## FASTUS

## Easy-to-Read,

Easy-to-Use,
Ultra-High-Speed
Fiber Sensor Amplifier NEW MODELS

- Analog output
- Short-Range/Small Object Detection
- Cable-less type


For technical and application support or checking price and delivery -
Contact Ramco Innovations today!

## 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.

02


## 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 $16 \mu \mathrm{~s}$. This facilitates $\mathbf{3 0 , 0 0 0}$ 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 $\rightarrow 200$, $20 \mathrm{~mA} \rightarrow 800$

## 開 <br> 20

## 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.


Models without OLED displays

D4RF-MC4
D4RF-S
Connect up to 16 interconnection fiber amplifiers to the IO-Link Master

D4RF


IO-Link gateway UC2-IOL

2 with firmware version 2.1.0.R or later (from lot 2307).


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IO-Link compatible equipment connection example


## Contributes to smart factories with IO-Link support

## Three advantages of deploying IO-Link

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.
Advantages of

IO-Link Introduction 1 $\quad$\begin{tabular}{c}
Advantages of <br>

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

\end{tabular}

Lineup

| Connection | Typ |  | Shape | No. of wires | OLED display |  |  | Interface |  | Model |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Cable | Stand-alone models |  |  | 5 | Yes | 2 outputs | 1 input | - | - | D4RF-TD (10-Link |
|  |  |  | 4 | Yes | 1 output | - | 1 swichable output/input | - | D4RF-T © IO-Link |
|  |  |  | 5 | Yes | 1 output | 1 input | - | 1 analog output | D4RF-TA |
|  |  | Main unit |  | 5 | Yes | 2 outputs | 1 input | - | - | D4RF-TDM |
|  |  |  |  | 4 | Yes | 1 output | - | 1 swichable output/input | - | D4RF-TM |
|  |  | $\begin{array}{\|c\|} \hline \text { Expansion } \\ \text { unit } \end{array}$ |  |  | 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 |
|  | $\begin{array}{\|c\|} \hline \text { Inter- } \\ \text { connection } \\ \text { models } \end{array}$ | Main unit |  | 4 | Yes | 1 output | - | 1 swichable output/input | - | D4RF-TMC4 |
|  |  |  |  | 2 | No | - | - | - | - | D4RF-MC4 |
|  |  | $\begin{gathered} \text { Expansion } \\ \text { unit } \end{gathered}$ |  | 2 | Yes | 1 output | - | 1 swichable output/input | - | D4RF-TSC4 |
| Cable-less | Interconnection models | Main unit |  | 0 | Yes | - | - | - | - | D4RF-TM-0 |
|  |  | $\begin{gathered} \text { Expansion } \\ \text { unit } \end{gathered}$ |  | 0 | Yes | - | - | - | - | D4RF-TS-0 |
|  |  |  |  | 0 | No | - | - | - | - | D4RF-S |

Options/Accessories


## Dimensions

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

$\square$ Inter-connection models (without display and keys) (D4RF-MC4/D4RF-S)

## Amplifier


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

Connector models

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

## Optional

## Mounting bracket



## Optional

## Connector cable




Cable material: PVC
$\mathrm{L}=2,000 \mathrm{~mm}$ ( $\mathrm{M} 84 \mathrm{CN}-2 \mathrm{~L})$ $\mathrm{L}=5,000 \mathrm{~mm}$ (M84CN-5L)

## I/O circuit diagrams

## Stand-alone model (IO-Link device)

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

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

IO-Link mode


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

[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

$\square$ 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)

[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

 *4 Input and output wires (White (2), Black (4)) are not equipped on models "Without outputinput 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 |  |  |  | $16 \mu \mathrm{~s}, 70 \mu \mathrm{~s}, 250 \mu \mathrm{~s}, 500 \mu \mathrm{~s}, 1 \mathrm{~ms}, 2 \mathrm{~ms}, 8 \mathrm{~ms}$ |  |
| 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 $128 \times 22$ pixel <br> Menu languages: English, Japanese, Korean, Simplified Chinese, Spanish |  |
|  | Indicators |  |  | $2 \times$ 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 <br> 1 output: Max. 100 mA , 2 outputs: Max. $50 \mathrm{~mA} / 30 \mathrm{VDC}$, residual voltage: 1.8 V or less | NPN/PNP open collector or Push-pull selectable by setting Max. $50 \mathrm{~mA} / 30 \mathrm{VDC}$, 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 $10 \mathrm{~V}, 1$ to 5 V , output impedance: 100 ohm or less, selectable by setting |
|  | External input |  |  | Teach, Counter-reset, Emitter off or Preset loading ${ }^{\text {2 }}$ | 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 $30,000 \mathrm{~ms}$ |  |
| 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: $4 \times$ cable diameter Connector model: M8 4-pin plug connector | Cable length 2 m <br> Minimum bending radius: $4 \times$ cable diameter |
| Insulation resistance |  |  |  | 20 Megohm or more (with 500 VDC) |  |
| Rating | Supply voltage | SIO mode |  | 12 to 30 VDC $\pm 10 \%$ including 10\% ripple (p-p) | 12 to $24 \mathrm{VDC} \pm 10 \%$ including 10\% ripple (p-p) |
|  |  | IO-Link mode |  | 18 to 30 VDC $\pm 10 \%$ including $10 \%$ ripple (p-p) | - |
|  | Current consumption | Eco mode: Off |  | 870 mW max. (29 mA or less at $30 \mathrm{VDC}$,33 mA or less at $24 \mathrm{VDC}, 52 \mathrm{~mA}$ or less at 12 VDC ) | 840 mW max. ( 35 mA or less at $24 \mathrm{VDC}, 52 \mathrm{~mA}$ or less at 12 VDC ) |
|  |  | Eco mode: |  | 780 mW max. (26 mA or less at $30 \mathrm{VDC}$,29 mA or less at $24 \mathrm{VDC}, 43 \mathrm{~mA}$ or less at 12 VDC ) | 744 mW max. (31 mA or less at $24 \mathrm{VDC}, 43 \mathrm{~mA}$ 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 $55^{\circ} \mathrm{C} / 35$ to $85 \% \mathrm{RH}$ (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 $\mathrm{X}, \mathrm{Y}$, and Z directions |  |
|  | Shock resistance |  |  | Approx. $50 \mathrm{G}\left(500 \mathrm{~m} / \mathrm{s}^{2}\right) 3$ times in each of the $\mathrm{X}, \mathrm{Y}$, 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 With display and keys |  | Inter-connection for communication unit |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | 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 outputinput |  | 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 |  |  | $\begin{gathered} 16 \mu \mathrm{~s}, 70 \mu \mathrm{~s}, 250 \mu \mathrm{~s}, \\ 500 \mu \mathrm{~s}, 1 \mathrm{~ms}, 2 \mathrm{~ms}, 8 \mathrm{~ms} \end{gathered}$ | - | - | - | - | - |
|  | Inter-connection use |  |  | $22 \mu \mathrm{~s}, 70 \mu \mathrm{~s}, 250 \mu \mathrm{~s}, 500 \mu \mathrm{~s}, 1 \mathrm{~ms}, 2 \mathrm{~ms}, 8 \mathrm{~ms}$ |  |  |  |  |  |
| Teach Mode |  |  |  | 1 point, 2 points, Auto, Through, 1-point Zone, 2-point Zone, Manual |  |  |  |  |  |
| Display | Digital display |  |  | OLED display $128 \times 22$ pixel Menu languages: English, Japanese, Korean, Simplified Chinese, Spanish |  |  |  |  |  |
|  | Indicators |  |  | $2 \times$ 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 <br> 1 output: Max. $100 \mathrm{~mA}, 2$ outputs: Max. 50 $\mathrm{mA} / 30 \mathrm{VDC}$, 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 $22 \mu \mathrm{~s}: 2 \mathrm{l}$ units, $70 \mu \mathrm{~s}: 3$ units, $250 \mu \mathrm{~s}: 4$ units, $500 \mu \mathrm{~s}$ : 9 units, $1 \mathrm{~ms}: 9$ units, $2 \mathrm{~ms}: 12$ units, $8 \mathrm{~ms}: 14$ units (including main unit) |  |  |  |  |  |
| Timer function |  |  |  | On delay, Off delay, On/off delay, Pulse output, On delay pulse, Adjustable 1 to $30,000 \mathrm{~ms}$ |  |  |  |  |  |
| Output mode |  |  |  | Light ON/Dark ON, selectable by setting |  |  |  |  |  |
| Number of connecable units |  |  |  | Max. 16 units (including main unit) |  |  |  |  |  |
| Connection |  |  |  | Cable model: 2 m , <br> Minimum bending radius: $4 \times$ cable diameter 5 wires with 2 -outputs and 1 -input main unit models, 4 wies with 1 -outputand 1 -swichable-outputifinut main unitmodess. 3 wires with 2 -outputs and 1 -input expansion unit models, 2 wies with- -ouputiand 1-swichade outputifnutitexpansion untimodels, Connector model: M8 4-pin plug connector |  | Without cable or connector |  | Connector model: <br> 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 $24 \mathrm{VDC} \pm 10 \%$ including 10\% ripple (p-p) | Supplied from main unit or communication unit ${ }^{3}$ 12 to $24 \mathrm{VDC} \pm 10 \%$ including $10 \%$ ripple ( $p$-p) | Supplied from communication unit*3 $12 \text { to } 24 \mathrm{VDC} \pm 10 \%$ <br> including $10 \%$ ripple ( $p-p$ ) |  | Supplied directly or from communication unit ${ }^{* 3}$ 12 to $24 \mathrm{VDC} \pm 10 \%$ including 10\% ripple (p-p) | Supplied from communication unit ${ }^{\text {³ }}$ 12 to $24 \mathrm{VDC} \pm 10 \%$ ncluding $10 \%$ ripple (p-p) |
|  | Current consumption ${ }^{+1}$ | Eco mode: Off |  | 792 mW max.(33 mA or less at $24 \mathrm{VDC}, 52 \mathrm{~mA}$ or less at 12 VDC ) |  | 720 mW max. <br> ( 30 mA or less at $24 \mathrm{VDC}, 49 \mathrm{~mA}$ or less at 12 VDC ) |  | 624 mW max. <br> ( 26 mA or less at $24 \mathrm{VDC}, 41 \mathrm{~mA}$ or less at 12 VDC ) |  |
|  |  | Eco mode: On |  | 696 mW max.$(29 \mathrm{~mA}$ or less at $24 \mathrm{VDC}, 43 \mathrm{~mA}$ or less at 12 VDC ) $)$ |  | 624 mW max. <br> ( 26 mA or less at $24 \mathrm{VDC}, 41 \mathrm{~mA}$ or less at 12 VDC ) |  |  |  |
| Weight |  |  |  | Cable models: Approx. 71 g (including cable), <br> 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: $50^{\circ} \mathrm{C}, 6$ to 16 connected units: $45^{\circ} \mathrm{C}$ (When used as UL certified product,
3 to 5 connected units: $50^{\circ} \mathrm{C}, 6$ to 16 connected units: $45^{\circ} \mathrm{C}$ (When used as UL certified product, 6 to 8 connected units: $45^{\circ} \mathrm{C}, 9$ to 16 connected units: $40^{\circ} \mathrm{C}$ )

- Specifications are subject to change without prior notice.

The information in this catalog is correct as of March 2023

## Common specifications

| Applicable <br> regulations | EMC | EU EMC directive (2014/30/EU) <br>  UK directive EMC (The Electromagnetic Compatibility |
| :--- | :--- | :---: |
| Regulations 2016) |  |  |$|$

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## FASTUS

 D4RF Series Y type*FASTUS is a product brand of OPTEX FA.


## Digital Fiber Amplifier for ShortRange and Small Object Detection

/ Applications


## / Feature

## $\square$ Detects small objects in a clean environment

- Detects minute changes in light intensity

Detection of small objects with only minute changes in light intensity


Transparent-object Detection

Short-range detection of $\quad \square \quad \square$ small objects
/ Lineup

| Connection | Type |  | Shape | No. of wires | OLED display | Interface |  |  | Model |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Cable | Stand-alone models |  |  | 5 | Yes | 2 outputs | 1 input | - | D4RF-TD-Y © IO-Link |
|  |  |  | 5 | Yes | 1 output | 1 input | 1 analog output | D4RF-TA-Y |
|  | Interconnection models | Main unit |  | 5 | Yes | 2 outputs | 1 input | - | D4RF-TDM-Y |
|  |  | Expansion unit |  | - 雷 | 3 | Yes | 2 outputs | 1 input | - | D4RF-TDS-Y |

## Specifications

| Type |  |  | Stand-alone model (IO-Link device) | Standard inter-connection | With display and keys | Stand-alone mode Analog output |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Main unit | Expansion unit |  |
| Model |  |  |  | D4RF-TD-Y | D4RF-TDM-Y | D4RF-TDS-Y | D4RF-TA-Y |
| Light source |  |  | 4-element Red LED (wavelength: 660 nm ) |  |  |  |
| Response time | Stand-alone use |  | $16 \mu \mathrm{~s}, 70 \mu \mathrm{~s}, 250 \mu \mathrm{~s}, 500 \mu \mathrm{~s}, 1 \mathrm{~ms}, 2 \mathrm{~ms}, 8 \mathrm{~ms}$ | $\begin{gathered} 16 \mu \mathrm{~s}, 70 \mu \mathrm{~s}, 250 \mu \mathrm{~s}, 500 \mu \mathrm{~s}, \\ 1 \mathrm{~ms}, 2 \mathrm{~ms}, 8 \mathrm{~ms} \end{gathered}$ | - | $16 \mu \mathrm{~s}, 70 \mu \mathrm{~s}, 250 \mu \mathrm{~s}, 500 \mu \mathrm{~s}, 1 \mathrm{~ms}, 2 \mathrm{~ms}, 8 \mathrm{~ms}$ |
|  | Inter-connection use |  |  | $22 \mu \mathrm{~s}, 70 \mu \mathrm{~s}, 250 \mu \mathrm{~s}, 500 \mu \mathrm{~s}, 1 \mathrm{~ms}, 2 \mathrm{~ms}, 8 \mathrm{~ms}$ |  | - - |
| Teach Mode |  |  | 1 point, 2 points, Auto, Through, 1-point Zone, 2-point Zone, Manual | 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 $128 \times 22$ pixel Menu languages: English, Japanese, Korean, Simplified Chinese, Spanish |  |  |  |
|  | Indicators |  | $2 \times$ Output indicator (orange), Power indicator (green): Lights up when power is on (blinks during IO-Link communication for stand-alone unit) | $2 \times$ Output indicator (orange), <br> Power indicator (green): Lights up when power is on |  | Control output indicator (orange), Analog output indicator (orange), Power indicator (green): Lights up when power is on |
| Interface | Control output |  | 2 outputs: NPN/PNP open collector or Push-pull selectable by setting Max. $50 \mathrm{~mA} / 30 \mathrm{VDC}$, residual voltage: 1.8 V or less | 2 outputs: NPN/PNP open collector or Push-pull selectable by setting Max. $50 \mathrm{~mA} / 30 \mathrm{VDC}$, residual voltage: 1.8 V or less ${ }^{\star 1}$ |  | NPN/PNP open collector or Push-pull selectable by setting Max. $50 \mathrm{~mA} / 30 \mathrm{VDC}$, 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 $10 \mathrm{~V}, 1$ to 5 V , output impedance: 100 ohm or less, selectable by setting |
|  | External input |  | Teach, Counter-reset, Emitter off or Preset loading | Teach, Counter-reset, Emitter off or Preset loading |  | Teach, Counter-reset, Emitter off, Hold out reset or Preset loading |
|  | IO-Link |  | Control output 1 is switchable to IO-Link | , |  | , |
| 10-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 | Resone |  | - |
| Number of units with cross talk prevention |  |  | - | Response time $22 \mu \mathrm{~s}: 2$ units, $70 \mu \mathrm{~s}: 3$ units, $250 \mu \mathrm{~s}: 4$ units, $500 \mu \mathrm{~s}: 9$ units, $1 \mathrm{~ms}: 9$ units, $2 \mathrm{~ms}: 12$ units, $8 \mathrm{~ms}: 14$ units (including main unit) |  | ms |
| Timer function |  |  | On delay, Off delay, On/off delay, Pulse output, On delay pulse, Adjustable 1 to $30,000 \mathrm{~ms}$ |  |  |  |
| Output mode |  |  | Light ON/Dark ON, selectable by setting |  |  |  |
| Number of connectable units |  |  | - - | Max. 16 units (including main unit) |  | - |
| Connection |  |  | Cable model: $2 \mathrm{~m}, 5$ wires with 2 -output and 1 -input models, Minimum bending radius: $4 \times$ cable diameter | Cable model: 2 m , Minimum bending radus: $4 \times$ cable diameter 5 wires with 2 -outputs and 1 -input main unit models, 3 wires with 2 -outputs and 1 -input expansion unit models |  | Cable length 2 m , Minimum bending radius: $4 \times$ cable diameter |
| Insulation resistance |  |  | 20 Megohm or more (with 500 VDC ) |  |  |  |
| Rating | Supply voltage |  | 12 to 30 VDC $\pm 10 \%$ including $10 \%$ ripple (p-p): SIO mode 18 to 30 VDC $\pm 10 \%$ including $10 \%$ ripple (p-p): IO-Link mode | Supplied directly or from communication unit ${ }^{* 2}$ 12 to $24 \mathrm{VDC} \pm 10 \%$ including $10 \%$ ripple ( $p-p$ ) | Supplied from main unit or communication unit² 12 to 24 VDC $\pm 10 \%$ including 10\% ripple (p-p) | 12 to $24 \mathrm{VDC} \pm 10 \%$ including $10 \%$ ripple (p-p) |
|  | $\begin{array}{\|l\|} \hline \begin{array}{l} \text { Current } \\ \text { consumption } \end{array} \\ \hline \end{array}$ | Eco mode: Off | 870 mW max. (29 mA or less at $30 \mathrm{VDC}, 33 \mathrm{~mA}$ or less at $24 \mathrm{VDC}$,52 mA or less at 12 VDC ) | 792 mW max. ( 33 mA or less at $24 \mathrm{VDC}, 52 \mathrm{~mA}$ or less at 12 VDC$)^{+1}$ |  | 840 mW max. ( 35 mA or less at $24 \mathrm{VDC}$,52 mA or less at 12 VDC ) |
|  |  | Eco mode: On | 780 mW max. (26 mA or less at $30 \mathrm{VDC}, 29 \mathrm{~mA}$ or less at $24 \mathrm{VDC},, 43 \mathrm{~mA}$ or less at 12 VDC$)$ | 696 mW max. ( 29 mA or less at $24 \mathrm{VDC}, 43 \mathrm{~mA}$ or less at 12 VDC$)^{+1}$ |  | 744 mW max. ( 31 mA or less at $24 \mathrm{VDC}, 43 \mathrm{~mA}$ 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 Listed or Recognize Proximity Switch Certified | ed Components 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 $55^{\circ} \mathrm{C} / 35$ to $85 \% \mathrm{RH}$ (no freezing or condensation) | -25 to $55^{\circ} \mathrm{C}^{* 3} / 35$ to $85 \% \mathrm{RH}$ (no freezing or condensation) |  | -25 to $55^{\circ} \mathrm{C} / 35$ to $85 \% \mathrm{RH}$ (no freezing or condensation) |
|  | Ambient illuminance |  | Sunlight: 10000 Ix or less, Incandescent light: 3000 Ix or less |  |  |  |
|  | Vibration resistance Shock resistance |  | 10 to 55 Hz , Double amplitude $1.5 \mathrm{~mm} ; 2$ hours in each of the $\mathrm{X}, \mathrm{Y}$, and Z directions |  |  |  |
|  |  |  | Approx. $50 \mathrm{G}\left(500 \mathrm{~m} / \mathrm{s}^{2}\right) 3$ times in each of the $\mathrm{X}, \mathrm{Y}$, and Z directions |  |  |  |
|  | Degree of protection |  | IP54 |  |  |  |
| Material |  |  | Housing, cover: PC |  |  |  |
| Weight |  |  | Approx. 71 g |  |  |  |
| Included items |  |  | Mounting bracket, Instruction manual |  |  |  |

1: The load current is limited by the number of connected units (including inter-connection main unit) as follow. Standard inter-connection use: 20 mA when connected with a 1 -output setting or 10 mA with a 2 -output setting.
2: For details on supplying power from the communication unit, refer to the instruction manual of the respective communication unit.
units: $50^{\circ} \mathrm{C}$, 6 to 16 connected units: $45^{\circ} \mathrm{C}$ (When used as UL certified product, 6 to 8 connected units: $45^{\circ} \mathrm{C}$,
9 to 16 connected units: $40^{\circ} \mathrm{C}$ )

Sensing distance

| Reflection | Model | Type | Shape | Wire |  |  |  | Sensing distance by response time (Unit: mm) Upper row: D4RF Lower row: D4RF-Y |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Type | $\begin{array}{\|c\|} \hline \text { Minimum } \\ \text { bending radius } \\ \hline \end{array}$ | Fiber length | Light axis diameter | $16 \mu \mathrm{~s}$ | $70 \mu \mathrm{~s}$ | $250 \mu \mathrm{~s}$ | $500 \mu \mathrm{~s}$ | 1 ms | 2 ms | 8 ms |
| Through-beam type |  |  | M2.6, Lens attachable |  |  | 2 m |  | 325 | 975 | 1,455 | 1,960 | 2,215 | 2,780 | 3,600 |
|  | NF-TB02 | M4 |  | Standard | R25 | Free cut | 8.0 | 55 | 165 | 240 | 295 | 340 | 445 | 545 |
|  |  |  | M2.6, Lens attachable |  |  | 2 m |  | 310 | 915 | 1,415 | 1,770 | 2,010 | 2,710 | 3,600 |
|  | NF-TK7 | M4 | = | Hexible | R1 | Free cut | 8.0 | 55 | 165 | 240 | 295 | 340 | 445 | 545 |
|  |  |  | M2.6, Lens attachable |  |  | 2 m |  | 320 | 955 | 1,505 | 1,835 | 2,055 | 2,880 | 3,600 |
|  | NF-rmot |  |  |  |  | Free cut | -1.0 | 55 | 165 | 240 | 295 | 340 | 445 | 545 |
|  |  |  | M2.6, Lens attachable |  |  | 2 m | 0.25 | 85 | 265 | 420 | 525 | 595 | 865 | 1,310 |
|  |  |  | $414=$ |  |  | Free cut |  | 14 | 40 | 60 | 70 | 85 | 110 | 140 |
|  | NF-TM02 | M3 | Sleeve: 5 mm long | Standard | R15 | 2 m | $\infty$ | 100 | 290 | 465 | 600 | 680 | 965 | 1,540 |
|  |  |  |  |  |  | Free cut |  | 15 | 50 | 75 | 95 | 110 | 150 | 190 |
|  | NF-TR14 |  | Straight view/Side view switchable type |  |  | 2 m |  | 305 | 885 | 1,430 | 1,845 | 2,200 | 2,730 | 3,600 |
|  |  |  |  |  |  | Free cut |  | 50 | 140 | 200 | 255 | 295 | 385 | 470 |
|  |  |  | $\delta \hat{\wedge}_{40 \mathrm{~mm}}$ |  |  |  |  | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 |
|  | NF-TS40 |  |  | Hexible | R2 | Free cut | 40 mm | 55 | 165 | 240 | 295 | 340 | 445 | 545 |
|  |  |  |  |  |  |  |  | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 |
|  |  |  | m |  |  | Free cut |  | 55 | 165 | 240 | 295 | 340 | 445 | 545 |
|  |  |  |  |  |  |  |  | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 |
|  |  |  |  |  |  | Free cut |  | 55 | 165 | 240 | 295 | 340 | 445 | 545 |
|  |  |  |  |  |  |  |  | 2,305 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 |
|  |  |  |  |  |  | Free cut |  | 14 | 40 | 60 | 70 | 85 | 110 | 140 |
|  |  |  |  |  |  |  |  | 2,765 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 |
|  |  |  |  |  |  | Free cut |  | 15 | 50 | 75 | 95 | 110 | 150 | 190 |

/Sensing distance



