRTL certification			UL Listed or Recognized Components Proximity Switch Certified for US and Canada	UL Recognized Component Proximity Switch Certified for US and Canada
Company standards			Noise resistance: Feilen Level 4 cleared	
Protection circuit			Reverse connection protection, Overcurrent protection	
Environmental resistance	Ambient temperature/humidity		-25 to 55°C/35 to 85% RH (no freezing or condensation)	
	Ambient illuminance		Sunlight: 10000 lx or less, Incandescent light: 3000 lx or less	
	Vibration resistance		10 to 55 Hz, Double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions	
	Shock resistance		Approx. 50 G (500 m/s^2) 3 times in each of the X, Y, and Z directions	
	Degree of protection		IP54	
Material			Housing, cover: PC	
Weight			Cable model: Approx. 71 g Connector model: Approx. 25 g	Approx. 71 g
Included items			Mounting bracket, Instruction manual	

*1: Input/output is not switchable for analog output.
*2: Preset loading is selectable only on 2-output and 1-output models.

Model specifications

Type			Standard inter-connection		Inter-connection for communication unit			
			With display and keys		With display and keys		Without display and keys	
			Main unit	Expansion unit	Main unit	Expansion unit	Main unit	Expansion unit
Model	1 output and 1 switchable output/input	Cable	D4RF-TM	D4RF-TS	-	-	-	-
		Connector	D4RF-TMC4	D4RF-TSC4	-	-	-	-
	2 outputs and 1 input	Cable	D4RF-TDM	D4RF-TDS	-	-	-	-
	Without output/input wires	Connector	-	-	-	-	D4RF-MC4	-
	Cable-less		-	-	D4RF-TM-0	D4RF-TS-0	-	D4RF-S
Light source			4-element Red LED (wavelength: 660 nm)					
Response time	Stand-alone use		16 µs, 70 µs, 250 µs, 500 µs, 1 ms, 2 ms, 8 ms	-	-	-	-	-
	Inter-connection use		22 µs, 70 µs, 250 µs, 500 µs, 1 ms, 2 ms, 8 ms					
Teach Mode			1 point, 2 points, Auto, Through, 1-point Zone, 2-point Zone, Manual					
Display	Digital display		OLED display 128 x 22 pixel Menu languages: English, Japanese, Korean, Simplified Chinese, Spanish				-	
	Indicators		2 × Output indicator (orange), Power indicator (green): Lights up when power is on					
Interface	Control output*1		NPN/PNP open collector or Push-pull selectable by setting 1 output: Max. 100 mA, 2 outputs: Max. 50 mA/30 VDC, residual voltage: 1.8 V or less		-			
	External input		Teach, Counter-reset, Emitter off or Preset loading*2		-			
Number of units with cross talk prevention			Response time 22 µs: 2 units, 70 µs: 3 units, 250 µs: 4 units, 500 µs: 9 units, 1 ms: 9 units, 2 ms: 12 units, 8 ms: 14 units (including main unit)					
Timer function			On delay, Off delay, On/off delay, Pulse output, On delay pulse, Adjustable 1 to 30,000 ms					
Output mode			Light ON/Dark ON, selectable by setting					
Number of connecable units			Max. 16 units (including main unit)					
Connection			Cable model: 2 m, Minimum bending radius: 4 x cable diameter 5 wires with 2-outputs and 1-input main unit models, 4 wires with 1-output and 1-swichable-output/input main unit models, 3 wires with 2-outputs and 1-input expansion unit models, 2 wires with 1-output and 1-swichable output/input expansion unit models, Connector model: M8 4-pin plug connector		Without cable or connector		Connector model: M8 4-pin plug connector (For supplying power)	Without cable or connector
Insulation resistance			20 Megohm or more (with 500 VDC)					
Rating	Supply voltage		Supplied directly or from communication unit*3 12 to 24 VDC ± 10 % including 10% ripple (p-p)	Supplied from main unit or communication unit*3 12 to 24 VDC ± 10 % including 10% ripple (p-p)	Supplied from communication unit*3 12 to 24 VDC ± 10 % including 10% ripple (p-p)		Supplied directly or from communication unit*3 12 to 24 VDC ± 10 % including 10% ripple (p-p)	Supplied from communication unit*3 12 to 24 VDC ± 10 % including 10% ripple (p-p)
	Current consumption*1	Eco mode: Off	792 mW max. (33 mA or less at 24 VDC, 52 mA or less at 12 VDC)		720 mW max. (30 mA or less at 24 VDC, 49 mA or less at 12 VDC)		624 mW max. (26 mA or less at 24 VDC, 41 mA or less at 12 VDC)	
		Eco mode: On	696 mW max. (29 mA or less at 24 VDC, 43 mA or less at 12 VDC)		624 mW max. (26 mA or less at 24 VDC, 41 mA or less at 12 VDC)		-	
Weight			Cable models: Approx. 71 g (including cable), Connector model: Approx. 25 g		Approx. 23 g			

*1: The load current and ambient temperature are limited by the number of connected units (including inter-connection main unit) as shown in the table below.
Standard inter-connection use: 20 mA when connected with a 1-output setting or 10 mA with a 2-output setting.
*2: Preset loading is selectable only on 2-output and 1-output models.
*3: For details on supplying power from the communication unit, refer to the instruction manual of the respective communication unit.
*4: The upper ambient temperature limit is as follows depending on the number of connected units.
3 to 5 connected units: 50°C, 6 to 16 connected units: 45°C (When used as UL certified product, 6 to 8 connected units: 45°C, 9 to 16 connected units: 40°C)

● Specifications are subject to change without prior notice.

Common specifications

Applicable regulations	EMC	EU EMC directive (2014/30/EU) UK directive EMC (The Electromagnetic Compatibility Regulations 2016)
	Environment	EU RoHS directive (2011/65/EU) UK RoHS (The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012) China RoHS (MIIT Order No.32)
Applicable standards		EN 60947-5-2
NRTL certification		UL Listed or Recognized Components Proximity Switch Certified for US and Canada
Company standards		Noise resistance: Feilen Level 4 cleared
Protection circuit		Reverse connection protection, Overcurrent protection
Environmental resistance	Ambient temperature*4 /humidity	-25 to 55°C/35 to 85% RH (no freezing or condensation)
	Ambient illuminance	Sunlight: 10000 lx or less, Incandescent light: 3000 lx or less
	Vibration resistance	10 to 55 Hz, Double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions
	Shock resistance	Approx. 50 G (500 m/s²) 3 times in each of the X, Y, and Z directions
	Degree of protection	IP54
Material		Housing, cover: PC
Included accessories		Mounting bracket, Instruction manual

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