Easy-to-use and low cost.
The 3rd generation of high-speed fiber amplifiers.

- Industry's No. 1 Fastest high-speed response in the world (according to Feb. 2010 in-house survey)
- Supports cross talk prevention functions for up to 2 units, even in the fastest mode
- New generation specifications for sensing distance as well
- 100% display for better recognition of level change

Selection table

<table>
<thead>
<tr>
<th>Type</th>
<th>Shape</th>
<th>Control output</th>
<th>Light source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand-alone type</td>
<td></td>
<td>Single output</td>
<td>4 element red LED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dual output</td>
<td></td>
</tr>
<tr>
<td>Inter-connection master</td>
<td></td>
<td>Single output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dual output</td>
<td></td>
</tr>
<tr>
<td>Inter-connection slave</td>
<td></td>
<td>Single output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dual output</td>
<td></td>
</tr>
<tr>
<td>Water detection</td>
<td></td>
<td>Single output</td>
<td>Infrared LED</td>
</tr>
</tbody>
</table>

Model (Models in parentheses are connector types)

<table>
<thead>
<tr>
<th>NPN type</th>
<th>PNP type</th>
</tr>
</thead>
<tbody>
<tr>
<td>D3RF-TN</td>
<td>D3RF-TP</td>
</tr>
<tr>
<td>(D3RF-TCN4)</td>
<td>(D3RF-TCP4)</td>
</tr>
<tr>
<td>D3RF-TDN</td>
<td>D3RF-TDP</td>
</tr>
<tr>
<td>D3RF-TMN</td>
<td>D3RF-TMP</td>
</tr>
<tr>
<td>(D3RF-TMCN4)</td>
<td>(D3RF-TMCP4)</td>
</tr>
<tr>
<td>D3RF-TDMN</td>
<td>D3RF-TDMP</td>
</tr>
<tr>
<td>D3RF-TSN</td>
<td>D3RF-TSP</td>
</tr>
<tr>
<td>(D3RF-TSCN4)</td>
<td>(D3RF-TSCP4)</td>
</tr>
<tr>
<td>D3RF-TDSN</td>
<td>D3RF-TDSP</td>
</tr>
</tbody>
</table>

Options/Accessories

- **End plate**
  - BEF-EB01-W190 (2 pieces)

- **Reflective sheet**
  - Diamond grade sheet
    - 100 x 100 mm (adhesive type)

- **Connector cable**
  - Straight
    - JCN-5
      - Cable length: 2 m
  - L-shaped
    - JCN-L
      - Cable length: 2 m
    - JCN-5L
      - Cable length: 5 m
    - JCN-10S
      - Cable length: 10 m
High-speed digital type D3RF, D3IF series

Easy to see and intuitive

Widest display in the industry.
The display area is equipped with the widest display in the industry, expanded by 4 mm compared to conventional models. The adoption of high brightness LEDs, a 7-segment display, with high brightness and high visibility even from a distance is made possible.

100% display for better recognition of level change
Display for receiving light quantity can be changed to a percentage display with one simple single action, making changes in receiving light quantity are easy to recognize even when linked.

Dual “ASC” for easy maintenance (Through Teaching or Percent Teaching)
Unique functionality in which automatic sensitivity corrections are performed when light level decreases occur due to contamination of fiber tips caused by dust, etc. After cleaning, the threshold value is automatically restored, so there is no need for re-teaching. *For dual output types, ASC operates only for control output 1.

Cordial design to prevent misoperation
By featuring a design in which basic setup can be performed by pressing the teach button for 2 seconds and in which advanced functions are performed at deeper levels, setting changes caused by misoperation can be prevented.

“FALUX” function that suppresses fluctuations in emitting power.
a temperature correction circuit in the emitting circuit suppresses emission power fluctuations caused by temperature changes. Stable detection can be performed with little change in brightness, even immediately after turning the power on. Since the brightness of the emitting LED is constant without being influenced by the internal temperature, heat sinks and an APC, which accelerates the deterioration of the LED, become unnecessary.

Adjustable hysteresis
Hysteresis can be adjusted widely from 1% to 40%. This enables the sensor to be optimized for detecting slight differences in parts or applications with a lot of vibration.

[Image of display area expanded by 4 mm]

[Image of Dual “ASC” for easy maintenance]

[Image of Cordial design to prevent misoperation]

[Image of “FALUX” function that suppresses fluctuations in emitting power]
High-speed digital type D3RF, D3IF series

No. 1 in speed and power.

Super high-speed processor “FAntron DUO” [Patent pending]
A new, in-house developed processor that achieves both long and short dual pulse emission. Resistant to ambient light, it enables high-speed, long distance detection.

- Conventional model: Single pulse emitting
- D3RF: Dual pulse emitting

Emission waveform
Because light is emitted using one type of pulse, ambient light on the same pulse width or in the periphery can easily have an effect.

D3RF is the world’s first to emit light using two long and short types of pulse width. By sampling these unique pulses 6 times, ambient light has little effect and high-speed/long range detection is made possible.

Fastest high-speed response in the world
1-HS mode 16 μs (stand-alone) 22 μs (linked)

Our originally developed super high-speed processor “FAntron DUO” enables the fastest speed in its class at 16 μs (stand-alone/1-HS mode). It can detect over 30,000 workpieces per second.

Maximum speed during linked use is 22 μs (1-HS mode). It can prevent cross talk for up to 2 units even in maximum speed mode. Copying of setting is also possible.

Seven response times can be selected: 1-HS, 2-FS, 3-ST, 4-LG, 5-PL, 6-UL and 7-EL.

New generation specifications for sensing distance as well
With the new built-in “FAntron DUO” processor, a long and short dual pulse width emission is realized, instead of the conventional single pulse width emissions. In addition, due to the synergistic effect of the high power LEDs and high efficiency condensing lens, sensing distance is increased a maximum of 3x compared to conventional products with diffuse types, and a maximum of 5x compared to conventional products with through-beam types. Long range detection becomes possible even for heat resistant and flexible fibers, in which until now long range detection has been difficult.

Power saving in ECO mode
Features an ECO mode that enables power saving by turning off the sub-monitor (green) and darkening the main-monitor (red).

Sensing distance comparison
With the D3RF, in which long range detection is made possible, response time settings can also reach a maximum of 8 ms (7-EL mode). Long range detection is realized without lengthening the response time unnecessarily to several tens of ms.

<table>
<thead>
<tr>
<th>Fiber unit model</th>
<th>Conventional model (Long mode: 2 ms)</th>
<th>D3RF (7-EL mode: 8 ms)</th>
<th>Comparison to conventional model</th>
</tr>
</thead>
<tbody>
<tr>
<td>NF-DB01 (M6 coaxial)</td>
<td>450 mm</td>
<td>1200 mm</td>
<td>2.7x</td>
</tr>
<tr>
<td>NF-DI01 (M6 R2 mm)</td>
<td>350 mm</td>
<td>1100 mm</td>
<td>3.1x</td>
</tr>
<tr>
<td>NF-DH01 (heat resistant 180°C)</td>
<td>450 mm</td>
<td>1250 mm</td>
<td>2.8x</td>
</tr>
<tr>
<td>NF-TB01 (M4 standard)</td>
<td>1800 mm</td>
<td>4000 mm</td>
<td>2.2x</td>
</tr>
<tr>
<td>NF-TR01 (M4 R2 mm)</td>
<td>800 mm</td>
<td>4000 mm</td>
<td>5x</td>
</tr>
<tr>
<td>NF-TH02 (heat resistant 180°C)</td>
<td>1000 mm</td>
<td>4000 mm</td>
<td>4x</td>
</tr>
</tbody>
</table>

Fiber used: NF-DH01 (Reflective type/heat resistant 180°C)

Normally 864 mW or less
Approx. 31% decrease
When set to power-saving mode (ECO ALL mode) 600 mW or less

 Ramirez National - Optex FA Sensors
www.Optex-Ramco.com
Got Questions? 1-800-280-6933
More convenient, even when linked.

Cross talk prevention
Prevents malfunctions caused by cross talk by linking master and slave units to electrically shift the timing of the emitting element. Up to 12 units can be linked closely together, with up to 16 units in ECO mode.

Batch setting of amplifier
Settings can be made collectively for linked (expanded) amplifiers. Zero reset and various types of teaching, as well as copying of amplifier settings from upstream (master unit side) to downstream (terminal slave unit side) can be performed.

| No. of units applicable to cross talk prevention (including master unit) |
|---------------------------------|-----------------|
| Eco mode: OFF, disp             | Eco mode: rESP, ALL |
| 1-HS mode                      | 2 units         | 4 units         |
| 2-FS mode                      | 4 units         | 8 units         |
| 3-ST mode                      | 4 units         | 8 units         |
| 4-LG mode                      | 8 units         | 16 units        |
| 5-PL mode                      | 8 units         | 16 units        |
| 6-UL mode                      | 12 units        | 16 units        |
| 7-EL mode                      | 12 units        | 16 units        |

When linked in modes with differing response times, the number of units applicable to cross talk prevention may decrease.

Detection of only water is possible
Employs an infrared LED (wavelength: 1.45 μm) for the light source that are absorbed by water. Detection of only water is made possible using water detection amplifier D3IF-TN and the specialized fiber unit shown on the right.
### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Specified type</th>
<th>Inter-connection master</th>
<th>Inter-connection slave</th>
<th>Water detection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NPN Single output</td>
<td><strong>D3RF-TN</strong></td>
<td><strong>D3RF-TMN</strong></td>
<td><strong>D3IF-TN</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector type</td>
<td><strong>D3RF-TCN4</strong></td>
<td><strong>D3RF-TMCN4</strong></td>
<td><strong>D3RF-TSCN4</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NPN Dual output</td>
<td><strong>D3RF-TDN</strong></td>
<td><strong>D3RF-TDMN</strong></td>
<td><strong>D3RF-TDNS</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector type</td>
<td><strong>D3RF-TCN4</strong></td>
<td><strong>D3RF-TMCN4</strong></td>
<td><strong>D3RF-TSCN4</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PNP Single output</td>
<td><strong>D3RF-TP</strong></td>
<td><strong>D3RF-TMP</strong></td>
<td><strong>D3IF-TP</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector type</td>
<td><strong>D3RF-TCN4</strong></td>
<td><strong>D3RF-TMCN4</strong></td>
<td><strong>D3RF-TSCN4</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PNP Dual output</td>
<td><strong>D3RF-TDP</strong></td>
<td><strong>D3RF-TDMP</strong></td>
<td><strong>D3RF-TDSP</strong></td>
</tr>
</tbody>
</table>

**Light source**
- 4 element red LED (wavelength 632 nm)
- Infrared LED (wavelength 1.45 μm)

**Response time**
- 1-HS mode: 16 μs
- 1-HS mode (when linked): 22 μs
- 2-FS mode: 70 μs
- 2-FS mode (when linked): 85 μs
- 3-ST mode: 250 μs
- 4-LG mode: 500 μs
- 5-PL mode: 1 ms
- 6-UL mode: 2 ms
- 7-EL mode: 8 ms

**Distance adjustment**
Various types of teaching and manual adjustment

**Indicators**
- Single output type: Output indicator (orange)
- Dual output type: Output indicator (orange) x2

**Digital display**
7-segment, 8-digit display (red: 4-digit, green: 4-digit)

**Control output**
- NPN/PNP open collector
- Max. 100 mA/30 VDC
- Residual voltage: 1.8 V or less

**External input**
- Teach input*, Test input, synchronous input, counter reset input**

**Timer function**
- ON delay, OFF delay, one-shot, ON + OFF delay, ON + one-shot settable 0.1 to 9999 ms

**Output mode**
- Light ON / Dark ON selectable by setting

**No. of connectable units (including master unit)**
Max. 16 units

**Connection type**
- Cable type: Cable length: 2 m
- Connector type: M8, 4-pin

**Insulation resistance**
20 MΩ or more (with 500 VDC)

**Supplementary voltage**
12 to 24 VDC ±10%, including 10% ripple (p-p)

**Power consumption (normally)**
- Single output type: 864 mW (36 mA or less at 24 V)
- Dual output type: 936 mW (39 mA or less at 24 V)

**Power consumption (Eco ALL)**
- Single output type: 600 mW (25 mA or less at 24 V)
- Dual output type: 672 mW (28 mA or less at 24 V)

**Applicable regulations**
- EMC directive (2004/108/EC)
- EN 60947-5-2

**Company standards**
- Noise resistance: Feilen Level 4 cleared

**Environmental resistance**
- Ambient temperature/humidity: -25 to +55°C / 35 to 85% RH (no freezing or condensation)
- Ambient illuminance: Sunlight: 10,000 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: IP50

**Material**
- Housing, cover: PC

**Weight**
- Cable type: Approx. 71 g / Connector type: Approx. 25 g

**Included accessories**
- Mounting bracket

---

*Specifications are subject to change without prior notice for product improvement purposes.

*1. When Eco mode is set to rESP or ALL, the response time is doubled.

*2. For dual output types, the threshold value/timer and Light ON/Dark ON can be set individually for output 1 and output 2. Additionally, ASC is only available for output 1.

*3. No. of connectable units when used stand-alone or as the master unit: 2 to 3 units. Please use a load current of 50 mA or less for 4 to 8 units, and 20 mA or less for 9 to 16 units.

*4. Teaching mode from external input is a mode executed in advance by the main unit (default: 2-point teaching).

*5. The counter function is a function only for the dual output type, as counter reset input is not equipped to single output types.

*6. No. of connectable units when used stand-alone or as the master unit: 2 to 3 units. Keep at -25 to +50°C for 4 to 8 units, and -25 to +45°C for 9 to 16 units.
I/O circuit diagram

NPN output type

PNP output type

Note: Control output 2 (gray) is equipped only for dual-output types. In addition, power supply wires (brown/blue) are not equipped for inter-connection slave units.

Connector type

Connecting

When not used for control output 2 or external input, cut the lead wire and wrap it individually with insulating tape, and do not connect it to any other terminal.

1 to 4 correspond to connector pin No.

Notes

When using a switching regulator for the power supply, be sure to ground the frame ground terminal.

Because wiring sensor wires with high-voltage wires or power supply wires can result in malfunctions due to noise, which can cause damage, make sure to wire separately.

Avoid using the transient state while the power is on (approx. 300 ms).

The connector direction is set as in the diagram below when using the L-shaped connector cable. Be aware that rotation is not possible.

When using a switching regulator for the power supply, be sure to ground the frame ground terminal.

Because wiring sensor wires with high-voltage wires or power supply wires can result in malfunctions due to noise, which can cause damage, make sure to wire separately.

Avoid using the transient state while the power is on (approx. 300 ms).

The connector direction is set as in the diagram below when using the L-shaped connector cable. Be aware that rotation is not possible.
High-speed digital type D3RF, D3IF series

**Dimensions**

**Stand-alone type**

- D3RF-TN, -TCN4, -TDN
- D3RF-TP, -TCP4, -TDP
- D3IF-TN, -TCN4, -TP, -TCP4

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>mm</td>
<td>37.3</td>
</tr>
<tr>
<td>Height</td>
<td>mm</td>
<td>9.2</td>
</tr>
<tr>
<td>Depth</td>
<td>mm</td>
<td>68.9</td>
</tr>
<tr>
<td>Cable Length</td>
<td>mm</td>
<td>3.55</td>
</tr>
<tr>
<td>Maximum Aperture</td>
<td>°</td>
<td>Approx. 180</td>
</tr>
</tbody>
</table>

**Inter-connection type**

- D3RF-TMN, -TMCN4, -TDMN
- D3RF-TSN, -TSCN4, -TDSN
- D3RF-TMP, -TMCP4, -TDMP
- D3RF-TSP, -TSCP4, -TDSP

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>mm</td>
<td>51.9</td>
</tr>
<tr>
<td>Height</td>
<td>mm</td>
<td>9.2</td>
</tr>
<tr>
<td>Depth</td>
<td>mm</td>
<td>37.3</td>
</tr>
<tr>
<td>Cable Length</td>
<td>mm</td>
<td>3.55</td>
</tr>
<tr>
<td>Maximum Aperture</td>
<td>°</td>
<td>Approx. 180</td>
</tr>
</tbody>
</table>

Cable length 2 m, ø3.8, 5-wire × 0.2 mm² (master single output type), ø3.8, 4-wire × 0.2 mm² (master single output type), ø3.8, 3-wire × 0.2 mm² (slave single output type), ø2.8, 2-wire × 0.2 mm² (slave single output type).
High-speed digital type D3RF, D3IF series

Connector cable (optional)
- JCN-S, JCN-5S, JCN-10S
- JCN-L, JCN-5L, JCN-10L

Photoelectric Sensors
- Specialized Photoelectric Sensors
- Laser Displacement Sensors
- Fiber Amplifiers
- D3RF, D3IF
  - UC1-CL11
  - D2RF
  - BRF, BIF
  - JRF

Got Questions? 1-800-280-6933

www.Optex-Ramco.com