NA1-11
Small/Slim Object Detection Area Sensor

Letter or Visiting Card Detectable!
Slim objects can be detected by using the cross-beam scanning system.

Emitting and Receiving Element Pitch: 10mm
A minimum sensing object size of \( \geq 13.5 \text{mm} \) is realized by using an emitting and receiving element pitch of 10mm.

Just 10mm Thick
It is extremely slim, being just 10mm thick. Further, it can be mounted in a narrow space since its cable exit direction is freely adjustable.

Wide Area
Though being very slim, it realizes a wide sensing area of 1m length and 100mm width. It is most suitable for object detection on a wide assembly line, or for detecting the dropping of, or incursion by, small objects whose travel path is uncertain.

No Synchronization Wire
Wiring is saved and made simple as no synchronization wire is required between the emitter and the receiver.

Globally Useable
It conforms to the EMC Directive and has UL Recognition. Moreover, PNP output type, which is much in demand in Europe, is also available.

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Clearly Visible Indicator

A clearly visible large indicator, having a 55mm width, is incorporated on both the emitter and the receiver. Further, if the sensing output is directly connected to the large indicator input, the indicator can be conveniently used as a large operation indicator. Moreover, its operation can be selected as lighting or blinking.

Cross-beam Scanning System

In a conventional area sensor, slim objects cannot be detected since the emitting and the receiving elements are scanned, synchronously, as a set. In contrast, in **NA1-11**, only the elements 1 to 6 of the emitter are scanned to obtain emission. The elements of the receiver are not scanned, so that when element 1 of the emitter emits light, all the elements of the receiver receive light. Hence, even if there is one element on the receiver which does not receive light, it results in light interrupted operation. With this technique, detection of slim objects is possible.

**WARNING** Never use this product in any personnel safety application.
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ORDER GUIDE

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<th>Sensing range (Note)</th>
<th>Model No.</th>
<th>Output</th>
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<tr>
<td></td>
<td>sensing height: 100mm</td>
<td>NA1-11</td>
<td>NPN open-collector transistor</td>
</tr>
<tr>
<td></td>
<td>No. of elements per emitter/receiver: 11</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>element pitch: 10mm</td>
<td>NA1-11-PN</td>
<td>PNP open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.17 to 1m</td>
<td></td>
</tr>
</tbody>
</table>

Note: The sensing range is the possible setting distance between the emitter and the receiver. The sensor can detect an object less than 0.17m away.

OPTIONS

<table>
<thead>
<tr>
<th>Designation</th>
<th>Model No.</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Sensor mounting</td>
<td>MS-NA1-1</td>
<td>Four bracket set four M4 (length 15mm) screws with washers, eight nuts, four hooks, four spacers and eight M4 (length 18mm) screws with washers are attached. (Spacers are not attached with MS-NA1-1.)</td>
</tr>
<tr>
<td>bracket</td>
<td>MS-NA2-1</td>
<td>Four bracket set four M4 (length 15mm) screws with washers, eight nuts, four hooks, four spacers and eight M4 (length 18mm) screws with washers are attached. (Spacers are not attached with MS-NA1-1.)</td>
</tr>
</tbody>
</table>

Sensor mounting bracket

- **MS-NA1-1**
  - M4 screws with washers, nuts and hooks are attached.

- **MS-NA2-1**
  - M4 screws with washers, nuts, hooks and spacers are attached.
### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>NPN output</th>
<th>PNP output</th>
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<tbody>
<tr>
<td>Sensing height</td>
<td>100mm</td>
<td></td>
</tr>
<tr>
<td>Sensing range (Note 1)</td>
<td>0.17 to 1m</td>
<td></td>
</tr>
<tr>
<td>Element pitch</td>
<td>10mm</td>
<td></td>
</tr>
<tr>
<td>Number of emitting/receiving elements</td>
<td>11 Nos. each on the emitter and the receiver, respectively</td>
<td></td>
</tr>
<tr>
<td>Sensing object</td>
<td>≥13.5mm or more opaque object (Note 2)</td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>12 to 24V DC ± 10% Ripple P-P 10% or less</td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>Emitter: 80mA or less, Receiver: 100mA or less</td>
<td></td>
</tr>
</tbody>
</table>

**Output**
- NPN open-collector transistor
  - Maximum sink current: 100mA
  - Applied voltage: 30V DC or less (between output and 0V)
  - Residual voltage: 1V or less (at 100mA sink current)
- PNP open-collector transistor
  - Maximum source current: 100mA
  - Applied voltage: 30V DC or less (between output and +V)
  - Residual voltage: 1V or less (at 100mA source current)

**Utilization category**
- DC-12 or DC-13

**Output operation**
- ON or OFF when beam is interrupted, selectable by operation mode switch

**Short-circuit protection**
- Incorporated

**Response time**
- In Dark state: 5ms or less, In Light state: 10ms or less

**Indicators**
- **Emitter**
  - Power indicator: Green LED (lights up when the power is ON)
  - Large indicator: Orange LED (lights up or blinks when the large indicator input is Low, lighting pattern is selected by operation mode switch)
- **Receiver**
  - Operation indicator: Orange LED (lights up when the output is ON)
  - Large indicator: Orange LED (lights up or blinks when the large indicator input is Low, lighting pattern is selected by operation mode switch)

**Pollution degree**
- 3 (Industrial environment)

**Protection**
- IP62 (IEC)

**Environmental resistance**
- **Ambient temperature**
  - 10 to + 55°C (No dew condensation or icing allowed), Storage: -20 to + 70°C
- **Ambient humidity**
  - 35 to 85% RH, Storage: 35 to 85% RH
- **Ambient illuminance**
  - Sunlight: 10,000 lx at the light-receiving face, Incandescent light: 3,000 lx at the light-receiving face
- **EMC**
  - Emission: EN50081-2, Immunity: EN50082-2

**Voltage withstandability**
- 1,000V AC for one min. between all supply terminals connected together and enclosure

**Insulation resistance**
- 20MΩ or more, with 250V DC megger between all supply terminals connected together and enclosure

**Vibration resistance**
- 10 to 150Hz frequency, 1.5mm amplitude in X, Y and Z directions for two hours each

**Shock resistance**
- 500m/s² acceleration (50G approx.) in X, Y and Z directions for three times each

**Emitting element**
- Infrared LED (cross-beam scanning system)

**Material**

**Cable**
- 0.3mm² 4-core (emitter: 3-core) oil resistant cable, 2m long

**Cable extension**
- Extension up to total 100m is possible, for both emitter and receiver, with 0.3mm², or more, cable.

**Weight**
- Emitter: 80g approx., Receiver: 85g approx.

Notes:
1) The sensing range is the possible setting distance between the emitter and the receiver. The sensor can detect an object less than 0.17m away.

2) Although this product can detect slim objects by using the cross-beam scanning system, the size of the slim object which can be stably detected differs with the setting distance. When this sensor is used to detect slim objects, make sure to confirm stable detection using the actual objects.
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I/O CIRCUIT AND WIRING DIAGRAMS

### NA1-11

**NPN output type**

#### I/O circuit diagram

- **Color code**
  - Brown (+V)
  - Black (Output/Note)
  - Blue (0V)
  - Pink (Input)

- **Sensing circuit**
  - Tr: NPN output transistor
  - E: Large indicator (INDICATOR)

- **Users’ circuit**
  - Internal circuit

#### Wiring diagram

- **Color code**
  - Brown (+V)
  - Black (Note)
  - Blue
  - Pink

- **Wiring**
  - 12 to 24V DC ≤ 10%

- **Note:** The emitter is not incorporated with the output.

#### Symbols
- **D**: Reverse supply polarity protection diode
- **Zo**: Surge absorption zener diode
- **Tr**: NPN output transistor
- **E**: Large indicator (INDICATOR)

### NA1-11-PN

**PNP output type**

#### I/O circuit diagram

- **Color code**
  - Brown (+V)
  - Black (Output/Note)
  - Blue (0V)
  - Pink (Input)

- **Sensing circuit**
  - Tr: PNP output transistor
  - E: Large indicator (INDICATOR)

- **Users’ circuit**
  - Internal circuit

#### Wiring diagram

- **Color code**
  - Brown (+V)
  - Black (Note)
  - Blue
  - Pink

- **Wiring**
  - 12 to 24V DC ≤ 10%

- **Note:** The emitter is not incorporated with the output.

#### Symbols
- **D**: Reverse supply polarity protection diode
- **Zo**: Surge absorption zener diode
- **Tr**: PNP output transistor
- **E**: Large indicator (INDICATOR)

### SENSING CHARACTERISTICS (TYPICAL)

**Correlation between setting distance and excess gain**

![Graph showing the correlation between setting distance and excess gain](image)

**Excess gain**

- Setting distance L (m)
  - 0
  - 1
  - 2
  - 3
  - 4
  - 5

**High** (4V or more): lights up or blinks
Low (0 to 0.6V, or open): lights off

Note: The emitter does not have the black wire.
SENSING CHARACTERISTICS (TYPICAL)

Parallel deviation

Vertical direction
- Common for both horizontal and vertical directions

Horizontal direction

Angular deviation

Emitter angular deviation

Receiver angular deviation

Correlation between setting distance and minimum length of detectable object

The minimum length of the detectable object, which lies in a plane perpendicular to the sensor front surface, varies with the setting distance, as shown in the left graph. However, note that the minimum length of the detectable object also varies with the object thickness.

PRECAUTIONS FOR PROPER USE

- This sensor is not for press machine safeguard. Do not use this sensor for any press machine.
- This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.
- Area sensors conforming to safety standards are available. For details, please contact our office.

Mounting
- Use M4 screws with washers and M4 nuts. The tightening torque should be 0.5N·m or less. (Please arrange the screws and nuts separately.)

Selection of large indicator operation
- Lighting/Blinking is selected by the operation mode switch on the emitter and the receiver.

<table>
<thead>
<tr>
<th>Operation mode switch</th>
<th>Emitter</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting</td>
<td>LIGHT</td>
<td>LIGHT</td>
</tr>
<tr>
<td>Blinking</td>
<td>BLINK</td>
<td>BLINK</td>
</tr>
</tbody>
</table>

Selection of output operation
- The output operation mode is selected by the operation mode switch on the receiver. The switches must be set with the power supply off. The operation mode does not change if the switch setting is changed with the power supplied.

<table>
<thead>
<tr>
<th>Operation mode switch</th>
<th>Output operation</th>
<th>Operation indicator (Orange)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-ON</td>
<td>ON in Dark state</td>
<td>Lights up when the output is ON</td>
</tr>
<tr>
<td>L-ON</td>
<td>OFF in Dark state</td>
<td>Lights up when the output is ON</td>
</tr>
</tbody>
</table>

Note: LIGHT/BLINK switch is not related to the output operation selection.
## NA1-11

### PRECAUTIONS FOR PROPER USE

**Others**

- Make sure to carry out the operation of the operation mode switch in the power supply off condition.
- Do not use during the initial transient time (0.5 sec.) after the power supply is switched on.
- Although this sensor can detect slim objects by using the cross-beam scanning system, the size of the slim object which can be stably detected differs with the setting distance. Hence, when the sensor is used to detect slim objects, make sure to confirm stable detection using the actual objects.
- In case of this sensor, light from the emitter spreads above and below the sensor. Hence, take care that if there is a reflective object above or below the sensor it will affect the sensing.

![Diagram of sensor and reflective object](image)

### DIMENSIONS (Unit: mm)

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<thead>
<tr>
<th>NA1-11</th>
<th>NA1-11-PN</th>
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<tbody>
<tr>
<td>Sensor</td>
<td>Sensor</td>
</tr>
</tbody>
</table>

- **Emitter**:
  - 2 × 4.6 supplementary mounting holes 1.1 deep (on both sides)
  - 2 × 4.5 mounting holes with M4 nut seats 3.3 deep (1.1 deep on back side)
  - Power indicator (Green)
  - Large indicator (Orange)
  - (Sensing height) 100
  - Operation mode switch

- **Receiver**:
  - 2 × 4.5 mounting holes with M4 nut seats 3.3 deep (1.1 deep on back side)
  - 2 × 4.6 supplementary mounting holes 1.1 deep (on both sides)
  - Operation mode switch
  - Power indicator (Green)
  - Large indicator (Orange)
  - (Sensing height) 100
  - Operation indicator (Orange)

- **Dimensions**:
  - Sensing height 100
  - Adjacent distance 30
  - 3.7 cable 2m long
MS-NA1-1  Sensor mounting bracket (Optional)

**DIMENSIONS (Unit: mm)**

**Assembly dimensions**
Mounting drawing with the receiver

**Material:** Cold rolled carbon steel (SPCC) (Uni-chrome plated)

Four bracket set

Four M4 (length 15mm) screws with washers, eight nuts, four hooks, four spacers, and eight M4 (length 18mm) screws with washers are attached.

2-M4 screws with washers
2-hooks

MS-NA2-1  Sensor mounting bracket (Optional)

**Assembly dimensions**
Mounting drawing with the receiver

**Material:** Cold rolled carbon steel (SPCC) (Uni-chrome plated)

Four bracket set

Four M4 (length 15mm) screws with washers, eight nuts, four hooks, and eight M4 (length 18mm) screws with washers are attached.

2-M4 screws with washers
2-hooks