The next-generation new form series
A new alternative to fiber sensors

Simpler design

All you need to do is to make a ø4 mm (ø0.157 in) hole where you would like to stop or check the object. Furthermore, the center of the sensing axis is the same as the center of the mounting hole, which makes it much easier to set the sensing position.

New design solves all weak points of fiber sensors

The EX-30 series solves all of the difficulties associated with fiber sensors, such as:
- Difficulty finding a suitable place for the amplifier
- Fragility of the fiber
- Extra space needed because of difficulty in bending the fiber
- The nuisance of having to use a protective tube to prevent fiber breakage

BASIC PERFORMANCE

Electric power saving*

The EX-30 series achieves reductions in power consumption of up to 65%. These sensors contribute to environmental friendliness.

Long sensing range

The EX-30 series achieves long distance sensing (thru-beam type: 500 mm (19.685 in), reflective type: 50 mm (1.969 in)).

High response speed of 0.5 ms

The same high response speed of 0.5 ms as fiber sensor amplifiers is provided, making these sensors ideal for sensing small objects, counting objects that are moving quickly and positioning items such as circuit boards.

*Effective from production in April 2011.
**APPLICATIONS**

- Detecting IC height
- Detecting quantity of labels in label magazine
- Checking IC pins (using slit masks)

**VARIETIES**

New thru-beam types now feature operation mode switch and sensitivity adjuster!

**EX-33(-PN)**

1. **Operation mode switch**
   - Switching between light-ON and dark-ON operating modes is possible with a single model.

2. **Sensitivity adjuster**
   - It is convenient when you need fine adjustment.

3. **Bright 2-color indicator**
   - A bright 2-color indicator has been incorporated in all types.

**MOUNTING / SIZE**

Can be installed in the same way as standard fibers

The EX-30 series can be screwmounted (M4 for thru-beam type, M6 for reflective type) in the same way as standard fiber sensors. This means that they can be inserted into production lines in exactly the same way as conventional high-priced fiber sensors.

Conventional photoelectric sensors required four (for thru-beam type) or two (for reflective type) mounting holes and screws to be used. However, the EX-30 series is installed with a single screw, thus cutting down on installation work by half.

**Takes up very little space**

Unlike conventional fibers, bending radius is not a problem, so that the sensor can be securely installed alongside conveyors.
ENGLISH RESISTANCE

Incorporated an inverter countermeasure circuit*

The EX-30 series become significantly stronger against inverter light and other extraneous light.
*Effective from production in April 2011.

FUNCTIONS

Bright 2-color indicator

A bright 2-color indicator is incorporated in all types.

No protective tube needed

The EX-30 series has high bending strength, so that the protective tube used to protect conventional fiber from breakage is not needed. This also adds up to excellent cost performance.

Waterproof IP67 (IEC)

The sensor can be hosed down because of its IP67 construction.

Note: However, take care that if it is exposed to water splashes during operation, it may detect a water drop itself.

ORDER GUIDE

<table>
<thead>
<tr>
<th>Type</th>
<th>Appearance</th>
<th>Sensing range</th>
<th>Model No.</th>
<th>Output</th>
<th>Output operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thru-beam</td>
<td></td>
<td>500 mm 19.685 in</td>
<td>EX-31A</td>
<td>NPN open-collector transistor</td>
<td>Light-ON</td>
</tr>
<tr>
<td>Thru-beam</td>
<td></td>
<td>500 mm 19.685 in</td>
<td>EX-31B</td>
<td>PNP open-collector transistor</td>
<td>Dark-ON</td>
</tr>
<tr>
<td>Thru-beam</td>
<td></td>
<td>800 mm 31.496 in</td>
<td>EX-31A-PN</td>
<td>NPN open-collector transistor</td>
<td>Switchable either Light-ON or Dark-ON</td>
</tr>
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<td>Thru-beam</td>
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<td></td>
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<td>EX-32B-PN</td>
<td>PNP open-collector transistor</td>
<td>Dark-ON</td>
</tr>
</tbody>
</table>

Note: The model No. with “P” shown on the label affixed to the thru-beam type sensor is the emitter, “D” shown on the label is the receiver.

5 m 16.404 ft cable length type

5 m 16.404 ft cable length type (standard: 2 m 6.562 ft) is also available for NPN output type [excluding EX-33(PN)].

When ordering this type, suffix “-C5” to the model No. (e.g.) 5 m 16.404 ft cable length type of EX-31A is “EX-31A-C5”.

*Effective from production in April 2011.
**OPTIONS**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Model No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slit mask (For thru-beam type sensor only)</td>
<td>OS-EX30-1 ([Slit size ø1 mm](0.039 in))</td>
<td>Slit on one side • Sensing range: 200 mm 7.874 in [EX-31A-PN] 320 mm 12.598 in [EX-33-PN] • Min. sensing object: ø2 mm ø0.079 in • Sensing range: 150 mm 5.906 in 240 mm 9.449 in [EX-33-PN] • Min. sensing object: ø1 mm ø0.039 in</td>
</tr>
</tbody>
</table>

Note: One slit and two spacers are provided per set. Two sets are required when installing on both sides.

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Thru-beam</th>
<th>Diffuse reflective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>With operation mode switch</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Light-ON</td>
<td>Dark-ON</td>
</tr>
<tr>
<td>Output</td>
<td>&lt;NPN output type&gt;</td>
<td>NPN open-collector transistor</td>
<td>• Maximum sink current: 50 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 2 V or less (at 50 mA sink current) 1 V or less (at 16 mA sink current)</td>
</tr>
<tr>
<td></td>
<td>&lt;PNP output type&gt;</td>
<td>PNP open-collector transistor</td>
<td>• Maximum source current: 50 mA • Applied voltage: 30 V DC or less (between output and +V) • Residual voltage: 2 V or less (at 50 mA source current) 1 V or less (at 16 mA source current)</td>
</tr>
<tr>
<td>Utilization category</td>
<td>DC-12 or DC-13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output operation</td>
<td>Light-ON</td>
<td>Dark-ON</td>
<td>Switchable either Light-ON or Dark-ON</td>
</tr>
<tr>
<td>Short-circuit protection</td>
<td>Incorporated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>0.5 ms or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation indicator</td>
<td>Orange LED (lights up when the output is ON) (incorporated on the receiver for thru-beam type)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stability indicator</td>
<td>Green LED (lights up under stable light received condition or stable dark condition, incorporated on the receiver)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green LED (lights up under stable light received condition or stable dark condition)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity adjuster</td>
<td>Continuously variable adjuster</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Pollution degree**: 3 (Industrial environment)  
- **Protection**: IP67 (IEC)  
- **Ambient temperature**: –25 to +55 °C –13 to +131 °F (No dew condensation or icing allowed), Storage: –30 to +70 °C –22 to +158 °F  
- **Ambient humidity**: 35 to 85 % RH, Storage: 35 to 85 % RH  
- **Ambient illuminance**: Incandescent light: 3,000 lx at the light-receiving face  
- **EMC**: EN 60947-5-2  
- **Voltage withstandability**: 1,000 V AC for one min. between all supply terminals connected together and enclosure  
- **Insulation resistance**: 20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure  
- **Vibration resistance**: 10 to 500 Hz frequency, 3 mm 0.118 in amplitude (20 G max.) in X, Y and Z directions for two hours each  
- **Shock resistance**: 500 m/s² acceleration (50 G approx.) in X, Y and Z directions for three times each  
- **Emitting element**: Red LED (modulated)  
- **Material**: Enclosure: Die-cast zinc (Nickel plated), Lens: Polycarbonate [EX-32□-PN (Acrylic)], Enclosure cover: Polycarbonate  
- **Cable**: 0.1 mm² 3-core (thru-beam type sensor emitter: 2-core) cable, 2 m 6.6 ft long  
- **Cable extension**: Extension up to total 50 m 164.042 ft is possible with 0.3 mm², or more, cable (thru-beam type: both emitter and receiver)  
- **Weight**: Net weight (emitter and receiver): 20 g approx. Gross weight: 65 g approx.  

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C 73.4 °F. 2) The sensing range and the hysteresis are specified for white non-glossy paper (100 × 100 mm 3.937 × 3.937 in) as the object. 3) Make sure to confirm detection with an actual sensor before use.
### I/O CIRCUIT AND WIRING DIAGRAMS

#### NPN output type

**I/O circuit diagram**
- **Color code**
  - Brown: +V
  - Back Output: Z
  - Blue: 0 V
- **Internal circuit**
  - Users' circuit
- **Note:** The emitter of the thru-beam type sensor does not incorporate the output.

**Wiring diagram**
- **Color code**
  - Brown: Load
  - Black: (Note)
- **Internal circuit**
  - Users' circuit
- **Note:** The emitter of the thru-beam type sensor does not incorporate the black wire.

#### PNP output type

**I/O circuit diagram**
- **Color code**
  - Brown: +V
  - Back Output: Z
  - Blue: 0 V
- **Internal circuit**
  - Users' circuit
- **Note:** The emitter of the thru-beam type sensor does not incorporate the output.

**Wiring diagram**
- **Color code**
  - Brown: Load
  - Black: (Note)
- **Internal circuit**
  - Users' circuit
- **Note:** The emitter of the thru-beam type sensor does not incorporate the black wire.

### SENSING CHARACTERISTICS (TYPICAL)

#### EX-31□ - EX-31□-PN

<table>
<thead>
<tr>
<th>Parallel deviation</th>
<th>Angular deviation</th>
<th>Parallel deviation with slit mask on one side</th>
<th>Parallel deviation with slit masks on both sides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting distance L (mm in)</td>
<td>Operating point ℓ (mm in)</td>
<td>Left Center Right</td>
<td>Left Center Right</td>
</tr>
<tr>
<td>3.507</td>
<td>1.969</td>
<td>1.969</td>
<td>1.575</td>
</tr>
<tr>
<td>3.937</td>
<td>1.969</td>
<td>1.969</td>
<td>1.575</td>
</tr>
<tr>
<td>4.724</td>
<td>2.026</td>
<td>2.026</td>
<td>1.575</td>
</tr>
<tr>
<td>5.906</td>
<td>2.026</td>
<td>2.026</td>
<td>1.575</td>
</tr>
</tbody>
</table>

#### Thru-beam type

<table>
<thead>
<tr>
<th>Correlation between setting distance and excess gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting distance L (mm in)</td>
</tr>
<tr>
<td>1.575</td>
</tr>
<tr>
<td>2.000</td>
</tr>
<tr>
<td>3.937</td>
</tr>
<tr>
<td>7.874</td>
</tr>
</tbody>
</table>

#### Diffuse reflective type

<table>
<thead>
<tr>
<th>Correlation between sensing object size and sensing range</th>
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</thead>
<tbody>
<tr>
<td>Setting distance L (mm in)</td>
</tr>
<tr>
<td>1.575</td>
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</table>
**SENSING CHARACTERISTICS (TYPICAL)**

**EX-33**

**Thru-beam type**

**EX-33-PN**

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**PRECAUTIONS FOR PROPER USE**

- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, refer to p. 1458~ for general precautions.
- Do not use during the initial transient time (50 ms) after the power supply is switched on.
- In case of using the sensor at a place where static electricity is generated, use a metal mounting plate. Also, ensure to ground the mounting plate.

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**DIMENSIONS (Unit: mm in)**

**EX-31□**

- Opposing faces 7.026, thickness 2.4 0.094
- Toothed lock washer ø8.5 ø0.035
- Beam axis
- Toothed lock washer ø11 ø0.433
- Operation indicator (Green) (Note 1)

**EX-31□-PN**

- Opposing faces 7.026, thickness 2.4 0.094
- Operation indicator (Orange) (Note)

**EX-33**

- Opposing faces 7.026, thickness 2.4 0.094
- Toothed lock washer ø8.5 ø0.035
- Operation indicator (Orange) (Note 1)

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**EX-32□**

- Opposing faces 10 0.394, thickness 2 0.075
- Operation indicator (Orange)

**EX-32□-PN**

- Opposing faces 10 0.394, thickness 2 0.075
- Operation indicator (Orange)

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**Notes:**

1) Not incorporated on the emitter.
2) Internal thread part M4 x 0.7 0.028, 3.8 0.150 deep

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**Slit mask**

- Material: Brass(Nickel plated)

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The CAD data in the dimensions can be downloaded from our website.