Miniature High-Performance Photoelectric Sensors

Enhanced detection accuracy and response time
## Sensing Methods

<table>
<thead>
<tr>
<th>Sensing Method</th>
<th>Through-beam</th>
<th>Background Suppression</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part No.</strong></td>
<td>SA2E-T</td>
<td>SA1E-LT SA2E-P SA1E-LP SA1E-X</td>
</tr>
<tr>
<td><strong>Sensing Range</strong></td>
<td>20m</td>
<td>30m 5m 10m 2m</td>
</tr>
<tr>
<td><strong>Light Source Element</strong></td>
<td>Red LED</td>
<td>Red laser Red LED Red laser Red LED</td>
</tr>
<tr>
<td><strong>Detectable Object</strong></td>
<td>Opacity</td>
<td>Ø6mm opaque opaque ø6mm opaque opaque/transparent</td>
</tr>
<tr>
<td><strong>Response Time</strong></td>
<td>0.5ms</td>
<td>0.25ms 0.5ms 0.25ms 0.5ms</td>
</tr>
<tr>
<td><strong>Sensitivity Adjustment</strong></td>
<td>Single-turn control (approx. 240°)</td>
<td>Single-turn control (approx. 240°)</td>
</tr>
<tr>
<td><strong>Operation Mode</strong></td>
<td>Light ON/Dark ON (select by model)</td>
<td>Light ON/Dark ON (selectable) (select using the Operation Mode Switch)</td>
</tr>
<tr>
<td><strong>Control Output</strong></td>
<td>NPN/PNP open collector</td>
<td>NPN/PNP open collector</td>
</tr>
<tr>
<td><strong>Current Draw</strong></td>
<td>Projector: 20mA maximum</td>
<td>Projector: 15mA maximum</td>
</tr>
<tr>
<td><strong>Degree of Protection</strong></td>
<td>IP67</td>
<td>IP67</td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>–30 to +55°C</td>
<td>–10 to +55°C –30 to +55°C</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>W10.8 x D19.5 x H31.5 (excluding LEDs and controls)</td>
<td>W10.8 x D19.5 x H31.5 (excluding LEDs and controls)</td>
</tr>
</tbody>
</table>

### Through-beam
- **SA2E-T**: 20m sense range, Red LED, 0.5ms response time, NPN/PNP open collector, IP67, –30 to +55°C operating temperature, W10.8 x D19.5 x H31.5 dimensions.
- **SA1E-LT**: 30m sense range, Red laser, 0.25ms response time.

### Background Suppression
- **SA2E-P**: 5m sense range (depends on the reflector), Red LED, 0.5ms response time.
- **SA1E-LP**: 10m sense range (depends on the reflector), Red laser, 0.25ms response time.
- **SA1E-X**: 2m sense range (depends on the reflector), Red LED, 0.5ms response time.
## Distances, & Sensing Objects

### Sensing Methods
- Through-beam
- Retro-reflective
- Reflective
- Polarized Retro-reflective
- Coaxial Polarized Retro-reflective

### Background Suppression (BGS)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>SA2E-T</th>
<th>SA1E-LT</th>
<th>SA2E-P</th>
<th>SA1E-LP</th>
<th>SA1E-X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensing Range</td>
<td>20m (Depends on the reflector)</td>
<td>30m</td>
<td>5m</td>
<td>10m</td>
<td>2m (Depends on the reflector)</td>
</tr>
</tbody>
</table>

### Adjustable Sensing Range
- 10 to 350mm
- 20 to 300mm
- 100mm
- 500mm
- 1m
- 50 to 150mm
- 20 to 300mm
- 40 to 300mm
- 100mm
- 500mm
- 1m
- 50 to 150mm

### Detectable Objects
- Opaque ø6mm
- Opaque ø0.2mm (copper wire, at 170mm)
- Opaque/Mirror/Transparent
- Opaque/Transparent

### Response Time
- 0.5ms
- 0.25ms

### Sensing Range Adjustment
- Single-turn control (approx. 240°)
- Approx. 7-turn endless control
- 6-turn endless control
- Single-turn control (approx. 240°)

### Operation Mode
- Light ON/Dark ON
- Light ON/Dark ON (selectable)
- Light ON/Dark ON (selectable)

### Control Output
- NPN open collector or PNP open collector
- NPN open collector
- NPN open collector

### Current Draw
- Projector: 20mA maximum
- Receiver: 35mA maximum
- Projector: 15mA maximum
- Receiver: 30mA maximum
- Projector: 20mA maximum
- Receiver: 20mA maximum

### Degree of Protection
- IP67

### Operating Temperature
- –30°C to +55°C
- –10°C to +55°C
- –30°C to +55°C
- –30°C to +55°C

### Dimensions
- W10.8 × D19.5 × H31.5 (excluding LEDs and controls)
Small objects moving at high speed were detected at intervals, but with SA2E, the response time is 0.5ms, allowing continuous detection of small objects at high speed.

**Sensing range variations**

- **Through-beam**
  - SA2E
  - SA1E
  - SA1E-L
  - Max. 5m (AC-R5/R8)
  - Max. 10m (laser) (AC-R5/R8)

- **Polarized Retro-reflective**
  - SA2E
  - SA1E-L
  - Max. 2m (AC-R8)

- **Coaxial Polarized Retro-reflective**
  - SA1E
  - Max. 10to 350mm

- **Diffuse reflective**
  - SA2E
  - 100mm
  - 500mm
  - 1m

- **Background Suppression**
  - SA2E
  - SA1E-L
  - 10 to 350mm
  - 20 to 300mm (laser type)

- **Small-beam**
  - SA2E
  - 50 to 150mm

**0.5ms response time, high-speed detection**

Small objects moving at high speed were detected at intervals, but with SA2E, the response time is 0.5ms, allowing continuous detection of small objects at high speed.
**Beam diameter enables accurate detection of various objects (BGS)**

IDEc’s unique air blower unit mounting bracket is available as an option. By reducing the light beam diameter by 30 to 40% compared to conventional photoelectric sensors, the accuracy of the detecting position is improved.

**Air blower unit allows stable detection in dusty environment**

IDEc’s unique air blower unit mounting bracket is available as an option. Maintains detection performance of the sensor and keeps the detection surface clean.

**Operational at a temperature of -30 to 55°C**

Features operating temperature range of -30 to +55°C. Ideal for installation on equipment used in cold storage warehouses.

**Output reverse-polarity protection circuit**

In addition to reverse-polarity protection for the power voltage, an output reverse-polarity protection circuit is also built-in, to protect the sensor from damage in the event of incorrect wiring.
**Sensors available to suit a variety of workpieces**

**Background Suppression (BGS)**

Ignores background and reliably detects workpieces. Not easily affected by the color of the workpiece and edges can be accurately detected by narrow beams. Detailed setting of distances is possible.

**Coaxial Polarized Retro-reflective**

Detected transparent objects of various shapes. Coaxial optical structure and narrow beam ensure stable detection; unaffected by narrowing, inclination or shaking of transparent objects.

**Application examples of transparent object sensing**

Because of its coaxial structure, SA1E-X does not have a blind zone, such as shown below. Other than detecting transparent objects, because the workpiece can be detected closely to the sensor, SA1E-X can be used in applications in narrow installation locations and where objects are near the sensor.

**Application examples**

<table>
<thead>
<tr>
<th>SA2E</th>
<th>SA1E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated parking garage</td>
<td>Detection of mirror surfaces</td>
</tr>
<tr>
<td>Detection of mirror surfaces</td>
<td>Restroom sink</td>
</tr>
<tr>
<td>Restroom sink</td>
<td>Detecting PC board at inspections</td>
</tr>
<tr>
<td>Detecting the end of a transparent film</td>
<td>Coaxial Polarized Retro-reflective Transparent Object Sensing</td>
</tr>
</tbody>
</table>

Mail sorting machine
Laser models ensure fast response and accurate sensing

**SA1E-L**

**Easy-to-align optical axis**
IDEC’s unique optical lens adjust function achieves easy and speedy optical adjustment when installing machines and equipment. Simple and accurate set up of long distance and small workpiece reading.

**Detects fast-moving objects**
The fast 0.25ms response speed allows reliable detection of closely spaced objects on a fast-moving conveyor.

**Dust and water resistant**
IP67 protection suitable for environments exposed to dust or water vapor.

**Easy positioning**
Because the visible red laser is easily seen in both short (20mm) and long (30m) distances, the detecting position and optical axis can be seen at a glance. The small beam can detect small objects, and also enables easy positioning of the sensor in applications where the beam passes through narrow spaces. All models are Class 1 laser compliant (JIS, IEC, FDA).

**Application examples**

<table>
<thead>
<tr>
<th>SA1E-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection from narrow locations</td>
</tr>
</tbody>
</table>

![Image of laser models and application examples]

IDEC's unique optical lens adjustment mechanism
Beam irradiation parallel to the mechanical axis of the housing is achieved for easy on-site installation. (Patent pending)

![Diagram of laser model components]

- Housing
- Optical lens (position adjustment)
- Laser diode
- Adjustment
- Parallel to the mechanical axis of the housing

**High-speed 0.25ms**

![Image of high-speed response]

**IP67**

![Image of dust and water resistant protection]

**SA1E-L**

![Viewed from the top]

- Housing
- Optical lens (position adjustment)
- Laser diode
## Miniature Photoelectric Sensors (Built-in Amplifier)/Laser Model

**SA2E/SA1E**

<table>
<thead>
<tr>
<th>Sensing Method</th>
<th>Sensing Range</th>
<th>Connection</th>
<th>Cable Length (m)</th>
<th>Operation Mode</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through-beam</td>
<td>![Through-beam Diagram]</td>
<td>Cable 2</td>
<td>20m</td>
<td>Select Light ON/Dark ON</td>
<td><strong>SA2E-TN3-2M</strong> SA2E-TP3-2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td></td>
<td><strong>SA2E-TN3C</strong> SA2E-TP3C</td>
</tr>
<tr>
<td></td>
<td>![Through-beam Diagram]</td>
<td>Cable 2</td>
<td>20m</td>
<td>Select Light ON/Dark ON</td>
<td><strong>SA2E-PN3-2M</strong> SA2E-PP3-2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td></td>
<td><strong>SA2E-PN3C</strong> SA2E-PP3C</td>
</tr>
<tr>
<td></td>
<td>![Through-beam Diagram]</td>
<td>Cable 2</td>
<td>20m</td>
<td>Select Light ON/Dark ON</td>
<td><strong>SA2E-DN3L-2M</strong> SA2E-DP3L-2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td></td>
<td><strong>SA2E-DN3LC</strong> SA2E-DP3LC</td>
</tr>
<tr>
<td></td>
<td>![Through-beam Diagram]</td>
<td>Cable 2</td>
<td>20m</td>
<td>Select Light ON/Dark ON</td>
<td><strong>SA2E-DN3M-2M</strong> SA2E-DP3M-2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td></td>
<td><strong>SA2E-DN3MC</strong> SA2E-DP3MC</td>
</tr>
<tr>
<td></td>
<td>![Through-beam Diagram]</td>
<td>Cable 2</td>
<td>20m</td>
<td>Select Light ON/Dark ON</td>
<td><strong>SA2E-DN3S-2M</strong> SA2E-DP3S-2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td></td>
<td><strong>SA2E-DN3SC</strong> SA2E-DP3SC</td>
</tr>
<tr>
<td></td>
<td>![Through-beam Diagram]</td>
<td>Cable 2</td>
<td>20m</td>
<td>Select Light ON/Dark ON</td>
<td><strong>SA2E-BN3-2M</strong> SA2E-BP3-2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td></td>
<td><strong>SA2E-BN3C</strong> SA2E-BP3C</td>
</tr>
<tr>
<td></td>
<td>![Through-beam Diagram]</td>
<td>Cable 2</td>
<td>20m</td>
<td>Select Light ON/Dark ON</td>
<td><strong>SA2E-NN3-2M</strong> SA2E-NP3-2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td></td>
<td><strong>SA2E-NN3C</strong> SA2E-NP3C</td>
</tr>
<tr>
<td></td>
<td>![Through-beam Diagram]</td>
<td>Cable 1</td>
<td>2.0m (using AC-R9)</td>
<td>Light ON/Dark ON</td>
<td><strong>SA1E-XN1</strong> SA1E-XP1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td>Dark ON</td>
<td><strong>SA1E-XN2</strong> SA1E-XP2</td>
</tr>
<tr>
<td></td>
<td>![Through-beam Diagram]</td>
<td>Cable 2</td>
<td>2.0m (using AC-R9)</td>
<td>Light ON/Dark ON</td>
<td><strong>SA1E-XN1-2M</strong> SA1E-XP1-2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td>Dark ON</td>
<td><strong>SA1E-XN2-2M</strong> SA1E-XP2-2M</td>
</tr>
<tr>
<td></td>
<td>![Through-beam Diagram]</td>
<td>Cable 5</td>
<td>1.0m (using AC-R10)</td>
<td>Light ON/Dark ON</td>
<td><strong>SA1E-XN1-5M</strong> SA1E-XP1-5M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td>Dark ON</td>
<td><strong>SA1E-XN2-5M</strong> SA1E-XP2-5M</td>
</tr>
<tr>
<td></td>
<td>![Through-beam Diagram]</td>
<td>Cable 1</td>
<td>1.0m (using AC-R11)</td>
<td>Light ON/Dark ON</td>
<td><strong>SA1E-XN1C</strong> SA1E-XP1C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td>Dark ON</td>
<td><strong>SA1E-XN2C</strong> SA1E-XP2C</td>
</tr>
</tbody>
</table>

*1: Maintain at least the distance shown in the ( ) between the photoelectric switch and reflector.

*2: Reflectors are not supplied and must be ordered separately.

1. Through beam SA2E-T models are engraved with SA2E-T*3P (projector) and SA2E-T*3R (receiver) for identification.

See website for details on approvals and standards.
<table>
<thead>
<tr>
<th>Sensing Method</th>
<th>Sensing Range</th>
<th>Connection</th>
<th>Cable Length (m)</th>
<th>Part No.</th>
<th>PNP Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through-beam</td>
<td>30m</td>
<td>Cable</td>
<td>1</td>
<td>SA1E-LTN3</td>
<td>SA1E-LTP3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>SA1E-LTN3-2M</td>
<td>SA1E-LTP3-2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>SA1E-LTN3-5M</td>
<td>SA1E-LTP3-5M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td>SA1E-LTN3C</td>
<td>SA1E-LTP3C</td>
</tr>
<tr>
<td>Polarized Retro-reflective</td>
<td>10m [300mm]</td>
<td>Cable</td>
<td>1</td>
<td>SA1E-LPN3</td>
<td>SA1E-LPP3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>SA1E-LPN3-2M</td>
<td>SA1E-LPP3-2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>SA1E-LPN3-5M</td>
<td>SA1E-LPP3-5M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td>SA1E-LPN3C</td>
<td>SA1E-LPP3C</td>
</tr>
<tr>
<td>Background Suppression (BGS)</td>
<td>20 to 300 mm</td>
<td>Cable</td>
<td>1</td>
<td>SA1E-LBN3</td>
<td>SA1E-LBP3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>SA1E-LBN3-2M</td>
<td>SA1E-LBP3-2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>SA1E-LBN3-5M</td>
<td>SA1E-LBP3-5M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector</td>
<td>—</td>
<td>SA1E-LBN3C</td>
<td>SA1E-LBP3C</td>
</tr>
</tbody>
</table>

*1: Maintain at least the distance shown in [ ] between the photoelectric switch and reflector. Reflectors are not supplied and must be ordered separately.

* See the characteristics on P21.

* See the characteristics on P22.
### Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>SA1E-T</th>
<th>SA2E-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Voltage</td>
<td>12 to 24V DC (Operating range: 10 to 30V DC) equipped with reverse-polarity protection</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current Draw</th>
<th>Projector: 20mA maximum</th>
<th>Receiver: 20mA maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensing Range</td>
<td>20m</td>
<td></td>
</tr>
<tr>
<td>Adjustable Sensing Range</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Detectable Object</td>
<td>Opaque</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>—</td>
<td>20% maximum</td>
</tr>
<tr>
<td>Response Time</td>
<td>0.5ms maximum</td>
<td>0.5ms maximum</td>
</tr>
<tr>
<td>Sensitivity Adjustment</td>
<td>Single-turn control (approx. 240°)</td>
<td></td>
</tr>
<tr>
<td>Sensing Range Adjustment</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Light Source Element</td>
<td>Red LED</td>
<td>Red LED</td>
</tr>
<tr>
<td>Operation Mode</td>
<td>Light ON/Dark ON (select using the Operation Mode Switch)</td>
<td></td>
</tr>
<tr>
<td>Control Output</td>
<td>NPN open collector or PNP open collector (30V DC, 100 mA maximum with short circuit protection circuit)</td>
<td></td>
</tr>
<tr>
<td>Voltage drop:</td>
<td>2V max. (30V DC, 100mA)</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-30 to +55°C (no freezing)</td>
<td></td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>35 to 95% RH (no condensation)</td>
<td></td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40 to +70°C (no freezing)</td>
<td></td>
</tr>
<tr>
<td>Degree of Protection</td>
<td>IP67 (IEC60529)</td>
<td></td>
</tr>
<tr>
<td>Extraneous Light Immunity</td>
<td>Sunlight: 40,000 lux maximum, Incandescent lamp: 10,000 lux maximum (at receiver)</td>
<td></td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>Between live part and mounting bracket: 20 MΩ minimum (500V DC megger)</td>
<td></td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000V AC, 50/60 Hz, 1 minute (between live part and mounting bracket)</td>
<td></td>
</tr>
<tr>
<td>Vibration Resistance</td>
<td>10 to 55 Hz, amplitude 1.5mm</td>
<td></td>
</tr>
<tr>
<td>Shock Resistance</td>
<td>1000m/s²</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Case: PBT</td>
<td></td>
</tr>
<tr>
<td>Lens: PMMA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicator Model: PC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (approx.)</td>
<td>Cable Type: Projector: 50g, Receiver: 50g (*2)</td>
<td></td>
</tr>
<tr>
<td>Connector Type: Projector: 10g, Receiver: 10g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection Method: Cable Type: ø3.5mm, 3-core (2-core for through-beam), 0.2mm², vinyl calybrie cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connector Type: M8 connector (4-pin)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1: Maintain at least the distance shown below between the photoelectric switch and reflector.
IAC-RS/R5/R6/R7: 50mm, IAC-RS1/R5/R6: 150mm

*2: Cable length: 2m (50g when the cable length is 1m, 110g when the cable length is 5m.)
## SA2E/SA1E

### Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>SA2E-D/3S</th>
<th>SA2E-D/3M</th>
<th>SA2E-D/3L</th>
<th>SA2E-B/□</th>
<th>SA2E-N□</th>
<th>SA1E-X□</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Voltage</strong></td>
<td>12 to 24V DC (Operating range: 10 to 30V DC) equipped with reverse-polarity protection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current Draw</strong></td>
<td>20mA maximum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sensing Range</strong></td>
<td>100mm (using 200 × 200mm white paper)</td>
<td>500mm (using 200 × 200mm white paper)</td>
<td>1m (using 200 × 200mm white paper)</td>
<td>10 to 350mm (using 200 × 200mm white paper)</td>
<td>50 to 150mm (using 100 × 100mm white paper)</td>
<td>2m (using IAC-R9)</td>
</tr>
<tr>
<td><strong>Adjustable Sensing Range</strong></td>
<td>—</td>
<td>20 to 350mm (using 200 × 200mm white paper)</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Detectable Object</strong></td>
<td>Opaque/transparent</td>
<td>Opaque</td>
<td>Opaque/transparent</td>
<td>Opaque/transparent/mirror</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hysteresis</strong></td>
<td>20% maximum</td>
<td>5% maximum</td>
<td>20% maximum</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Response Time</strong></td>
<td>0.5ms maximum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sensitivity Adjustment</strong></td>
<td>Adjustable using a control (approx. 240°)</td>
<td>—</td>
<td>Adjustable using a control (approx. 240°)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sensing Range Adjustment</strong></td>
<td>—</td>
<td>Approx. 7-turn endless control</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Light Source Element</strong></td>
<td>Infrared LED</td>
<td>Red LED</td>
<td>Infrared LED</td>
<td>Red LED</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operation Mode</strong></td>
<td>Light ON/Dark ON (selectable) (select with the Operation Mode Switch)</td>
<td>Light ON/Dark ON (select by Part No.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control Output</strong></td>
<td>NPN open collector or PNP open collector (30V DC, 100mA maximum with short circuit protection circuit)</td>
<td>Voltage drop: 2V max. (30V DC, 100mA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LED Indicators</strong></td>
<td>Operation LED: Amber</td>
<td>Operation LED: Yellow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interference Prevention</strong></td>
<td>Two units can be mounted in close proximity.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Degree of Protection</strong></td>
<td>IP67 (IEC60529)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Extraneous Light Immunity</strong></td>
<td>Sunlight: 40,000 lux maximum, Incandescent lamp: 10,000 lux maximum (at receiver)</td>
<td>Sunlight: 10,000 lux maximum, Incandescent lamp: 5,000 lux maximum (at receiver)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>-30 to +55°C (no freezing)</td>
<td>-25 to +55°C (no freezing)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operating Humidity</strong></td>
<td>35 to 95% RH (no condensation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>-40 to +70°C (no freezing)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Insulation Resistance</strong></td>
<td>Between live part and mounting bracket: 20 MΩ minimum (50V DC megger)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dielectric Strength</strong></td>
<td>1,000V AC, 50/60 Hz, 1 minute (between live part and mounting bracket)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vibration Resistance</strong></td>
<td>10 to 55 Hz: amplitude 1.5mm 55 to 500 Hz, acceleration 90m/s² 1 cycle 5 mins 30 mins in each of 3 axes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shock Resistance</strong></td>
<td>1000m/s² 3 shocks in 6 directions on 3 axes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>Case: PBT</td>
<td>PC/PBT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lens</strong></td>
<td>PMMA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Indicator Model</strong></td>
<td>PC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Cable Type 50g</td>
<td>55g (*1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connector Type</strong></td>
<td>20g</td>
<td>20g</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connection Method</strong></td>
<td>Cable Type M3.5mm, 3-core, 0.2mm², vinyl cabletyre cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connector Type</strong></td>
<td>M8 connector (4-pin)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1: Cable length: 2m (35g when the cable length is 1m. 120g when the cable length is 5m.)
## Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>SA1E-L</th>
<th>SA1E-LP</th>
<th>SA1E-LB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Voltage</strong></td>
<td>12 to 24V DC (Operating range: 10 to 30V DC) equipped with reverse-polarity protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current Draw</strong></td>
<td>Projector: 15mA maximum Receiver: 30mA maximum</td>
<td>35mA maximum</td>
<td></td>
</tr>
<tr>
<td><strong>Sensing Range</strong></td>
<td>Through-beam: 30m Polarized Retro-reflective: 0.3 to 10m (using IAC-R5/R8/R9) 20 to 300mm (using 100 × 100mm white paper)</td>
<td></td>
<td>Background Suppression (BGS): 40 to 300mm</td>
</tr>
<tr>
<td><strong>Adjustable Sensing Range</strong></td>
<td></td>
<td>40 to 300mm</td>
<td></td>
</tr>
<tr>
<td><strong>Detectable Object Size (typical)</strong></td>
<td>ø6mm minimum (opaque, at 3m)</td>
<td>ø0.2mm minimum (copper wire, at 170mm)</td>
<td></td>
</tr>
<tr>
<td><strong>Detectable Object</strong></td>
<td>Opaque</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hysteresis</strong></td>
<td></td>
<td>10% maximum</td>
<td></td>
</tr>
<tr>
<td><strong>Response Time</strong></td>
<td>0.25ms maximum</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sensitivity Adjustment</strong></td>
<td>Adjustable using a control</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sensing Range Adjustment</strong></td>
<td>6-turn control knob</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Light Source Element</strong></td>
<td>Red laser diode (emission wavelength: 650nm) (IEC/JIS/FDA Class 1) (*1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operation Mode</strong></td>
<td>Light ON/Dark ON (selectable) (select with the Operation Mode Switch)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control Output</strong></td>
<td>NPN open collector or PNP open collector (30V DC, 100mA maximum with short circuit protection circuit) Voltage drop: 1.5V max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LED Indicators</strong></td>
<td>Operation LED: Yellow Stable LED: Green, Power LED: Green (Through-beam type projector only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interference Prevention</strong></td>
<td>Two units can be mounted in close proximity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Degree of Protection</strong></td>
<td>IP67 (IEC60529)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Extraneous Light Immunity</strong></td>
<td>Sunlight: 10,000 lux maximum, Incandescent lamp: 5,000 lux maximum (at receiver)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>-10 to +55°C (no freezing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>-25 to +70°C (no condensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage Humidity</strong></td>
<td>35 to 85% RH (no condensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Insulation Resistance</strong></td>
<td>Between live part and mounting bracket: 20 MΩ minimum (500V DC megger)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dielectric Strength</strong></td>
<td>Cable types: 1,000V AC, 50/60 Hz, 1 minute (between live part and mounting bracket) Connector types when connected with connector cable: 500V AC, 50/60 Hz, 1 minute (between live part and clamp ring)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vibration Resistance</strong></td>
<td>10 to 55 Hz, amplitude 1.5mm 1 cycle 5 mins 30 mins in each of 3 axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shock Resistance</strong></td>
<td>500m/s² 3 shocks in 6 directions on 3 axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>Housing: PBT, Lens: PMMA, Indicator cover: PC, knob: POM</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weight (approx.)</strong></td>
<td>Cable Type: 35g (*2) Connector Type: 20g</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connection Method</strong></td>
<td>Cable Type: ø3.5mm, 3-core, 0.2mm², vinyl cable Connector Type: M8 connector (4-pin)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1: Compliant with Class 1 of FDA regulations (21 CFR 1040.10 and 21 CFR 1040.11 according to Laser Notice No. 50).

*2: Cable length: 1m (55g when the cable length is 2m. 120g when the cable length is 5m.)
Slit and Sensing Range (typical) [Through-beam SA2E-T□]

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Slit Width: A (See P26.)</th>
<th>Sensing Range (m)</th>
<th>Minimum Detectable Object Width (mm) (*1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attached on: Receiver</td>
<td>Attached on: Receiver/Projector</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attached on: Receiver</td>
<td>Attached on: Receiver/Projector</td>
<td></td>
</tr>
<tr>
<td>SA9Z-S06</td>
<td>0.5mm</td>
<td>2.5</td>
<td>0.5</td>
</tr>
<tr>
<td>SA9Z-S07</td>
<td>1.0mm</td>
<td>3.5</td>
<td>1.0</td>
</tr>
<tr>
<td>SA9Z-S08</td>
<td>2.0mm</td>
<td>6.0</td>
<td>2.0</td>
</tr>
<tr>
<td>SA9Z-S09</td>
<td>0.5mm</td>
<td>2.0</td>
<td>0.5</td>
</tr>
<tr>
<td>SA9Z-S10</td>
<td>1.0mm</td>
<td>3.0</td>
<td>1.0</td>
</tr>
<tr>
<td>SA9Z-S11</td>
<td>2.0mm</td>
<td>5.5</td>
<td>2.0</td>
</tr>
<tr>
<td>SA9Z-S12</td>
<td>0.5mm</td>
<td>0.8</td>
<td>0.5</td>
</tr>
<tr>
<td>SA9Z-S13</td>
<td>1.0mm</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>SA9Z-S14</td>
<td>2.0mm</td>
<td>2.5</td>
<td>2.0</td>
</tr>
</tbody>
</table>

*1: At 1mm from receiver surface.

- The slit can be snapped onto the front easily. (See the figure below.)
- To order, see Ordering Part No. on page 23.

- Horizontal slits and round slits have an orientation. Make sure that the TOP marking comes on top of the sensor (LED side).

Slit and Sensing Range (typical) [Through-beam SA1E-LT□]

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Slit Width: A</th>
<th>Sensing Range (m)</th>
<th>Minimum Detectable Object Width (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Used on receiver</td>
<td>Used on receiver</td>
<td></td>
</tr>
<tr>
<td>SA9Z-S12</td>
<td>0.5mm</td>
<td>6</td>
<td>1.1</td>
</tr>
<tr>
<td>SA9Z-S13</td>
<td>1.0mm</td>
<td>10</td>
<td>1.6</td>
</tr>
<tr>
<td>SA9Z-S14</td>
<td>2.0mm</td>
<td>22</td>
<td>2.5</td>
</tr>
</tbody>
</table>

- When slit is mounted only on the receiver (when mounting on one side).
- Minimum detectable object width (mm): when the object is at the intermediate point between the projector and receiver.

Dimensions

All dimensions in mm

Material: Stainless Steel
Output Circuit & Wiring Diagram

**SA2E**
Through-beam, Polarized Retro-reflective, Diffuse-reflective, Background Suppression (BGS), Small-beam Reflective

**NPN Output**

**PNP Output**

**Through-beam Projector**

**SA1E–X Coaxial Polarized Retro-reflective (Transparent Object Sensing)**

**SA1E–L**

**NPN Output**

**PNP Output**

**Through-beam Projector**

**Connector Pin Assignment**

- OUT
- NC
- 0V
- +V

12V to 24V DC
Cable Type
Through-beam (SA2E-T)
Polarized Retro-reflective (SA2E-P)
Diffuse-reflective (SA2E-D)
Background Suppression (BGS) (SA2E-B)
Small-beam Reflective (SA2E-N)

*1: LED power indicator (green) for SA2E-T through-beam.
*2: The SA2E-T through-beam does not have a sensitivity control, operation mode switch, or stable LED.
*3: SA2E-B has a knob for setting sensing range (7-turn endless control).

Dimensions (SA2E/SA1E)
All dimensions in mm.

Coaxial Polarized Retro-reflective
(Transparent Object Sensing) (SA1E-X)
Dimensions (SA2E/SAD1E)

Connector Type
Through-beam (SA2E-T)
Polarized Retro-reflective (SA2E-P)
Diffuse-reflective (SA2E-D)
Background Suppression (BGS) (SA2E-B)
Small-beam Reflective (SA2E-N)

*1: LED power indicator (green) for SA2E-T through-beam.
*2: The SA2E-T through-beam does not have a sensitivity control, operation mode switch, or stable LED.
*3: SA2E-B has a knob for setting sensing range (7-turn endless control).

Coaxial Polarized Retro-reflective (Transparent Object Sensing) (SA1E-X)

*1: The connector length is 18 mm when a right-angle connector cable (SA9Z-CMBX-4L) is attached.
**Dimensions (SA1E–L)**

All dimensions in mm.

### Cable Type

**Through-beam**
- Polarized retro-reflective
- Background suppression (BGS)

![Diagram of Through-beam (SA1E-LT)](image)

### Connector Type

**Through-beam**
- Polarized retro-reflective
- Background suppression (BGS)

![Diagram of Through-beam (SA1E-LT)](image)

---

*1: No stable LED, sensitivity control, and operation mode switch are attached on the through-beam projector.

*2: Power LED (green) for through-beam projector.

*3: Cable length depends on models.

*4: The connector length is 18mm when a right-angle connector cable (SA9Z-CM8K-4L) is attached.
Characteristics (Typical) (SA2E)

(1) Through-beam SA1E-T

Excess Gain vs. Sensing Distance (Without slit)

Excess Gain vs. Sensing Distance (With vertical slit)

Excess Gain vs. Sensing Distance (With horizontal slit)

Excess Gain vs. Sensing Distance (With round slit)

Lateral Displacement (Without slit)

Lateral Displacement (With 0.5-mm vertical slit)

Lateral Displacement (With 1.0-mm vertical slit)

Lateral Displacement (With 2.0-mm vertical slit)

Lateral Displacement (With 0.5-mm horizontal slit)

Lateral Displacement (With 1.0-mm horizontal slit)

Lateral Displacement (With 2.0-mm horizontal slit)

Lateral Displacement (With ø0.5-mm round slit)

Lateral Displacement (With ø1.0-mm round slit)

Lateral Displacement (With ø2.0-mm round slit)
Characteristics (Typical) (SA2E)

(2) Polarized Retro-reflective SA2E-P

Excess Gain vs. Sensing Distance

Operating Area

Angle

(3) Diffuse-reflective SA2E-DS (100mm)

Excess Gain vs. Sensing Distance

Operating Area

Sensing Distance vs. Object Size

(4) Diffuse-reflective SA2E-DM (500mm)

Excess Gain vs. Sensing Distance

Operating Area

Sensing Distance vs. Object Size

(5) Diffuse-reflective SA2E-DL (1m)

Excess Gain vs. Sensing Distance

Operating Area

Sensing Distance

(6) Small-beam Reflective SA2E-N

Excess Gain vs. Sensing Distance

Operating Area

Sensing Area vs. Object Size
Characteristics (SA2E/SA1E)

(7) Background Suppression (BGS) SA2E-B

Operating Area (Preset 100 mm)

Light Beam Diameter vs. Sensing Distance

Hysteresis vs. Sensing Distance

Sensing Distance vs. Control (turns)

Color (200×200mm paper), material vs. Sensing Distance

(Preset 100mm)

Excess Gain vs. Sensing Distance

Operating Area

Angle

Light Beam Diameter vs. Distance

(8) Coaxial Polarized Retro-reflective (Transparent Object Sensing) (SA1E-X)

Excess Gain vs. Sensing Distance

Operating Area

Reflection Angle (°)
### Characteristics (Typical) (SA1E–L)

#### (1) Through-beam SA1E-LT

**Excess Gain (Without slit)**

- **Operation Level**
  - 1
  - 5
  - 10
  - 15
  - 20
  - 25
  - 30
  - 35
  - 40
  - 45
  - 50

- **Sensing Distance (m)**
  - 0
  - 10
  - 20
  - 30
  - 40
  - 50

**Excess Gain (With slit)**

- **Operation Level**
  - 1
  - 5
  - 10
  - 15
  - 20
  - 25
  - 30
  - 35
  - 40
  - 45
  - 50

- **Sensing Distance (m)**
  - 0
  - 10
  - 20
  - 25

**Lateral Displacement (Without slit)**

- **Operation Level**
  - 1
  - 5
  - 10
  - 15
  - 20
  - 25
  - 30
  - 35
  - 40
  - 45
  - 50

- **Sensing Distance X (m)**
  - 0
  - 5
  - 10
  - 25
  - 50

**Light Beam Diameter**

- **Angle (without slit)**
  - 0
  - 10
  - 20
  - 30
  - 40
  - 50

- **Sensing Distance X (m)**
  - 0
  - 5
  - 10
  - 15
  - 20
  - 25
  - 30
  - 35
  - 40
  - 45
  - 50

**Receiver Angle θ°**

- **Sensing Distance X (m)**
  - 0
  - 5
  - 10
  - 15
  - 20
  - 25
  - 30
  - 35
  - 40
  - 45
  - 50

**Excess Gain**

- **Operation Level**
  - 1
  - 5
  - 10
  - 15
  - 20
  - 25
  - 30
  - 35
  - 40
  - 45
  - 50

- **Sensing Distance (m)**
  - 0
  - 10
  - 20
  - 30
  - 40
  - 50

**Lateral Displacement**

- **Sensing Distance X (m)**
  - 0
  - 5
  - 10
  - 15
  - 20
  - 25
  - 30
  - 35
  - 40
  - 45
  - 50

**Light Beam Diameter**

- **Sensing Distance X (m)**
  - 0
  - 5
  - 10
  - 15

#### (2) Polarized Retro-reflective SA1E-LP

**Excess Gain**

- **Operation Level**
  - 1
  - 5
  - 10
  - 15
  - 20
  - 25
  - 30
  - 35
  - 40
  - 45
  - 50

- **Sensing Distance (m)**
  - 0
  - 10
  - 20
  - 30
  - 40
  - 50

**Lateral Displacement**

- **Sensing Distance X (m)**
  - 0
  - 5
  - 10
  - 15
  - 20
  - 25
  - 30
  - 35
  - 40
  - 45
  - 50

**Angle**

- **Sensing Distance X (m)**
  - 0
  - 5
  - 10
  - 15

**Light Beam Diameter**

- **Distance (m)**
  - 0
  - 5
  - 10
  - 15

---

Light beam diameter is a reference value by visual inspection.

<table>
<thead>
<tr>
<th>Light Beam Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø0.5</td>
</tr>
<tr>
<td>ø1.0</td>
</tr>
<tr>
<td>ø2.0</td>
</tr>
</tbody>
</table>

---

距离 (m)

1 2 3 4 5 6 7 8 9 10

---

反射器: IAC-R5/R8

反射器: IAC-R9
Characteristics (Typical) (SA1E–L)

(3) Background Suppression (BGS) SA1E-L

Operating Area (Preset 150mm)

Operating Position Y (mm)

Sensing Distance X (mm)

Operating Area (Preset 300mm)

Light Beam Diameter

Light Beam Diameter vs. Control (turns)

Color (100×100mm matte paper), material vs. Sensing Distance (Preset 150mm)

Color (100×100mm matte paper), material vs. Sensing Distance (Preset 300mm)

Light Beam Diameter

Characteristics (Typical) (SA1E–L)
## Accessories (SA2E/SA1E) (optional)

### Slits (for through-beam)

<table>
<thead>
<tr>
<th>Item</th>
<th>Slit Size</th>
<th>Part No.</th>
<th>Ordering No.</th>
<th>Package Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Slit</td>
<td>0.5mm × 18mm</td>
<td>SA9Z-S06</td>
<td>SA9Z-S06PN02</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1.0mm × 18mm</td>
<td>SA9Z-S07</td>
<td>SA9Z-S07PN02</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0mm × 18mm</td>
<td>SA9Z-S08</td>
<td>SA9Z-S08PN02</td>
<td></td>
</tr>
<tr>
<td>Horizontal Slit</td>
<td>0.5mm × 6.5mm</td>
<td>SA9Z-S09</td>
<td>SA9Z-S09PN02</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.0mm × 6.5mm</td>
<td>SA9Z-S10</td>
<td>SA9Z-S10PN02</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0mm × 6.5mm</td>
<td>SA9Z-S11</td>
<td>SA9Z-S11PN02</td>
<td></td>
</tr>
<tr>
<td>Round Slit</td>
<td>ø0.5mm</td>
<td>SA9Z-S12</td>
<td>SA9Z-S12PN02</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ø1.0mm</td>
<td>SA9Z-S13</td>
<td>SA9Z-S13PN02</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ø2.0mm</td>
<td>SA9Z-S14</td>
<td>SA9Z-S14PN02</td>
<td></td>
</tr>
</tbody>
</table>

### Reflectors (for polarized retro-reflective)

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No. (Ordering No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>IAC-R5</td>
</tr>
<tr>
<td>Small</td>
<td>IAC-R6</td>
</tr>
<tr>
<td>Large</td>
<td>IAC-R8</td>
</tr>
<tr>
<td>Narrow (rear/ side mounting)</td>
<td>IAC-R7M</td>
</tr>
<tr>
<td>Narrow (rear mounting)</td>
<td>IAC-R7B</td>
</tr>
<tr>
<td>Narrow (side mounting)</td>
<td>IAC-R7S</td>
</tr>
<tr>
<td>Tape Type (40 × 35mm)</td>
<td>IAC-RS1</td>
</tr>
<tr>
<td>Tape Type (60 × 70mm)</td>
<td>IAC-RS2</td>
</tr>
</tbody>
</table>

### Reflectors (used only for coaxial polarized retro-reflective)

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No. (Ordering No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflector</td>
<td>Standard</td>
</tr>
<tr>
<td></td>
<td>Small</td>
</tr>
<tr>
<td></td>
<td>Ultra-small</td>
</tr>
</tbody>
</table>

### Reflector Mounting Bracket

- For IAC-R5: IAC-L2
- For IAC-R6: IAC-L3
- For IAC-R8: IAC-L5

### Mounting Brackets

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No. (Ordering No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Mounting</td>
<td>SA9Z-K01</td>
</tr>
<tr>
<td>Horizontal Mounting</td>
<td>SA9Z-K02</td>
</tr>
<tr>
<td>Cover type</td>
<td>SA9Z-K03</td>
</tr>
<tr>
<td>Back Mounting</td>
<td>SA9Z-K04</td>
</tr>
</tbody>
</table>

### Air Blower Mounting Block

- Two mounting screws (M3 × 20mm sems screws), one M5 × 6mm screw for plugging the air supply port, and one gasket (0.5mm thick) are supplied.
- The air tube fitting and mounting bracket are not supplied and must be ordered separately. (Recommended mounting bracket: SA9Z-K01)
- Material: Anodized aluminum surface

### Connector Cable (for M8 connector type)

<table>
<thead>
<tr>
<th>Number of Core Wires</th>
<th>Style &amp; Length</th>
<th>Part No. (Ordering No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Straight, 2m</td>
<td>SA9Z-CM8K-4S2</td>
</tr>
<tr>
<td></td>
<td>Straight, 5m</td>
<td>SA9Z-CM8K-4S5</td>
</tr>
<tr>
<td></td>
<td>Right angle, 2m</td>
<td>SA9Z-CM8K-4L2</td>
</tr>
<tr>
<td></td>
<td>Right angle, 5m</td>
<td>SA9Z-CM8K-4L5</td>
</tr>
</tbody>
</table>

### Sensitivity Control Screwdriver

- Part No.: SA9Z-AD01
### Accessory Dimensions (SA2E/SA1E) (optional)

**Reflectors**

**IAC-R5**

![IAC-R5 Diagram](image1)

(Effective reflecting area: 47.2×47.2)

**IAC-R6**

![IAC-R6 Diagram](image2)

(Effective reflecting area: 30×31)

**IAC-R8**

![IAC-R8 Diagram](image3)

(Effective reflecting area: 47×47)

**IAC-RS1**

![IAC-RS1 Diagram](image4)

(t=0.5)

**IAC-RS2**

![IAC-RS2 Diagram](image5)

(t=0.5)

**IAC-R7M (rear/side mounting)**

![IAC-R7M Diagram](image6)

Note: The mounting plate for reflector must be 0.8 to 2.5mm in thickness.

**IAC-R7B (rear mounting)**

![IAC-R7B Diagram](image7)

Note: The mounting plate for reflector must be 0.8 to 2.5mm in thickness.

**IAC-R7S (side mounting)**

![IAC-R7S Diagram](image8)

Note: The mounting plate for reflector must be 0.8 to 2.5mm in thickness.

**IAC-R9**

Reflector for SA1E-X (Coaxial Polarized Retro-reflective)

![IAC-R9 Diagram](image9)

(Effective reflecting area: 47×47.6)

**IAC-R10**

![IAC-R10 Diagram](image10)

(Effective reflecting area: 38.5×16)

**IAC-R11**

![IAC-R11 Diagram](image11)

(Effective reflecting area: 18×18.2)
### Accessory Dimensions (SA2E/SA1E) (optional)

**Reflector Mounting Brackets**

**IAC-L2 (for IAC-R5)**

![IAC-L2 diagram](image)

**IAC-L3 (for IAC-R6)**

![IAC-L3 diagram](image)

**IAC-L5 (for IAC-R8)**

![IAC-L5 diagram](image)

Material: SPCC

### Connector Cable (connector on one end)

- **Straight**
  - SA9Z-CM8K-4S

- **Right-angle**
  - SA9Z-CM8K-4L

Note: Dielectric strength when installed on the unit: 1000V AC (between live part and mounting bracket, except between live part and tightening ring)

### Slit Dimensions

- **Vertical Slit**
  - SA9Z-S06
  - SA9Z-S07
  - SA9Z-S08

- **Horizontal Slit**
  - SA9Z-S10
  - SA9Z-S11

- **Round Slit**
  - SA9Z-S12
  - SA9Z-S13
  - SA9Z-S14

Note: For slit width A, see P13.

### Air Blower Mounting Block

**SA9Z-A02**

![Air Blower Mounting Block](image)

Material: Anodized aluminum surface

---

*IAC-L5 (for IAC-R8)*

![IAC-L5 diagram](image)

Material: SPCC

---

*IAC-L3 (for IAC-R6)*

![IAC-L3 diagram](image)

Material: SPCC

---

*Connector Cable (connector on one end)*

- **Straight**
  - SA9Z-CM8K-4S

- **Right-angle**
  - SA9Z-CM8K-4L

Note: Dielectric strength when installed on the unit: 1000V AC (between live part and mounting bracket, except between live part and tightening ring)

### Slit Dimensions

- **Vertical Slit**
  - SA9Z-S06
  - SA9Z-S07
  - SA9Z-S08

- **Horizontal Slit**
  - SA9Z-S10
  - SA9Z-S11

- **Round Slit**
  - SA9Z-S12
  - SA9Z-S13
  - SA9Z-S14

Note: For slit width A, see P13.

### Air Blower Mounting Block

**SA9Z-A02**

![Air Blower Mounting Block](image)

Material: Anodized aluminum surface

---

**IAC-L5 (for IAC-R8)**

![IAC-L5 diagram](image)

Material: SPCC

---

**Connector Cable (connector on one end)**

- **Straight**
  - SA9Z-CM8K-4S

- **Right-angle**
  - SA9Z-CM8K-4L

Note: Dielectric strength when installed on the unit: 1000V AC (between live part and mounting bracket, except between live part and tightening ring)

### Slit Dimensions

- **Vertical Slit**
  - SA9Z-S06
  - SA9Z-S07
  - SA9Z-S08

- **Horizontal Slit**
  - SA9Z-S10
  - SA9Z-S11

- **Round Slit**
  - SA9Z-S12
  - SA9Z-S13
  - SA9Z-S14

Note: For slit width A, see P13.

### Air Blower Mounting Block

**SA9Z-A02**

![Air Blower Mounting Block](image)

Material: Anodized aluminum surface
Safety Precautions

- Be sure to turn off the power before performing installation, removal, wiring, maintenance, or inspection work. Failure to do so could result in electric shock and fire.

Operating Instructions

Read the instruction manual carefully before performing installation, wiring, maintenance, and inspection work, and before operating this product. Be sure to use the product correctly.

For details about mounting methods, wiring, and maintenance, see the instruction manuals at the following URLs.

- URL SA2E: https://product.idec.com/?product=SA2E
- URL SA1E-X: https://product.idec.com/?product=SA1E-X
- URL SA1E-L: https://product.idec.com/?product=SA1E-L

Installation

- Do not install the sensors in areas subject to the following conditions. Otherwise malfunction and damage might occur.
  1) Inductive devices or heat sources
  2) Extreme vibration or shock
  3) Large amount of dust
  4) Harmful gas environment
  5) Water, oil, chemicals
  6) Outdoors

- Make sure to prevent sunlight, fluorescent light, and especially the fluorescent light of inverters from entering the receiver of the photoelectric switch directly. Keep the through-beam model receiver away from intense extraneous light.

- Interference prevention allows two photoelectric sensors to be mounted in close proximity. However, the through-beam model is not equipped with interference prevention. Maintain appropriate distance between the sensors referring to the lateral displacement characteristics.

- Because the photoelectric sensors are IP67 waterproof, the sensors can be exposed to water. However, wipe water drops and smears from the lens and slit using a soft cloth to make sure of the best detecting performance.

- Polycarbonate or acrylic resins are used for optical elements. Do not use ammonia or caustic soda for cleaning, otherwise the optical elements will be dissolved. To remove dust and moisture build-up, use a soft, dry cloth.

- Tighten the mounting screws (M3) to a torque of 0.5 N·m. Do not tighten the mounting screws excessively or hit the switch with a hammer, otherwise the protection degree cannot be maintained.

Product Information

USB Powered Portable Sensor Checker

- SA1P
  - Easily connects 24V DC devices at any location. An external USB battery can be used enabling easy device testing and continuity check for 24V DC devices without power outlets near by. Connects to PCs using a USB connector.

Photoelectric Sensors

- SA1U
  - Universal voltage types operate on 24-240V AC and 12-240V DC. DC power types operate on 12-24V DC. Four sensing methods (through-beam, polarized retro-reflective, diffuse-reflective, and background suppression).

Magnetic Proximity Sensors

- DPRI
  - The DPRI magnetic proximity switch incorporates a sealed reed switch and four magnets inside a compact housing. This self-contained proximity switch requires no external power supply and can detect the presence of magnetic objects without contact.
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(3) The specifications / appearance and accessories of IDEC products listed in Catalogs are subject to change or termination of sales without notice, for improvement or other reasons.
(4) The content of Catalogs is subject to change without notice.

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   ii. Safety design, including redundant design and malfunction prevention design that prevents other danger and damage even in the event that an IDEC product fails
   iii. Wiring and installation that ensures the IDEC product used in your system, machine, device, or the like can perform and function according to its specifications
(4) Continuing to use an IDEC product even after the performance has deteriorated can result in abnormal heat, smoke, fires, and the like due to insulation deterioration or the like. Perform periodic maintenance for IDEC products and the systems, machines, devices, and the like in which they are used.
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   ii. Use in applications that require a high degree of reliability, such as provision systems for gas / waterworks / electricity, etc., systems that operate continuously for 24 hours, and settlement systems
   iii. Use in applications where the product may be handled or used deviating from the specifications or conditions / environment listed in the Catalogs, such as equipment used outdoors or applications in environments subject to chemical pollution or electromagnetic interference
If you would like to use IDEC products in the above applications, be sure to consult with an IDEC sales representative.

3. Inspections
We ask that you implement inspections for IDEC products you purchase without delay, as well as thoroughly keep in mind management/maintenance regarding handling of the product before and during the inspection.

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(1) Warranty period
The warranty period for IDEC products shall be one (1) year after purchase or delivery to the specified location. However, this shall not apply in cases where there is a different specification in the Catalogs or there is another agreement in place between you and IDEC.
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Should a failure occur in an IDEC product during the above warranty period for reasons attributable to IDEC, then IDEC shall replace or repair that product, free of charge, at the purchase location / delivery location of the product, or an IDEC service base. However, failures caused by the following reasons shall be deemed outside the scope of this warranty.
   i. The product was handled or used deviating from the conditions / environment listed in the Catalogs
   ii. The failure was caused by reasons other than an IDEC product
   iii. Modification or repair was performed by a party other than IDEC
   iv. The failure was caused by a software program of a party other than IDEC
   v. The product was used outside of its original purpose
   vi. Replacement of maintenance parts, installation of accessories, or the like was not performed properly in accordance with the user’s manual and Catalogs
   vii. The failure could not have been predicted with the scientific and technical standards at the time when the product was shipped from IDEC
   viii. The failure was due to other causes not attributable to IDEC (including cases of force majeure such as natural disasters and other disasters).
Furthermore, the warranty described here refers to a warranty on the IDEC product as a unit, and damages induced by the failure of an IDEC product are excluded from this warranty.

5. Limitation of liability
The warranty listed in this Agreement is the full and complete warranty for IDEC products, and IDEC shall bear no liability whatsoever regarding special damages, indirect damages, incidental damages, or passive damages that occurred due to an IDEC product.

6. Service scope
The prices of IDEC products do not include the cost of services, such as dispatching technicians. Therefore, separate fees are required in the following cases.
(1) In case of / for installation / adjustment and accommodation at test operation (including creating application software and testing operation, etc.)
(2) Maintenance inspections, adjustments, and repairs
(3) Technical instructions and technical training
(4) Product tests or inspections specified by you
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EP1750-4

Miniature Photoelectric Sensors (Built-in Amplifier)/Laser Model

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